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VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 1. AIR NAVIGATION AND COMMUNICATIONS

Section 1. Navigation: General Concepts and Guidance

5.1.1.1. GENERAL. This section provides an introduction to the chapter and an explanation of navigational concepts, direction, and guidance to be used by General Authority of Civil Aviation (GACA) aviation safety inspectors (Inspectors) when evaluating compliance with applicable navigation, communication and surveillance requirements prescribed for air operators. It also discusses methods and requirements necessary to approve or deny requests for certain operations that require GACA approval. These approvals may include the use of an aircraft and/or navigation systems new to that operator and/or proposed operations into new areas of operation using previously approved aircraft and navigational systems.

A. Evaluation of Aircraft Navigation Equipment. Due to the complex nature of air navigation, navigational requirements for flight operations, and the wide variation in air traffic control (ATC) separation standards used in these operations, Inspectors should evaluate each proposed operation and assess the operator's capability to operate an appropriately equipped aircraft including pilot training and procedures, in environments requiring differing navigational accuracies under a wide variety of meteorological conditions.

B. Evaluating Operations. This chapter provides guidance for evaluating operations using navigational systems that have established operational characteristics and limitations within airspace having particular and unique navigational requirements or tolerances. When an operator requests an approval to use a means of navigation not addressed by this guidance, the request must be forwarded to the Director, Flight Operations Division, and the Director, Airworthiness Division, when applicable.

C. The Objective of Air Navigation. In aviation, the following objectives of air navigation and navigational systems are necessary:

1) The first objective is to avoid all obstacles while en-route and to arrive safely and efficiently at the intended destination.

2) The second objective is to efficiently fly an intended route with enough precision to permit air traffic controllers to safely separate aircraft.

D. General Concepts. Early in aviation, only a few aircraft operated within any given area at the same time. The most demanding navigational requirements were to avoid obstacles and arrive at the intended destination with enough fuel remaining to safely complete a landing. As aviation evolved, the volume of air traffic grew and a corresponding need to prevent collisions increased. Today, the most significant and demanding en route navigational requirement in aviation is the need to safely separate aircraft. There are several factors that must be understood concerning the separation of aircraft by air traffic control (ATC).

1) When ATC does not have a means of surveillance, such as radar or Automatic Dependent Surveillance (ADS) to verify air traffic positions, ATC must rely entirely on pilot position reports relayed from an aircraft to determine its actual geographic position and altitude. In this situation, the flight crew's precision in navigating the aircraft and their timely transmittal of accurate position reports are critical to ATC's ability to provide safe separation.

2) When ATC does have a means of surveillance to verify the aircraft's position, precise navigation and position reports, when required, are a means of providing continuing safe separation. Flight safety in instrument flight rules (IFR) operations depends directly on the operator's ability to achieve and maintain certain levels of navigational performance. ATC radar or ADS is used to monitor navigational performance, detect navigational deviations, and expedite traffic flow.

3) The control of air traffic requires that a certain level of navigational performance be achieved by aircraft operating under visual flight rules (VFR) to ensure safe separation of aircraft and to expedite the flow of air traffic.

a) During cruising flight, the VFR flight altitude appropriate to the direction of flight must be maintained to ensure the required vertical separation between VFR and IFR aircraft and to assist in the prevention of collision between VFR aircraft.

b) Any aircraft operating in accordance with ATC instructions must navigate with the level of accuracy required to comply with ATC instructions.

c) If a clearance to enter controlled airspace has not been received, the flight crew must navigate the aircraft with sufficient precision to avoid that airspace.

d) A pilot must navigate VFR aircraft with sufficient precision to:

1. Avoid weather conditions that would prevent visual contact with terrain and other aircraft.

2. Locate a suitable aerodrome and land safely without requiring assistance from air traffic service (ATS) providers.

5.1.1.3. RELEVANT STANDARDS FOR INTERNATIONAL AIR NAVIGATION AS PROMULGATED BY THE INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO).

A. General.

1) The need to ensure protection of persons and property both in flight and on the ground is fundamental to the General Authority of Civil Aviation Regulations (GACARs). Many of the design and performance requirements in aircraft certification rules are established to provide this protection. This protection is also extensively addressed in the operating and equipment rules related to air navigation. It is important that the regulations provide this protection equally to persons and property in flight and on the ground. Approvals of route and areas of en-route operation must take into account the need to protect persons and property in flight and on the ground.

2) The foundation for the International Civil Aviation Organization (ICAO) was established on December 7, 1944, when the text of the convention was opened for signature in Chicago, Illinois. This document (ICAO Doc 7300) is referred to as the "ICAO Convention" or the "Chicago Convention." This "Convention" contains 96 Articles known as the Articles of the Convention. By signing the Convention, a government (State) agrees to abide by "certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically." The Articles of the Convention represent those certain principles and arrangements and serve as the foundation for international aviation laws, standards, recommended

practices and guidance material. Articles 44 through 66 established ICAO as a body within the United Nations. Articles 1 through 43 established general principles concerning international air navigation. The following are some of the more significant articles that relate to air navigation:

a) *Article 1* recognizes that each State has complete and exclusive sovereignty over the airspace above its territory.

b) *Article 3* states that the convention applies only to civil aircraft and that each State will require their state aircraft to operate with due regard for the safety of navigation of civil aircraft.

c) *Article 11* requires that the international air navigation laws and regulations of a contracting State relating to “the operation and navigation of such aircraft while within its territory, shall be applied to the aircraft of all contracting States without distinction to nationality, and shall be complied with by such aircraft upon entering or departing from or while within the territory of that state.”

d) *Article 12* is the most significant requirement related to flight operations (Rules of the Air). This Article requires that “each contracting State undertakes to adopt measures to ensure that every aircraft over or maneuvering within its territory and that every aircraft carrying its nationality mark, wherever such aircraft may be, shall comply with the rules and regulations relating to the flight and maneuver of aircraft, there in force.” This Article also requires that “over the high seas, the rules in force shall be those established under this convention. Each contracting State undertakes to ensure the prosecution of all persons violating the regulations applicable.”

e) *Article 37* requires each contracting State to achieve the highest practicable degree of uniformity with ICAO standards and recommended practices, in matters related to the safety, regularity, and efficiency of air navigation.

3) The Articles of the ICAO convention contain basic principles that are the foundation for ICAO annexes. ICAO annexes contain the Standards and Recommended Practices (SARPs) that have been adopted through international agreement to ensure the safety, regularity, and efficiency of air navigation. An ICAO standard is worded in mandatory language (shall, must, will) and is directive in nature. A recommended practice is worded in permissive language (should, may, can) and is not directive. Recommended practices represent practices that, although internationally recognized as safe operating practices, are not sufficiently comprehensive or lack the mature development appropriate for an international standard. The following are the ICAO annexes that are most significant to GACA Inspectors (Operations):

a) Annex 1, Personnel Licensing.

b) Annex 2, Rules of the Air.

c) Annex 6, Operation of Aircraft.

d) Annex 11, Air Traffic Services.

4) ICAO Annex 2 specifies international rules of the air agreed upon by ICAO member States. These rules are equivalent to the GACARs for operating within the territory of the Kingdom of Saudi Arabia (KSA). However, for

operations over the high seas, Annex 2 is unique since it relates to flight and maneuver of aircraft within the meaning of Article 12 of the convention. Over the high seas, Annex 2 applies without exception (compliance is mandatory for all civil aircraft). Annex 2 is incorporated by reference into GACAR § 91.475 (a)(1), and requires each person operating a civil aircraft of KSA registry outside the Kingdom of Saudi Arabia to comply with Annex 2 when operating over the high seas. The sections of Annex 2 most relevant to the discussion of air navigation are Chapter 3, General Rules, and Chapter 5, Instrument Flight Rules.

a) Chapter 3, paragraph 3.3 specifies requirements for ATC flight plans and paragraph 3.6 specifies requirements for ATC services.

b) Chapter 3, paragraph 3.6.2 requires an aircraft to adhere to its "current flight plan" (currently effective ATC clearance), to operate along the defined centerline of any ATS route used, and on any other route to operate directly between the points defining that route.

c) Chapter 3, paragraph 3.6.5 requires that the flight crew of any aircraft operated as a controlled flight to maintain a continuous listening watch on and establish two-way communication as necessary with (as required for air traffic control) the appropriate radio frequency of the appropriate ATC unit.

d) Chapter 5, paragraph 5.1.1 requires aircraft to be equipped with suitable instruments and navigational equipment appropriate to the route the pilot will fly.

e) Chapter 5, paragraph 5.2.1 requires all IFR flights to comply with the provisions of paragraph 3.6 when operating in controlled airspace.

f) These requirements, as specified in chapters 3 and 5 of Annex 2, mean that the aircraft must be navigated to the degree of accuracy required for ATC. Flight crews must maintain a continuous listening watch and communicate with ATC as necessary for the purpose of ATC.

g) ICAO Doc 7030, Regional Supplementary Procedures, forms the procedural part of the Air Navigation Plan developed by ICAO Regional Air Navigation (RAN) Meetings to meet those needs of specific areas that are not covered in the world-wide provisions. Flight crews must be aware of the regional procedures and NOTAMs for the areas in which they plan on operating, that complement the statement of requirements for facilities and services contained in the Air Navigation Plan publications. Procedures of world-wide applicability are either included in Annexes to the Convention as Standards and Recommended Practices (SARPs) or they form part of one of the documents titled, "Procedures for Air Navigation Services (PANS)."

5) ICAO Annex 6 has two parts applicable to fixed-wing aircraft. Part I specifies requirements for aircraft engaged in scheduled international air services and nonscheduled international air transport operations for compensation or hire. Part I applies to airplanes operated under the General Authority of Civil Aviation Regulation (GACAR) Part 121 and 135. Part II specifies requirements for international general aviation operations and this applies to airplanes operated under the General Authority of Civil Aviation Regulation (GACAR) Part 125. The purpose of Annex 6, Part I, is to facilitate safety in international airspace by providing standards for safe navigational operating practices. Part I also contributes to the efficiency and regularity of international air navigation by encouraging States to facilitate passage of other States' aircraft over their territories by operating in conformity with such standards. The application of Annex 2 to international operations differs slightly from Annex 6. A state may take exception (have different criteria) to Annex 2 standards for operations conducted in its sovereign

airspace; however, no State can take exception to Annex 2 standards for operations conducted over the high seas. Annex 2, which specifies the international rules of the air, applies to all operations over the high seas without exception. Under Annex 6 standards, a State may take exception for operations in its sovereign airspace and for operation of its aircraft over the high seas. For air navigation, the most relevant section of Annex 6 is Chapter 7, Aeroplane Communication and Navigation Equipment. This Chapter contains ICAO SARPs related to navigation and communication. Pertinent elements of these SARPs are described as follows:

a) Each aircraft must have radio communication equipment capable of receiving meteorological information during the flight and conducting two-way communication at any time during the flight with aeronautical stations on frequencies prescribed by the appropriate authority. This requirement cannot be routinely satisfied by relaying reports through other aircraft.

b) Each aircraft must have navigational equipment that enables it to proceed in accordance with its operational flight plan and the requirements of ATS services. Operations in MNPS airspace or routes or airspaces where a performance based navigation specification (PBN) has been established require navigational equipment that continuously provides information to the flight crew regarding adherence to or departure from track with respect to the required degree of accuracy at any point along that track. Any operation in MNPS or RNAV/RNP routes or airspace must be authorized by the State responsible for that operator.

c) Each aircraft must have enough navigation equipment installed and operational to ensure that, if one item of equipment fails at any time during the flight, the remaining equipment will be sufficient to enable navigation to the degree of accuracy (and to ensure continuity of service) required for ATC. Additionally, failure of any single unit required for communication or navigation purposes, or both, must not result in the loss of another required unit.

6) ICAO Annex 11 pertains to the establishment of airspace, ATC units, and services necessary to promote a safe, orderly, and expeditious flow of air traffic. A clear distinction is made between ATC service, flight information service, and alerting service. Its purpose, together with Annex 2, is to ensure that flying on international air routes is carried out under uniform conditions designed to improve the safety and efficiency of air operation. The SARPs in Annex 11 apply in those parts of the airspace under the jurisdiction of a Contracting State where air traffic services are provided and a Contracting State accepts the responsibility of providing air traffic services over the high seas or in airspace of undetermined sovereignty. A Contracting State accepting such responsibility may apply the SARPs in a manner consistent with that adopted for airspace under its jurisdiction.

B. Relationship Between the GACARs, ICAO Annexes, and Foreign National Regulations. The General Authority of Civil Aviation Regulations (GACARs) represents the regulatory implementation of the responsibilities assigned by the Civil Aviation Law and the implementation of the principles derived from the ICAO convention. The relationship between the GACARs, ICAO Annexes, and foreign national regulations are as follows:

1) GACAR Part 91 regulates the operation of all civil and public aircraft within the KSA and specifies minimum capabilities necessary to navigate to the degree of accuracy required for air traffic control. It also regulates the operation of civil aircraft of KSA registry outside the KSA. The following are examples of GACAR Part 91 regulations applicable outside the KSA:

a) GACAR § 91.475 (a)(1) requires each person operating a Saudi Arabian-registered aircraft to comply with ICAO Annex 2 when over the high seas and to comply with the regulations of a foreign country when operating within that country's airspace. This includes any local aerodrome rules that may be in force.

b) GACAR § 91.475 (a)(3) requires compliance with GACAR Part 91 when not in conflict with the regulations of a foreign nation or Annex 2.

2) In addition to GACAR Part 91 requirements in paragraph 1) above, for operators conducting operations under Part 121, GACAR § 121.9, specifies that these operators, when operating within a foreign country, must comply with the following:

a) Each certificate holder must, while operating an aircraft outside of the Kingdom of Saudi Arabia (KSA), comply with GACAR § 91.475, except where any rule of this part is more restrictive and may be followed without violating the rules of that country.

b) Annex 2 when over the high seas, in accordance with GACAR § 91.475.

3) The regulations listed below are in addition to GACAR Part 91 requirements. For operators conducting operations under GACAR Part 125, GACAR § 125.3 specifies that operators, comply with the following, when operating within a foreign country:

a) Each certificate holder must, while operating an aircraft outside of the KSA, comply with GACAR § 91.475, except where any rule of this part is more restrictive and may be followed without violating the rules of that country.

b) Annex 2 when operating over the high seas, in accordance with GACAR § 91.475.

4) The following regulations are in addition to GACAR Part 91 requirements. For operators conducting operations under GACAR Part 135, GACAR § 135.3 specifies that while operating outside the KSA, these operators must comply with the following:

a) Each certificate holder, while operating an aircraft in a country other than the Kingdom of Saudi Arabia, must comply with GACAR § 91.475, except where any rule of this part is more restrictive and may be followed without violating the rules of that country.

b) Annex 2, when operating over the high seas, in accordance with GACAR § 91.475.

5) GACAR Part 91 regulates the operation of all civil aircraft within the KSA and specifies minimum capabilities necessary to navigate to the degree of accuracy required for air traffic control.

C. Relationship of the GACARs to Air Navigation.

1) The GACARs related to air navigation have been promulgated to accommodate the need to efficiently handle a continuous growth in air traffic, and advances in air navigation technology, ATS techniques, and ATS equipment. Certain regulations, such as those requiring filing an ATS flight plan and complying with ATC clearances, are clearly related to this objective. The ATS system presumes compliance with all of the regulations related to air

navigation. Any noncompliance with these regulations can seriously degrade the ability to separate aircraft.

2) Examples of operational GACARs related to air navigation and the objective of safely separating aircraft include the following:

a) GACAR § 91.93 (b) (1)(2), Course to be flown.

b) GACAR § 91.101, Compliance with ATC Clearances and Instructions.

c) GACAR § 91.127, Operation in Class D Airspace.

d) GACAR § 91.129, Operation in Class C Airspace.

e) GACAR § 91.131, Operation in Class B Airspace.

f) GACAR § 91.135, Operations in Class A Airspace.

g) GACAR § 91.141, Temporary Flight Restrictions in the Vicinity of Disaster/Hazard Areas.

h) GACAR § 91.167, Special VFR Weather Minimums.

i) GACAR § 91.169, VFR Cruising Altitude.

j) GACAR § 91.185, IFR Flight Plan: Information Required.

k) GACAR § 91.183, ATC Clearance and Flight Plan Required.

l) GACAR § 91.201, IFR Cruising Altitude or Flight Level.

m) GACAR § 91.407, Minimum Navigation Performance Specifications Operations.

n) GACAR § 91.409, Reduced Vertical Separation Minimum Operations.

o) GACAR § 91.475, Operations of Saudi Arabian-Registered Civil Aircraft Outside of the Kingdom of Saudi Arabia.

p) GACAR Part 91, Appendix C, Section IX, Communication Equipment.

D. Regulations Specifying Air Navigation Equipment Requirements. The basic air navigation equipment requirements are prescribed in GACAR § 91.303 and the related sections of Appendix C (Sections VII to Section X). These requirements relate directly to the air navigation objective of safely separating aircraft. Some of these equipment rules specifically relate to the operational requirement of navigating to the degree of accuracy required for ATS. The air navigation equipment rules prescribed in GACAR Part 91 are supplemented by other requirements prescribed in GACAR Part 91, 121, 125 and 135 to address certain specialized operations. Operations specifications (OpSpecs) issued to those operators contain specific authorizations, limitations, and conditions under which compliance is required by operators conducting flights under those GACAR parts.

E. Essential Elements of Required Navigation Equipment. The essential elements of required navigation equipment that apply to all operations are prescribed in Section X of Appendix C to GACAR Part 91 are excerpted and reprinted here:

X. Navigation Equipment.

(a) ***All flights —***

(1) Navigation equipment that will enable the aircraft to proceed in accordance with the flight plan and with the requirements of Air Traffic Service (Air Traffic Service) except when navigation for flights under the VFR, if not so precluded by the appropriate authority, is accomplished by visual reference to landmarks.

(2) An operator must not employ electronic navigation data products that have been processed for application in the air and on the ground unless the operator has procedures for ensuring the process applied and the products delivered have met acceptable standards of integrity and the products are compatible with the intended function of the equipment that will use them. An operator must implement procedures to ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aircraft requiring it.

(3) The navigation equipment must be installed so that the failure of any single unit required for navigation purposes will not result in the failure of another unit required for communications or navigation purposes.

(b) ***All IFR flights and all flights of transport and commuter category aircraft***. Sufficient radio navigation equipment to permit the pilot, in the event of the failure at any stage of the flight of any item of that equipment, including any associated flight instrument display—

(1) To proceed to the destination aerodrome or proceed to another aerodrome suitable for landing; and

(2) Where the aircraft is operated in IMC, to complete an instrument approach and, if necessary, conduct a missed approach procedure.

F. Other Operating Rule Requirements.

1) Other sections of GACAR Part 91 specify navigation and communications equipment necessary for operations in Saudi Arabian airspace. The following are examples of other GACAR Part 91 equipment requirements, with clarification when appropriate.

a) GACAR §91.187, VOR Equipment Check for IFR Operations.

b) GACAR § 91.303, Instruments and Equipment Requirements: Powered Saudi Arabian-Registered Aircraft with Standard Airworthiness Certificates.

c) GACAR § 91.173, Use of Aircraft Lights.

d) GACAR § 91.229, Use of ATC Transponder and Altitude Reporting Equipment.

e) GACAR § 91.231, Data Correspondence Between Automatically Reported Pressure Altitude Data and the Pilot's Altitude Reference.

f) GACAR § 91.235, § 91.235, Use of Altitude Alerting System or Device: Turbojet-Powered Civil Airplanes.

g) GACAR § 91.237, Use of Airborne Collision Avoidance System Equipment.

2) GACAR Part 121 specifies the navigational equipment necessary for all operations conducted under that part, including operations outside the KSA. These requirements are in addition to the navigational equipment requirements of GACAR Part 91, but do not require duplication of any equipment specified in Part 91. All GACAR Part 121 en-route requirements reflect the concept of "demonstrated ability." The following are examples of GACAR Part 121 navigation equipment requirements.

a) The operator must show that it is able to conduct satisfactory operations over the routes and areas in which it operates. Approvals in areas and on specific routes are granted in OpSpecs and listed by "area of en-route operation" and specific route, when appropriate.

b) GACAR §121.97, En-Route Navigational Facilities.

1. GACAR § 121.97 implements the concept of "navigation performance" when conducting IFR navigation using nonvisual ground aids. Nonvisual ground aids are electronic Navigational Aids (NAVAID), but not necessarily limited to VOR, DME, or NDB. When required, each GACAR Part 121 operator must show that nonvisual ground aids are available and are located to allow navigation to the degree of accuracy required for ATS and the type of operation involved.

2. Area navigational systems (including space-based systems such as global navigation satellite system (GNSS)) that are certified for IFR flight in areas where domestic ATS procedures are applied, meet the intent of GACAR § 121.97.

3. GACAR § 121.97 does not apply to VFR pilotage operations, or long-range navigation operations using an inertial navigation system (INS).

c) GACAR § 121.513, Aircraft Instruments and Equipment.

d) GACAR § 121.521 Communication and Navigation Equipment.

e) GACAR § 121.525 Communication and Navigation Equipment for Extended Over-Water Operations and for Certain Other Operations.

NOTE: The intent of GACAR §§ 121.521 and 121.525 is met when any navigation operation is predicated on the following equipment:

a. For conventional point-to-point navigation in continental areas along (and within the service volumes) of ATS routes defined by VOR/DME and ADF navigational aid (NAVAIDS) when navigation operation is predicated on the following equipment:

o *VOR*: Provided dual independent VOR equipment is installed and operable in the aircraft

o *NDB*: Provided dual independent ADF equipment is installed and operable in the aircraft. However, if one ADF system and a dual independent VOR system are installed and operable, the intent of Part 91, Appendix C and GACAR § 121.521 is met provided VOR NAVAIDs are located at ground positions that would permit the flight to safely proceed (from any point along the route) to a suitable airdrome and complete an instrument approach without using ADF equipment

o *RNAV Systems*: Provided either dual independent RNAV systems certified under the appropriate guidance are installed and operable or if the capability exists to revert to VOR or NDB, a single RNAV system is installed and operable

b. For oceanic and remote operations when navigation operation is predicated on the following equipment:

o Long range navigation systems (LRNS) (such as INS, IRS, LORAN-C, GNSS, etc.) provided dual independent LRNS equipment certified under the appropriate guidance is installed and operable in the aircraft

NOTE: For operations in airspace areas designated with a performance-based navigation specification (e.g., PBN and MNPS), the aircraft must be equipped and certificated capable of navigating at the designated performance level.

NOTE: The intent of the GACARs with respect to navigation requirements is that when conducting VFR over the top operations, IFR operations, operations in extremely remote areas and overwater operations to include polar operations; the aircraft should be equipped with two independent navigation systems of the type required for that operation. (See GACAR Part 91, Appendix C, Section X, (a) and (b)).

5.1.1.5. NAVIGATION CONCEPTS.

A. Concept of Navigation Performance. The concept of navigation performance involves the precision that must be maintained for both the assigned route and altitude by an aircraft operating within a particular area. Navigation performance is affected by the deviation (for any cause) from the route of flight specified in the ATC clearance. This includes errors due to degraded accuracy and reliability caused by the design and maintenance of airborne and ground-based navigational equipment and the flight crew’s competency.

1) The concept of navigational performance is fundamental to the regulations. GACAR § 91.101 requirements related to compliance with ATC clearances and instructions also reflect this fundamental concept. The concept of navigational performance is also inherent in ICAO Standards and Recommended Practices (SARPs). For example, Annex 2 states that the aircraft “shall adhere to its current flight plan” (comply with the currently effective ATC clearance) and “when on an established air traffic service (ATS) route, operate along the defined centerline of that route.”

2) Performance based navigation (PBN) operations permit flight in any airspace with prescribed accuracy tolerances without the need to fly directly over ground-based navigation facilities. The application of PBN techniques in various parts of the world has already been shown to provide a number of advantages over more conventional forms of navigation.

3) PBN performance standards are being used and applied by aircraft and aircraft equipment manufacturers, airspace

planners, aircraft certification and operations, pilots and controllers, and international aviation authorities. PBN, along with other aspects of communications, navigation, and surveillance, can be applied to obstacle clearance or aircraft separation requirements to ensure a consistent application level. PBN is a concept that applies to navigation performance within defined airspace, and therefore affects both the airspace and the aircraft. PBN is intended to characterize a particularly defined airspace through a statement of the navigation performance accuracy (RNAV/RNP type) to be achieved within the airspace. The RNAV/RNP type is based on a navigation performance accuracy value that is expected to be achieved by the population of aircraft operating within the airspace 95 percent of the time. Required levels of navigation performance (standards) vary from area to area, depending on traffic density and complexity of the routes flown. The implementation of PBN is part of ICAO's Global Air Navigation Plan for Communication, Navigation, and Surveillance (CNS) and supports ICAO's air traffic management (ATM) concepts. The end state of the transition is the implementation of free flight, allowing user-defined trajectory. The development of the PBN concept recognizes that current aircraft navigation systems are capable of achieving a predictable level of navigation performance accuracy and that a more efficient use of available airspace can be realized on the basis of this navigation capability. The carriage of specialized navigation equipment is a requirement in some regions and may become a requirement in others.

B. Concept of Operational Service Volume. Operational service volume is that volume of airspace surrounding an ICAO standard airways navigation facility that is available for operational use. Within that volume of airspace, a signal of usable strength exists that is not operationally limited by co-channel interference. Within this volume of airspace (the operational service volume), an ICAO standard ground-based NAVAID signal in space conforms to flight inspection signal strength and course quality standards including frequency protection. ICAO standard ground-based NAVAIDs are VOR, VOR/DME, and NDB. GNSS has been accepted by ICAO as a standard NAVAID, however, a distinction is made between "standard ground based NAVAIDs" and "standard NAVAIDs." "Standard ground-based NAVAIDs" have an operational service volume and "standard NAVAIDs" do not. The airspace of ICAO contracting member States are based on the operational service volume of these ground-based facilities, but GNSS, by virtue of its universal signal coverage, is not restricted to an operational service volume. Navigational performance within the operational service volume and ATC separation minima can be predicated by the use of both standard ground-based NAVAIDs and standard NAVAIDs. The concept of operational service volume is critical for understanding and applying the principles of air navigation, as discussed in this handbook.

NOTE: ICAO Doc. 9613, titled the Performance-Based Navigation (PBN) Manual provides complete details concerning PBN concepts and implementation.

C. Categories of Navigational Operations. A thorough comprehension of the categories of navigational operations is essential to understand air navigation concepts and requirements discussed in this handbook and other documents. Understanding the categories of navigational operations is also essential for evaluating an operator's ability to navigate to the degree of accuracy required for the control of air traffic. In the broad concept of air navigation, four principal categories of navigational operations are identified:

1) Conventional point-to-point navigation in continental areas along (and within the operational service volumes) of ATS routes defined by ICAO standard ground-based NAVAIDs (VOR, VOR/DME, NDB).

a) Conventional point-to-point navigation includes VFR or IFR navigation operations on the following:

- Airways

• IFR direct routes in the KSA

• IFR off airway routes in the KSA

• Airways, Advisory Routes (ADRs), direct routes, and off airway routes published or approved by a foreign government, provided that these routings are continuously within the operational service volume (or foreign equivalent) of ICAO standard ground based NAVIDs

2) Oceanic and remote areas navigation using long range navigation systems (LRNS) outside of a route structure defined by ICAO standard ground-based NAVAIDs (VOR, VOR/DME, NDB).

NOTE: This category also includes navigation in continental areas along ATS routes defined by ICAO standard ground-based NAVAIDs (VOR, VOR/DME, and NDB) but OUTSIDE the operational service volumes of the NAVAIDs.

3) Performance-based area navigation (PBN)

NOTE: For the purposes of this Section, PBN includes operations in MNPS and RVSM airspace.

4) All other navigation (including pilotage, dead reckoning, celestial navigation, etc.)

NOTE: This fourth category of navigation operations has limited relevance in today's world of aviation and it will not be addressed in detail in this Chapter.

D. ATC Separation Minima.

1) Navigation requirements are directly related to separation minima used by ATC. IFR separation minima applied in most countries are based on the use of ICAO standard ground-based NAVAIDs. However, these separation minima can only be applied by ATC within areas where the ground-based NAVAID signal in space meets flight inspection signal strength and course quality standards. An ICAO standard ground-based NAVAID signal in space conforms to flight inspection signal strength and course quality standards, including frequency protection, within its designated operational service volume. Therefore, air navigation and the safe separation of aircraft within that service volume can be predicated on the use of these facilities.

2) Within areas where the safe separation of aircraft is based on the use of ICAO standard ground-based NAVAIDs, any IFR operation must be navigated with at least the same accuracy as the accuracy specified by the appropriate national separation minima.

E. Concept of the Degree of Accuracy Required for Control of Air Traffic. The fundamental concept for all IFR navigation standards, practices, and procedures is that all IFR aircraft must be navigated to the degree of accuracy required for control of air traffic.

1) When a flight adheres to the clearance assigned by ATC at all times, that aircraft is considered to be navigated to the degree of accuracy required for the control of air traffic. If an aircraft makes an unauthorized deviation from its assigned clearance that aircraft has not been navigated to the degree of accuracy required for control of air traffic.

2) ATC separation minima establish the minimum lateral, vertical, and longitudinal distances that are used to safely separate aircraft operating within a specified area. Separation minima also represent the minimum level of overall navigation performance and a buffer that can be accommodated at any time without jeopardizing safety of flight. These separation minima have been established for IFR operations in controlled airspace. These standards are usually established through international agreement and implemented through national regulations. These minima are established for particular categories of navigational operation and specified areas. Examples of particular categories of navigational operations and specified areas include navigation on airways in the national airspace of ICAO member States and long-range navigation in oceanic or remote land areas.

3) For operations where ATC services are provided by the GACA ANS Sector, separation minima are established by GACAR Part 171, which is based on ICAO Standards. For operations where air traffic services are provided by contracting ICAO member States, separation minima are established by the national regulations of the member States (if established) and in ICAO documents. Operations in Class G airspace are not provided ATC services (aircraft are not separated by ATC). Separation minima are not normally established for Class G airspace. The prevention of collision is dependent upon the "see and avoid" concept.

5.1.1.7. THE CONCEPT OF AN ATC CLEARANCE. Issuance of an ATC clearance by a controller and the acceptance of this clearance by a pilot is a negotiation process that establishes conditions for the prevention of collision hazards (in flight and terrain).

A. Controller Issued IFR Clearance. When a controller issues an IFR clearance, the controller agrees to reserve a three-dimensional block of airspace for that aircraft along the route defined in that clearance. The controller also agrees to issue clearances to all other controlled air traffic, ensuring safe separation.

B. Pilot Accepted ATC IFR Clearance. When a pilot accepts an ATC IFR clearance, the pilot agrees to continuously remain within that three-dimensional block of airspace assigned by ATC, and adhere to the rules of flight for that operation. The pilot is obligated to comply with the clearance unless amended or an emergency is declared.

C. Expected Degree of Pilot Accuracy. The pilot is expected to navigate to the degree of accuracy required for air traffic control. A failure to navigate to the degree of accuracy required may create a flight safety hazard.

D. Error Management, Plotting and Systematic Cross-Checking of Navigation Information. Long range navigation requires the standardized application of disciplined, systematic cross-checking of navigation information. Operator's long-range navigation programs should include those procedures.

NOTE: FAA AC 91-70, (as amended), provides an amplification of recommended crew procedures.

1) *Plotting Procedures*. Plotting procedures have had a significant impact on the reduction of gross navigational errors. There is a requirement to plot the route of flight on a plotting chart and to plot the computer position, approximately 10 minutes after waypoint passage. Plotting may or may not be required, depending upon the distance between the standard ICAO ground-based NAVAIDs. Plotting procedures are required in the following situations:

a) Plotting procedures are necessary for all operations where the route segment between the operational service volume of ICAO standard ground-based navigational aids exceeds 450 NM.

b) Plotting procedures also required for routes of shorter duration that transit airspace where special conditions exist, such as reduced lateral and vertical separation standards, high density traffic, or flight in proximity to potentially hostile border areas.

E. Non-Radar or Non-ADS Environment. In a non-radar or non-ADS environment, ATC has no direct knowledge of the actual position of an aircraft or its relationship to other aircraft in adjacent airspace. Therefore, ATC's ability to detect a navigational deviation and resolve collision hazards is seriously degraded when a deviation from an agreed-to clearance occurs.

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Section 2. Air Navigation Approval Requirements: General

5.1.2.1. GENERAL. This section contains general direction and guidance to be used by certification teams and aviation safety inspectors (Inspectors) when approving operator requests for areas of operation and other special air navigation operations. Inspectors approve these operations by issuing appropriate Part B operations specifications (OpSpecs). The approval process normally requires validation testing.

> **NOTE**: Detailed guidance for the approval of special navigation areas of operations are contained in Section 5 of this chapter.

5.1.2.3. SUBJECT FAMILIARIZATION AND APPROVAL REQUIREMENTS. Once an operator has requested approval for air navigation operations, it is essential that Inspectors fully understand the concepts, General Authority of Civil Aviation (GACA) policies, standard practices, direction and guidance related to the area of proposed operations.

5.1.2.5. AREAS OF OPERATION AND NAVIGATION APPROVAL REQUIREMENTS. The first determination that must be made when assessing areas of operation is the type of navigation that will be required to navigate within the airspace where operations are contemplated. The decisive factor in this determination is the operational service volume of International Civil Aviation Organization (ICAO) standard ground-based navigational aids (NAVAIDs) within the proposed area of operation and any other requirements prescribed by the air traffic service (ATS) providers providing air traffic control (ATC) services in the airspace.

A. If the minimum en-route flight altitudes specified and the locations of the ICAO standard ground-based NAVAIDs ensure that the flight will always be within the operational service volume, the entire en-route operation is considered conventional and no specific approval is required other than the issuance of OpSpec B31.

B. In situations where the entire area of operation (at the minimum flight altitude specified) is outside (beyond) the operational coverage volume of ICAO standard ground-based NAVAIDs, the operation is unconventional and will require some form of long range navigation system and the operator must be approved to a performance-based navigation (PBN) specification commensurate with the airspace in which they navigate even if the airspace has not been official designated with a performance-based navigation specification. OpSpec B34 is used for this purpose.

C. For airspace with designated navigation performance specifications (e.g., PBN, MNPS, RVSM) the aircraft must be equipped and certificated to comply with the prescribed navigation performance and the operator must be authorized to conduct these operations. OpSpec B34 is used for this purpose. The following paragraphs provided further detail on these special operations.

> **NOTE**: Visual flight rules (VFR) navigation under General Authority of Civil Aviation Regulation (GACAR) Part 91, 125 and 135 do not require specific approval from the President. Detailed guidance for the approval of VFR navigation for GACAR Part 121 air operators are contained in Section 3 of this chapter.

D. Flight Altitude. It is important to understand that the minimum flight altitude is a key factor in the determination of the category of navigation. The operational service volume of a particular standard ground-based NAVAID is heavily influenced by flight altitude. For example, at high altitude (above flight level (FL) 180), most very high frequency omnidirectional range stations (VOR) published for use at these altitudes have an operational service volume that extends to a radius of at least 130 nautical miles (NM) from the facility. However, at low altitudes (below 10,000 feet mean sea level (MSL)), the operational service volume of many VORs seldom exceeds 40 NM.

E. Range of Standard Ground-Based NAVAIDs. Generally, determination of the exact range (operational service volume) of the ground-based NAVAIDs intended to be used is not necessary. For example, a flight departing from the continental United States (US) with a destination in Europe or the Middle East would obviously perform conventional navigation using ground-based NAVIDs and oceanic/remote navigation using long-range navigation system (LRNS) and would require equipment appropriate for both. The flight might also navigate in PBN designated airspace such as RNAV 5 airspace. In other situations, it can be readily determined that flight operations will only be conducted entirely within the operational service volume of standard ground-based NAVAIDs. However, sometimes a determination of the exact range of a NAVAID is required in order to evaluate compliance with the requirement for a reliable fix once each hour.

F. Foreign/Remote Operations. In foreign countries and in oceanic/remote areas, this determination is more complex. In general, VOR, VOR/distance measuring equipment (DME) routes and fixes published in those areas are within the operational service volume of the ground-based NAVAIDs specified. However, most ATS routes based on non-directional radio beacons (NDBs) in oceanic/remote areas require LRNS over a considerable portion of the route. For example, the standard service volume (or coverage) of high powered NDBs seldom exceeds 75 NM. Aeronautical Information Publications (AIP) issued by individual States are the best and most up to date sources of information on the operational service volume of these NAVAIDs.

5.1.2.7. SPECIAL OPERATIONS. Certain specific areas of operations require authorizations from the President in order for the operator to be permitted to engage in flight operations in these areas.

A. Examples of special areas of operation include the following:

- Areas of Magnetic Unreliability (AMU)
- Polar operations
- North Atlantic Minimum Navigation Performance Specification (NAT/MNPS) airspace
- Canadian MNPS airspace
- Central East Pacific (CEPAC) airspace
- North Pacific (NOPAC) airspace
- Pacific Organized Track System (PACOTS)
- Restricted international areas
- Reduced Vertical Separation Minimum (RVSM)

• Areas designated with a performance-based navigation specification (PBN)

5.1.2.9. NAVIGATION EQUIPMENT.

A. Written Aircraft Eligibility Documentation. In all cases, it is necessary for the operator to provide written aircraft eligibility documentation that explicitly states that the aircraft is properly certificated, equipped, and maintained to perform the required functions for the specific type of navigation and other requirements related to any special operation (referred to in paragraph 5.1.2.7, above).

1) The written evidence may take the form of a type certificate (TC), supplemental type certificate (STC), Aircraft Flight Manual (AFM), AFM Supplement (AFMS), or Federal Aviation Administration (FAA) Flight Standardization Board (FSB) Report. In certain cases involving special areas of operation, such as AMU, PBN airspace, RVSM, and NAT/MNPS, the airworthiness approval must reflect that these special requirements are also met.

2) The eligible aircraft must have equipment where the aircraft documentation explicitly states that the installation has received airworthiness approval for the type of operations contemplated.

B. Conventional Navigation Equipment. In the case of conventional navigation using equipment, such as VOR, VOR/DME, NDB, a statement in the AFM or STC that the navigation system and/or equipment is approved for instrument flight rules (IFR) flight is sufficient. For navigation with other types of RNAV equipment, the equipment must be certified for IFR operations and installed and maintained in accordance with the GACA approved documentation appropriate for that specific RNAV equipment.

C. Area Navigation (RNAV). RNAV provides enhanced navigational capability. RNAV equipment can automatically compute the aircraft position, actual track, and ground speed and then provide meaningful information relative to a route of flight selected by the pilot. Typical equipment will provide the distance, time, bearing, and crosstrack error relative to the selected “TO” or “active” waypoint and the selected route. Several RNAV systems with different navigational performance characteristics are capable of providing area navigational functions. Present day RNAV equipment is considered to be equipment that operates by automatically determining aircraft position from one or a combination of the following sensors with the means to establish and follow a desired path:

1) *VOR/DME*.

2) *DME/DME*.

3) *INERTIAL NAVIGATION SYSTEM (INS).*

4) *GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS).*

a) GNSS systems must be approved in accordance with:

• FAA AC 20-138 (as amended), Airworthiness Approval of Global Positioning System (GPS) (GNSS) Navigation Equipment for Use as a VFR and IFR Supplemental Navigation System.

• FAA AC 90-94 (as amended), Guidelines for Using GPS (GNSS) Equipment for IFR En route and

Terminal Operations and for Non-precision Instrument Approaches in the U.S. National Airspace System, found at web site:

• Technical Standard Order (TSO) C-129, Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS) (GNSS)

• TSO C-145, Airborne Navigation Sensors Using the Global Positioning System (GPS) (GNSS) Augmented by the Wide Area Augmentation System (WAAS)

• TSO C-146, Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) (GNSS) Augmented by the Wide Area Augmentation System (WAAS), and other installation criteria

5) Modern multi-sensor systems (such as IRS/flight management system (FMS)) can integrate one or more of the above sensors to provide a more accurate and reliable navigational system. See FAA AC 20-130, (as amended) and FAA AC 25-15 (as amended), Approval of Flight Management Systems in Transport Category Airplanes).

6) RNAV systems must include a statement that the system meets the reliability and performance criteria, that the system is approved for instrument flight rules (IFR) flight, and if required, is approved for specific navigation specifications in accordance with the ICAO Doc. 9613 (as amended) and all applicable FAA Advisory Circulars that are incorporated by reference in ICAO Doc. 9613.

5.1.2.11. TRAINING PROGRAMS AND MANUALS. Other important areas that must be considered are approved/accepted training programs and approved/accepted company manuals for the equipment used. The training programs and company manuals must adequately address the special characteristics of the proposed area of operation and the operational (navigation) practices and procedures that must be used. Other sections of this chapter provide additional direction and guidance on some specific requirements for training programs and company manuals for the various navigation systems and/or areas of operation.

5.1.2.13. MINIMUM EQUIPMENT LISTS (MEL). Additionally, most approvals of navigation equipment and/or areas of operation new to a particular operator also require changes to the company MEL. In all cases, principal inspectors must review the company MEL to ensure that complete and accurate direction and guidance are provided to company personnel.

5.1.2.15. NAVIGATION PRACTICES, TECHNIQUES, AND PROCEDURES. Navigation practices, techniques, and procedures are other important parts of the approval process. They are especially significant in long range navigation systems and in operations using RNAV systems. The approval of these operations almost always necessitates changes in cockpit checklists and operating practices and procedures. Due to the complexity of these operations, the necessary changes must be determined on a case-by-case basis considering the operator, the equipment, and the area of operations.

5.1.2.17. VALIDATION TESTING REQUIREMENTS. It is essential for the Inspector to evaluate the need for validation testing. In a simple case, such as approving navigation in areas within the Kingdom of Saudi Arabia (KSA) using conventional VOR/DME systems, a validation test is not necessary. However, in more complex cases, (long-range navigation, for instance) validation testing is essential to demonstrate the operator's capability and competence to safely conduct the proposed operation.

5.1.2.19. APPROVAL OF GLOBAL NAVIGATION SATALLITE SYSTEMS (GNSS) EQUIPMENT AND

OPERATIONS.

A. Portable Units. Portable GNSS receivers can only be used as a supplemental aid to VFR in conjunction with other approved means of navigation. The operator of the aircraft must determine that each and any portable electronic device will not cause interference with the navigation and communications systems of the aircraft on which it is to be used. Yoke mounts usually sold with a portable GNSS unit must be mounted as to not interfere with the operation of the aircraft controls. Permanent mounts and externally mounted antennas for use with a portable GNSS unit must be installed in an approved manner. A critical aspect of any GNSS installation is the installation of the antenna. Shadowing by the aircraft structure can adversely affect the operation of the GNSS equipment. Operators should be aware that a GNSS signal is weak, typically below the value of the background noise. Electrical noise or static in the vicinity of the antenna can adversely affect the performance of the system.

B. GNSS Approvals. GNSS equipment may require both an installation approval and an operational approval depending on its type and use. . See Table 5.1.2.1, below.

Table 5.1.2.1, GNSS Approval Requirements

TSO-C129					
GNSS Approval Required For Authorized Use					
EQUIPMENT TYPE	INSTALLATION APPROVAL REQUIRED	OPERATIONAL APPROVAL REQUIRED	IFR EN-ROUTE	IFR TERMINAL	IFR APPROACH
Hand Held	X				
VFR Panel Mount	X				
IFR En-Route and Terminal	X	X	X	X	X
IFR Oceanic/ Remote	X	X	X	X	
IFR En-Route, Terminal, and Approach	X	X	X	X	X

Note: X means an approval is required.

C. Avionics Installations and Continued Airworthiness. The operator must ensure that the GNSS equipment is properly installed in accordance with approved data and maintained in accordance with the instructions for continued airworthiness (ICAs).

5.1.2.21. REFERENCES. There are numerous references to FAA ACs in this document. Those ACs may be found at: http://www.faa.gov/.

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Section 3. VFR Navigation

5.1.3.1. GENERAL. This section provides information relative to the concepts, direction, and guidance that should be used by aviation safety inspectors (Inspectors) when evaluating and approving requests from General Authority of Civil Aviation Regulation (GACAR) Part 121 operators for authorizations to conduct VFR navigation operations.

> **NOTE**: Visual flight rules (VFR) navigation under GACAR Part 91, 125 and 135 does not require specific approval from the President.

5.1.3.3. VFR NAVIGATION. VFR navigation is any navigation operation conducted under VFR in visual meteorological conditions (VMC). The primary objectives of VFR navigation are as follows:

- Arrive at the intended destination with sufficient fuel remaining to safely complete a landing
- Operate with sufficient visual references to reliably “see and avoid” all obstacles along the actual routes of flight
- Operate with sufficient visibility to safely “see and avoid” all other aircraft
- Navigate with sufficient precision to avoid special area of operation areas and positive air traffic control (ATC) areas or to comply with the special requirements of those areas
- Protect persons and property on the ground, which is an important factor in route selection and route approval, especially for those aircraft that have inadequate performance capability with an engine inoperative

A. Safe Separation of Aircraft Under VFR. Since the safe separation of aircraft under VFR is provided by “see and avoid” procedures, an Inspector must ensure that the flight conditions (ceiling and visibility) specified for an operation reliably permit application of this concept. In most cases, basic VFR weather minima (GACAR § 91.165), are sufficient for the “see and avoid” concept. However, the requirements to arrive at the intended destination, avoid obstacles along the actual route of flight, and adequately protect persons and property on the ground are more complex. In general, basic VFR weather minima are adequate to safely accomplish these objectives in uncongested areas that have numerous prominent landmarks and benign terrain/obstacle characteristics. However, operations in other areas generally require a case-by-case evaluation and may require flight conditions that require better seeing-conditions than that provided by basic VFR weather minima. In determining the degree of accuracy required for VFR operations, the Inspector must consider the minimum flight conditions (ceiling and visibility) required for safe operations.

B. Conduct of VFR Flight. In the conduct of VFR flight, the prevention of collisions (safe separation from other aircraft) is solely the responsibility of the pilot in command (PIC) to see and avoid. However, there are regulatory requirements for use of navigation systems such as very high frequency omnidirectional range (VOR) for VFR operations in oceanic or desolated land areas or for night VFR and VFR over the top operations. These regulatory requirements are related to locating the intended destination, avoiding obstacles along the actual route of flight, and the protection of persons and property on the ground.

5.1.3.5. TYPES OF VFR NAVIGATION. These are two types of VFR navigation. They are referred to as "pilotage" and "station-referenced."

A. Pilotage. One of the primary means of conducting VFR navigation is by pilotage. Pilotage is defined in GACAR Part 1 as "navigation by visual reference to landmarks."

1) Pilotage is an appropriate means of navigation only in those areas and/or situations where the flight conditions (ceiling and visibility) are sufficient to consistently identify prominent landmarks and to "see and avoid" obstacles and other aircraft. Examples of prominent landmarks include villages, rivers, roads, valleys, ridges, transmission lines, and in some cases, lighted objects at night.

2) Pilotage is not an appropriate means of VFR navigation in areas or situations where prominent landmarks or lighted objects do not exist or where these visual references are widely separated. For example, desolate areas without prominent and permanent features, such as deserts, huge forests, certain Arctic areas, or large bodies of water (such as the Mediterranean), are areas where pilotage is not an appropriate means of navigation.

B. Station-Referenced. In situations where pilotage is not appropriate, it is necessary to use other means of conducting VFR navigation to locate the intended destination, avoid obstacles, and protect persons and property on the ground. This is accomplished by using electronic station-referenced (nonvisual) navigational aids (NAVAID), such as VOR, distance measuring equipment (DME), non-directional beacon (NDB) and global navigation satellite system (GNSS).

1) Conventional ground-based NAVAIDs (VOR, DME and NDB) can be used to fly published routes. In this case, obstacle avoidance is provided if the operation is conducted at or above the published minimum en route instrument flight rules (IFR) altitude minimum en route altitude (MEA) or (if appropriate) the minimum obstruction clearance altitude (MOCA).

2) Area navigation systems may be used to conduct VFR navigation. Most area navigation systems are station-referenced systems; however, an inertial navigation system (INS) is self-contained and the GNSS is space based. Although these systems are referenced to specific navigation stations (VOR, VOR/DME), area navigation systems permit point-to-point navigation and are not limited to routes from one ground station to the next. Since the VFR navigation performance requirements are not as demanding as IFR requirements, operators can use area navigation systems for VFR that are not certificated for IFR en-route operations. However, certain systems, such as GNSS, must be certified as airworthy for VFR and installed in accordance with approved documentation.

5.1.3.7. VFR NAVIGATION APPROVALS.

A. Determining Degree of Accuracy. In determining the degree of accuracy required for pilotage and station-referenced VFR navigation, an Inspector must consider the minimum flight conditions necessary for safe operations. If it is determined that flight conditions better than basic VFR weather minima are required for safe operations, the specific flight conditions (e.g., ceiling visibility) must be specified in the operations specifications (OpSpecs) for the pertinent area or route. When making this determination for station referenced navigation, consideration should be given to the additional accuracy provided by the electronic navigation equipment. In addition, station referenced navigation requires that the navigational equipment used is airworthy for VFR operations within the proposed area of operation and installed in accordance with approved data. The operator must provide written evidence of the airworthiness approval for the required equipment. When a minimum flight condition for either pilotage or station referenced navigation is specified in the OpSpecs, it must provide for the following criteria:

- Meets regulatory requirements for the operation
- Meets the standard practices in this handbook
- Provides accepted, safe operating practice
- Permits “see and avoid”
- Permits the identification and avoidance of obstacles
- Ensures adequate protection of persons and property on the ground
- Permits reliable identification of prominent landmarks or lighted objects at night
- Permits reliable navigation to the intended destination

B. Pilotage and Station-Referenced Approvals. Pilotage and station-referenced approvals are granted by issuance or amendments to the OpSpecs. The areas of operation authorized for pilotage or station-referenced VFR navigation, along with any required minimum flight condition, must be specified in the OpSpec B51.

C. Area Navigation Systems.

- VOR-DME
- DME-DME
- GNSS
- INS/Inertial Reference System (IRS)

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NOTE: This guidance to be developed at a later date.

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Section 5. Special Navigation Areas of Operation

5.1.5.1. GENERAL. Special areas of operation are geographic areas having unique characteristics that require the use of special equipment, procedures, and/or techniques to safely conduct flight operations. These special areas also include operational situations when the application of standard criteria is not sufficient, and other-than-standard criteria are more appropriate and can be safely used. This section provides direction and guidance for aviation safety inspectors (Inspector's) for the evaluation and approval or denial of an operator's request to conduct operations in these special areas of operation. Special areas of operation include the following:

- Areas requiring high levels of performance due to a reduction in separation standards
- Areas with prescribed navigation performance requirements (e.g. performance-based navigation (PBN) designated airspace, minimum navigation performance specifications (MNPS) airspace)
- Areas with prescribed height-keeping performance requirements (e.g. reduced vertical separation minimums (RVSM) airspace)
- Areas where navigation by magnetic reference is unreliable and/or inappropriate
- Areas where metric altitudes/flight levels (FL) are used (altitudes in meters)
- Areas where communication difficulties are frequently encountered
- Areas where air traffic control (ATC) difficulties are frequently encountered

5.1.5.3. AREAS REQUIRING HIGH LEVELS OF PERFORMANCE. In special areas of operation, the ATC system supports a reduction in separation standards. This reduction in separation standards requires improved levels of performance. Significant increases in air traffic over certain busy routes, such as United States (U.S.) Airspace, European Domestic Airspace, and the North Atlantic (NAT), can be accommodated efficiently if the ATC separation minimums are reduced to permit more aircraft to operate in the same airspace at the same time. However, this reduction in separation minimums can only be safely accomplished through significant improvements in ATC capabilities and the performance of all aircraft operating within that segment of airspace. The options currently available to permit reductions in ATC separation minimums include the use of the following:

- Independent surveillance (ATC radar)
- Automatic Dependent Surveillance (ADS) (data link of the aircraft's present position to the ATC system)
- Improved traffic flows through the use of time-based metering
- Reduced lateral separation minimums

• Reduced Vertical Separation Minimums (RVSM)

• Reduced longitudinal separation minimums

• Communication

5.1.5.5. NAT/MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) AIRSPACE.

A. General. The NAT/MNPS, as implemented in the North Atlantic Region, is a demanding standard. Safety of flight in this airspace is critically dependent on each operator achieving and continuously maintaining a high level of navigation accuracy. The references are General Authority of Civil Aviation Regulation (GACAR) Part 91, Appendix D, Section IV, and the current edition of Federal Aviation Administration (FAA) Advisory Circular (AC) 91-70 (as amended), Oceanic and International Operations. GACAR § 91.407 requires each operator to acquire approval before conducting any operation in MNPS airspace. The operator must obtain this approval for each aircraft and navigation/system combination used for operations in this airspace. To obtain MNPS approval, the operator must show compliance with the following conditions:

• Each aircraft is suitably equipped and capable of meeting the MNPS standards

• The operator has established operating procedures that ensure that MNPS standards are met

• The flight crews are trained and capable of operating to MNPS requirements

B. Navigational Performance. The NAT/MNPS represents navigational performance (necessary to reduce the risk of collision) on an internationally established level. (See Figure 5.1.5.1, Illustration of NAT/MNPS Rectangular Separation.) While the NAT/MNPS airspace currently does not have a published Required Navigation Performance (RNP) value, it is anticipated that a PBN requirement will be implemented in the future. The NAT/MNPS predates the implementation of PBN, but is consistent with PBN principles. The MNPS establishes the following demanding criteria:

1) The average lateral deviation (for any cause) cannot be greater than 6.3 nautical miles (NM) from the centerline of the assigned route over any portion of the route.

2) Ninety-five percent of all of the lateral displacements (for any cause) from the centerline of the assigned route cannot be greater than 12.6 NM for all flights over any portion of that route.

3) Each operator cannot have more than 1 lateral deviation (for any cause) of 30 NM or more in 1,887 flights in the NAT/MNPS airspace. When errors of these magnitudes occur, the aircraft has failed to navigate to the degree of accuracy required for the control of air traffic.

4) Each operator cannot have more than 1 lateral deviation (for any cause) that is within ±10 NM of a multiple of the separation minimums applied in 7,693 flights in the NAT/MNPS airspace. NAT/MNPS airspace routes are separated by 60 NM. If an error of 50-70 NM occurs, the aircraft has blundered into the airspace of an adjacent route. Errors of these magnitudes are extremely serious. The potential for a collision is high because the resulting flightpath can overlap the flightpath assigned to another aircraft (possibly coming from the opposite direction).

NOTE: Operational history in NAT/MNPS airspace clearly shows that most serious navigational errors are directly related to operator/pilot error. Equipment malfunction and equipment accuracy are usually not the primary cause for these errors. Most errors are caused by the flight crew navigating very precisely to the wrong place while believing that the aircraft is complying with the “currently effective” ATC clearance.

C. Initial NAT/MNPS Approvals. Each operator, and each aircraft and navigation system combination, must be approved before operating in NAT/MNPS airspace. Each operator must demonstrate (validate) that it can meet MNPS standards before receiving approval.

1) Validation flights must be conducted through NAT/MNPS airspace.

2) Inspectors must ensure that requirements of the applicable AC(s) and/or other General Authority of Civil Aviation (GACA) documentation for GNSS, or multi-sensors (or equivalent) are fully met by the operator using those systems before approving any operation in this airspace. All NAT/MNPS approvals are granted by issuing OpSpec B39, and by adding that area of en route operation to the standard OpSpec B50. Normally OpSpec B34 for PBN is also issued.

D. Maintaining NAT/MNPS Authorization. In addition to initially meeting MNPS criteria, each operator must continuously maintain the required level of navigational performance. Each gross navigational error (GNE) (errors of 25 NM or more) has a significant impact on flight safety in this airspace and must be fully investigated in a timely manner. The cause of each error must be identified and effective action must be taken to prevent reoccurrence of similar errors. GNEs are detected by ATC and reported to one of the regional monitoring agencies of the world. The regional monitoring agency then provides the notification of the GNE to not only the operator that made the GNE, but also to the GACA. When an Inspector learns of a GNE by one of his operators, the Inspector must immediately contact the operator and advise that the GNE will be investigated. The Inspector must ensure that the operator takes timely corrective action. After this notification, Inspectors must determine the effectiveness of the operator’s actions as follows:

1) If it is determined that an operator’s actions will prevent the occurrence of similar errors, the operator should be permitted to continue NAT/MNPS operations with close surveillance of the operator’s navigational performance. If similar errors occur in subsequent operations more frequently than permitted by the standard; stronger action must be taken.

2) If an operator fails to take action to improve navigation performance, action must be initiated to suspend NAT/MNPS authorization (OpSpec B39 is rescinded).

3) If it is determined that an operator’s actions to improve navigational performance are inadequate or otherwise unsatisfactory, the operator must be notified that the corrective action is unacceptable. When an operator does not implement a satisfactory solution in a timely manner, the action must be initiated to suspend NAT/MNPS authorization and it could include enforcement action.

5.1.5.7. CANADIAN MNPS AIRSPACE. Certain high altitude airspace in northern Canada has been designated as MNPS airspace (see the Canadian Aeronautical Information Publication (AIP)). The navigational performance criteria for operation in Canadian MNPS airspace are identical to the criteria for NAT/MNPS airspace.

A. General Criteria. In general, any aircraft/navigation system combination approved for unrestricted operation in

NAT/MNPS airspace for a particular operator also meets Canadian MNPS criteria. A particular operator can (under most circumstances) be authorized to conduct Canadian MNPS operations with those aircraft and navigation system combinations authorized for that operator in NAT/MNPS airspace. However, due to the unique nature of operations in high latitudes and in areas of magnetic unreliability (AMU), approval for Canadian MNPS operation is not automatic. Each proposed operation must be evaluated on its own merits.

B. Special Factors. These special factors must be considered and carefully evaluated before granting air navigation approvals for operation in Canadian MNPS airspace:

1) For operators currently authorized to use an aircraft in NAT/MNPS airspace:

a) A primary means inertial navigation system (INS)/inertial reference system (IRS)/Inertial Reference Unit (IRU) meeting NAT/MNPS criteria automatically meets Canadian MNPS criteria.

b) Other LRNS meeting NAT/MNPS criteria automatically meet Canadian MNPS criteria except for operations in the AMUs. The LRNS must be evaluated on a case-by-case basis for AMU authorization.

c) Operations at high latitude airports (greater than 67° N/S) must not be authorized unless INS platform alignment has been successfully demonstrated and approved for those latitudes. If operations are proposed for areas in the Canadian MNPS that fall within the AMU, a validation flight and AMU authorization is required.

2) Training programs and crew procedures for operations at high latitudes must provide techniques and methods for the following:

• Approaches and departures using appropriate heading references other than magnetic

• Use of ground-based Navigational Aids (NAVAID) oriented to appropriate directional references other than magnetic

3) For operators who are not currently authorized to use an aircraft and a navigation system combination in NAT/MNPS airspace, but propose to operate in the Canadian MNPS airspace.

a) The operator’s equipment must meet the criteria in the appropriate AC (or equivalent), considering the conditions unique to Canadian MNPS airspace. The Canadian AIP should also be consulted for airspace requirements.

b) The operator must also meet the special factors specified in subparagraphs 5.1.6.7, B1) and/or 5.1.6.7, B2), above, as appropriate.

C. Canadian MNPS Approvals. For GACAR Part 121 and 125 operators, Canadian MNPS airspace approvals are granted by adding that area of en route operations to OpSpec B50.

5.1.5.9. REFERENCES, FORMS, AND JOB AIDS.

A. References:

- North Atlantic MNPS Airspace Manual, International Civil Aviation Organization (ICAO) NAT Doc 007, Guidance Concerning Air Navigation In and Above the North Atlantic MNPS Airspace (available from the European and North Atlantic (EUR/NAT) Office web site at: http://www.paris.icao.int)

- Aeronautical Information Service (AIS) of NAT Air Traffic Service (ATS) Provider States

- ICAO Doc 7030, Regional Supplementary Procedures (SUPPS)

- FAA AC 120-33, Operational Approval of Airborne Long-Range Navigation Systems for Flight within the North Atlantic Minimum Navigation Performance Specifications Airspace

B. Forms. None.

C. Job Aids. None.

5.1.5.11. CENTRAL EAST PACIFIC (CEP) AND NORTH PACIFIC (NOPAC) ROUTE SYSTEMS.

NOTE: GACA has adopted the acronym “CEP” in place of “CEPAC” to be congruent with the term that ATC is using for the Central East Pacific.

A. General. The CEP system is the organized route system between Hawaii and the west coast of the United States (US). Several ATS routes and associated transition waypoints are within the CEP. Effective February 24, 2000, RVSM and Required Navigation Performance 10 (RNP 10) is required for aircraft operating on the CEP routes. Non-approved aircraft can expect to fly above or below the exclusionary airspace. See FAA AC 91-70, (as amended), and the Alaskan aeronautical information publication (AIP), as well as the Pacific Supplement, for further information.

B. Applicable ATC Procedures. Applicable ATC procedures can be found in the current edition of FAA Order 7110.65, Air Traffic Control; FAA Order 8400.12 (as amended), Required Navigation Performance 10 (RNP 10) Operational Authorization; ICAO Doc 7030; ICAO Annex 2, Appendix 3; and ICAO Doc 9574, Manual on Implementation of a 300 m (1,000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (RVSM guidance).

C. Authorization Required. Operations in the CEP and NOPAC are authorized with the issuance of OpSpec B37.

5.1.5.13. AREAS OF MAGNETIC UNRELIABILITY (AMUs). Two large areas of en route operation have unique features which significantly complicate air navigation. These two areas are centered around the Earth’s magnetic poles.

A. Concept. Conventional magnetic compasses sense magnetic direction by detecting the horizontal component of Earth’s magnetic field. Since this horizontal component vanishes near the magnetic poles, magnetic compasses are highly unreliable and unusable in an area approximately 1,000 NM from each magnetic pole. Within these areas, air navigation tasks are further complicated by very rapid changes in magnetic variation over small distances. For example, when flying between the magnetic North Pole and the true North Pole, a heading of true North results in a magnetic heading of South (a magnetic variation of 180 degrees).

B. Convergence of the Meridians. Since these two major AMUs also occur near Earth’s geographic poles, the convergence of the meridians also presents additional directional complications. When flying “great circle” courses at latitudes greater than 67 degrees, convergence of the meridians can create rapid changes in true headings and true courses with small changes in aircraft position. As a result, relatively small errors in determining the aircraft's actual position can produce very large errors in determining the proper heading to fly and to maintain the assigned flightpath. When even small errors occur, very large navigation errors can develop over extremely short distances. An extreme example of this phenomenon occurs at earth's geographic North Pole. Flight in any direction from the exact pole is initially due South (that is, the direction to Russia or the United States is South).

C. Special Equipment, Techniques, and/or Procedures. Special navigation equipment, techniques, and/or procedures are critical to operate safely in polar areas, including the two AMUs. Operations based solely on magnetic references within AMUs are unsafe, unacceptable, and must not be approved. Operations within these areas can only be conducted safely if the primary heading reference is derived from sources other than magnetic.

1) All INS/IRS/IRU are capable of calculating true North independently from other aircraft systems. INS/IRS/IRU can be approved and safely used for operations in AMUs and polar areas provided the following conditions are met:

a) The INS is certified as airworthy for the highest latitude authorized for these operations.

b) Ground alignment of the INS/IRS/IRU is restricted to those airports where satisfactory alignment has been demonstrated or otherwise approved.

c) The operator's training programs and crew procedures provide acceptable techniques and methods for the following:

- Approaches and departures using appropriate heading references other than magnetic

- The use of ground-based NAVAIDs, which are oriented to appropriate directional references other than magnetic

NOTE: It is GACA's policy that Inspectors should not approve operations in polar areas and/or AMUs without the participation and concurrence of the Director, Flight Operations Division.

2) There is a wide variety of other methods, systems, techniques, and procedures that can be used for navigation in AMUs and polar areas. However, due to the variety of means and the complexity of air navigation in these areas, specific direction and guidance for these other means of navigation are not provided in this order.

D. Boundaries of the AMU.

1) For the North Atlantic area of operations, the Canadian AIP establishes the basic boundaries for the AMU. Canadian regulations state that no person may operate an aircraft in instrument flight rules (IFR) flight within Canadian northern domestic airspace unless it is equipped with a means of establishing direction that is not dependent on a magnetic source. The special equipment, training, and procedures discussed in this paragraph are required for all operations into the area of northern domestic airspace. The boundaries of this area are shown in Figure 5.1.6.2, Canadian Domestic Airspace. This area is also outlined on Canadian en route charts. For the purposes of this paragraph, northern domestic airspace is considered to extend from ground level to infinity.

2) For the southern hemisphere, any operation south of lat. 65°00'00" S is considered to be within the AMU.

E. Approvals. All approvals for operations into AMUs are granted by issuing OpSpec B40, and by adding that area of en route operation to the standard OpSpec B50.

5.1.5.15. POLAR OPERATIONS. The North Polar area of operations is defined as the area that lies north of lat. 78°00'00" N (see OpSpec B55). The north polar routes across Russia are shown in the Russian AIP or in commercial charting publications for Eastern Europe and Eurasia. The south polar area of operations is defined as that area that lies south of latitude S 67°00'. OpSpec B50 must show the specific routes approved for these polar operations. See the applicable section in Volume 15 for more information on this authorization. In general, in addition to the authorization for operations in the AMUs, the following will be required for authorizing operations in the polar areas.

A. Fuel Freeze Temperature. A procedure must be established to determine the fuel freeze temperature of the actual fuel load onboard the aircraft that requires coordination between maintenance, dispatch, and assigned flight crew. The operator may develop a fuel freeze analysis program in lieu of using the standard minimum fuel freeze temperatures for specific types of fuel used.

B. Communication Capability. In accordance with GACAR § 121.85, the operator must have effective communications capability with dispatch and with ATS for all portions of the flight route. The operator must show the GACA the communications medium(s) that it intends to use to fulfill these requirements in the Polar Areas.

1) The communications medium used must meet GACA regulatory requirements and fulfill policy/procedures established by each ATS unit providing control on the route of flight. Most countries publish ATS policies and procedures in their State AIPs.

2) High frequency (HF) voice has been considered the primary communications medium in the North Polar Area. However, other mediums may be used as a supplemental means in accordance with the applicable policy. For example, although HF voice remains primary for communications with area control centers, in areas where there is satellite coverage, satellite communication (SATCOM) voice may be used as a backup to communicate with ARINC Radio and, in non-routine situations, to establish direct pilot-controller voice communications.

3) In areas of satellite coverage, Controller-Pilot Data Link Communications (CPDLC) may be used for ATC communications, provided the ATS unit has an approved capability. In addition, provided the capability is approved under OpSpec A56, HF datalink may also be used to fulfill communications requirements with ATS units having the capability and with airline dispatch. Inspectors must ensure that the operators meet the regulatory and policy requirements for long-range communication systems (LRCS). HF voice capability is always required.

4) It is recognized that SATCOM may not be available for short periods during flight over the North Pole, particularly when operating on some designated polar routes. Communication capability with HF radios may also be affected during periods of solar flare activity. For each dispatched polar flight, the operator must take into consideration the predicted solar flare activity and its effect on communication capability.

C. Minimum Equipment List (MEL). Before receiving GACA authority to conduct polar operations, the MEL must indicate that the following systems/equipment is required for polar operations dispatch:

1) Fuel quantity indicator system (FQIS) (to include fuel tank temperature indicating system).

2) Autothrottle system.

3) Communication system(s) relied on by the flight crew to satisfy the requirement for effective communication capability.

4) Except for all-cargo operations, expanded medical kit to include automated external defibrillators (AED).

5) For Extended Operations (ETOPS) aircraft:

a) All MEL restrictions for 180-minute operations are applicable.

b) Auxiliary power unit (APU) for two-engine airplanes (including electrical and pneumatic supply to its designed capability).

D. Training Program Requirements. The following must be in the approved training programs:

• Training on Barometric pressure for Standard Altimeter Setting (QNE)/Barometric pressure for Local Altimeter Setting (QNH) and meter/feet issues is required for flight crew and dispatcher training

• Training on fuel freeze (included in maintenance, dispatch, and flight crew training (special curriculum segments))

• General area- and route-specific training on weather patterns and aircraft system limitations.

• Training on special considerations, such as diversion decision making into austere airport environments to include aircraft performance; crash, fire, and rescue availability; and passenger support

• Flight crew training in the use of the cold weather anti-exposure suit

E. Special Flight Crew Issues for Long-Range Operations. The operator needs to address the following special long-range flight crew issues:

• Long range flight crew rest plan submitted to the principal operations inspector (POI) for review and approval

• Multicrew (augmented flight crews) flight proficiency/currency issues need to be addressed in the training program

• The progression of pilot-in-command (PIC) authority, as designated in the operator’s manual

• A minimum of two cold weather anti exposure suits will be required to be onboard so that outside coordination at a diversion aerodrome with extreme climatic conditions can be accomplished safely

F. En Route Polar Diversion Alternate Aerodrome Requirements. Operators are expected to define a sufficient set of polar diversion alternate aerodromes such that one or more can be reasonably expected to be suitable and available in varying weather conditions (FAA AC 120-42 (as amended), Extended Operations (ETOPS and Polar Operations), provides additional guidance for two-engine airplanes).

G. Aircraft and Passenger Recovery Plans. A recovery plan is required that will be initiated in the event of an unplanned diversion. The recovery plan should address the care and safety of passengers and flight crew at the diversion airport and include the plan of operation to extract the passengers and flight crew from that aerodrome.

H. Validation Flights. A GACA observed validation flight is required in which the operator exercises its reaction and recovery plan in the event of a diversion to one of its designated en route polar diversion alternate aerodromes. The exercise of the operator's reaction and recovery plan may also be completed prior to the validation flight. The GACA will approve a request by the operator to conduct the validation flight in a passenger revenue status, only if the operator's reaction and recovery plan has been previously demonstrated to the satisfaction of the GACA. If the operator elects to demonstrate its reaction and recovery plan as part of and during the validation flight, the flight cannot be conducted in a passenger revenue status.

5.1.5.17. AREAS WITH SIGNIFICANT COMMUNICATIONS AND/OR ATC DIFFICULTIES. The levels of sophistication in communication, navigation, and ATS capabilities in many areas of operation throughout the globe vary widely. The following subparagraphs provide evaluation criteria that must be considered when approving operations in these areas.

A. NAVAIDs. The ground-based facilities that are implemented to support air navigation in some of these areas are based on antiquated technology and frequently experience reliability problems. The National Airspace System (NAS) and the navigational performance requirements in many countries are based almost exclusively on non-directional radio beacons (NDB). Also, many of the NAVAIDs do not operate continuously. For example, NAVAIDs are shutdown from dusk to dawn in certain countries.

B. Communication. The primary means of en route communication with ATC in many areas of operation is almost exclusively HF radio. Atmospheric noise created by extensive thunderstorm activity in tropical areas and aurora activity in polar areas significantly increases the difficulty of using HF as a prime means of communication with ATC.

C. Air Traffic Services (ATS). The level of ATS varies from radar-based services (equivalent to domestic Kingdom of Saudi Arabia (KSA) operations) to a total absence of any ATS in certain parts of the world. Flight information regions (FIR) have been established in most areas of the world. Specific ICAO Member States have been assigned the responsibility of providing ATS in these FIRs. There are wide variations in the ATC services available. En route ATC radar is not available in all countries and ATC may rely heavily on position reports and airborne navigation performance capabilities for the separation of aircraft. Various levels of ATC provided in these areas are as follows:

NOTE: It is critical that flight crews understand that subtle terminology differences and language barriers may exist in foreign countries where they operate. For example, crews must ensure they understand whether the altimeter setting issued by ATS is in hectopascals (millibars) or inches of mercury.

1) Within controlled airspace, ATC provides ATC service to prevent collisions between aircraft and to expedite and maintain an orderly flow of air traffic. This also includes air traffic advisory services and those alerting services related to weather and search and rescue.

2) Within advisory airspace, air traffic advisory service is available to provide separation, to the extent possible, between aircraft operating on IFR flight plans. It is important to understand that this is an advisory service; it is not a control (prevention of collision) service. In advisory airspace, flight crews are provided information concerning the location of other aircraft. Prevention of collision is the responsibility of the PIC. Terrain clearance

is also the responsibility of the PIC. The ATSs available also include those alerting services related to search and rescue. In certain areas, special reporting procedures called “broadcasts in the blind” have been established to assist pilots in avoiding other aircraft. At designated intervals, each pilot broadcasts the aircraft’s position, route, and FL over a specified very high frequency (VHF). Awareness of the proximity of other aircraft is obtained by maintaining a continuous listening watch on the specified frequency. This procedure is an “expected” practice in large portions of Northwestern Africa (including the Dakar FIR) and South America (including most Brazilian airspace). In many of these areas, the “broadcast in the blind” procedure is used to augment the separation of IFR aircraft.

3) FIRs have not been established for a few areas in the world. These are commonly called uncontrolled information regions or “no man’s land.” The largest of these areas is in the South Atlantic Ocean, annotated as “No FIR.” Flight Information Services (FIS) also do not exist in the high altitude structure in other large areas (above the top of controlled airspace). Within some uncontrolled areas, aircraft separation (prevention of collision) is entirely the responsibility of the PIC. Advice and information for the safe and efficient conduct of flights is not provided from an ATS unit. An ATS unit may not provide alerting services related to search and rescue.

D. Metric Flight Levels. The airspace in many Eastern European countries and some mainland Asian countries are based on the use of metric flight altitudes/FLs. Operations within these areas require special procedures for conversion charts between metric FLs and FLs based on feet. For example, a FL of 10,000 meters represents FL 328 or a flight altitude of 1,000 meters represents an altitude of 3,280 feet.

5.1.5.19. EVALUATION CRITERIA FOR AREAS WITH COMMUNICATIONS AND ATC DIFFICULTIES. POIs must evaluate, on a case-by-case basis, all proposals to conduct operations in the sovereign airspace of countries that are not equivalent or similar to the KSA.

A. General Criteria. The operator must show (considering factors unique to the proposed area of operation) that safe operations can be conducted within the area of operation and that the facilities and services necessary to conduct the operation are available and serviceable during the period when their use is required. The operator must also show that the proposed operation is in full compliance with the requirements in OpSpecs Part B that are applicable to that operation.

B. Operations in Advisory Airspace. The operator must show that its training programs and operating procedures permit safe operations in advisory airspace and ensure compliance with the “expected” operating practices.

C. Operations in Uncontrolled Information Regions. Since ATC, air traffic advisory, flight information, and alerting services are not available from ATS units when operating within these areas, the operator must show that acceptable, alternative means are available to ensure the following:

1) The appropriate organization can be notified in a timely manner when search and rescue aid is needed.

2) Changes in significant weather information can be provided to the flight crew in a timely manner.

3) Changes in the serviceability of the required NAVAIDs are available to the flight crew and the operator’s operational control system.

4) Reliable information concerning other IFR aircraft operating within this area is available in flight (e.g.,

Airborne Collision Avoidance System (ACAS), Automatic Dependent Surveillance-Broadcast (ADS-B)). This includes “broadcast in the blind” procedures and other “expected” practices.

5) The required navigation facilities necessary to safely conduct the operation are available and serviceable.

5.1.5.21. OPERATIONS IN RESTRICTED INTERNATIONAL AREAS. Operations by KSA operators within the sovereign airspace of certain countries have restrictions levied by various agencies of the KSA or other tangential considerations. The following are examples:

• Commercial trade restrictions

• No-fly zones

A. Information on Restricted Areas. The current list of restrictions and information about the processes and agencies to contact in regard to those restrictions can be accessed from various aviation documents and GACA management

B. GACA Review of Restrictions. The operator should review the current list of restrictions with the POI to confirm what restrictions apply in order for the operator to obtain the applicable license and/or exemption for flight operations in that restricted area.

C. Operator Actions Required. It is important that the operator be advised to take simultaneous actions with all of the agencies that are necessary for the licenses and/or exemptions for the restricted country or countries in which or over which they are requesting to operate. The Principal Operations Inspector (POI) should recommend that operators make the requests as far in advance as possible of the intended date of flight. It is critical that over-flight permits be coordinated in a timely manner.

5.1.5.23. PERFORMANCE BASED NAVIGATION (PBN). The implementation of PBN is part of a worldwide effort by ICAO and the participating states to implement performance-based communication, navigation, surveillance, and air traffic management (CNS/ATM) concepts.

A. General. Aircraft/operators that operate on routes where PBN navigation specifications (NavSpecs) are applied must be approved by the State of Operator as capable of navigating to prescribed PBN standards (e.g., RNAV 5/RNP 5 for the entire route on which RNAV 5/RNP 5 is required). Different aircraft separation standards require different PBN NavSpecs (e.g., 50-NM lateral separation requires RNAV 10, while 30-NM lateral separation requires Required Navigation Performance 4 (RNP 4), as well as enhanced communication and surveillance capabilities). The implementation of more stringent PBN NavSpecs and other CNS capabilities is part of an ICAO-coordinated effort to introduce separation standards that will enable more efficient ATM while maintaining acceptable levels of safety. Benefits to users are increased availability of fuel-/time-efficient altitudes, routes and enhanced airspace capacity, and controller flexibility.

B. PBN Approval Requirements. GACAR § 91.405, requires that no person may operate an aircraft in airspace, on routes or in accordance with procedures where Performance-Based Navigation (PBN) specifications are established unless:

1) The operator and the operator’s aircraft comply with the minimum standards of Section III of Appendix D to GACAR Part 91.

2) The operator is authorized by the President or the state of operator to conduct PBN operations in the defined airspace.

3) The flight using PBN is conducted in accordance with the operator's authorized procedures.

NOTE: Operators do not need an authorization to conduct operations in KSA airspace that is designated as RNAV 5 (RNP 5).

C. Detailed background information on PBN concepts and the implementation and approval requirements for all PBN operations is detailed in ICAO Doc. 9613 (latest edition), Performance-Based Navigation. Inspectors shall follow the requirements for the approval of PBN operations using this ICAO guidance. Inspectors should consult with the Director, Flight Operations Division for further guidance. PBN authorizations are granted with OpSpec B34. For non-commercial operations with small aircraft the PBN authorization will be granted with a Certificate of Authorization.

5.1.5.25. RVSM AIRSPACE. RVSM airspace is any airspace or route where aircraft are separated by 1,000 feet vertically between FL 290 and FL 410, inclusive. Generally, aircraft and operators that have not been authorized to conduct RVSM operations cannot operate at FLs where RVSM is applied. Exceptions to this rule are published by individual air traffic service providers (ATSPs). ATSPs have elected to implement RVSM as a means to provide more fuel-/time-efficient altitudes and routes to operators and to enhance en route airspace capacity.

A. Inspector Action. Using the guidance provided in FAA AC 91-85 (as amended), Authorization of Aircraft and Operators for Flight in Reduced Vertical Separation Minimum Airspace, Inspectors will ensure that operators and aircraft meet the standards of GACAR Part 91, Appendix D, Section V.

B. Guidance. FAA AC 91-85. It provides an acceptable means to authorize operators and aircraft to conduct flight in RVSM airspace. It provides detailed guidance for aircraft manufacturers, other engineering organizations, and operators to follow when developing programs intended to meet the RVSM standards of GACAR Part 91 Appendix D, referenced above.

C. Alternatively, ICAO Document 9574, Edition 2, references ATO Guidance 91-RVSM as an acceptable means for RVSM approval.

D. Overview of the Authorization Process. The POI and the principal maintenance inspector (PMI) should coordinate the issuance of OpSpec B46 to grant the operator authority to conduct RVSM operations for a specific aircraft type or group. The GACA will issue the OpSpec if the following conditions exist:

1) The GACA determines that operator aircraft comply with RVSM standards. For in-service aircraft, the GACA determines that inspections and/or aircraft system modifications are completed as required by the applicable Service Bulletin (SB), Service Letter (SL), Supplemental Type Certificate (STC), or other GACA approved document.

2) For aircraft manufactured RVSM compliant, the GACA determines that the airplane flight manual (AFM) or Type Certificate Data Sheet (TCDS) contains a statement of RVSM eligibility. The following are involved with RVSM approval:

• The GACA approves the operator’s RVSM maintenance program

• The GACA approves the operator’s RVSM operations program

• The GACA accepts the operator’s plan to participate in monitoring programs

• If required by the POI in coordination with the PMI, the operator successfully completes a validation flight

E. RVSM Authorization Process and Policy.

1) Before issuing OpSpecs, the POI must coordinate with the PMI.

2) FAA AC 91-85, (as amended) provides guidance on the major events in the RVSM authorization process.

3) FAA AC 91-85, (as amended) provides the following policy for GACAR Part 91, 121, 125 and 135 operators: The GACA will authorize initial operational approval for RVSM operations by issuing OpSpec B46 (or Certificate of Authorization for a GACAR Part 91 operator). Areas of RVSM operation that are new to the operator will be authorized by adding OpSpec B46.

4) Currently, in designated oceanic airspaces, operators are required to obtain both RVSM authorization and certain horizontal navigation authorizations. These are separate, specific authorization actions. For example, to operate in NAT/MNPS airspace, operators are required to obtain both RVSM and NAT/MNPS authority.

5) The phrases “determining aircraft RVSM compliance” and “initial RVSM airworthiness approval” both appear in RVSM documents to indicate that the GACA has determined that the operator’s aircraft comply with the RVSM standards. The following is provided as guidance for Inspectors:

a) FAA AC 91-85 (as amended) provides guidance on the Inspector’s determination that aircraft are RVSM compliant. FAA AC 91-85 discusses the documents that the operator must submit to the GACA to show that in-service aircraft or aircraft manufactured RVSM compliant are in compliance with the RVSM requirements.

b) For most in-service aircraft, the RVSM airworthiness documents take the form of service bulletins (SBs), service letters (SLs,) or standard type certificates (STCs). These documents contain requirements that are specific to individual aircraft types or groups and generally require inspections and/or hardware or software modifications. The operator must submit documents to the GACA to show that the required actions have been completed for each airframe that will operate in RVSM airspace.

c) For aircraft manufactured RVSM compliant, the AFM or TCDS must contain statements that show the aircraft to be eligible for RVSM operations.

6) Volume 5, Chapter 5, Section 2, Evaluate Reduced Vertical Separation Minimums (RVSM), contains additional guidance for the evaluation and approval of an operator’s RVSM maintenance program.

7) Evaluation of operations programs should be completed in conjunction with the evaluation of the operator’s maintenance programs.

a) FAA AC 91-85, (as amended) provides operating practices and procedures applicable to all RVSM operations. It also lists special emphasis items for pilot training.

b) FAA AC 91-85, Appendix 5, provides specific practices and procedures for RVSM operations in oceanic airspace.

c) Operators may use FAA AC 91-85, (as amended) as the basis for their RVSM operations training and operating practices/procedures. Operators will be responsible for incorporating this material into their programs prior to conducting RVSM operations.

8) Validation tests and flights.

a) FAA AC 91-85, (as amended) provides guidance on the RVSM validation test. In some cases, review of the operator's RVSM application and program documents may suffice for validation test purposes. However, as determined by the POI and PMI, the final step of the approval process may be the completion of a validation flight. The GACA may accompany the operator on a flight to verify that RVSM operations and maintenance procedures and practices are used effectively. The validation flight may be accomplished during a revenue flight, as determined by the PIs on a case-by-case basis.

b) Validation flights are not required to be conducted in conjunction with the monitoring flights described below. Also, the validation flight may be conducted before monitoring requirements are completed.

NOTE: See Volume 4, Chapter 17, Section 8, for additional guidance on validation flights.

F. Monitoring Programs.

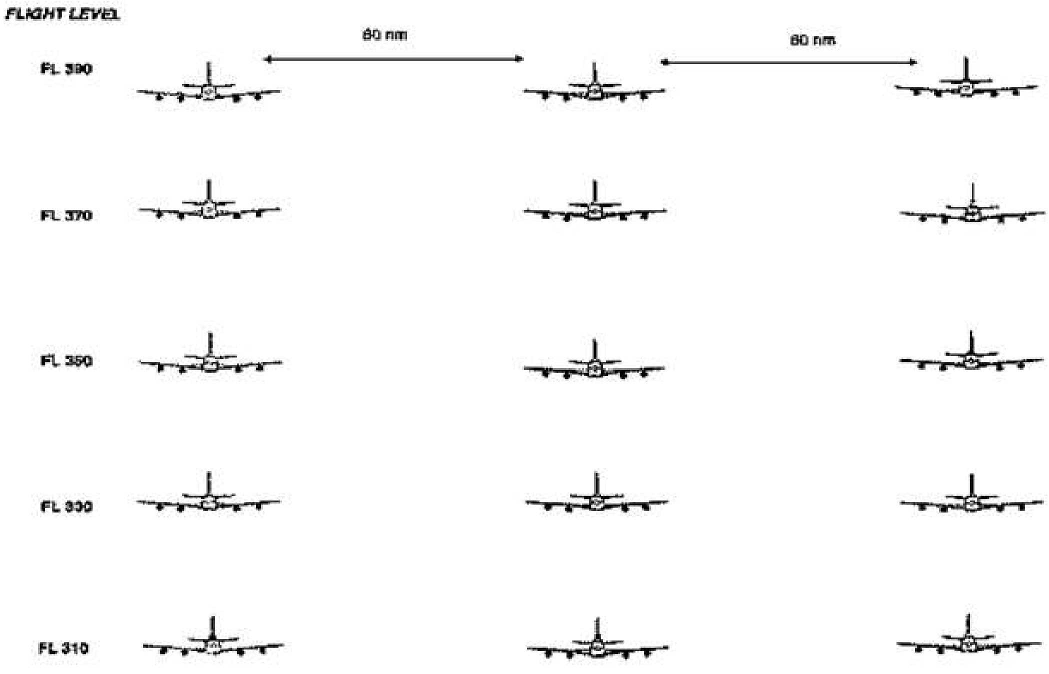
1) The primary goal of monitoring is to provide a quality control (QC) check on the altitude-keeping performance of the wide variety of operators and aircraft. It has been determined that this may be accomplished by sampling a number of airframes of each aircraft type that an operator will operate in RVSM airspace. Altitude-keeping performance data is analyzed to determine that the aircraft fleet, as well as individual operators, exhibit performance that is consistent with RVSM standards.

2) FAA AC 91-85, (as amended) calls for each operator to submit a plan to participate in monitoring programs in its application for RVSM authority.

NOTE: Operators are no longer required to complete monitoring prior to being granted operational approval.

3) Operator aircraft of a specific type or group are monitored after they have been determined to be RVSM compliant. Currently, the operator can have its aircraft monitored by either the ground-based height monitoring unit (HMU) or a portable GNSS-based Monitoring Unit (GMU) that can be placed on the aircraft.

Figure 5.1.5.1. Illustration of NAT/MNPS Rectangular Separation



NORTH ATLANTIC MNPS SEPARATION STANDARDS. Aircraft are separated by one of the following methods:

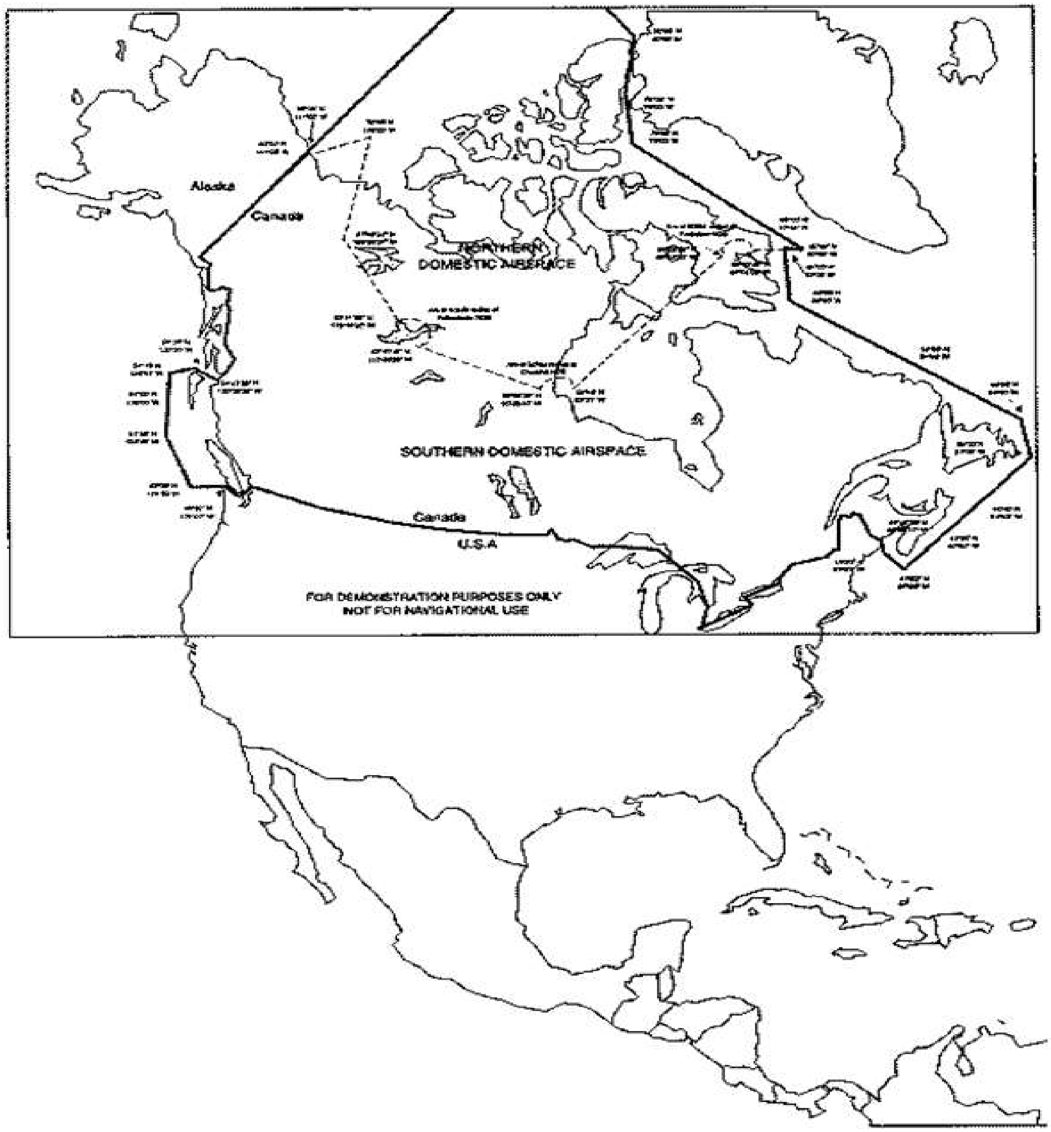
A. Lateral Separation. Lateral separation between co-altitude aircraft (aircraft at the same flight level) is 60 nm.

B. Vertical Separation. Vertical separation between aircraft on the same track is 2,000 feet.

C. Longitudinal Separation. Basic longitudinal separation between aircraft on the same track is 10 minutes. If an aircraft is flying faster than the aircraft behind it (mach advantage), than this criteria may be reduced.

NOTE: Separation standards may be changed. Consult Regional Supplementary Procedures (ICAO Document 7030/3) for current standards applied in the NAT Region

Figure 5.1.5.2. Canadian Domestic Airspace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VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 1. AIR NAVIGATION AND COMMUNICATIONS

Section 6. Communications: General Concepts and Guidance

5.1.6.1. GENERAL. This section contains information and guidance concerning the communication equipment requirements in General Authority of Civil Aviation Regulation (GACAR) Part 91, 121, 125 and 135 during extended over-water operations.

A. For all operations, GACAR § 91.95(a)(1) requires that the pilot in command (PIC) of each aircraft maintain a continuous watch on the appropriate frequency when operating an aircraft as a controlled flight.

5.1.6.3. COMMUNICATION EQUIPMENT REQUIREMENTS. The communication equipment requirements are prescribed in GACAR § 91.303 and the related Section IX of Appendix C to GACAR Part 91. The communication equipment rules of GACAR Part 91 are supplemented by other requirements prescribed in GACAR Parts 121, 125 and 135 to address certain specialized operations.

A. The essential elements of required communication equipment that apply to all operations are prescribed in Section IX of Appendix C to GACAR Part 91. Those essential elements are excerpted from GACAR Part 91 and reprinted here.

(a) ***All aircraft*** —

(1) An aircraft must be provided with radio communication equipment capable of—

(i) Conducting two-way communication for aerodrome control purposes;

(ii) Receiving meteorological information at any time during flight except in remote locations and areas of mountainous terrain where geographical constraints make such communication impossible, and

(iii) Conducting two-way communication at any time during flight with at least one aeronautical station and with such other aeronautical stations and on such frequencies as may be prescribed by the appropriate authority except in remote locations and areas of mountainous terrain where geographical constraints make such communication impossible.

(2) The radio communication equipment must provide for communications on the aeronautical emergency frequency 121.5 MHz.

(3) The communication equipment must be installed so that the failure of any single unit required for communication purposes will not result in the failure of another unit required for communications or navigation purposes.

(b) ***For all transport and commuter category aircraft*** —

(1) In addition to the communication equipment required for all aircraft—

(i) One additional radio communication unit capable of receiving meteorological information at any time during flight.

(ii) Two microphones and two headsets, or one headset and one speaker. A boom or throat microphone must be provided for each flight crew member.

(2) In addition, the failure of any single communication equipment unit must not result in the failure of another unit required for communications purposes.

(c) ***For all rotorcraft in commercial service***: In addition to the communication equipment required for all aircraft: A boom or throat microphone must be provided for each flight crew member.

5.1.6.5. COMMUNICATION EQUIPMENT REQUIREMENTS FOR EXTENDED OVER-WATER OPERATIONS.

A. Extended Over-Water Operations. GACAR Part 1 defines extended over-water operation for aircraft as an operation over water at a horizontal distance of more than 50 NM from the nearest shoreline and for rotorcraft as an operation over water at a horizontal distance of more than 50 NM from the nearest shoreline and more than 50 NM from an off-shore heliport structure.

B. Regulations. The appropriate regulations and accompanying guidance for conducting extended over-water operations under the GACAR Part 121 and 135 are as follows:

1) GACAR § 91.303(e)(5), “ Two-way radio communication and navigation equipment suitable for the route to be flown, in accordance with Sections IX and X of Appendix C to this part, respectively”. Concerning communications, GACAR Part 91, Appendix C, Section IX requires the ability to conduct two-way communication at any time during flight with at least one aeronautical station and with such other aeronautical stations and on such frequencies as may be prescribed by the appropriate authority except in remote locations and areas of mountainous terrain where geographical constraints make such communication impossible. In addition to this, for all transport and commuter category aircraft, one additional radio communication unit capable of receiving meteorological information at any time during flight.

NOTE: The intent of the rule with respect to communications requirements is that when one is conducting visual flight rules (VFR) over the top operations, instrument flight rules (IFR) operations, operations in remote areas and overwater operations to include polar operations; one should have at least two independent communications systems of the type required for that operation.

2) The radio equipment must be able to satisfactorily receive all radio navigational facilities to be used by either of the two independent systems.

3) The radio equipment must permit the crew to communicate with at least one appropriate ground station from any point en route.

4) The radio equipment must allow the crew to communicate with appropriate air traffic control (ATC) from any point in the airspace within which flights are intended.

5) The radio equipment necessary must allow the crew to receive meteorological information from any point en

route by either of two independent systems.

C. Part 121 Guidance. To ensure adequate communication with ground stations, GACAR § 121.525 requires operators engaged in extended over-water operations to have all aircraft equipped with two independent communication systems. Each of these independent communication systems must be capable of communicating with at least one appropriate ground station from any point on the route.

1) If this requirement can be complied with on all over-water routes by using very high frequency (VHF) equipment, the aircraft need only be equipped with two VHF receivers and two VHF transmitters.

2) On the other hand, if compliance with can only be accomplished with high frequency (HF) equipment, the aircraft must be equipped with two HF systems, and at least one VHF system to also comply with GACAR Part 91, Appendix C, Section IX.

D. Part 135 Guidance. GACAR §§ 135.207 and § 91.303(e), (prohibits operators from flying under IFR or on extended over-water operations unless the aircraft is equipped with certain communication and navigation equipment. Guidance for Part 135 operators regarding this equipment is specified as follows:

1) GACAR Part 91, Appendix C, IX, Communications Equipment.

2) GACAR Part 91 also requires that an additional communications transmitter be used for extended over-water operations. This would mean that if an HF radio is required to communicate with ATS over any part of an extended over-water route, the aircraft will be required to be equipped with two independent HF transmitters and two independent HF receivers.

5.1.6.7. REQUIRED COMMUNICATION PERFORMANCE (RCP) AIRSPACE. The implementation of RCP is part of a worldwide effort by ICAO and the participating states to implement performance-based communication, navigation, surveillance, and air traffic management (CNS/ATM) concepts.

A. General. Aircraft/operators that operate on routes or in airspace where RCP specifications are applied must be approved by the State of Operator as capable of communication with air traffic services (ATS) to prescribed RCP standards (e.g., RCP 240, RCP 400, etc.). The implementation of RCP is part of an ICAO-coordinated effort to introduce separation standards that will enable more efficient ATM while maintaining acceptable levels of safety. Benefits to users are increased availability of fuel-/time-efficient altitudes, routes and enhanced airspace capacity, and controller flexibility.

B. RCP Approval Requirements. GACAR § 91.404, requires that no person may operate an aircraft in airspace, on routes or in accordance with procedures where Required Communication Performance (RCP) specifications are established unless:

1) The operator and the operator's aircraft comply with the minimum standards of Section IX of Appendix D to GACAR Part 91.

2) The operator is authorized by the President or the state of operator to conduct RCP operations in the defined airspace.

3) The flight using RCP is conducted in accordance with the operator's authorized procedures.

C. Detailed background information on RCP concepts and the implementation and approval requirements for all RCP operations is detailed in ICAO Doc. 9869 (latest edition), Manual on Required Communication Performance (RCP). Inspectors shall follow the requirements for the approval of RCP operations using this ICAO guidance. Inspectors should consult with the Director, Flight Operations Division for further guidance as this is a rapidly evolving area. RCP authorizations using datalink communications are granted with OpSpec A56. The following paragraph provides further details on the use of datalink communications. For non-commercial operations with small aircraft the RCP authorization will be granted with a Certificate of Authorization.

5.1.6.9. USE OF DATALINK COMMUNICATIONS. The use of datalink communications as a supplement to voice communications with air traffic service (ATS) providers requires prior approval from GACA. OpSpec A56 is used to authorize the use of datalink communications.

A. General. To conduct data link communications using aircraft systems that are certificated for air–ground air traffic services (ATS) the operator must confirm that the aircraft is correctly equipped as required by the ATS provider in documents such as the Aeronautical Information Publication (AIP).

1) GACAR Part 91, 121, 125, and 135 operators conducting flight operations in oceanic and remote airspace may use datalink communications systems (e.g., Future Air Navigation System (FANS) (FANS-1/A *or* equivalent)). Operations using data link communications within continental airspace usually require very-high frequency (VHF) radios called very-high frequency digital link Mode 2 (VDL 2), compatible with ATS.

2) Datalink may be used as a supplement to voice communications with ATS. Voice communications must be continually monitored because aircraft still must be equipped with operating VHF voice and, when required, high frequency (HF) voice radios along the entire flight route.

3) Often datalink operations in continental airspace are limited to the en route phase of flight where radar or an equivalent surveillance system such as Automatic Dependence Surveillance-Broadcast (ADS-B) is available for surveillance services.

4) All aircraft used to conduct datalink operations in continental airspace must generally be equipped with an airborne collision avoidance system (ACAS) that is on and operating.

5) The FANS-1/A communications system can only be approved for data link operations in oceanic and remote area airspace. FANS-1/A systems are not interoperable with the VDL-2 infrastructure for continental data link communications.

B. Data Link Training. GACAR Part 121, 125 and 135 certificate holders must have an approved data link training program for their maintenance and flight crew personnel, as outlined in FAA AC 120-70 (as amended), Operational Authorization Process for use of Data Link Communication System.

C. Authorization for Data Link Use. For GACAR Part 91, 121, 125, and 135 operators the POI will coordinate with the PMIs on the following matters:

1) Equipment and systems certification, and airworthiness approval review.

2) The content of the OpSpec authorization.

3) The required communication performance.

4) The AFM.

5) Additional MEL requirements and relief.

6) Other elements necessary for the safe and effective use of data link communications.

NOTE: POIs should be aware that there may be additional limitations and guidance for specific airplanes in FAA Flight Standardization Board (FSB) reports.

D. Contents of Operator Application for Operational Authorization to Use Data Link. The operator’s application to obtain authorization to use data link must address and contain the following subjects:

1) List of source documents used:

a) For generic data link operations (e.g., aircraft/avionics manufacturer documents).

b) For area of operations specific policy/procedures.

2) Description of aircraft data link systems including certification documents and current configuration. Table 5.1.6.1 provides further information on the types of datalink systems and their associated uses and technical standards.

3) Data link system type, make/model/series and all associated limitations and procedures.

4) General information.

5) Areas of operation/routes where operator intends to use data link.

a) List of areas and/or routes where operator intends to conduct data link operations.

b) List of air traffic service providers with which the operator intends to communicate via data link.

c) List of policy and procedures source documents applicable to each area(s) of operations, such as:

1. Operations manuals for specific areas of operations (e.g., FANS-1/A Operations Manual (FOM) for operation in Asia–Pacific flight information regions (FIR)).

2. State Aeronautical Information Publications (AIP).

3. State Notices to Airmen.

6) Flight crew qualification programs.

7) Manuals and other publications.

8) MMEL/MEL.

9) Issues unique to a particular operator.

10) Maintenance programs.

E. Contents of Flight Crew Qualification Programs.

1) *Academic Training Subjects*. A basic source document for data link procedures in oceanic areas is the FOM, part 5. Policy and procedures applicable to specific FIRs are in state AIPs and NOTAMs. Address the following areas:

- Acronym Source: FOM part 2
- General concepts of digital and analog communications
- Expected flight crew response
- ATS coordination
- Aircraft digital or analog communication equipment components, displays, alerts. (Sources: aircraft manufacturer documents.)
- Interface with other aircraft systems
- AFM information MEL provisions
- Data link events reports
- Data link malfunction or irregularity reports
- Human factors—lessons learned

2) Operational Use Training.

- General requirement
- Simulators
- Computer based instruction
- Policy on initial pilot evaluation
- Recurrent training and evaluation

3) Currency (recent experience).

4) Line Checks and Route Checks (if applicable).

5) Line-Oriented Flight Training (if applicable).

F. Operational Authorization Documents. This issuance of OpSpec A56 grants approval to use datalink communications in operations. Volume 15 of this Handbook has further details on OpSpec A56.

Table 5.1.6.1. Communications Systems and Operating Environments

Row	Aircraft Data Link System Type	Operating Environment			Applicable Standards
		Type of Airspace	ATS Unit System	Capabilities and Uses	
1	ATN B1	Continental	ATN B1	Supplemental ATC communications: Communication application supports data link initiation capability (DLIC) data link service. Controller Pilot Data Link Communications (CPDLC) application supports ACM, ACL, and AMC data link services. Note 1: departure clearance (DCL), downstream clearance (DSC), (Digital- Automatic Terminal Information Service (D-ATIS), and Flight Plan Consistency (FLIPCY) data link services are not supported.	a. DO-290/ED-120, Chg. 1 and Chg. 2, Continental Safety and Performance (SPR) Standard. b. DO-280B/ED-110B air traffic management (ATM) B1 INTEROP Standard.
2	FANS 1/A+	Continental	ATN B1 FANS-1/A	Same as row 1 except: Uses Aeronautical Telecommunications Network (ATN) ATC Facilities Notification (AFN) application for DLIC data link service. For CPDLC application, UM 215, TURN (direction) (degrees) is not supported. Note 2: FANS 1/A aircraft will require use of DM67 (free text) to mimic certain message elements per DO-290/ED-120 Chg 1 and Chg 2. See DO-305/ED-154 paragraph 4.2.13.2. Note 3: In accordance with DO-290/ED-120, Chg 1 and Chg 2, FANS 1/A aircraft will require use of a message latency timer per DO-258A/ED-100A, paragraph 4.6.6.9 and is denoted by a "+" appended to the "FANS 1/A" label. Note 4: Only via VHF data link subnetwork.	Same as row 1 plus: a. DO-305/ED-154, FANS 1/A-ATN INTEROP Standard (Applies only to ATS Unit except see note 2). b. DO-258A/ED-100A, FANS 1/A INTEROP Standard (Applies only to aircraft).
3	FANS 1/A+ or	Oceanic and	FANS-1/A	Normal means of ATC communication uses AFN and CPDLC applications for direct	a. DO-306/ED-122, Oceanic SPR

Row	Aircraft Data Link System Type	Operating Environment			Applicable Standards
		Type of Airspace	ATS Unit System	Capabilities and Uses	
3	FANS 1/A+ or FANS 1/A	Oceanic and Remote	FANS-1/A	Normal means of ATC communication uses AFN and CPDLC applications for direct controller-pilot communications (DCPC). Eligible for: Required Communication Performance (RCP) 240 operations via VHF, SATCOM Iridium and SATCOM Inmarsat subnetworks. RCP 400 operations via HF data link subnetwork. No RCP operations. Note 4: Aircraft capability that supports multiple RCP type operations needs to include appropriate indications and/or alerts to enable the flightcrew to notify ATC when aircraft equipment failures result in the aircraft's ability to no longer meet its criteria for any of the RCP types, per DO-306/ED-122, paragraph 5.2.6.a) and 5.2.6.b). Uses ADS-C application for automatic position reporting.	a. DO-306/ED-122, Oceanic SPR Standard. b. DO-258A/ED-100A (or earlier versions) FANS 1/A INTEROP Standard.
4	FANS 1/A+ or FANS 1/A	Oceanic and Remote	CADS	No CPDLC application. Uses ADS-C application for automatic position reporting.	a. DO-306/ED-122 Oceanic SPR Standard. b. DO-258A/ED-100A (or earlier version), FANS 1/A INTEROP Standard (Applies only to aircraft) c. Centralized ADS (CADS) Common Specification, Version 2.0, approved ICAO NAT FIG/10, Paris, March 29–April 2, 2004 (Applies only to ATS unit)
5	Flight manageme nt system waypoint position	Oceanic and Remote	CFRS	Same as row 4	a. DO-306/ED-122, Oceanic SPR Standard b. ARINC 702A, Advanced Flight Management Computer System

Row	Aircraft Data Link System Type	Operating Environment			Applicable Standards
		Type of Airspace	ATS Unit System	Capabilities and Uses	
	reporting (FMS WPR)				(Applies only to aircraft) c. Central Flight Management Computer Waypoint Reporting System (CFRS) Common Specification, Version 2.0, approved International Civil Aviation Organization (ICAO) North Atlantic (NAT) FIG/10, Paris, March 29–April 2, 2004 (Applies only to ATS unit when ATS unit is CADS)
6	FANS 1/A ADS-C	Oceanic and Remote	FANS-1/A or CADS	Same as row 4	a. DO-306/ED-122 Oceanic SPR Standard b. DO-258A-ED-100A (or earlier version) FANS 1/A INTEROP Standard (If ATS unit is CADS, applies only to aircraft) c. CADS Common Specification, Version 2.0, approved ICAO NAT FIG/10, Paris, March 29–April 2, 2004 (Applies only to ATS unit when ATS unit is CADS

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CHAPTER 1. AIR NAVIGATION AND COMMUNICATIONS

Section 7. Surveillance: General Concepts and Guidance

5.1.7.1. GENERAL. This section contains information and guidance concerning the surveillance concepts applicable to worldwide aircraft operations.

5.1.7.3. THE CONCEPT OF REQUIRED SURVEILLANCE PERFORMANCE (RSP). The International Civil Aviation Organization is in the process of implementing the concept of required surveillance performance (RSP) to complement similar concepts for navigation (RNP) and communications (RCP). This paragraph will be updated with additional information as the RSP concept matures. In the meantime, certain elements of the RSP concept are already been implemented in certain parts of the world. The Automatic Dependent Surveillance - Broadcast (ADS-B) is one manifestation of this concept being realized.

5.1.7.5 AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B). This paragraph described the ADS-B system. The operational approval of ADS-B (Out) is achieved with the issuance of OpSpec A153. Consult Volume 15 of this handbook for further guidance on the issuance of operations specifications associated with the operational approval of ADS-B (Out).

A. ADS-B System. The ADS-B system:

1) Automatically and periodically transmits position, velocity, and other information with no pilot or controller action required for the information to be transmitted;

2) Is dependent on the aircraft position source (e.g., GNSS/GPS);

3) Is used for surveillance services, much like traditional radar; and

4) Is used to broadcast aircraft position and other data to any aircraft or ground station equipped to receive ADS-B.

B. ADS-B System Elements. The ADS-B system consists of three elements:

1) Avionics. Installed aircraft avionics gather, format, and transmit the message elements from the aircraft via a discrete frequency. ADS-B messages include at least the following elements:

- Aircraft horizontal position (latitude/longitude).
- Aircraft barometric altitude.
- Aircraft identification: the assigned, unique ICAO 24-bit address.
- Flight ID.

• Special Position Indicator (SPI).

• Emergency status.

NOTE: Flight ID, SPI, and the emergency status are the only message elements that can be modified by the flight crew.

2) Positioning Source. Position data is typically derived from GNSS/GPS to provide an aircraft's position.

3) Ground Radio Stations. The ground infrastructure must be in place to receive and process the message elements from aircraft and to provide the air traffic automation system with the necessary information for ATC surveillance and separation services.

C. ADS-B Out (Transmit) Functions. Different avionics packages and suites are available to support ADS-B Out. The transmission of message elements by ADS-B-equipped aircraft is known as ADS-B Out.

D. Position Source Dependency.

1) ADS-B derives horizontal and vertical position information from the positioning source on the aircraft, which is typically the GNSS/GPS navigation system. This can mean that the accuracy of the ADS-B system is directly related to the availability of the GPS constellation of satellites. In some installations, the altimeter is also used as an added vertical cross-check referred to as baro-aiding. The navigation service and the altimeter must be available and of sufficient quality in order to provide the required level of safety to meet air traffic separation services standards.

2) The ADS-B system is heavily dependent on the continued high performance of the avionics and position source. This dependency requires an operator to ensure that the planned operation can meet the performance requirements for the entire route and time of the flight. For this reason, certificate holders/operators should check the availability of the ADS-B service and GNSS/GPS (e.g., NOTAM) to ensure that ADS-B performance is available.

E. Air Traffic Separation Services.

1) Air traffic separation services using ADS-B enhances operations in several ways. ADS-B data is provided to ATC at a higher rate than existing radar surveillance, resulting in more accurate position information to the controller. This increased position accuracy enables more efficient and effective use of airspace.

2) Air traffic separation services using ADS-B are dependent on the quality and performance of the individual aircraft and the ground system. It is critically important that each piece of the system is operated and maintained in a manner that ensures design performance, supporting the approved safety levels associated with the operation.

F. Contingency Operations. A failure of any one component of the ADS-B system requires ATC to "fallback" to procedural separation standards. Therefore, service provider or certificate holder/operator reliance on ADS-B must be carefully weighed for the contingency operations, which may be required should the ground service, avionics, or positioning source fail.

G. Automatic Dependent Surveillance-Broadcast (ADS-B)-Related Definitions.

1) ADS-B. A surveillance system in which an aircraft or vehicle to be detected is fitted with cooperative equipment in the form of a data link transmitter.

a) The aircraft or vehicle periodically broadcasts its GPS-derived position and other information such as velocity over the data link, which is received by a ground-based transmitter/receiver (transceiver) for processing and display at an ATC facility.

b) ADS-B is a system for airborne or surface aircraft, or other surface vehicles operating within the airport surface movement area, that periodically transmits a state vector (horizontal and vertical position, horizontal and vertical velocity) and other information.

c) ADS-B is a function on an aircraft or surface vehicle operating within the surface movement area that periodically broadcasts its state vector and other information. ADS-B is automatic because no external stimulus is required to elicit a transmission; it is dependent because it relies on onboard navigation sources and onboard broadcast transmission systems to provide surveillance information to other users.

d) ADS-B is an advanced surveillance technology where ADS-B Out-equipped aircraft share position, altitude, velocity, and other information with ATC and other appropriately equipped aircraft.

2) ADS-B Out.

a) The capability of an aircraft to periodically broadcast its position, velocity, and other information. ADS-B Out is automatic in the sense that no flight crew or controller action is required for the information to be transmitted. It is dependent surveillance in the sense that the surveillance information depends on the navigation and broadcast capability of the source.

b) Transmission of an aircraft’s position, altitude, velocity, and other information to other aircraft and ATC ground-based surveillance systems.

3) Extended Squitter (ES). A long message (e.g., format DF=17) that Mode S transponders transmit automatically, without need for interrogation by radar, to announce the own ship aircraft’s presence to nearby ADS-B-equipped aircraft.

4) Global Navigation Satellite System (GNSS).

a) A worldwide position, velocity, and time determination system that includes one or more satellite constellations, receivers, and system integrity monitoring, augmented as necessary to support the RNP for the actual phase of operation.

b) The generic term for a satellite navigation system, such as GPS, that provides autonomous worldwide geospatial positioning and may include local or regional augmentations.

5) Global Positioning System (GPS).

a) A space-based radio positioning, navigation, and time transfer system. The system provides highly accurate position and velocity information, and precise time (on a continuous global basis) to an unlimited number of properly equipped users. The system is unaffected by weather and provides a worldwide common grid reference system. The GPS concept is predicated upon accurate and continuous knowledge of the spatial position of each satellite in the system with respect to time and distance from a transmitting satellite to the user. The GPS receiver automatically selects appropriate signals from the satellites in view and translates these into three-dimensional position, velocity, and time. System accuracy for civil users is normally 100 meters horizontally.

b) A space-based position, velocity, and time system composed of space, control, and user segments.The space segment, when fully operational, will be composed of 24 satellites in 6 orbital planes. The control segment consists of five monitor stations, three ground antennas, and a Master Control Station (MCS). The user segment consists of antennas and receiver processors that provide positioning, velocity, and precise timing to the user.

c) A U.S. satellite-based radio navigation system that provides a global positioning service. The service provided by GPS for civil use is defined in the GPS Standard Positioning System Performance Standard, 4th Edition.

6) International Civil Aviation Organization (ICAO) 24-bit Address. Address assigned to each aircraft transponder of an ADS-B transmitter. For aircraft equipped with Mode S transponders, their replies to TCAS interrogations and their ADS-B transmissions should use the same 24-bit address, allowing correlations by Airborne Surveillance and Separation Assurance Processing (ASSAP).

7) Mode S. A Secondary Surveillance Radar (SSR) system that operates using addressed interrogation on 1030 megahertz (MHz), and the transponder replies on 1090 MHz. Mode S systems interrogate for aircraft identity (Mode A), altitude (Mode C), and other aircraft-specific information. The aircraft transponder replies with the requested information. Mode S supports a two-way data link that provides ADS-B data through an ES.

8) Position Source.

a) The onboard avionics equipment that provides the latitude, longitude, geometric altitude, velocity, position and velocity accuracy metrics, and position integrity metrics. Additionally, the position source may provide the vertical rate parameters.

b) Within this OpSpec, RAIM is a synonym for Aircraft-Based Augmentation System (ABAS) and is used to refer to both RAIM and RAIM-equivalent algorithms.

9) Secondary Surveillance Radar (SSR). A radar sensor that listens to replies sent by transponders carried onboard airborne targets. SSR sensors, in contrast to primary surveillance radar (PSR) sensors, require the aircraft under surveillance to carry a transponder.

10) Surveillance. Detection, tracking, characterization, and observation of aircraft, other vehicles, weather, and airspace status information and phenomena for the purposes of conducting flight operations in a safe and efficient manner. The primary purposes of traffic surveillance (as distinct from all surveillance functionality) are to control the flow of aircraft, to provide SA for pilots and controllers, and to separate aircraft.

5.1.7.7. ADS-B (OUT) OPERATIONAL APPROVAL.

A. Applicability. The following information identifies GACA approval requirements for Saudi Arabian aircraft operators in foreign airspace where a foreign authority requires an ADS-B Out operational approval. Additionally, a regional authorization (via OpSpec B050) is also required for operations in areas outside of KSA airspace (e.g., ADS B use within the Hong Kong flight information region (FIR) will also require B050 for China). Although A153 is not required for ADS-B (Out) operations in Saudi Arabian airspace operators should be encouraged to request this OpSpec whenever their aircraft are equipped and their crews are training for ADS-B (Out) operations. Authorization is not required to use Flight Information Service-Broadcast (FIS-B) or Traffic Information Service-Broadcast (TIS-B) services for situational awareness onboard the aircraft.

NOTE: The ADS-B A153 Application Checklist provides the most up to date information on which countries require A153. As additional regions are implementing ADS-B, Saudi Arabian operators are advised to monitor the regions (applicable Aeronautical Information Publication (AIP) and/or AICs) applicable to their operation for any changes related to ADS-B requirements and to comply with GACAR § 91.475, Operations of civil aircraft of KSA registry outside of the KSA.

B. Authorization. OpSpec A153 is an optional authorization applicable to all certificate holders/operators conducting ADS-B Out operations under GACAR Parts 91, 121, 125, 133, and 135.

C. Application Process.

1) The operator submits an application identifying each aircraft make, model, and series (M/M/S) during initial and subsequent requests for A153 authorization. Subsequent requests to add additional aircraft of the same M/M/S to an existing authorization should include documentation contained in subparagraphs D2), D3), and D6) below.

2) The assigned Inspector will conduct a review of the applicant's submitted proposal using the A153 Application Checklist. When compliance with the applicable requirements has been determined, the principal inspector (PI) will issue A153.

D. ADS-B Application.

1) Checklist. The operator must complete the required A153 Application Checklist. The following requirements correspond to the checklist items and should be documented, referenced, and attached to the application in order:

2) Letter of Request. The PI must review the operator's letter of request for issuance of authorization. Verify the letter of request includes the following information:

a) Type of aircraft (M/M/S);

b) Airplane registration marks and serial number(s);

c) Areas of intended operation.

3) Copy of Manual. The PI should verify that the Aircraft Flight Manual (AFM)/Aircraft Flight Manual Supplement (AFMS)/Airplane Operations Manual (AOM) or pilot's operating handbook (POH) (as appropriate), which states that the aircraft's ADS-B Out system complies with any of the following:

• GACAR Part 91, Appendix C, Section VII

• FAR 91.227.

• The current edition of FAA AC 20-165, Airworthiness Approval of Automatic Dependent Surveillance Broadcast (ADS-B) Out Systems.

• EASA AMC 20-24, Certification Considerations for the Enhanced ATS in Non-Radar Areas using ADS-B Surveillance (ADS-B-NRA) Application via 1090 MHZ Extended Squitter (until rescinded).

• Regulation (EU) no. 1207/2011.

NOTE: The following is an example of an AFM statement for an ADS-B system which complies with FAR § 91.227: "The installed ADS-B Out system has been shown to meet the equipment requirements of 14 CFR § 91.227."

NOTE: ADS-B Out systems approved per previous versions of FAA AC 20-165 must have any variances, with subsequent revisions of that guidance, resolved through the FAA/manufacturer issue paper process. Such systems do not require revision of existing AFM/AFMS/AOM/POH/FOM or equivalent FAA AC 20-165 compliance statements.

4) B050. The PI should review a copy of the operator's draft OpSpec B050 annotating the authorized en route areas where A153 will be used. (N/A for GACAR Part 91 operators. For GACAR Part 91 operators, the PI will enter the area(s) of intended operations in the "Conditions and Limitations" box located in "Table 1" of the COA template.)

5) Part 91 Operators. The PI must verify the operator provided a statement that the operator's pilot(s) has knowledge of current air traffic ADS-B directives for the intended areas of en route operation(s).

NOTE: Part 91 statement example: Company XX pilots have knowledge of current air traffic ABS-B directives for the intended areas of en route operation and will comply with GACAR § 91.475.

6) Maintenance Record. The PI should review the operator's aircraft maintenance record (e.g., aircraft's maintenance record, logbook, or Computerized Maintenance Program (CMP)) that verifies ADS-B installation on applicable aircraft was accomplished per Supplemental Type Certificate (STC) or other approved means. (N/A for new aircraft certified with ADS-B Out.)

E. Administrative Changes to Part 91 COAs.

1) The following changes are considered to be administrative in nature only:

a) Change in the primary business address of an ADS-B Out-Compliant Aircraft and/or A153 authorization holder.

b) Change in an existing operator's designated A153 Responsible Person or A153 Point of Contact (POC).

c) Change in the registration markings of an ADS-B Out-Compliant Aircraft being operated by an existing A153 authorization holder.

d) Removal of an ADS-B Out-Compliant Aircraft from an existing A153 authorization that has multiple ADS-B Out-Compliant Aircraft listed.

2) The operator requesting an administrative change should then submit a written request to the PI, that:

a) States which of the applicable administrative changes are occurring;

b) Further affirmatively states that none of the previously accepted A153 authorization elements that formed the basis for the initial issuance of the affected ADS-B Out authorization have changed or are changing; and

c) Requests the issuance of an amendment to the existing A153 authorization that acknowledges the administrative change being made.

NOTE: The operator should also provide such further information as the PI may request in order to efficiently process the request.

3) The PI should issue an amended A153 as follows:

a) Reissue the amended A153 authorization that is identical to the initial A153 authorization in all respects other than reflecting the new amended information without further inspections required.

b) Reserved.

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CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 1. Background of All Weather Terminal Area (AWTA) Operations

5.2.1.1. GENERAL BACKGROUND. All weather terminal area (AWTA) operations include all terminal area operations conducted under instrument flight rules, including certain operations conducted in visual meteorological conditions. This chapter introduces concepts and guidance to be used by General Authority of Civil Aviation (GACA) aviation safety inspectors (Inspectors) when evaluating, approving, or denying requests for an authorization to conduct AWTA operations.

A. AWTA Operations. Due to the complexity of AWTA operations, and wide variations in equipment, procedures and standards used, Inspectors must evaluate proposed AWTA operations considering the capabilities of the following:

- The operator's aircraft
- Type of AWTA operations proposed
- Aerodromes being used
- Operating minima
- Operator's experience with other aircraft and equipment in the type of operation proposed
- Operator's experience with the same aircraft and equipment in other AWTA operations

B. All Weather Terminal Area Operations vs. Lower Visibility Operations – Use of the Terms. General Authority of Civil Aviation Regulation (GACAR) Part 91 and other rules and references refer to Lower Visibility Operations, e.g., GACAR §§ 91.393 to 91.403, et.al., whereas this chapter and other references in industry refer to All Weather Terminal Area Operations when discussing lower weather minimums for takeoff, approach and landing. As these terms are used here they are essentially synonymous. The term All Weather Terminal Area Operations as used by the GACA and other regulatory authorities is a broader definition with applicability in all operations as opposed to operations that are limited to lower visibility conditions.

C. Specific Standards. Specific standards are provided in this chapter for evaluating operations using aircraft and equipment, which have well understood operational characteristics and limitations in specific AWTA operations. When an operator requests approval to conduct operations not covered in these standards, or when an operator requests to use lower operating minima than the ones provided in these standards, the request must be forwarded to the Director, Flight Operations Division who will develop the necessary AWTA operational concepts and will provide policy and direction to be used in evaluating these proposals.

5.2.1.3. EVOLUTION OF AWTA OPERATIONS. In the early years of aviation, all flight operations were conducted in visual flight conditions. During those early years, electronic ground based navigation aids were not available and cockpit instrumentation could not support flight in instrument meteorological conditions. The capability of AWTA operations slowly evolved as flight instrumentation, airborne navigation equipment, and ground based electronic navigation aids were developed and improved. The development of the gyro, providing reliable attitude information, was the technological advance that established the foundation for instrument flight as we know it today. The essential information provided by this device permitted pilots to safely control aircraft during instrument flight conditions. Operating minima were gradually reduced as overall capability for instrument flight improved. The introduction of turbojets for commercial service, circa 1958, provided the stimulus for further and more rapid refinement of equipment, operating procedures, and standards.

A. The evolution of AWTA operations has progressed to the point where landing and takeoff operations can continue safely in almost all meteorological conditions provided systematic and disciplined procedures and practices are followed which are based on the extensive research, testing and operation experience of the last 50 years.

B. Sections 2 through 12 of this chapter outline keys elements of this broad subject area in further detail.

5.2.1.5. AUTHORITY AND RESPONSIBILITY FOR APPROVAL OF AWTA OPERATIONS. The complex nature of AWTA operations in domestic and international environments, the wide variation of airborne and ground-based equipment, and the variation in procedures and standards used in these operations, require a broad based evaluation and approval process.

A. Evaluation and Approval. An evaluation and approval process has been established to ensure that AWTA operations are conducted at facilities, which have the capabilities necessary for safe operation. This process is necessary for safely accommodating the varying levels of standardization and capabilities of the ground based facilities that can be used to conduct the various categories of AWTA operations. The process must take into consideration wide variations in the capabilities of the airborne equipment options available to air operators. The operational concepts and procedures, flight crew training programs, and aircraft maintenance programs vary widely from one operator to another. All of these factors require a special review and approval process to ensure that proposed operations are compatible with the intent of established AWTA operational concepts, procedures, and safe operating practices.

B. Systems Approach. Due to these operational and technical complexities, it is essential for this evaluation and approval process to use a “systems approach” (big picture approach). This systems approach must involve many personnel who are knowledgeable in their respective areas. When the safety of a proposed operation is being evaluated, personnel knowledgeable in such areas as aircraft certification, navigation equipment design and maintenance, visual aid concepts and criteria, instrument approach procedure design criteria, aerodrome design criteria, flight inspection, air traffic services (ATS) procedures, flight operational programs, aircraft maintenance programs and aircrew/maintenance personnel training programs must be involved. This broad-based systems approach process is particularly important in the evaluation and approval of CAT II and CAT III approach and landing operations.

5.2.1.7. FURTHER READING AND REFERENCES.

A. Further reading on subjects related to AWTA operations may be found in the following documents:

- ICAO Annex 10 / Telecommunications Vol. I
- ICAO Annex 14 / Aerodromes
- ICAO Doc 8186 / PANS - OPS Aircraft Operations
- ICAO Doc 9365 / AWO Manual

- ICAO Doc 9476 / SMGCS Manual (Surface Movement Guidance And Control Systems)
- ICAO Doc 9157 / Aerodrome Design Manual
- ICAO Doc 9328 / Manual for RVR Assessment
- ICAO Doc 9613 / Performance Based Navigation Manual

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CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 2. General Concepts for All Weather Terminal Area (AWTA) Operations

5.2.2.1. GENERAL. This section contains a discussion of all-weather terminal area (AWTA) operations, including takeoff, departure, approach, and landing operations. AWTA operations are those operations conducted in the terminal area under instrument flight rules. This section discusses general concepts for AWTA approach and landing operations conducted only under instrument flight rules (IFR). The basic principle for AWTA approach and landing operations is that operating minimums are permitted to be reduced through improvements in operational capabilities. This principle is valid only if an acceptable escape capability (missed approach) is maintained or if an extremely high probability of safely completing the landing maneuver exists. All instrument approach procedures (IAP) are constructed to permit safe instrument flight to the missed approach point followed by an instrument missed approach. The safety of conducting an instrument approach to a published minimum and executing the missed approach is not dependent on establishing visual reference with the landing surface. The criteria for constructing an instrument approach are based on the premise that an instrument missed approach will be necessary under certain circumstances. Visual reference with the landing surface, however, becomes a safety factor when the flight descends below the published IFR minimum height or altitude. The visibility or runway visual range (RVR) for a particular runway becomes a safety consideration in both fuel planning and selection of alternate aerodromes.

A. Terminal Control Area. Recall that a Terminal Control Area is normally established at the confluence of air traffic services (ATS) routes in the vicinity of one or more aerodromes.

B. Control Area Operations. Control area operations are those operations conducted in the vicinity of a Terminal Control Area (TCA).

5.2.2.3. BASIC TYPES OF AWTA APPROACH AND LANDING OPERATIONS. There are two generic classes of approach and landing operations, those conducted under VFR and those conducted under IFR. There are two basic types of IFR approach and landing operations: visual approaches, and instrument approaches.

A. Visual Approaches. A visual approach may be authorized by ATS if the aircraft is being operated under IFR in visual meteorological conditions (VMC) conditions. Although a pilot conducting a visual approach is expected to proceed to the destination aerodrome by pilotage or by visual reference to another aircraft, the flight remains under an instrument flight plan. ATS retains responsibility for both traffic separation and wake/vortex separation, unless the pilot is following another aircraft and has established visual contact with it. ATS will provide flight-following and traffic information until the aircraft is instructed to contact the control tower. Either ATS or the pilot may initiate a request for a visual approach.

B. Instrument Approaches. Instrument approach procedures are provided to permit descent in instrument conditions from the en route environment to a point where a safe landing can be made at a specific aerodrome. Instrument approach procedures are defined by International Civil Aviation Organization (ICAO) as “a series of predetermined maneuvers by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply.

1) Instrument approach procedures are classified as follows:

- *Non-precision approach (NPA) procedure.* An instrument approach procedure which utilizes lateral guidance but does not utilize vertical guidance

- *Approach procedure with vertical guidance (APV).* An instrument approach procedure which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations

- *Precision approach (PA) procedure.* An instrument approach procedure using precision lateral and vertical guidance with minima as determined by the category of operation

2) The types of instrument approach procedures include approaches based on ICAO standard navigation aids (NAVAIDs) - (instrument landing system (ILS), microwave landing system (MLS), global navigation satellite system (GNSS), very high frequency omnirange station (VOR), VOR/distance measuring equipment (DME), and non-directional beacon (NDB)) as well as approaches based on ATS radar services (aerodrome surveillance radar/precision approach radar (ASR/PAR)). Instrument approach procedures also include Performance-based navigation (PBN) procedures that are developed in accordance with ICAO Procedures for Air Navigation Services Aircraft Operations (PANS-OPS) Required Navigation Performance concepts that are consistent with the performance characteristics of systems such as global navigation satellite system (GNSS), or DME/DME/ Inertial Reference Units (IRU), or flight management system (FMS)/GNSS, or FMS/GNSS/IRU.

5.2.2.4 CATEGORIES OF AIRCRAFT. Aircraft performance has a direct effect on the airspace and visibility required for the various maneuvers associated with the conduct of instrument approach procedures. The most significant performance factor is aircraft speed. Accordingly, categories of typical aircraft have been established. These categories provide a standardized basis for relating aircraft maneuverability to specific instrument approach procedures. For precision approach procedures, the dimensions of the aircraft are also a factor for the calculation of the obstacle clearance height (OCH). Aircraft approach category means a grouping of aircraft based on a speed of Vref, if specified, or if Vref is not specified, 1.3 Vso at the maximum certificated landing mass. Vref, Vso, and the maximum certificated landing mass are those values as established for the aircraft under GACAR Part 21. The categories are as follows—

(1) Category A: Speed less than 91 knots.

(2) Category B: Speed 91 knots or more but less than 121 knots.

(3) Category C: Speed 121 knots or more but less than 141 knots.

(4) Category D: Speed 141 knots or more but less than 166 knots.

(5) Category E: Speed 166 knots or more.

The instrument approach chart will specify the individual categories of aircraft for which the procedure is approved. Normally, procedures will be designed to provide protected airspace and obstacle clearance for aircraft up to and including Category D. However, where airspace requirements are critical, procedures may be restricted to lower speed categories. Alternatively, the procedure may specify a maximum speed for a particular segment without reference to aircraft category. In any case, it is essential that pilots comply with the procedures and information depicted on instrument flight charts if the aircraft is to remain in the areas developed for obstacle clearance purposes.

An operator may impose a permanent lower landing mass, and use of this mass for determining the aircraft approach category if the change is approved by the President. The category defined for a given aircraft must be a permanent value and thus independent of changing day-to-day operations.

5.2.2.5. CATEGORIES OF INSTRUMENT APPROACH PROCEDURES. Various categories of precision instrument approach operations have been established to accommodate a wide variety of airborne and ground-based or space-based capabilities. These operational categories are necessary for the granting of credit to operators who choose to establish capabilities exceeding the minimum regulatory requirements. These operational categories also provide the distinction between operational capabilities and ground support system configurations. Category (CAT) I, CAT II, and CAT III are the three basic categories of instrument approach operations.

A. CAT I Operations. CAT I operations are defined as precision approach and APV approach and landing operations (precision like) conducted under IFR using CAT I operating minima. CAT I operating minima consist of a specified IFR descent altitude (height) (DA(H)) that is not lower than the equivalent of 200 feet above the touchdown zone, and a visibility, or a runway visual range (RVR) that is not lower than 1/2 statute mile (800m) or RVR 1800/550m respectively. If authorized, circling maneuvers may be used to complete a visual landing on the intended runway following the completion of the instrument portion of an approach.

B. CAT II Operations. CAT II operations are precision approach and landing operations conducted with a DH of less than 200 feet but not less than 100 feet, and an RVR of not less than 1,200 feet (350 meters).

C. CAT III Operations. CAT III operations are separated into three separate subcategories: CAT IIIa, CAT IIIb, and CAT IIIc.

1) *CAT IIIa Operations*. CAT IIIa is an approach and landing operation with an RVR of not less than 700 feet (200 meters) without a DH, or with a DH of less than 100 feet, or an alert height (AH) of 100 feet or less. Both fail passive and fail operational airborne equipment can be used in CAT IIIa operations.

2) *CAT IIIb Operations*. CAT IIIb is an approach and landing operation with an RVR of less than 700 feet (200 meters) but not less than 150 feet (50 meters) and a DH of 50 feet or less, or an AH of 100 feet or less. Fail operational airborne equipment must be used for CAT IIIb operations.

3) *CAT IIIc Operations*. CAT IIIc is an approach and operation landing without a DH and without RVR limitations (zero-zero). CAT IIIc operations are not currently authorized.

5.2.2.7. PERFORMANCE-BASED NAVIGATION (PBN) – INSTRUMENT APPROACHES. Instrument approaches under the Performance-Based Navigation (PBN) concept covers all segments of the instrument approach, i.e. initial, intermediate, final and missed approach. These include RNP specifications requiring a navigation accuracy of 0.3 NM to 0.1 NM or lower. Typically, three sorts of RNP applications are characteristic of this phase of flight: new procedures to runways never served by an instrument procedure, procedures either replacing or serving as backup to existing instrument procedures based on different technologies, and procedures developed to enhance aerodrome access in demanding environments. The relevant RNP specifications for PBN instrument approaches are addressed in Volume II of the ICAO PBN Manual (ICAO Doc. 9613). The PBN instrument approach navigation specifications currently in existence are RNP APCH and RNP AR APCH. An additional navigation specification called Advanced RNP is also planned. Approach navigation specifications cover all segments of the instrument approach. There are no RNAV approach specifications although all RNP approach charts depicting procedures that meet the RNP APCH navigation specification criteria include the term **RNAV (GNSS)** in the identification.

A. Minima for **RNAV (GNSS)** approach procedures are labeled on the chart as follows:

1) Non-precision approach procedures = “LNAV”.

2) Approach procedures with vertical guidance (APV):

a) SBAS LNAV/VNAV performance level and Baro-VNAV = “LNAV/VNAV”

b) SBAS APV-I/II performance level = “LPV”.

B. All RNP approach procedures require additional levels of scrutiny, control and authorization. The increased risks and complexities associated with these procedures are mitigated through more stringent RNP criteria, advanced aircraft capabilities, airworthiness requirements, and increased aircrew training.

C. The Federal Aviation Administration (FAA) published approval guidance for RNP procedures with Special Aircraft and Aircrew Authorization Required (SAAAR) through FAA AC 90-101. The European Aviation Safety Agency (EASA) has developed equivalent guidance in AMC 20-26. In line with the PBN concept, this navigation specification is developed to harmonize standards and requirements for highly specialized instrument approach procedures. For GACA, the ICAO PBN Manual (ICAO Doc. 9613) is the governing guidance document.

5.2.2.9. AERODROME OPERATING MINIMA. The lowest operating minima for AWTA operations must be established with the criteria prescribed in Sections 5 through 10 of this chapter. For operations conducted under GACAR Part 121, 125 and 135 these criteria are specified in operating specifications (OpSpecs) – for all others, they are prescribed in the low visibility operations Certificate of Authorization. GACAR Part 129 minima are established by the State of the operator or the President and approved in the authorizing document issued under GACAR Part 129.

5.2.2.11. CONTROLLING MINIMUM CONCEPT. The concept of a controlling minimum is based on reported weather conditions at the destination aerodrome. The controlling minimum concept includes considerations for the reported weather conditions, the capabilities of the flight crew, and the capabilities of the airborne and ground or space based equipment. This concept prohibits a pilot from continuing past the final approach fix (FAF), or beginning the final approach segment of an instrument approach procedure unless the reported visibility (or RVR, if applicable) is equal to or greater than the authorized visibility (or RVR) minimum for that instrument approach procedure. The basic objective of the controlling minimum concept is to provide reasonable assurance that once the aircraft begins the final approach segment, the pilot will be able to safely complete the landing. The controlling minimum concept, however, permits a pilot to continue a CAT I approach to DA(H) if the visibility/RVR was reported to be at or above the controlling minimum when the pilot began the final approach segment even though a later visibility/RVR report indicates a below minimum condition. RVR reports, when available for a particular runway, are the reports (controlling reports) that must be used for controlling whether an approach to, and landing on, that runway are authorized or prohibited.

5.2.2.13. GENERAL FACTORS AFFECTING OPERATING MINIMA. The external visual references necessary for controlling an aircraft solely by visual means are not available throughout an instrument approach and landing operation in instrument conditions. Therefore, the pilot must control the aircraft along the desired flightpath by reference to instruments, or by reference to a combination of instrument and external visual information. In AWTA operations, the desired level of safety is achieved through the use of special equipment, special training, instrument flight procedures, and associated operating minima. These factors ensure that the combination of information (available from external sources and airborne instruments and equipment) is sufficient to enable an aircraft to be safely operated along the desired flightpath, provided weather conditions are at or above the operating minimum. As external visual information decreases due to restricted seeing-conditions, the quality and quantity of information from instrument and other equipment sources and the proficiency of the flight crew must increase. For approach and landing operations, the specific considerations involved when determining operating minima are related to the following factors:

- Precision with which the aircraft can be controlled along the desired approach path using the guidance provided by Navigational Aids (NAVAID) through reference to aircraft instrumentation and use of airborne equipment
- Flight characteristics of the aircraft
- Physical characteristics of the aircraft
- Character of the ground environment and obstructions
- Flight crew proficiency
- Extent to which external visual information must be used to control the aircraft
- Interaction of these factors to provide satisfactory total system performance

5.2.2.15. PRECISION OF FLIGHTPATH CONTROL. The precision of flightpath control is dependent upon at least the following factors:

- Accuracy and integrity of the “signals-in-space” radiated by NAVAIDs (accuracy and integrity of NAVAIDs)
- Accuracy of airborne equipment in detecting the “signals in space” and in providing instrument information to the pilots or autopilot (accuracy of airborne equipment)
- Precision with which the pilot or autopilot maintains the selected flightpath in varying environmental conditions (flight technical error)

5.2.2.17. OBSTACLE CLEARANCE. Obstacle clearance is achieved by the pilot seeing and avoiding the obstacles, by the pilot’s use of instrument information, and/or through instrument procedure design. General Authority of Civil Aviation Regulation (GACAR) Part 172 addresses instrument flight procedure design. It is not always practical to design an instrument flight procedure that permits instrument information to be used for avoiding obstacles. In these situations, operating minima are established which ensure the flight crew will have sufficient seeing-conditions to identify obstacles and safely maneuver to landing using external visual references. Accuracy of the guidance and control systems, and the pilot’s proficiency, determine the size of the area in which obstacle clearance must be considered. The more precise a total system, the smaller the area in which obstacles must be considered (fewer obstacles) and usually lower operating minima may then be established. When obstacles are not limiting, the height to which an approach can be conducted without establishing external visual reference is limited by performance of the total system. Generally, lower operating minima are achieved by increasing precision, reliability, and integrity of the total system (both airborne and ground based).

5.2.2.19. FUNCTION OF EXTERNAL VISUAL REFERENCES.

A. General. Except for certain CAT III operations, external visual information is essential for a pilot to safely takeoff or to complete an instrument approach and landing. This external visual information (visual cues) is necessary for a pilot when assessing the three-dimensional position of the aircraft, its velocity, and its acceleration or deceleration in relation to the intended landing or takeoff surface. This information is essential for a pilot when manually maneuvering (or when evaluating the autopilots performance in maneuvering) the aircraft into alignment with the centerline of a landing or takeoff surface. External visual references are essential for a pilot to safely touchdown (decelerate to air taxi/hover for rotorcraft) within the touchdown zone and for maintaining directional control so as to stop on the runway (maintain directional control and avoid obstacles while air taxiing for rotorcraft). In degraded seeing-conditions, the quality of external visual information can be significantly improved by use of visual aids, such as runway markings and lighting. Such visual aids are necessary to increase the conspicuousness of the landing or takeoff surface. These aids provide pilots with the necessary visual references during takeoff, the final stages of approach and landing, and ground movement. The importance of visual aids increases as seeing-conditions decrease.

B. Lateral Position and Crosstrack Velocity or Acceleration. Approach lighting, touchdown zone lighting, runway centerline lighting, runway edge lighting, and runway markings, provide visual references to pilots for assessing lateral position and crosstrack velocity or acceleration.

C. Visual Roll References during Landing, Takeoff, Rotation, and Initial Climb. Approach lighting, threshold lighting, in-runway lighting, and runway markings, provide visual roll references during landing, takeoff, rotation, and initial climb.

D. Visual Information for a Pilot. Touchdown zone lighting and runway markings indicate the plane of a landing surface and identify the touchdown area, thereby providing a vertical and longitudinal reference. These visual aids provide necessary visual information for a pilot to determine vertical position, sink rate, and vertical acceleration or deceleration.

E. Adequate Alignment and Directional Control Information. The visual guidance information from in-runway lights and/or markings must be sufficient to ensure adequate alignment and directional control information during takeoff or during final stages of landing and deceleration.

F. External Visual Aids. Reference to external visual aids is a primary requirement for controlling the aircraft’s flightpath when operating below the minimum altitude (height) published for instrument flight.

5.2.2.21. MAXIMUM SINK RATES.

A. Perceptual Limitations. Restricted seeing-conditions significantly affect a pilot’s ability to visually detect or perceive vertical height, sink rate (vertical velocity), and vertical acceleration. As seeing-conditions decrease, the pilot’s ability to perceive vertical height, sink rate, and vertical acceleration degrades faster than the ability to perceive lateral errors and lateral accelerations. Personnel establishing operating minima must consider these human perceptual limitations.

B. Aircraft Structural Limitations. According to structural design criteria, the aircraft structure must tolerate touchdown sink rates (vertical velocity) of at least 10 feet per second (600 fpm). Touchdown sink rates higher than the maximum rates evaluated during the certification of an aircraft can cause serious structural damage including catastrophic failure. Therefore, instrument procedure design must provide for sink rates that give a pilot the capability of detecting unacceptable situations and adjusting the flightpath to achieve a safe landing considering available visual aids and operating minima. Visual aids and operating minima must provide a high probability that a pilot will be able to control the aircraft adequately and adjust the vertical flightpath to achieve acceptable sink rates at touchdown and touchdown within the touchdown zone.

C. Maximum Acceptable Sink Rates. Operational experience and research have shown that a sink rate of greater than approximately 1,000 feet per minute (fpm is unacceptable during the final stages of an approach (below 1,000 feet above ground level). This is due to a human perceptual limitation that is independent of the type of aircraft operated. Therefore, the initial approach fixes (IAPs) and the operational practices and techniques must ensure that sink rates greater than 1,000 fpm are not required or permitted in either the instrument or visual portions of an approach and landing operation. Operating minima and available visual aids must provide reasonable assurance that a pilot will have adequate external visual references in the visual portions of all instrument flight procedures (certain CAT III operations excepted). To be considered adequate, these external visual references must permit a pilot to adequately perceive sink rates and manually maneuver the aircraft (or evaluate autopilot performance) to achieve an acceptable touchdown sink rate and touchdown point, considering the operating minima and the available visual aids.

5.2.2.23. COCKPIT DESIGN. Physical design of an aircraft cockpit has a significant impact on seeing-conditions during takeoff and the final stages of an instrument approach and landing. Cockpit design has a direct effect on a pilot's ability to determine the three-dimensional position of an aircraft in relation to a landing or takeoff surface and, consequently, on the ability to safely control the flightpath of the aircraft. Therefore, cockpit design is a significant factor in establishing operating minima of a particular aircraft. Generally, aircraft with larger cockpit cutoff angles (better downward viewing angles over the nose) and shallower landing pitch attitudes provide for better seeing-conditions. Improved seeing-conditions derived from improved cockpit design can be used to justify lower operating minima.

5.2.2.25. MINIMUM INSTRUMENT FLIGHT ALTITUDES. Except for certain CAT III operations, all instrument approach and landing operations have limitations related to obstacles, airborne instrumentation and equipment, ground-based navigation equipment, and/or visual aids. Because of these limitations, external visual information is required to safely complete instrument approaches and landings. Airborne instruments and equipment and the signals in space radiated by ground-based NAVAIDs must provide pilots adequate guidance to safely control an aircraft by reference solely to instruments until the aircraft arrives at a pre-established minimum height or altitude (decision altitude (DA) height (H) or minimum descent altitude (MDA)) for instrument flight. The total system (airborne and ground based) does not provide this capability below the minimum height or altitude for instrument flight. Therefore, descent below the specified minimum height or altitude for instrument flight can only be safely accomplished when adequate external visual references are available. If adequate external visual references are not established, a pilot must execute an instrument missed approach at or before passing a pre-established missed approach point (MAP).

> **NOTE**: Descent below the specified minimum instrument flight rules (IFR) altitude without adequate visual references to control and maneuver the aircraft to a landing is unsafe and prohibited. The minimum height or altitude for instrument flight for an instrument approach and landing is specified in various ways depending on the type and category of the instrument approach conducted.

A. Non-Precision Approach Procedures. The minimum heights or altitudes for IAPs that do not have vertical guidance can be specified as an MDA, height above touchdown (HAT), height above aerodrome/airport (HAA), minimum descent height (MDH), obstacle clearance altitude (OCA), obstacle clearance height (OCH), or obstacle clearance limit (OCL).

MDA, HAT, HATh, and HAA are used by the U.S. and certain foreign countries that use U.S. Terminal Instrument Procedures (TERPS) criteria. OCA, OCH, and OCL are used in the many other countries, and they are established in accordance with International Civil Aviation Organization (ICAO) Procedures for Air Navigation Services (PANS)-(OPS). Although the current version of ICAO PANS-OPS eliminated use of OCL, some countries still use OCL criteria from previous versions of PANS-OPS. Some countries, in addition to OCA and OCH, provide MDA and MDH. MDA and OCA are barometric flight altitudes referenced to mean sea level (MSL). HAT, HATh, HAA, MDH, OCH, and OCL are radio or radar altitudes referenced to the elevation of the aerodrome, the elevation of the touchdown zone or the elevation of the landing threshold.

• MDA or OCA may be specified for any approach procedure that does not have vertical guidance

• HAT, MDH, OCH, or OCL may be specified for straight-in approach procedures that do not have vertical guidance

• HAA, MDH, OCH, or OCL may be specified for circling maneuvers

B. Precision and APV Approach Procedures. The minimum heights or altitudes for instrument approach procedures with vertical guidance can be specified as a DA, OCA, DH, OCH, or OCL. In the United States (US) and certain foreign countries that use US TERPS criteria, the minimum instrument flight altitude for precision and APV approaches with vertical guidance is DA(H). DA(H) is specified as a decision altitude referenced to MSL for aircraft equipped with only barometric altimeters and as HAT or HATh (for procedures developed with harmonized visibility minima) for aircraft equipped with radio or radar altimeters. DA, DH, OCH, and OCL are used in the Kingdom of Saudi Arabia (KSA) and many other countries, and they are established in accordance with ICAO PANS-OPS. DA and OCA are referenced to a barometric altitude (MSL). DH (in most countries), OCH, and OCL are referenced to a radio or radar height above either the elevation of the airport, the elevation of the touchdown zone, or the elevation of the landing threshold.

C. Lowest Permissible Height or Altitude for Instrument Flight. The lowest permissible height or altitude for instrument flight for any approach cannot be lower than any of the following:

• Minimum height specified by the approved aircraft flight manual

• Minimum height or altitude for which the signals from ground-based or space-based navigation equipment can be relied upon for instrument flight

• Minimum height or altitude which provides adequate obstacle clearance

• Minimum height or altitude authorized for the flight crew

• Minimum height or altitude authorized for the operator for that aircraft and equipment combination

• Minimum height or altitude permitted by the operative airborne and ground-based or space-based equipment

• Minimum height or altitude published or otherwise established for the instrument approach

• Minimum height or altitude authorized in OpSpecs for the operation being conducted

5.2.2.27. MINIMUM VISIBILITY, AND/OR RUNWAY VISUAL RANGE. Upon arrival at the minimum height or altitude for instrument flight and before passing a pre-established decision point, a pilot must establish adequate seeing-conditions to safely complete the approach and landing. Operating minima are expressed as visibility, or runway visual range (RVR). Criteria for establishing aerodrome operating minima must provide a reasonable assurance that a pilot can establish the required seeing-conditions before passing the decision point. This criterion provides this assurance, if the weather conditions are reported to be at or above the landing minimum when the approach is initiated. To achieve this objective, the operating minima specified for the procedure (visibility, RVR) must be compatible with the minimum height or altitude for instrument flight and the decision point specified for the procedure. Therefore, when the reported weather conditions are at the authorized minima, a pilot should be able to establish external visual references upon arrival at the minimum height or altitude (DA (H) or MDA), and before passing the decision point (DA(H), MAP, or visual descent point (VDP)). At this point a pilot must be able, by external visual reference, to maneuver to a landing without exceeding a descent rate of 1000 fpm or exceeding aircraft limitations on touchdown. For example, it would not be practical to specify a DA(H) of 200 feet (HAT 200) with an operating minimum of RVR 200m since the first visual contact in a typical aircraft would not occur until approximately 130 feet above the elevation of the touchdown zone. The specified operating minimum must also permit adequate external visual references to be established early enough for a normal descent to landing (less than 1000 feet per minute). For example, it would not be reasonable to specify an MDA equivalent to a HAT of 400 feet (125m) and an operating minimum of RVR 500m for typical turbojet airplanes. In this situation, the pilot would not establish first visual contact until the airplane is within 4000 feet (1200m) of the landing threshold and would require a descent rate much higher than 1000 fpm to land within the touchdown zone.

5.2.2.29. SAFETY DURING GO-AROUNDS.

A. Executing a Go-Around. Most aircraft used in air transportation have the capability, in a normal approach and landing configuration, of safely executing a go-around from any point before touchdown, even when significant failures occur, such as engine, hydraulic, or autopilot failures. This aircraft performance capability for safety in go-arounds should be provided for, particularly for go-arounds caused by operational factors, such as airborne and ground based equipment failures, ATS contingencies, loss of external visual references, and misalignment with the landing surface. This capability is required in all CAT II and CAT III operations. When one is establishing operating minima for aircraft that do not have this capability, the consequences of the failures that would preclude a safe go-around must be considered. Operating minima for aircraft without the performance capability to safely go-around following engine failure must provide adequate seeing conditions to successfully accomplish a forced landing in a pre-established location. The following factors must be considered when evaluating the safety of go-arounds from any point in the approach before touchdown:

B. Go-Around Capability. The go-around capability is based on normal operating conditions at the lowest authorized operating minimum. Factors related to geometric limitations of the aircraft during the transition to a go-around (such as tail strike, or rotor strike) must be considered. Other factors such as the available visual cues, autopilot or flight director mode switching, altitude loss in transition to go around, and altitude loss due to autopilot malfunction must also be considered.

C. Inadvertent Touchdown. If a go-around could result in an inadvertent touchdown, the safety of such an event must be considered. The aircraft design and/or procedures used must accommodate for relevant factors. Examples of relevant factors, which must be considered, include operation of engines, the operation of autothrottle, autobrakes, autospoilers, autopilot mode switching, and other systems, that could be adversely affected by an inadvertent touchdown.

D. Failure Condition in the Aircraft. If the occurrence of any failure condition in the aircraft or its associated equipment could preclude a safe go-around from low altitude, then these failure conditions must be clearly identified. In these cases, a minimum height must be specified from which a safe go-around can be initiated if the failure occurs. If the failure occurs below the specified height, pilots must be made aware of the effects or consequences of any attempt to go around.

E. Appropriate Procedures for Low Altitude Go-Arounds. Information must be provided to the flight crew concerning appropriate procedures for low altitude go-arounds and the height loss expected. If the conduct of certain approach and landing operations is authorized with an engine-out, height loss information for engine out operations must also be provided to the flight crew.

5.2.2.31. CONCEPTS OF DECISION ALTITUDE AND DECISION HEIGHT (DA(H)).

A. DA(H) Concept. The DA(H) concept is the foundation for CAT I and CAT II approach and landing operations. It is also an essential concept in certain CAT III operations. This concept evolved after the introduction of turbojets in 1958. It was established to resolve problems created by use of a ceiling as an element of operating minima, especially during rapidly changing weather conditions. The use of the DA(H) concept also enhances safety of operations in degraded seeing-conditions. A DA(H) is established to require that the pilot, decide whether adequate visual references are available for accomplishing the following actions, before passing the specified height:

- Verifying that the aircraft is in a position which will permit a safe landing in the touchdown zone

- Determining that sufficient external visual references are available to manually maneuver the aircraft (or assess autopilot maneuvering in CAT II and III operations) into alignment with the runway centerline

- Determining that the aircraft can be maneuvered to touchdown within the touchdown zone, that directional control can be maintained on the runway, and that the aircraft can be stopped within the available runway length

- For rotorcraft operations, determining that sufficient visual references are available to: maneuver the rotorcraft to align with the landing area; decelerate to air taxi, or hover; and maintain directional control while air taxiing.

B. Operational Viewpoint. From an operational viewpoint, DA(H) is the limit to which a pilot can descend before having to decide to continue the approach by visual means. If the visual references required to safely continue the approach have not been established before passing DA(H), a missed approach must be executed at DA(H). This does not mean that a pilot waits until arriving at DA(H) before deciding to go around or to continue the approach based on visual references. The decision making process begins when the approach is initiated and continues throughout the approach. A pilot must continually evaluate course and glidepath displacement information throughout the approach. Knowing that significant changes cannot occur instantaneously, a pilot begins to formulate a decision concerning the probable success of the approach long before reaching DA(H). Although DA(H) is a specified point in space at which a pilot must make an operational decision, the pilot accumulates the information required to make that decision throughout the approach. It is incorrect to assume that all aspects of the decision making process are delayed until the critical instant the aircraft arrives at DA(H). The visual cues, which become available during the descent to DA(H) enhances the pilot’s formulation of the decision, which must be made at DA(H). The operational decision to continue the approach by visual means, however, must be made before passing DA(H). At DA(H), a decision to continue the approach by reference to visual cues is appropriate if a pilot is satisfied that the total pattern of the visual cues provides sufficient guidance and the aircraft is in a position and tracking so as to remain within a position from which a safe landing can be made. However, if at DA(H), a pilot is not satisfied that all of these conditions exist, a missed approach must be executed.

C. Before Passing DA(H). The decision that the pilot must make before passing DA(H) is not a commitment to land. It is a decision to continue the approach based on visual cues. This distinction is important since the possibility exists that, after passing DA(H), visual cues may become inadequate to safely complete the landing, or the aircraft may deviate from the flightpath to a point where a safe landing cannot be assured. Since many variables are involved, the final decision to commit to a landing is the PIC's and is primarily a judgment based on all the relevant operational factors. The PIC shall usually delay the decision to commit to a landing until the final stages of flare and landing.

1) The following is a list of statements that describe what DA(H) is:

- DA(H) is a specified decision point.
- DA(H) is the point at which a specific action must be initiated (either continue the approach by reference to visual aids or go-around).
- DA(H) is the lowest permissible height to which an approach with vertical guidance can be continued by reference to flight instruments alone.
- DA(H) is the limit to which a pilot can descend before having to decide to continue the approach using external visual references.

2) The following is a list of statements that describe what DA(H) is not:

- DA(H) is not a point where a decision or commitment to land is made
- DA(H) is not a point where the decision-making process begins
- DA(H) is not the latest point at which a go-around could or should be made
- DA(H) is not a point where all aspects of the decision are instantaneously formulated

5.2.2.33. CONCEPT OF MINIMUM DESCENT ALTITUDE AND MISSED APPROACH POINT (MDA/MAP). The MDA/MAP concept is the foundation for safe non-precision approach operations that do not have vertical path guidance (e.g., VOR, NDB or LNAV IAP). Electronic glidepath information cannot be provided at certain locations because of obstacle or terrain problems, NAVAID sighting problems, and cost benefit factors. The MDA/MAP concept provides for safe approach operations in instrument conditions at locations that do not have vertical path guidance.

A. Minimum Descent Altitude (MDA). An MDA is the lowest permissible height (for a non-precision approach procedure) at which an aircraft can be controlled by reference only to instrument information. After passing the final approach fix (FAF), a pilot should descend on a vertical path that will enable a stabilized approach and, if the visual conditions are adequate, a descent to the runway without any intermediate level-off at the MDA. If the visual conditions are not adequate, the pilot must level-off at the MDA until sufficient visual references are available to safely complete the approach and landing.

NOTE: See related guidance later in paragraph 5.2.2.55 concerning to the Continuous Descent Final Approach (CDFA) technique for additional information concerning the preferred method for flying the final approach segment of straight-in non-precisions IAPs.

B. Establish an MDA. An MDA is established to require that the pilot, before descending below the specified height and before passing the MAP, determines that adequate visual references are available for accomplishing the following actions:

- Verifying that the aircraft is in a position that will permit a safe landing in the touchdown zone
- Determining that sufficient visual references are available to manually maneuver the aircraft to align it with the runway centerline, touchdown within the touchdown zone, and maintain directional control on the runway
- For rotorcraft operations, determining that sufficient visual references are available to: maneuver the rotorcraft to align with the landing area, decelerate to air taxi, or hover, and maintain directional control while air taxiing

1) The following is a list of statements that describe what MDA is:

- MDA is the lowest permissible height at which an approach can be continued by reference solely to flight instruments
- MDA is the limit to which a pilot can descend before having to decide whether or not to continue the approach by using external visual references
- MDA is the minimum height above the surface to which the aircraft can descend, unless the pilot determines that the aircraft is in a position from which it can be safely maneuvered using normal rates of descent (less than 1,000 feet per minute) to a touchdown within the touchdown zone (decelerate to air taxi or hover for rotorcraft)

2) The following is a list of statements that describe what MDA is not:

- MDA is not a specified decision point
- MDA is not a point at which a specific action is initiated
- MDA is not a point where the decision process begins
- MDA is not the latest point at which a go-around could or should be made
- MDA is not a point where all aspects of the decision are instantaneously formulated

C. Missed Approach Point (MAP). For an approach that does not have vertical guidance, it is necessary to define a point on or near the aerodrome where a missed approach must be executed, if adequate external visual references for safely continuing the approach are not available. This point is specified as the MAP. An MAP is a three-dimensional airborne position where the MDA passes over a specified geographic fix (the MAP).

1) The following is a list of statements which describe what MAP is:

- MAP is a specified decision point
- MAP is the last point at which the approach can be continued by reference solely to flight instruments. After the MAP, the approach must be discontinued
- MAP is the last point at which the published missed approach can be safely executed in instrument conditions

2) The following is a list of statements which describe what MAP is not:

- MAP is not the last point at which a pilot can decide to continue the approach by external visual references. Often, the MAP is located at a point where a pilot cannot safely descend and land if the MDA is maintained until arriving at the MAP (for example, when the MAP is located over the VOR on the airport)
- MAP is not a point where a decision or commitment to land is made
- MAP is not a point where the decision process is begun
- MAP is not a point where all aspects of the decision are instantaneously formulated

5.2.2.35. CONCEPT OF CIRCLING MANEUVERS.

A. Instrument Approach Design Criteria. In many situations, instrument approach design criteria will not permit a "straight-in" approach to the landing runway. In these situations, a circling procedure is necessary to maneuver the aircraft to a landing on the intended runway. Circling maneuvers are usually necessary when there is an obstacle or terrain problem. Circling maneuvers are also required when a NAVAID is located in a position that precludes a straight-in approach to the intended landing runway. Unless specifically restricted in the procedure, a circling maneuver can be initiated from any instrument approach procedure and must be conducted entirely by external visual references. Electronic course or glidepath guidance cannot be used to perform a circling maneuver. A circling maneuver is not an instrument maneuver. Sufficient visual references for manually maneuvering the aircraft to a landing must be maintained throughout a circling maneuver. The pilot must keep the aircraft's position within the established maneuvering area while performing the circling maneuver. The circling approach MDA must be maintained until an aircraft (using normal maneuvers) is in a position from which a normal descent (less than 1,000 fpm) can be made to touchdown (decelerate to air taxi or hover for rotorcraft) within the touchdown zone. It is critical for pilots to understand that the published missed approach procedure may not provide adequate obstacle clearance, especially during the initial portion of a missed approach executed during a circling maneuver. The published missed approach is designed to provide obstacle clearance only when the missed approach is executed on the published final approach course at or above the MDA, and before passing the MAP. A published missed approach may not guarantee the necessary safety margin when a missed approach is executed past the MAP and/or below the MDA. The aircraft must remain within the established circling maneuvering area until the aircraft is at or above the MDA and established on the missed approach course. The following statements summarize the basic concepts of a circling maneuver:

- A circling maneuver is a visual maneuver
- Sufficient visual references to manually maneuver the aircraft to a landing must be maintained throughout a

circling maneuver

• The aircraft must be maintained at the MDA until it is at a position from which a safe landing can be made

• A missed approach must be executed when external visual references are lost or sufficient visual cues to manually maneuver the aircraft cannot be maintained

B. Missed Approach Procedure. The traditional published missed approach procedure does not guarantee obstacle clearance during the initial phases of a missed approach, if initiated during a circling maneuver after descending below MDA or after MAP. Therefore, when a missed approach from a circling maneuver is executed, the direction of the initial turn must always be toward the airport to ensure obstacle clearance and to keep the aircraft within the maneuvering area until it is above MDA and can safely proceed on the missed approach course.

5.2.2.37. CONCEPT OF RUNWAY VISUAL RANGE (RVR).

A. Operating Minima. Operating minima are specified in terms of visibility, and runway visual range (RVR). As operating minima were reduced due to improvements in airborne and ground based equipment, it became more likely that pilots would not see the full length of the runway upon arrival at the specified decision point. Positions established for taking visibility observations were often several miles from the approach end of many runways. This resulted in reported visibility values that frequently did not represent the seeing-conditions encountered during the final stages of approach and landing. This deficiency was particularly critical when rapidly changing weather conditions within the terminal area occurred. These factors generated a need for systems such as RVR, which could rapidly and reliably provide reports of the seeing-conditions, which a pilot could expect to encounter in the touchdown zone and along the runway.

B. RVR Measurements. RVR measurements are taken by a system of calibrated transmissometers and account for the effects of ambient background light and the runway light intensity. Transmissometer systems are strategically located to provide RVR measurement associated with one or more of the three basic portions of a runway: the touchdown zone (TDZ) portion, the mid runway (MID) portion, and the rollout (Rollout) portion.

C. Instrumentally Derived Value. RVR is an instrumentally derived value that reflects an artificially created seeing condition on or near the portion of the runway associated with the RVR report. This artificially created seeing condition is achieved by using high intensity runway edge, touchdown zone, and centerline lights. These lights increase the conspicuousness of the landing surface and “reach out” to the pilot thereby creating a seeing condition which is significantly better than the reported ground visibility or tower visibility. For any particular fog density, RVR will be significantly greater than reported visibility because RVR is based on the use of high intensity lights. Since RVR is based on high intensity lights, an RVR report only has meaning when associated with the seeing-conditions on or near the portion of the runway where the report was obtained (TDZ, MID, or Rollout). An RVR report has no meaning unless a pilot is also seeing the high intensity lights on which the report is based.

1) To properly apply operating minima it is important to understand RVR. The following is a list of statements that describe what RVR is:

• RVR is an instrumentally derived value

• RVR is currently measured by transmissometers located approximately 400 feet (125m) from runway centerline

• RVR is related to the transmissivity (degree of opaqueness) of the atmosphere

• RVR is an approximation of the distance a pilot should see when an aircraft is on, or slightly above, the portion of the runway associated with the report

• RVR is calibrated by reference to runway lights and/or the contrast of objects

• RVR is a value that varies with runway light setting

• RVR is a value, which only has meaning for the portions of the runway associated with the RVR report (TDZ, MID, or Rollout)

2) The following is a list of statements that describe what RVR is not:

• RVR is not a measure of meteorological visibility

• RVR is not a measure of surface visibility or tower visibility

• RVR is not a measure of seeing-conditions on taxiways, ramps, or aprons

• RVR is not a measure of seeing-conditions at or near MDA or DA(H)

• RVR IS NOT "VISIBILITY"

NOTE: RVR is a value, which can be five to six times greater than ground or tower visibility at night and two to three times greater during daytime.

D. Concept of Controlling RVR. Controlling RVR means that RVR reports are used to determine operating minima whenever operating minima are specified in terms of RVR, and RVR reports are available for the runway being used. All CAT I operating minima below 1/2 statute mile (800m) visibility and all CAT II and III operating minima are based on RVR. The use of visibility is prohibited because the reported visibility may not represent the seeing-conditions on the runway. All takeoff minima below 1/4 statute mile (400m) visibility are predicated on RVR and use of visibility is prohibited. For example, if the takeoff minimum published for a particular operation is TDZ RVR 350m, Rollout RVR 300m, RVR reports are controlling and a takeoff is prohibited unless the TDZ RVR report is at or above RVR 350m and the rollout RVR report is at or above RVR 300m. In this example, a takeoff cannot be based on visibility if the RVR system is operative, even if the reported visibility is greater than 1 statute mile (1600m).

5.2.2.39. GENERAL FACTORS AFFECTING SEEING-CONDITIONS. Seeing-conditions during AWTA operations are affected by numerous factors. These factors are related to aircraft design, weather conditions, ambient lighting level (day or night), airport environment, and available visual aids. Seeing-conditions are also affected by operational factors, such as aircraft configuration, speed, and gross weight, the maneuver being conducted, use of aircraft lights, level of cockpit lighting selected, and the pilot's eye reference position (proper seat adjustment). Any of these factors can adversely affect seeing-conditions during any particular operation in instrument conditions. The effect of these factors significantly increases as visibility or RVR decreases. For example, a pilot's seat adjustment (eye reference position) used by many pilots for en route or CAT I operations in some aircraft may not provide adequate seeing-conditions for takeoff or landing operations in CAT II and CAT III weather conditions.

5.2.2.41. WEATHER CONDITIONS/FOG STRUCTURE.

A. Weather Conditions. Weather conditions have the most obvious effect on seeing-conditions. Visible moisture such as clouds, rain, snow, and fog, are the most common elements that obstruct pilot vision. Airborne particles such as smoke, dust, or haze can also significantly obstruct vision. During operations in CAT I weather conditions; the most frequently encountered obstructions to vision are related to cloud bases, visible precipitation, and airborne particles. In CAT II weather conditions and especially in CAT III conditions, various forms of fog are the primary obstructions to vision. The primary factors associated with these types of obstructions to pilot vision, and those, which have the most significant effects on-seeing conditions, are as follows:

- Density of the obstruction (number of airborne particles per unit volume)
- Depth of the obstruction (thickness)
- Variation in density as a function of height above the surface (vertical structure)
- Variation in density as a function of distance from the runway (lateral structure)
- Vertical/Lateral Structure

B. Cloud Bases. Cloud bases commonly encountered in CAT I weather conditions represent an extreme example of vertical structure. Cloud bases are created by an abrupt change in the density of water droplets suspended in the atmosphere as a function of height above the surface (abruptly increased density as height increases). Above the cloud base, vision is significantly restricted due to the higher density of suspended water droplets. As a cloud base is penetrated on descent, seeing-conditions rapidly improve because of a significant reduction in the density of the obscuring phenomena. Another example of vertical structure is a condition known as homogeneous fog. The density of water droplets in homogeneous fog is uniform with height and does not change as the aircraft descends. In classic homogeneous fog, the seeing-conditions gradually improve as the aircraft descends, primarily because the depth of the obstruction to vision decreases as the distance between the pilot's eyes and the runway decreases. Shallow ground fog represents the opposite extreme of the cloud base example. When shallow ground fog exists, the density of the water droplets increases as the aircraft descends into the fog. In these situations, seeing-conditions can decrease dramatically, and result in loss of adequate external visual references necessary to maneuver the aircraft manually in the final stages of landing. Shallow ground fog can be insidious. In some shallow ground fog conditions the entire landing surface may be visible several miles out on final approach, but just before touchdown seeing-conditions may deteriorate to less than 500 feet (150m). Although the variability in fog conditions is almost infinite, there are three general types of fog structures. These general types of fog structures are as follows:

C. Homogeneous Fog. Homogeneous fog is a condition in which the density is uniform with height (uniform vertical structure). Homogeneous fog conditions are fog conditions typically programmed into most flight simulators. In training scenarios using this fog condition, seeing-conditions steadily improve as the aircraft descends. Homogenous fog is usually encountered in very stable meteorological conditions and can exist for long periods of time.

D. Mature Fog. Mature fog is a condition in which water droplet density increases with height. Seeing-conditions rapidly deteriorate with height and conversely rapidly improve as an aircraft descends. Mature fog conditions are seldom programmed into flight simulators. Mature fog is usually encountered when fog begins to “lift” after an extended period of stable homogeneous fog. Often, mature fog will evolve into a cloud base before dissipating.

E. Shallow Ground Fog. Shallow ground fog is a condition in which water droplet density decreases with height. Seeing-conditions rapidly improve with height and conversely rapidly deteriorate as an aircraft descends. In extreme cases during the early formation of shallow ground fog, it is possible from the cockpit of a large aircraft (B-747) to see the control tower and tails of other airplanes but not to see the runway or taxiway at all. Shallow ground fog is usually encountered when radiation fog begins to form as the surface cools following sunset. If appropriate conditions exist for an extended period, shallow ground fog will usually evolve into homogeneous or mature fog.

F. Fog Structures and Other Weather Conditions Have a Major Effect on Seeing-Conditions. The wide variation in weather conditions that routinely occur do not permit the use of “hard and fast” rules to determine the precise seeing-conditions that will be encountered during any particular operation. Variations in weather conditions are the primary reasons why the decision that must be made at DA(H) or MDA/MAP is not a decision to land but is a decision either to continue the approach using external visual references or to go-around. Instrument procedure design criteria and operational procedures allow for these limitations; therefore safe alternatives are provided if adequate visual references cannot be established upon arrival at a decision point or maintained after descending below that point.

5.2.2.43. VISUAL AIDS AND RUNWAY ENVIRONMENT. A primary factor in the identification of objects, such as landing surfaces, depends on a pilot’s ability to see contrasts between the object and the surrounding background. The ability to see and recognize contrasts in the brightness or color of an object is much greater than the ability to determine the actual level of illumination of an object. For example, a 100-watt light bulb seems to be much brighter at night than during daylight conditions even though the actual level of illumination is the same. The contrast between a 100-watt light and a dark night background is much greater than it is in a daylight background. The presence of airborne Particles or water droplets causes the available light to diffuse or scatter. This scattering effect raises the overall illumination of the background that, in turn, reduces the level of contrast between an object and its background. This is the primary reason why seeing-conditions decrease when landing into the sun on a hazy or foggy day or when the landing lights of an aircraft are turned on in snow or fog conditions. Reduced levels of contrast increase the difficulty of identifying objects such as snow covered runways or runways located in heavily lighted urban areas. As a result, contrast levels must be increased to provide the seeing-conditions necessary for the safe conduct of operations with reduced operating minima. Seeing-conditions can be improved by using visual aids and by enhancing the level of contrast within the runway environment. For example, the difference in the level of contrast between a landing or takeoff surface and the surrounding area can be improved through good aerodrome maintenance practices. Such practices as planting and maintaining grass around a runway and between a runway and a taxiway, and plowing snow-covered runways, improve levels of contrast. The most effective way to improve the contrast of a landing or takeoff surface, however, is to use visual aids because they are effective in a variety of weather conditions. Visual aids such as approach lights, runway lights, and runway markings significantly improve the contrast between a landing or takeoff surface and the immediate surrounding area. The improved contrast provided by approach and runway lighting significantly improves seeing-conditions in both night and daylight operations. Approach lighting and runway lighting are essential elements of all landing operations conducted in weather conditions below RVR 1200m and all takeoff operations below RVR 500m.

5.2.2.45. EFFECTS OF AIRCRAFT/COCKPIT DESIGN ON SEEING-CONDITIONS.

A. Design of an Aircraft. The overall design of an aircraft and the design of a cockpit significantly affect seeing-conditions during the latter stage of an approach and landing and during the initial stage of a takeoff. Seeing-conditions are affected by geometric factors related to the design of an aircraft's structure and by aerodynamic factors related to an aircraft's pitch axis. The visual segment used in these illustrations represents that portion of the approach light and landing surface visible to the pilot when looking over the nose of the aircraft from the proper sitting position (eye reference position). When analyzing these illustrations, it is important to note the following:

- The radio (radar) altimeter is calibrated to read the height of the landing gear above the terrain (when in the landing configuration)
- The glidepath antenna tracks down the centerline of the glideslope when the instruments in the cockpit indicate the aircraft is on glidepath
- The pilot's eyes are always higher than what is indicated on the radio (radar) altimeter
- The pilot's eyes are above the electronic glideslope in most aircraft

B. Aircraft and Cockpit Physical Design. The significant factors related to the physical design of an aircraft and cockpit combination that affect seeing-conditions most, are as follows:

- Distance along the longitudinal axis from directly above the main landing gear to directly beneath the pilot's eyes
- Vertical distance from the pilot's eyes to a position abeam the main landing gear
- Distance along the longitudinal axis from directly beneath the glideslope antenna to directly beneath the pilot's eyes
- Vertical distance from the glideslope antenna to abeam the pilot's eyes
- Cockpit cutoff angle

C. The Cockpit Cutoff Angle. The cockpit cutoff (CCO) angle is the angle, measured downward, from the longitudinal axis of the aircraft (zero pitch reference) to the lowest (most depressed) angle that can be seen over the aircraft's nose from the proper sitting position (eye reference position). The CCO angle in most transport category aircraft is between 15 and 25 degrees. Although many VFR rotorcraft have an excellent CCO angle, most IFR rotorcraft have CCO angles equivalent to transport category aircraft.

D. Aircraft Aerodynamic Design. The significant factors associated with the aerodynamic design of an aircraft that affect seeing-conditions, are related to pitch attitudes. The pitch attitudes necessary for final approach, flare (deceleration for rotorcraft), and landing (air taxiing for rotorcraft), have a major effect on seeing-conditions. This is because a "nose up" attitude reduces the downward viewing angle relative to the horizon, which reduces seeing-conditions. For example, an aircraft with an excellent CCO angle of 21 degrees and a high final approach pitch attitude of 8 degrees would have a seeing-condition comparable to a similar size aircraft having a poor CCO angle of 13 degrees and a 0 degree pitch attitude. Since the pitch attitude on final approach varies with approach speed, aircraft configuration, and gross weight, the seeing-conditions change as these operational factors change. The aircraft's flare characteristics (deceleration for rotorcraft) can also have a significant effect on the seeing-conditions during landing.

The seeing-conditions during flare decrease if any positive pitch change is required. In rotorcraft, the most severe degradation to the seeing-conditions occurs during deceleration to air taxi or hover. Often, the deceleration rate in a rotorcraft must be limited to maintain adequate seeing-conditions. For example, when a typical IFR rotorcraft with an 18 degree CCO angle and a 0 degree final approach attitude approaches an 18 degree pitch attitude during a maximum effort deceleration, the pilot will lose sight of the landing surface. At an 18 degree pitch attitude with an 18 degree CCO angle, the lowest downward viewing angle would be parallel with the horizon. Therefore, a deceleration pitch attitude must be maintained significantly below 18 degrees to maintain adequate visual references with the landing surface. A similar situation is encountered in turbojet airplanes during takeoff rotation and initial climb when external visual references can be lost.

5.2.2.47. EYE REFERENCE POSITION. Eye reference position is a critical factor in achieving optimum seeing-conditions. A pilot's seat must be individually adjusted so that the pilot's eyes are located at an optimum eye reference position. When seated in this position, a pilot should be able to take advantage of the full CCO angle, maintain reference with the necessary flight instruments, and operate all necessary controls. Many aircraft have special devices that indicate proper seat adjustment. Improper seat adjustment, especially in CAT II and III operations, can prevent the pilot from acquiring adequate external visual reference upon arrival at DA(H) or MDA/MAP. The seating position commonly used for en route operations in many aircraft is too low and too far aft for the pilot to achieve optimum seeing-conditions during approach and landing operations. This lower and further aft seating position results in a reduction of the CCO angle which degrades the seeing-conditions by reducing the segment of the approach and landing surface visible over the aircraft's nose. A pilot maintaining this undesirable seating position during approach and landing may tend to compensate for the reduced CCO angle, and its effects, by leaning forward in an attempt to acquire the necessary external visual references. A consequence of this practice is a tendency to unintentionally reduce the pitch attitude. Since seeing-conditions improve as the nose is lowered, this tendency to reduce pitch attitude can contribute to the tendency to "duck under," which has resulted in landings short of the runway.

5.2.2.49. THRESHOLD CROSSING HEIGHT (TCH) CONCEPT. Many complex technical factors must be considered during the installation of ILS equipment to support approach and landing operations at any particular runway. The signals in space radiated by the facility must meet required flight inspection requirements (accuracy and course structure) for the particular category of operation to be supported. Design of ground support systems must be such that there is an extremely small probability of losing electronic guidance during actual operations (continuity of service). The design must also provide for an extremely high probability of providing continuously reliable electronic guidance (integrity). The ILS accuracy and course structure, continuity of service, and integrity must meet established standards for the category of operation authorized at that facility. Another critical factor in installing and siting these systems is the TCH. The following discussion addresses significant factors that must be considered when establishing acceptable TCHs.

A. Aircraft Glideslope/Elevation Antenna Location. The glideslope/elevation receiver of the aircraft detects vertical movement (displacement) of the glideslope/elevation antenna in relation to the centerline of an electronic glideslope/elevation radiated from a ground facility. As a result, the location of the glideslope/elevation antenna on the aircraft directly relates to terrain and obstacle clearance during the final stages of an approach and landing. The physical dimensions and aerodynamic characteristics of the aircraft (especially pitch attitude) are important factors in the determination of the proper location of a glideslope reception antenna. In conventional aircraft, the glideslope/elevation antenna is located above the height of the main landing gear. Since an aircraft is maneuvered so that its antenna tracks the centerline of the electronic glidepath, the main landing gear will track below the glidepath. For example, if the antenna of an aircraft is located 12 meters above the landing gear and the electronic glidepath crosses 9 meters above the runway threshold, the main landing gear will touchdown short of the runway since the antenna, not the landing gear, flies the glidepath. This example illustrates the important relationship between the aircraft antenna location and the electronic glidepath TCH. This situation can be resolved by siting the ILS to achieve a specified TCH and by requiring proper location of the glideslope/elevation antenna on the aircraft. Similar problems are encountered when using visual vertical guidance systems such as VASI or PAPI, since the pilot's eyes track the visual glidepath and the gear follows a lower path. The need to maintain certain landing gear crossing heights at the threshold establishes the minimum safe TCH for a particular aircraft. The current minimum TCH requirements are based on the DC-10 that has, in landing configuration, the greatest vertical displacement between the antenna location and the landing gear.

B. Barometric VNAV TCHs. The most significant factor in determining the threshold wheel crossing height for aircraft using Barometric VNAV for vertical guidance during the Final Approach Segment is the vertical distance between the static ports and the bottom of the main landing gear, with the aircraft is in its normal approach attitude. The minimum and maximum acceptable TCHs for these aircraft are determined in a manner similar to ILS equipped aircraft using the static ports and the main landing gear height, instead of the glideslope/elevation antenna to landing gear height.

C. Acceptable TCHs. Siting ILS equipment to achieve a particular TCH can be a complex task. Operational experience with siting these systems has shown a need to establish a range of acceptable TCHs. The types of aircraft likely to use a particular facility must be considered. Another consideration in establishing the range of acceptable TCHs is the pilot's ability to detect (by external visual references) deviations from the proper glidepath and to make the necessary flightpath adjustments for adequate landing gear clearance at the threshold. Proper TCHs in CAT II and especially CAT III operations are more critical because of the limited visual cues available and the use of automatic landing systems.

5.2.2.51. VISUAL ILLUSIONS. Human perceptual limitations can cause visual illusions during all-weather terminal area operations. Generally, visual illusions are due to limitations in a pilot's ability to accurately perceive the three-dimensional position of the aircraft, its velocity, and/or its acceleration in relation to a takeoff or landing surface. These illusions usually become more prevalent as seeing-conditions deteriorate. The following is a discussion on the significance of some visual illusions that can occur during approach and landing operations.

A. Vertical Height and Flightpath Illusions. The ability to visually perceive vertical height and vertical flightpath in relation to a surface depends upon many factors. These factors include the size and orientation of a surface in relation to its background (level, tilted up/down, or tilted left/right) and the number of discrete visual feature available. An example of a vertical position illusion caused by the size of a landing surface is when a pilot perceives that the aircraft is lower than it actually is when landing on a wider than normal runway or on a large, smooth water surface. This illusion can occur even in excellent seeing-conditions and often results in "flaring high." Conversely, an illusion of "being too high" can occur during a landing on very narrow surfaces. The distance from a particular surface is also difficult to determine visually, unless numerous visual features are available within a pilot's near field vision. The absence of features in the near field vision such as in the situation commonly referred to as a "black hole" can create an illusion of being "too high." This illusion is caused by the absence of discrete features in a pilot's near field vision resulting in the incorrect perception that the distance to the landing surface is closer than it actually is during an approach. This illusion can cause a pilot to believe the aircraft is too high. The pilot's response to this illusion can be to fly the aircraft below the desired approach path. As weather conditions deteriorate, the reduction in external visual cues in the near field vision can have similar effects. Visual determination of vertical flightpath is strongly influenced by the orientation of the plane of the landing surface and/or the orientation of its surrounding background. For example, an upward sloping runway or background can create an illusion that a 3 degree vertical flightpath is too steep since a 2 degree upslope can make a 3 degree flightpath look like 5 degrees. The pilot's ability to accurately perceive vertical height and flightpath rapidly degrades as seeing-conditions deteriorate. This degraded ability is caused by reductions in the number of visual features available in a pilot's near field vision. For CAT I operations with minima below 3/4 statute mile (1200m), it is necessary to establish certain criteria to negate the adverse effects of vertical height and flightpath illusions. Some of these criteria are as follows:

- Maximum acceptable runway gradients
- Maximum acceptable gradients (up or down) for the approach lights
- The installation of approach and in-runway lights and runway markings to more clearly define the plane of the landing surface

B. Lateral Position and Flightpath Illusions. The ability to perceive accurately lateral position and lateral rates of movement in relationship to the orientation of the landing or takeoff surface depends upon the number of discrete visual features in a pilot's far field vision. With sufficient visual cues in the far field vision, a pilot can readily orient the aircraft's lateral position, direction, and rate of movement, with respect to the orientation of the surface. Lateral position errors can also be readily detected by visual features in a pilot's near field vision. In fact, deteriorating seeing-conditions can enhance a pilot's ability to perceive the aircraft's lateral position with respect to the takeoff or landing surface by restricting the pilot's vision to near field vision. The pilot's ability to perceive the aircraft's directional orientation in relation to the runway is significantly degraded, however, when there is a deterioration or loss of visual features in the pilot's far field vision. This deterioration in directional cues increases the difficulty of manually maintaining directional control or manually establishing the drift correction necessary for tracking runway centerline. If the pilot's primary visual task is to assess the performance of an automatic flight control system, near field visual features permit the detection of an abnormal autopilot tracking performance sooner, because of the enhanced ability to perceive lateral displacement and rates of change in lateral position. During manual takeoffs and landings, however, this lateral illusion can, in certain circumstances, adversely affect the pilot's ability to control the aircraft. This illusion exaggerates lateral position errors and/or the rate of displacement from runway centerline. As a result, a pilot may tend to overcompensate (overcorrect) when making heading changes and get into a "pilot induced oscillation." Pilot induced oscillations can lead to loss of directional control and possible departure from the runway. Criteria that have been established to negate the effects of lateral illusions include the following:

- Installation of approach and in-runway lights to more clearly define the orientation (direction) of the landing surface
- Use of automatic flight control systems (autoland) or special flight instruments (such as HGS)
- Special flight crew training and qualification requirements

C. Other Illusions. Poor seeing-conditions, especially in patchy or variable weather conditions can create illusions that affect a pilot's ability to accurately perceive aircraft attitude and/or groundspeed. Visual roll (bank) cues are usually available during the latter stages of approach and landing (even in most CAT III operations). In very poor seeing-conditions, however, a subtle deterioration in visual roll cues can occur that can affect a pilot's ability to quickly recognize an unacceptable touchdown roll attitude (bank angle). This illusion, that the visual roll cues are better than they actually are, can result in the wingtip or flap track contacting the runway. Pitch attitude illusions can occur during operations conducted in patchy or variable weather conditions. Most pilots have learned through experience that the visual scene expands as an aircraft descends and that it contracts when the aircraft pitch attitude increases. As a result, a descent into rapidly deteriorating seeing-conditions, during the final phases on an approach and landing can create a "pitch up" or "leveling off" illusion. Conversely, a descent into rapidly improving seeing-conditions such as "breaking out" in a mature fog condition can create a pitch down or rapid descent illusion. The ability to correctly perceive groundspeed can also be significantly degraded by deteriorated visual cues, especially during operations in CAT III weather conditions.

NOTE: Human perceptual limitations and the resulting visual illusions are prime reasons for establishing specific requirements as prerequisites for conducting various categories of AWTA operations. Some of these specific requirements include the establishment of operating minima, special operating procedures, special flight crew training and qualification, and special airborne and ground-based equipment. Operations not in compliance with these specific requirements are unsafe.

5.2.2.53. STABILIZED APPROACH CONCEPT. In instrument weather conditions, a pilot must continuously assess instrument information throughout an approach to properly maneuver the aircraft (or monitor autopilot performance) and to decide on the proper course of action at the decision point (DA(H) or MDA/MAP). Significant speed and configuration changes during an approach can seriously complicate tasks associated with aircraft control, increase the difficulty of properly evaluating an approach as it progresses, and complicate the decision of the proper action to take at the decision point. The handling and engine response characteristics of most turbojet aircraft further complicate pilot tasks during approach and landing operations. A pilot must begin formulating a decision concerning the probable success of an approach before reaching the decision point. The pilot's decision making process requires the pilot to be able to determine displacements from the course or glidepath centerline, to mentally project the aircraft's three-dimensional flightpath by referring to flight instruments, and to then apply control inputs as necessary to achieve and maintain the desired approach path. This process is simplified by maintaining a stable approach speed, descent rate, vertical flightpath, and configuration during the final stages of an approach. Maintaining a stable speed, descent rate, vertical flight paths, and configuration is a procedure commonly referred to as the stabilized approach concept. Operational experience has shown that the stabilized approach concept is essential for safe operations with turbojet aircraft, and it is strongly recommended for all other aircraft. Configuration changes at low altitude should be limited to those changes that can be easily accommodated without adversely affecting pilot workload. A stabilized approach for turbojet aircraft means that the aircraft must be in an approved landing configuration (including a circling configuration, if appropriate), must maintain the proper approach speed with the engines spooled up, and must be established on the proper flightpath before descending below the minimum "stabilized approach height" specified for the type of operation being conducted. These conditions must be maintained throughout the rest of the approach for it to be considered a stabilized approach. Operators of turbojet aircraft must establish and use procedures that result in stabilized approaches. Pilots operating propeller driven aircraft should also maintain a stable speed and flightpath on final approach. A stabilized approach must be established before descending below the following minimum stabilized approach heights:

- 500 feet above the aerodrome elevation during VFR or visual approaches and during straight in instrument approaches in VFR weather conditions

- MDA or 500 feet above aerodrome elevation, whichever is lower, if a circling maneuver is to be conducted after completing an instrument approach

- 1,000 feet above the aerodrome or touchdown zone elevation during any straight in instrument approach in instrument flight conditions

• 1,000 feet above the aerodrome during contact approaches, if applicable

NOTE: Principal Inspectors (PIs) shall not approve an operator's procedure unless the stabilized approach concept is used for all turbojet aircraft operations. It is recommended for all propeller driven aircraft and rotorcraft in IMC conditions.

5.2.2.55. CONTINUOUS DESCENT FINAL APPROACH (CDFA) CONCEPT. The CDFA technique is a specific method of flying the final approach segment of a straight-in non-precision instrument approach procedure. The application of this technique complements the stabilized approach concept because the stabilized approach requirements and minimum stabilized approach heights are more easily obtained if CDFA methods are employed throughout the final approach.

A. CDFA Technique. The CDFA technique requires that a continuous descent be maintained, without level-off, from an altitude at or above the final approach fix altitude to a point approximately 50 feet above the landing runway threshold, or to the point where the flare maneuver should begin for the type of aircraft flown. The descent is calculated and flown to pass at or above the minimum altitude at any step -own fixes.

B. Use of the CDFA Techniques. Appropriate use of the CDFA technique requires the pilot to maintain a continuous descent (no level-off) on a vertical path(s) that will comply with altitude restrictions at any step-down fixes and require little or no adjustment as the pilot transitions from instrument to visual references. A suitable vertical path(s) may be established by flying published descent angle(s) (designed to extend from at or above the FAF altitude to the desired threshold crossing height) that observe applicable altitude restrictions. The descent angle used to maintain the vertical path during the final portion of the CDFA must be constant from at least 1,000 feet above the aerodrome or touchdown zone in accordance with stabilized approach requirements. CDFA use is restricted to published descent angles to avoid errors with real-time in-flight calculation. Pilots can maintain an appropriate descent on these vertical paths using one of the following methods:

1) Vertical guidance from onboard baro VNAV systems using coded navigation data from an approved database.

2) Distance height crosschecks using published references based on DME intervals or RNAV distances from threshold.

3) Altitude time crosschecks using applicable ground speeds (two pilot operation required).

C. Visual References Have Not Been Acquired. If the required visual references have not been acquired when the aircraft is approaching the MDA, the vertical (climbing) portion of the missed approach is initiated at an altitude above the MDA sufficient to prevent descent through the MDA. This altitude is often referred to as a derived decision altitude. At no time is the aircraft flown in level flight at or near the MDA. Any turns on the missed approach must not begin until the aircraft reaches the missed approach point. If the aircraft reaches the missed approach point before descending to the MDA, the missed approach must be initiated at the missed approach point.

D. CDFA Technique Allows Only Two Options. As there is no level flight segment after reaching the MDA, it is important to emphasize that the CDFA technique only allows two options for the crew as they approach the MDA:

1) Continue the descent to land with required visual references in sight or

2) Execute a missed approach, as described above.

E. Stabilized Approach Requirements. The use of the CDFA technique is consistent with stabilized approach requirements because the stabilized approach requirements and minimum stabilized approach heights remain the same. Pilots employing the CDFA technique, may adjust the descent angle during the initial portion of the descent, as necessary, but need to observe stabilized approach requirements no later than the minimum stabilized approach heights appropriate for meteorological conditions (IMC or VMC). The CDFA technique complements the stabilized approach concept because the stabilized approach requirements and minimum stabilized approach heights are more easily obtained if CDFA methods are employed throughout the final approach.

F. List of Statements. The following is a list of statements that describe what CDFA is and is not:

- CDFA techniques are applicable to straight-in non-precision approaches (the CDFA concept is already incorporated into precision and APV approach procedures by design)
- CDFA and stabilized approach concepts are not the same, but CDFA techniques are consistent with the stabilized approach concept and safety initiatives to reduce CFIT
- CDFA techniques are not appropriate for circling approaches
- CDFA techniques may not be appropriate for non-precision approach procedures where a combination of final approach course offset and one or more environmental factors (crosswinds, icing, ceiling at or near MDA, etc.) may make an expeditious descent to a level-off at the MDA desirable to minimize icing exposure or attain runway alignment sooner

NOTE: FAA AC 120-108, (as amended), Continuous Descent Final Approach

5.2.2.57. BASIC IFR AND STANDARD OPERATING PRACTICES. As AWTA instrument operations evolved, certain operating practices and procedures have been shown to be effective in providing enhanced situational awareness in the cockpit during IFR flight. These practices and procedures provide an effective means for ensuring that flight crewmembers maintain a common understanding of the aircraft’s flight progress, including the actions and sequence of actions that must be performed for continued safe flight and landing.

A. Conduct of Instrument Approach Procedures, Altitude Awareness, Ascent and Descent Rate Management, and the Use of Checklists. These standard operating practices and procedures apply to the conduct of instrument approach procedures, altitude awareness, ascent and descent rate management, and the use of checklists. When properly and consistently applied, the standard operating practices discussed in this paragraph have been shown to significantly reduce the potential for misunderstandings and accidents or serious incidents. These practices enhance flight safety, and are good examples of safe operating practices and procedures. It is GACA policy that each operator must develop standard operating procedures for AWTA operations, and that these practices must be included in operator manuals, training programs, and operating procedures.

B. Evaluating an Operator’s Practices and Procedures . When evaluating an operator’s practices and procedures, an aviation safety inspector (Inspector) should use the practices discussed in this paragraph as the norm. The Inspector should ensure that any operating procedures used by an operator are equivalent to these norms. All basic IFR and AWTA operations should be conducted in accordance with these standard operating practices and procedures (or their approved equivalents).

C. Basic IFR Operating Practices. The operating practices and procedures for basic IFR operations are related to altitude awareness, ascent and descent rate management, and the use of checklists. The basic purpose of these practices is to provide a means for the flight crew to continuously function as a coordinated team to ensure the safe completion of the planned flight. This is accomplished by establishing crew duties and responsibilities that clearly define each flight crewmember's role during a particular operation. Under normal circumstances, at least one pilot should maintain a full-time instrument reference to monitor flight progress.

1) Operational practices and procedures must be established to ensure that there is never any doubt who the pilot-flying (PF) is, and who the pilot-not-flying (PNF) is, at any particular point in the flight. The PNF should monitor and assist the PF by making callouts for each significant transition point, event, or failure condition, and by performing any actions requested by the PF or required in the established operating procedures. If the primary responsibility for controlling the aircraft is transferred from one pilot to the other during any portion of the flight, the procedures used should clearly describe how this transfer of responsibility is announced to and confirmed by the other flight crewmembers.

2) Checklists and cockpit check procedures must be established to ensure that all actions required for a particular flight are properly performed. These checklists and the associated operating practices and procedures should be designed to minimize the attention required inside the cockpit without lessening the effectiveness of cockpit check procedures. The checklists and cockpit procedures used should incorporate the following general principles:

- Checklist procedures should include only those items that are essential for safe operation
- Operating procedures should be arranged so that one pilot can be looking outside with a minimum of interruption or distraction from visual scanning tasks while the other pilot is performing tasks inside the cockpit
- Cockpit procedures should be arranged to minimize the cockpit checking that must be done at critical times such as during climb or descent and during departures or arrivals in congested areas
- Operating procedures and the management of the flight deck should be arranged to enhance the detection of potential mid-air collision threats during those phases of flight where threats are likely to occur, such as departure, climb, descent, and arrival
- The arrangement of checklist items and the printing (format presentation) used on the checklists should not involve prolonged concentration for the pilots' eyes to adjust to changes from distant to near vision

3) Standard Callouts. Standard callouts for basic IFR operations should be established to ensure that the flight crew functions as a well-coordinated team and maintains the situational awareness necessary for safe operation of the aircraft. The PNF should be assigned the responsibility for monitoring the flight progress and for providing callouts to the PF for each significant transition point, event, or failure condition. The following additional PNF callouts should also be used as standard operating practices for all basic IFR operations:

- During climb to assigned altitude, the PNF should provide a callout when passing through the transition altitude (as a reminder to reset the altimeters) and when approaching one thousand feet below assigned altitude

• During cruise, the PNF should provide a callout when the aircraft altitude deviates by 200 feet or more from the assigned altitude

• During descent from en route flight altitude to initial approach altitude, the PNF should provide a callout when approaching 1,000 feet above the assigned altitude, an altitude where a speed reduction is required (e.g. 10,000 feet in the U.S.), 1,000 feet above the initial approach altitude (above field elevation for approaches in VFR conditions), and when passing the transition level

D. Standard Instrument Approach Operating Practices. The standard operating practices and procedures for AWTA operations are related to proper approach and missed approach preparation, altitude awareness, terrain and obstacle awareness, airspeed control, propulsion system control, flightpath control, descent rate management, the use and limitations of navigation systems and of visual cues, and the use of checklists. The basic purpose of these standard procedures and practices is to provide a means for the flight crew to continuously function as a well-coordinated team for ensuring the safe completion of the instrument approach and the subsequent landing or missed approach. The following standard operating practices and procedures, which are in addition to the standards required for basic IFR operations, should be established for instrument approach operations:

1) Before executing any instrument approach procedure, the flight crew should review the approach procedure before the final approach fix. As a minimum, this review should include the field elevation, the minimum safe altitude (MSA), the type of approach, the final approach course, the MDA or DA(H), the controlling minima, and the missed approach procedure.

2) For all straight-in approaches conducted in IFR conditions, the final checklist (“before landing checklist”) must be completed before the aircraft passes 1,000 feet above the elevation of the touchdown zone. For circling approaches conducted in IFR conditions, all checklist items except the final landing flap configuration must be completed before the aircraft passes 1,000 feet above the aerodrome elevation, and the checklist must be completed before passing the MDA or 500 feet, whichever is lower. For approaches conducted in VFR conditions, all checklist items must be completed before passing 500 feet above the touchdown zone elevation.

3) All approaches conducted with turbojet aircraft must be conducted in accordance with the stabilized approach concept. The use of the stabilized approach concept by all other aircraft is strongly recommended because of its potential safety benefits.

4) All non-precision instrument approaches conducted with turbojet aircraft should also be conducted in accordance with the CDFA technique. The application of this method complements the stabilized approach concept because the stabilized approach requirements and minimum stabilized approach heights are more easily obtained if CDFA methods are employed throughout the final approach. The use of this approach concept by all other aircraft is strongly recommended because of its potential safety benefits.

5) Generic callouts for instrument approach operations should be established to ensure that the flight crew functions as a well-coordinated team and maintains the situational awareness necessary for the safe operation of the aircraft. As a minimum, the following generic PNF callouts, in addition to the callouts specified for basic IFR operations, should be used during instrument approach operations:

a) Just before beginning the final approach segment, a callout should be provided to cross-check the altimeter settings and instrument indications and to confirm the status of warning flags for the flight and navigation instruments and other critical systems. During flight director or autocoupled approaches, proper flight director and/or autopilot mode engagement and lateral and/or vertical navigational signal tracking should be confirmed.

b) If the flight altitude is less than 2,000 feet AGL, the PNF should provide a callout when the rate of descent exceeds 2,000 FPM. Additionally, a callout should be provided when the rate of descent exceeds 1,000 FPM if the flight altitude is less than 1,000 feet AGL.

6) The PNF should provide a callout at 1,000 feet above the landing elevation to confirm aircraft configuration and to cross-check the flight and navigation instruments. For approaches conducted in IFR conditions, the PNF should also provide a callout at 100 feet above the MDA or DA(H) (as applicable) followed by a callout upon arriving at the MDA or DA(H). Unless the available external visual references meet the requirements of GACAR § 91.191, for descent below MDA or DA(H), the PNF should also provide callouts if the aircraft descends below the authorized MDA or DA(H). If radio altimeters are installed and operational, callouts should be provided at 10 foot intervals between 50 feet and touchdown.

7) The PNF should provide a callout at any point in the approach when the airspeed is below the planned speed for the existing aircraft configuration. If the aircraft has entered the final approach segment, a callout should also be provided when the airspeed exceeds 10 knots above the planned final approach speed.

8) Except for low visibility operations when operators are encouraged to use the standard AWTA operating procedure operations that are conducted in accordance with the standard AWTA operating procedure, the PNF should provide a callout when the visual cues required to continue the approach by visual reference are acquired, such as “approach lights” or “runway.” This callout should not be made unless the available visual cues meet the requirements of § 91.191 for descent below the MDA or DA(H).

9) The PNF should provide a callout if the approach becomes destabilized. The approach is destabilized if the criteria for a “stabilized approach” are not met and maintained.

E. Approach Profile Callout for Traditional Approaches. The PNF should provide a callout if the aircraft deviates from the proper approach profile during any portion of an instrument approach. Furthermore, the PNF should provide a callout if the aircraft has entered the final approach segment of an ILS approach and the localizer (azimuth) displacement exceeds 1/3 dot and/or the glideslope (elevation) displacement is greater than one dot. For localizer (azimuth)-based approaches, a callout should be made if the displacement exceeds 1/3 dot during the final approach segment. For VOR-based approaches, a callout should be made if the displacement exceeds 2 degrees during the final approach segment. For NDB-based approaches, a callout should be made if the displacement exceeds 5 degrees during this segment.

F. Approach Profile Callout for Performance–Based Approaches. For performance-based approaches that include both lateral and vertical guidance, the PNF should provide a callout if the aircraft deviates from the proper approach profile during any portion of an instrument approach. Furthermore, the PNF should provide a callout if the aircraft has entered the final approach segment of a performance-based approach that uses a DA(H) if the lateral and/or vertical displacement exceeds the values in the manufacturers recommended procedures for that type of approach. For performance-based approaches that use an MDA, a callout should be made if the displacement exceeds the manufacturers recommended procedures for that type of approach. A general rule of thumb is that these displacements should not exceed the equivalent of 1 time the required performance value.

5.2.2.59. THE STANDARD AWTA OPERATING PROCEDURE.

A. General. Throughout the evolution of AWTA operations, numerous research programs have investigated various concepts in an attempt to optimize crew duties and responsibilities and to develop the ideal operational practices and procedures for operations in the restricted seeing-conditions associated with these operations. One method of specifying crew duties and responsibilities has been demonstrated to be especially effective, and is beginning to be widely used. For the purpose of this handbook, this particular method of conducting AWTA operations is called the "standard AWTA operating procedure." The standard AWTA operating approach procedure is based on the use of autocoupled approaches to minimize flight crew workload and to increase the precision of flightpath control. This concept was also designed to distribute the workload between the two pilots during the critical final approach segment and to provide a smoother transition from instrument to visual flight for completion of the landing. Another advantage to this concept is that the approach will default to a missed approach if any confusion, hesitation, or disorientation occurs at the critical decision point (DA(H) or MDA/MAP). It is GACA policy that all operators (except for those operators using heads-up display equipment) should be encouraged to use the standard AWTA operating procedure for instrument approaches when the weather conditions are equal to or less than RVR 1500m for approaches that have an MDA and RVR 1200m for approaches that have a DA(H).

B. The Standard AWTA Operating Procedure Concept. The standard AWTA operating procedure specifies a separation of the crew duties and responsibilities for the pilot who manipulates the controls during the landing (the landing pilot) and the pilot who is not manipulating the controls during the landing (the non-landing pilot).

1) The non-landing pilot maintains a full-time instrument reference throughout the approach and landing or missed approach. The non-landing pilot also serves as the master monitor of the flight instruments, navigation instruments, the autoflight system, and other critical aircraft systems.

a) The non-landing pilot is assigned the responsibility for hands-on control of the aircraft from the beginning of the final approach segment until arrival at DA(H). At MDA or DA(H), the non-landing pilot is responsible for making the go-around decision if the landing-pilot does not immediately respond to the "decide" challenge (callout) at DA(H) or MDA/MAP. If, before passing MDA or DA(H), the landing-pilot makes the decision to continue the approach and assumes hands-on control of the aircraft, the non-landing pilot relinquishes aircraft control and continues to serve as the master monitor throughout the subsequent landing or, if required, a missed approach.

b) The non-landing pilot is responsible for hands-on control of the aircraft from the beginning of the final approach segment until arrival at MDA/MAP or DA(H). Upon arrival at this point, the non-landing pilot is also responsible for immediately executing a go-around and maintaining hands-on control throughout the missed approach segment, unless one of the following three events occurs.

c) The landing-pilot determines that the aircraft's flightpath is acceptable and the external visual cues are adequate for continuing the approach by visual references. In this case, the landing-pilot assumes hands-on control of the aircraft by a callout such as, "I've got it" and simultaneously pushes the non-landing pilot's hand from the throttles. This double confirmation (verbal and tactile) is essential for ensuring an orderly transfer of control during this critical flight phase.

d) The landing-pilot determines that either the flightpath or the external cues are unacceptable and executes a missed approach by assuming hands-on control of the aircraft. The transfer of control should be accomplished in the same manner as previously described.

e) The landing-pilot detects or strongly suspects an unsafe condition and executes a missed approach by assuming hands-on control of the aircraft in the same manner as previously described.

2) The landing-pilot serves as the secondary monitor of the flight instruments and aircraft systems. The landing-pilot has the primary responsibility for evaluating the overall performance of the approach, determining the adequacy of the external visual cues, and for making the decision at MDA/ MAP or DA(H) to either continue the approach and landing or to go-around. During the approach, the landing-pilot incorporates external visual cues with the instrument references until reaching 100 feet above MDA/MAP or DA(H). At 100 feet above MDA or DA(H), the landing-pilot transitions to head-up scanning to evaluate the adequacy of external visual cues and to begin formulating the decision that must be made before passing MDA/MAP or DA(H).

a) If, before passing MDA/MAP or DA(H), the landing-pilot decides that the aircraft's flightpath is acceptable and the external visual cues are adequate for continuing the approach visually, the landing-pilot assumes hands-on control of the aircraft by making a callout such as "I've got it" and simultaneously pushes the non-landing pilot's hand from the throttles. The landing-pilot is responsible for manipulating the controls during the landing or throughout the missed approach if a go-around is necessary below MDA or DA(H).

b) If the landing-pilot decides that a go-around is necessary before assuming hands-on control of the aircraft, the landing-pilot should give the callout "go-around," and simultaneously push the throttles toward go-around power. The non-landing pilot will then execute the missed approach. In unusual circumstances, such as when the non-landing pilot hesitates to follow the go-around command, the landing-pilot can execute the missed approach by giving another callout such as, "I've got it; going around" while simultaneously pushing the non-landing pilot's hand from the throttles and assuming hands-on control of the aircraft.

c) The landing-pilot must manipulate the controls when operating below the MDA or DA(H). Therefore, the landing-pilot must execute the missed approach and manipulate the controls throughout the missed approach segment if a go-around is necessary below MDA or DA(H).

C. The Decision at MDA/MAP or DA(H). The landing-pilot is responsible for making the landing or go-around decision at MDA/MAP or DA(H). The non-landing pilot is responsible for making the go-around decision at MDA/MAP or DA(H) if the landing pilot does not immediately respond to the "decide" challenge (callout) at MDA/MAP or DA(H).

5.2.2.61. AIR TRAFFIC CONTROL CONCEPTS. Air traffic control (ATC) services are important elements of operations in instrument weather conditions. These services are essential for the safe conduct of CAT II or CAT III operations. The requirement for ATC to provide certain services to flight crews becomes more critical as seeing-conditions deteriorate. In such conditions, a higher degree of reliance must be placed on both the guidance provided by the electronic and visual aids, and by the necessary ATC services that ensure those aids provide reliable guidance. In poor seeing-conditions, controllers and pilots cannot see other traffic in the terminal area and increased reliance must also be placed on ATC information and collision prevention services. The objectives of air traffic control services in all-weather terminal area operations are as follows:

- Preventing collisions between aircraft
- Preventing collisions between aircraft and obstacles during operations on maneuvering areas of the aerodrome
- Expediting and maintaining an orderly flow of traffic
- Providing necessary protection to the runway safety areas, obstacle critical areas, and ILS critical areas
- Providing advice and information necessary for safe and efficient operations
- Providing notification and assistance during crash, fire, and rescue operations

A. Prevention of Collisions. Seeing-conditions associated with most CAT I operations permit pilots to see and avoid other traffic and obstacles during ground movement and during the final stages of landing. Under the same seeing-conditions, however, air traffic controllers may not be able to visually identify the aircraft or obstacles. In many CAT I situations and during CAT II and CAT III operations, neither controllers nor pilots will be able to see all traffic or obstacles that could affect safe operations. Therefore, it is essential during these conditions to use a system and/or procedures, that effectively ensures the separation of an aircraft from other aircraft and an aircraft from vehicles and obstacles. The systems and procedures used to satisfy these objectives must be tailored to accommodate the unique environment of each aerodrome. The overall system used usually incorporates the following general principles:

- Control procedures, that ensure that the runway is kept free of other aircraft and obstructions while an aircraft is landing or taking off on that runway
- Use of procedures, visual aids, and/or systems (such as surface movement radar (ASDE) to facilitate ground movement)
- Training for ground personnel
- Procedures to deny access to nonessential personnel and vehicles in aircraft movement areas
- The requirement for vehicles in movement areas to maintain radio contact with ATC
- Procedures to notify persons operating within movement areas when the restrictions change due to varying weather conditions.

B. Maintaining an Orderly Flow of Air Traffic. It is preferable that ATC arrange the traffic flow so that aircraft equipped for CAT II and CAT III operations are not unnecessarily delayed by aircraft not equipped for those operations. ATC may need to provide additional longitudinal separation between successive landing aircraft since poorer seeing-conditions increase the difficulty of ground movement. In these situations pilots require more time to exit the runway and its associated runway safety areas, obstacle-free zones, and ILS critical areas. During weather conditions requiring approaches with vertical guidance, adjustments in traffic flow must be made to establish an aircraft on a proper course for interception of the final approach course (maximum of 45 degrees offset) before glidepath interception. In these conditions, speed restrictions must be removed in enough time for the pilot to begin a stabilized approach before descending below 1,000 feet (300m) AGL.

C. Runway Safety Area, Obstacle-Free Zone, and ILS Critical Area Protection. Seeing-conditions encountered during AWTA operations may prohibit a pilot from seeing and avoiding all obstacles. As a result, the pilot must rely on the ground based electronic guidance, ATC control equipment, and ATC procedures and techniques to avoid obstacles. These procedures and equipment must ensure that other aircraft and/or vehicles are not within the runway safety areas, obstacle-free zones, and the ILS critical areas when an aircraft is in the final stages of an approach and landing or when taking off on that runway. Runway safety areas and obstacle-free zones must be controlled to ensure that obstacle protection is provided during takeoff, approach, and landing, and during a missed approach from low altitudes. ILS critical areas must be controlled to ensure that electronic guidance signal integrity is maintained. Aircraft and/or vehicles within these critical areas can cause significant disturbances to electronic guidance signals. ILS signals can also be disturbed by reflections caused by aircraft overflying an ILS antenna or flying through the on course signal between an ILS antenna and a landing aircraft. Aircraft and/or vehicles can also adversely affect glidepath signals if they are in close proximity to a glideslope or elevation antenna. In CAT II and particularly CAT III operations, additional longitudinal separation between landing aircraft may be required to allow an aircraft to complete the landing and to taxi clear of the critical areas or zones before the next aircraft enters a critical phase of an approach.

D. Advice and Information. During instrument flight operations, in the terminal area, it is essential for pilots and operators to have accurate information concerning weather conditions, runway surface conditions, and the status of necessary facilities and services. The types of advice and information needed to conduct instrument flight operations in terminal areas include the following:

- Reports of weather conditions (such as altimeter settings, visibility, RVR, winds, and cloud heights)
- Operational status of navigation facilities
- The degree of protection provided to ILS critical areas, obstacle-free zones, and runway safety areas
- Factors that could significantly affect ground movement and control of ground movement
- Reports on runway surface conditions (such as wet, snow covered, icy) and braking action reports, if appropriate
- NOTAMs that could affect operations

E. Rescue and Fire Fighting (RFF). Poor seeing-conditions increase the difficulty of identifying, locating, and responding to aircraft requiring RFF services. As seeing-conditions deteriorate, the role of ATC in notifying RFF facilities and assisting in RFF efforts increases in significance. Procedures, systems, and techniques must be used to ensure that aircraft requiring assistance can be quickly identified and located and RFF services can be dispatched and provided expeditiously.

5.2.2.63. AERODROME FACILITIES AND SERVICES. The varied-seeing conditions encountered in AWTA operations require pilots to rely heavily on visual aids, electronic guidance from ground based facilities, and other facilities and services provided by the aerodrome, including surface movement guidance and control systems (SMGCS), (see sub-paragraph G, following). Therefore, basic VFR aerodrome facilities and services must be enhanced before safe operations can be conducted in instrument flight conditions. Runways and taxiways must meet more stringent criteria with respect to width, length, marking, and lighting. Instrument approach aids and instrument approach procedures are required. Visual aids are needed to assist a flight crew during transition from instrument to visual flight and during ground movement. Meteorological observation and measurement equipment must be available to provide real-time information on weather conditions. Equipment and procedures must be established to provide aeronautical information on runway surface conditions and the status of airport facilities and services.

A. VFR Aerodrome Facilities and Services. Enhancements to basic VFR aerodrome facilities and services necessary to support instrument flight operations include the following general factors:

- Physical characteristics of the runway environment, including approach, departure, and pre-threshold terrain characteristics
- Obstacles and the obstacle limitation assessment surfaces
- Visual aids
- Electronic aids
- Secondary (standby) power supplies

B. Physical Characteristics. Physical characteristics of a runway environment become increasingly important as seeing-conditions deteriorate. Excessive runway or approach light gradients can create undesirable visual illusions and can cause hard or long landings. Longer runway lengths are necessary for reasons such as the tendency to land further down the runway because of visual illusions and the increased difficulty in controlling the aircraft's flightpath. The topography in the approach and pre-threshold areas should be regular and preferably level to ensure proper operation of radio (radar) altimeters, flight director systems, and automatic landing systems. The operation of automatic landing systems and other systems that provide flight guidance during flare and landing (such as HUD/HGS) is dependent on input from radio altimeters. As a result, the flare profile, touchdown sink rate, and touchdown point can be adversely affected by the profile of the pre-threshold terrain. Where the pre-threshold terrain for a particular runway could affect safe operations (an in-flight demonstration must be made to determine that the flight control system of a particular aircraft is not adversely affected by the pre-threshold terrain profile. Additionally, the pre-threshold terrain at certain runways may not permit a radio altimeter to be used to define DH for CAT II or AH/DH for CAT III operations for certain aircraft. In certain situations, an inner marker (IM) can be used to define the CAT II DH or the CAT III AH.

C. Obstacles and Obstacle Limitation Assessment Surfaces. Degraded seeing-conditions decrease a pilot's ability to see and avoid obstacles. Therefore, it is essential that obstacle protection is provided along the approach paths, missed approach and departure flight paths, and in areas on or near runways used for takeoffs and landings. In certain situations, obstacles may prevent the conduct of CAT II or CAT III operations. In other situations, higher than normal minima for CAT I or CAT II operations may be required to provide necessary seeing-conditions to see and avoid controlling obstacles. During operations using approaches with vertical guidance, it is essential to provide obstacle protection in runway safety areas and obstacle-free zones. A runway safety area is an area adjacent to the runway that must be free from fixed or mobile "non-breakable" obstructions. Runway safety areas reduce the potential for catastrophic accidents if portions of the aircraft structure (such as a wingtip) extend beyond the runway edge, or if an aircraft departs the runway during a landing or takeoff roll. An obstacle-free zone is a three-dimensional area including portions of the landing surface that provides obstacle clearance during landings or during rejected landings, including missed approaches after touchdown. The only fixed obstructions permitted in runway safety areas or obstacle free zones are frangible objects or obstructions that are fixed by their functional purpose. “Fixed by their functional purpose” means that the installation of the object in those areas is essential to the safe conduct of operations on the runway; there are no alternative locations (examples include such objects as runway lights, glideslope/elevation antennas, and RVR reporting systems). Mobile obstructions (such as aircraft and/or vehicles) are not permitted within runway safety areas or obstacle-free zones while aircraft are using the runway. Aircraft, vehicles, and other objects that could disturb ILS electronic guidance are not permitted in ILS critical areas when other aircraft are critically dependent on this type of guidance. Since protection of these areas or zones is critical to safe operations (particularly during degraded seeing-conditions), visual aids (such as signs, markings, or lighting) must be provided for identifying the boundaries of these areas to pilots and operators of other vehicular traffic. ATC procedures and ground movement restrictions must be provided to ensure that these areas are protected.

D. Visual Aids. Visual aids are essential for most AWTA operations. Visual aids are also important for the safe and expeditious guidance and control of taxiing aircraft. These aids include signs, markings, and lights that identify holding points or indicate directions, and the marking or lighting of the taxiway centerline and edges. The conspicuousness of runway and taxiway markings deteriorates rapidly, especially at busy aerodromes. These markings must be frequently inspected and maintained, particularly for CAT II or CAT III operations. All lighting systems should be monitored by ATC so that timely information on system failures or malfunctions can be provided to pilots. Regular visual inspections of all sections of the lighting systems are normally used to determine the status of individual lights. Therefore, it is usually only necessary for ATC to remotely monitor lighting circuits to determine whether the proper amount of power is being demanded by, and delivered to, the lighting systems. Remote monitoring of approach, runway edge, and in-runway lighting is essential during CAT II and CAT III operations, unless frequent visual inspections (every 2 hours) or timely pilot reports indicate the lights are serviceable for the operations in progress.

E. Nonvisual (Electronic) Aids. Ground based or space based systems that provide electronic guidance must provide the quality of guidance (flight inspected course structure), integrity (degree of trust that can be placed on the accuracy of the guidance), and continuity of service (protection against loss of signal) appropriate to the category of the operation being conducted (CAT I/II/II). Systems used operations using approaches with vertical guidance must provide acceptable flightpath angles and acceptable TCHs. A classification system has been established through ICAO for ground based electronic systems used for approaches with vertical guidance. This classification system reflects the ground based system configuration, course quality, integrity, and continuity of service capabilities. Since the electronic aids provide such a critical function, pilots conducting takeoff or landing operations must be notified immediately of any changes in system status, or of any malfunctions or failures. To meet this requirement, all facilities associated with ILS ground equipment must be constantly monitored by ATC or other appropriate personnel. The required levels of reliability, integrity, and continuity of service for these facilities are usually provided by automatic electronic monitoring systems, on-line standby equipment (backup transmitters), duplication of key functions, and secondary power supplies.

F. Secondary Power Supplies. Secondary power sources (standby power supplies) are essential for ensuring that visual aids, electronic aids, meteorological reporting systems, and communication facilities continue to function, even if the main source of power is interrupted. Loss of power to these systems becomes more critical as seeing-conditions deteriorate. Therefore, as conditions change from CAT I to CAT II or CAT III, the levels of required redundancy increase, and standby power switchover times decrease. Secondary power supply requirements are established in ICAO Annexes 10 and 14.

G. Surface Movement Guidance and Control System (SMGCS). In order to enhance taxiing capabilities in low visibility conditions and reduce the potential for runway incursions, improvements have been made in signage, lighting, and markings at many aerodromes. In addition to these improvements, authorities may require low visibility taxi plans for affected aerodromes. The FAA, for instance, describes those taxi plans in FAA Advisory Circular (AC) 120-57 (as amended), Surface Movement Guidance and Control System, more commonly known as SMGCS (acronym pronounced 'SMIGS'), for those aerodromes which have takeoff or landing operations with less than 1,200 feet (350 meters) runway visual range (RVR) visibility conditions. This plan affects both air crew and vehicle operators. Taxi routes to and from the SMGCS runway must be designated and displayed on a SMGCS Low Visibility Taxi Route chart. Further information on SMGCS and Advanced-SMGCS can be found in ICAO Doc. 9476 and 9830 respectively.

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CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 3. General Approval Requirements for All Weather Terminal Area (AWTA) Operations

5.2.3.1. APPROVAL CONSIDERATIONS. All Kingdom of Saudi Arabia (KSA) operators who wish to conduct All Weather Terminal Area (AWTA) operations must request approval and be approved for those operations. This section addresses the requirements for obtaining General Authority of Civil Aviation (GACA) approval for AWTA operations.

A. Approval Process. All AWTA operational approvals are processed using the generic 5 Phase approval process discussed in Volume 1, Chapter 4, Section 1, General Information and the Approval or Acceptance Process.

B. Overview Matrix. An overview of the key requirements for all AWTA operational approvals are highlighted in Figure 5.2.3.1 (Airplanes) or 5.2.3.2 (Rotorcraft), as applicable. This matrix should be used as a guide to identify whether an operational approval is required for the specific AWTA operation of interest. If an operational approval is required, the matrix identifies where the related guidance is found in this chapter of the eBook, what the essential requirements are that must be met by the applicant before the operational approval can be granted, and the associated operations specification (OpSpecs) for each kind of AWTA operation.

C. Specific Guidance. Specific guidance for each AWTA operational approval is contained in Sections 4 through 11 of this chapter.

D. Approval Method. AWTA approvals are granted via operations specification (OpSpecs) or Certificates of Authorization (COA) (see Figure 5.2.3.1 or 5.2.3.2, as applicable for a complete listing).

E. GACAR Part 91 Requirements. General requirements for low visibility operations (LVO) are prescribed in General Authority of Civil Aviation Regulation (GACAR) Part 91, Appendix D and include:

1) *Aerodrome Considerations.*

a) The operator must not use an aerodrome for LVO unless:

1. The aerodrome has been approved for such operations by the State where the aerodrome is located.

2. LVOs have been established.

b) At aerodromes where the term LVO is not used, the operator must ensure that there are equivalent procedures that adhere to the requirements of LVO at the aerodrome. This situation must be clearly noted in the operations manual or LVO procedures manual including guidance to the flight crew on how to determine that the equivalent LVO are in effect.

2) *Flight Crew Training and Qualifications.*

a) The operator must ensure that before conducting an LVO:

1. Each flight crew member:

a. Complies with the training and checking requirements prescribed in the operations manual or LVO procedures manual, including flight simulation training device (FSTD) training, in operating to the limiting values of RVR and DH specific to the operation and the aircraft type; and

b. Is qualified in accordance with the standards prescribed in GACAR Part 61 or the operations manual;

2. The training and checking is conducted in accordance with a detailed syllabus approved by the President.

3) *Operating Procedures.*

a) The operator must establish procedures and instructions to be used for LVOs. Except as provided in paragraph (2) below these procedures must be included in the operations manual and contain the duties of flight crew members during taxiing, takeoff, approach, flare, landing, rollout and missed approach operations, as appropriate.

b) For operators not certificated under GACAR Part 119 or authorized under GACAR Part 129, the operating procedures must be included in an LVO procedures manual.

c) Before commencing an LVO, the PIC must be satisfied that:

1. The status of the visual and nonvisual facilities is sufficient.

2. Appropriate LVOs are in force at the aerodrome according to information received from Air Traffic Service.

3. Flight crew members are properly qualified.

4) *Minimum Equipment.*

a) The operator must include the minimum equipment that must be serviceable at the commencement of an LVO in accordance with the airplane flight manual (AFM) or other approved document in the operations manual or LVO procedures manual, as applicable.

b) The PIC must be satisfied that the status of the aircraft and of the relevant airborne systems is appropriate for the specific operation to be conducted.

5) *Maintenance Program.*

a) The operator must establish an LVO maintenance program to include the following elements:

1. A schedule that provides for the performance of inspections of required equipment to support LVO operations.

2. A schedule that provides for the performance of required bench checks.

3. A schedule that provides for the performance of a test and inspection of each static pressure system in accordance with Appendix D to GACAR Part 43 within 12 months after the date of the previous test and inspection.

4. The procedures for the performance of the periodic inspections and functional flight checks to determine the ability of each required instrument and item of equipment to perform as approved for LVO operations including a procedure for recording functional flight checks.

5. A procedure for assuring that the pilot is informed of all defects in listed instruments and items of equipment.

6. A procedure for assuring that the condition of each listed instrument and item of equipment upon which maintenance is performed is at least equal to its required condition before it is returned to service for LVO operations.

7. A procedure for an entry in the maintenance records that shows the date, aerodrome, and reasons for each discontinued LVO operation because of a malfunction of a listed instrument or item of equipment.

5.2.3.3. MANUAL REQUIREMENTS. The following information and procedures should be included in the Operations Manual (or LVO Manual for GACAR Part 91 operators):

A. Aircraft Identification. Registration number, serial number, make and model of the aircraft utilized in operations.

B. Maintenance Program. A maintenance program as specified in GACAR Part 91, Appendix D, Section II, g, Maintenance Program.

C. Procedures. The procedures and instructions related to:

- Decision Height (DH)
- Use of runway visual range information
- The decision region (the region between the middle marker and DH)
- The maximum permissible deviations of the basic ILS indicator within the decision region
- A missed approach
- Use of equipment, minimum altitude for use of autopilot (AP)
- Instrument and equipment failure warning systems
- Instrument failure
- Other procedures, instructions, and limitations that may be found necessary by the President

5.2.3.5. PROCEDURES.

A. Initial Inquiry. Upon initial inquiry, determine the type of AWTA operation is being proposed and then using Figure 5.2.3.1 or 5.2.3.2, as applicable, determine which key approval requirements apply (e.g., Letter of Intent, Compliance Statement, Manuals, etc.):

- Low Visibility Takeoff
- Non-Precision, APV and Standard CAT I
- Lower Than Standard CAT I
- Standard CAT II
- Other than Standard CAT II
- CAT III operations
- RNP AR APCH
- Enhanced Vision Systems

1) Provide the applicant with a list of the relevant requirements and guidance material.

2) Advise the applicant which key approval requirements must be completed. Inform the applicant that the application must be signed by the owner or an authorized official of the company. If the owner is a corporation, the full name of the corporation and its principal business office address must be indicated.

3) Advise the applicant that all required items of submission must be submitted at least 30 days before intended operations begin.

4) Approval will be noted by issuance of relevant OpSpecs or a COA.

5) Disapproval should be noted by a letter to applicant indicating disapproval. The reasons for disapproval should be specified in the letter.

B. Receipt of Application. Upon receipt of the letter of intent (LOI) and/or application, as appropriate:

- Ensure that the LOI contains at least the information outlined in Figure 5.2.3.1 or 5.2.3.2, as applicable
- Provide a copy of the LOI and/or application to the Airworthiness Division for timely inter office coordination and review
- Using the information provided by the applicant review for all pertinent information for the proposed operations
- Ensure that the applicant has indicated the name of the organization or individual applying and the name of a

person responsible for matters concerning the application

• Ensure that the applicant has indicated the permanent mailing address of the organization or individual named in item 1

• Ensure that the applicant has described the proposed AWTA operation

• Ensure that the operator seeking CAT II or CAT III approval has listed all requested aerodromes

• Ensure all details concerning aircraft make and model and required equipment are provided

C. Review the Manual(s).

1) Ensure that the manual(s) contains the items discussed in paragraph 5.2.3.3.

2) Coordinate review of the manual with the Airworthiness Division as necessary.

a) Unsatisfactory Manual. If the manual is unsatisfactory:

1. Contact the applicant and explain areas of the manual that need to be corrected.

2. Prepare a letter of disapproval (Figure 5.2.3.3), with a suspense date for submission of the corrected manual.

b) Satisfactory Manual. If the manual is satisfactory:

1. Approve the manual IAW the criteria in Volume 4, Chapter 12, Section 2, Approval and Acceptance of Manuals and Checklists. Aviation safety inspectors (Inspectors) (Operations) should coordinate Inspectors (Airworthiness) regarding any airworthiness and avionics concerns as may be necessary.

2. Prepare a letter of approval (Figure 5.2.3.4).

D. Office File. Establish a GACA office file on the operator that includes, but is not limited to, a copy of the following, as applicable:

• LOI, application

• The approved Operations/LVO Manual

• The OpSpecs

• Letter of approval

• Letter of disapproval

• Other documents of correspondence

5.2.3.7. GAR. Make appropriate GAR entries.

5.2.3.9. TASK OUTCOMES. Completion of this task results in one or more of the following:

- An approved Operations/LVO Manual
- The issuance of a Certificate of Authorization or OpSpecs
- A disapproved application
- A letter indicating disapproval of a LVO operations manual
- A letter indicating approval of a LVO operations manual

5.2.3.11. FUTURE ACTIVITIES.

- Renewal of AWTA authorization
- Review revisions to the operator's LVO manual
- Possible enforcement investigation

Figure 5.2.3.1. All Weather Terminal Approach (AWTA) Approval Matrix-Airplanes

NOTE: See the job aid "Low Visibility Operations - A Summary of Approval Requirements" which is found in the ARS Library under the Guidance/Job Aids section

Figure 5.2.3.2. All Weather Terminal Approach (AWTA) Approval Matrix-Rotorcraft

NOTE: See the job aid "Low Visibility Operations - A Summary of Approval Requirements" which is found in the ARS Library under the Guidance/Job Aids section

Figure 5.2.3.3. Sample Letter of Disapproval of a LVO Operations Manual

[Date]

[Applicant's name and address]

Dear [applicant's name]:

This is to inform you that the LVO operations manual submitted on [indicate date] has been disapproved for the following reasons:

[list reasons for disapproval]

Please make the corrections noted and resubmit to this office within 15 days of receipt of this letter.

If you have any questions please feel free to contact this office during regular business hours at the following telephone number [indicate number].

Sincerely,

[POI's signature]

Figure 5.2.3.4. Sample Letter of Approval of a LVO Manual

[Date]

[Applicant's name and address]

Dear [applicant's name]:

This is to inform you that the LVO operations manual submitted on [indicate date] has been approved.

If you have any questions please feel free to contact this office during regular business hours at the following telephone number [indicate number].

Sincerely,

[POI's signature]

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CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 4. Low Visibility Takeoff

5.2.4.1. GENERAL. This section contains information to be used by aviation safety inspectors (Inspectors) concerning standard takeoff minima and the approval of lower than standard takeoff minima. Under General Authority of Civil Aviation Regulation (GACAR) § 91.191(l)(l), unless otherwise authorized by low visibility takeoff (LVTO) minimums of Subpart D of GACAR Part 91, no pilot in command (PIC) may take off from a civil aerodrome under IFR unless the weather conditions at time of takeoff are at or above the weather minimums for IFR takeoff prescribed for that aerodrome under GACAR Part 97. If take off weather minimums are not prescribed under GACAR Part 97 for a particular aerodrome, the following standard weather minimums apply to takeoffs under instrument flight rules (IFR):

- For aircraft, other than rotorcraft, having two engines or less—1500 m visibility
- For aircraft having more than two engines—800 m visibility
- For rotorcraft—800 m visibility

A. Regulatory Basis. The authority for lower than standard takeoff minima is contained in the GACAR § 91.393. When appropriate, principal operations inspectors (POIs) will issue operations specification (OpSpec) C78 (airplanes) or R116 (rotorcraft), to authorize lower than standard takeoff minima. These OpSpecs contain specific guidance regarding pilots, aircraft, and aerodromes when lower than standard takeoff minima are used.

5.2.4.3. TRAINING. POIs shall ensure that operators requesting lower than standard takeoff minima provide training to their personnel in all procedures contained in the OpSpecs. In addition, the operator's training program must contain at least the following, as applicable:

- Rejected takeoffs in a low visibility environment
- Engine failure at V1 in low visibility
- Taxiing in a low visibility environment with emphasis on preventing runway incursion
- Critical areas
- Crew coordination and planning
- Dispatcher training
- Procedures for operators not using dispatch systems
- Required ground based visual aids (such as stop bars, taxi holding position lights)
- Required ground based electronic aids (such as instrument landing system (ILS) transmissometers)

• Determination of takeoff alternate aerodromes, as applicable

5.2.4.5. OPSPEC C56, STANDARD INSTRUMENT FLIGHT RULES (IFR) TAKEOFF MINIMA. OpSpec C56 is issued to all operators who conduct operations with airplanes under GACAR Part 121. OpSpec C56 prescribes the standard takeoff minima for use by the applicable operators. If an operator is not authorized to use lower than standard takeoff minima, OpSpec C78 or R116 will not be issued.

5.2.4.7. OPSPECS C78 or R116, LOWER THAN STANDARD IFR TAKEOFF MINIMA.

OpSpec C78 or R116 allows for lower than standard takeoff minima.

A. Takeoff Minima. According to the requirements prescribed in Subpart D of GACAR Part 91:

(1) The operator may only conduct a LVTO operation with airplanes as follows—

(i) With an RVR below 400 m if the criteria specified in Table D–1 are met.

(ii) With an RVR below 150 m to 125 m if:

(A) High intensity runway centerline lights spaced 15 m (50 ft) or less apart and high intensity edge lights spaced 60 m (200 ft) or less apart are in operation.

(B) A 90 m (295 ft) visual segment is available from the flight crew compartment at the start of the take-off run; and

(C) The required RVR value has been achieved for all of the relevant RVR reporting points.

(iii) With an RVR below 125 m to 75 m, if—

(A) Runway protection and facilities equivalent to CAT III landing operations are available; and

(B) The aircraft is equipped either with an approved lateral guidance system or, an approved HUD/HUD landing system (HUDLS) for takeoff.

TABLE D–1. LVTO Airplanes

Facilities	RVR[2]
Day: runway edge lights and runway centerline markings Night: runway edge lights or runway centerline lights and runway end lights	300m
Runway edge lights and runway centerline lights	200m
Runway edge lights and runway centerline lights and relevant RVR information [3]	TDZ, Midpoint (MID), rollout 150m
High intensity runway centerline lights spaced 15 m (49 ft) or less and high intensity edge lights spaced 60 m (200 ft) or less are in operation [3]	TDZ, MID, rollout 125m
Runway protection and facilities equivalent to CAT III landing operations are available and the aircraft is equipped either with an approved lateral guidance system or an approved HUD/HUDLS for takeoff.	TDZ, MID, rollout 125m

[1]The reported RVR value representative of the initial part of the take-off run can be replaced by pilot assessment.

[2]Multi-engine airplanes which in the event of an engine failure at any point during takeoff can either stop or continue the takeoff to a height of 1500 ft (450 m) above the aerodrome while clearing obstacles by the required margins.

[3]The required RVR value to be achieved for all relevant RVRs

(2) The operator may only conduct an LVTO with rotorcraft if the criteria specified in Table D–2 are met.

TABLE D–2. LVTO Rotorcraft

Onshore heliport with IFR departure procedures	RVR
No light and no markings (day only)	250m or the rejected take-off distance, whichever is the greater
No markings (night)	800m
Runway edge/(Final Approach and Takeoff (FATO) light and centerline marking	200m
Runway edge/FATO light, centerline marking and relevant RVR information	150m
Offshore helideck [1]	
Two-pilot operations	250m
Single-pilot operations	500m

[1]The take-off flight path to be free of obstacles.

B. Pilot Assessment of Lower than Standard Takeoff Minima. OpSpec C78 allows for pilots to make an assessment of RVR when the TDZ RVR is inoperative, is not reported, or the pilot determines that reported TDZ RVR is in error in the takeoff regime. This assessment, when equal to or greater than that required in the TDZ report for takeoffs made with only outside visual references, or for takeoffs using takeoff guidance systems, can be used for takeoff when the Mid and Rollout reports are available, and are equal to or greater than that required. To take advantage of this possibility, each operator must:

1) For each runway for which the assessment is allowed, have an approved procedure for assessing RVR that includes identification of an appropriate number and type of runway lights or markings of known spacing that

must be visible to the pilot when viewed from the flight deck with the aircraft in the takeoff position. This procedure must include variability of runway light intensity settings and ambient lighting (day or night).

2) For each runway for which the assessment is allowed, have an approved procedure for describing the actions to be taken when local visibility conditions, as determined by the pilot, indicate that a significantly different visibility exists from that reported for the TDZ.

3) For each runway for which the assessment is allowed, have an approved procedure for coordinating release with air traffic control (ATS) and dispatch.

4) GACA approved procedures for RVR assessment, for determining that TDZ RVR reports are in error, and for takeoff and flight release in operating manuals and in such materials that are readily available to the flight crew in the cockpit.

5) A GACA approved training and validation program of the GACA approved procedures for all flight crews authorized to participate. Validation of the procedures will be accomplished in a GACA qualified and approved flight simulator. No flight crewmember may participate in these operations until this portion of the approved training program is accomplished satisfactorily.

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CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 5. Non-Precision, APV and Category I

5.2.5.1. GENERAL. This section provides General Authority of Civil Aviation (GACA) aviation safety inspectors (Inspectors) with the necessary concepts and direction and guidance for evaluating and approving or denying operator requests for authorization to conduct non-precision approach (NPA), approach procedure with vertical guidance (APV) and Category (CAT) I precision approach operations.

A. General Concepts, Policies, Direction and Guidance. This section amplifies the general concepts, policies, and direction and guidance provided in previous Sections 1, 2, and 3 of this chapter. Specific standards are provided for evaluating non-precision, APV and Category CAT I precision instrument approach operations using airborne and ground-based or space-based equipment that have well understood operational characteristics and limitations.

5.2.5.3. FUNDAMENTAL OPERATING PRINCIPLES.

A. AWTA Operating Minima. AWTA operating minima are established on two fundamental principles:

1) The first principle is that the flight crew may have acquired only the minimum aeronautical knowledge, experience, skill, qualifications and training required by GACAR Part 61, 91, 121, 125 and 135 (as applicable) relative to these operations.

2) The second principle is that only the minimum airborne and ground-based or space-based equipment required for AWTA operations by the aircraft certification rules (GACAR Part 21) and the applicable operating rules GACAR Part 91, 97, and 121, 125 and 135 (as applicable) will be available.

B. Assumptions and Criteria. The assumptions and criteria used in aircraft certification and instrument approach procedure design must be based on these principles. The fundamental objective that must be met during aircraft certification and instrument approach procedure design is to ensure that flight crews and aircraft that meet only the minimum requirements of GACAR Part 21, 61, 91, 121, 125 or 135 (as appropriate) can safely conduct operations using AWTA operating minima.

C. Special Equipment or Procedures. Any special equipment or procedures necessary to achieve this objective must be specified in the airworthiness certification basis of the aircraft (or supplemental type certificate) and/or the approved Aircraft Flight Manual (AFM). Any requirement for special training, knowledge, or skills is not an acceptable means of meeting this fundamental objective because there are no regulatory provisions in GACAR Part 61 or 91 that can be used to enforce such requirements.

5.2.5.5. AWTA OPERATING MINIMA FOR INSTRUMENT APPROACHES. The criteria for operating minima associated with instrument approaches are established in the published instrument approach procedure for each of the various types of approaches (such as NDB, VOR, LOC, ILS, RNAV). Standard operating minima have also been established for each of the various navigation systems and runway lighting system combinations currently in use. Reductions in operating minima below the basic values established for each NAVAID are based primarily on the use of approach and runway lighting systems. These lighting systems are necessary to increase the conspicuity of the landing surface, which in turn enhances the pilot's ability to use external visual references to control and maneuver the aircraft in reduced seeing-conditions.

A. Lighting System Credits. All straight-in ILS operating minima below 3/4 statute mile (1200m) visibility or RVR 1200m visibility (or RVR 1100m for rotorcraft) are based on the use of ground-based visual aids to enhance seeing-conditions during the final stages of approach and landing operations (deceleration for rotorcraft). These reductions are known as lighting system credits and cannot be used to reduce operating minima for circling maneuvers due to the large area required for safe maneuvering (turn radius) at the various speeds used. Therefore, operating minimum reductions based on lighting credits can only be authorized for instrument approaches to runways that provide a straight-in landing capability. The standard minimum IFR altitudes cannot be reduced due to obstacle limitations, NAVAID signal limitations, and/or navigation system limitations. As such, reductions in operating minima below the basic values established for each type of approach are expressed only as reductions in the visibility/RVR required to safely conduct the approach. The minima for the various navigation systems and lighting system combinations are specified in ICAO PANS-OPS design criteria and in operations specifications (OpSpecs) C52 and R103.

B. Straight-In Minima for Approaches with an MDA. The lowest permissible minima for Categories A, B, and C and D aircraft during the conduct of straight-in IAPs that have an MDA are height above touchdown (HAT) 250 and 1/2 statute mile (800m) visibility or RVR 750m. The lowest permissible minima for rotorcraft operated at 90 knots or less are HAT 250 and 1/4 statute mile (400m) visibility or RVR 500m. These minima for rotorcraft operated at more than 90 knots are HAT 250 and 1/2 statute mile (800m) visibility or RVR 750m. These minima are the lowest authorized for approaches that have an MDA and are restricted to runways that are equipped with Full Approach Lighting Systems (FALS) such as Medium-Intensity Approach Lighting System with Runway Alignment Indicator (MALSR), Short Approach Lighting System with Runway Alignment Indicator (SSALR), Approach Lighting System with Sequenced Flashing Lights (ALSF-1), or ALSF-2 approach lighting systems, or foreign equivalents.

C. Straight-In Minima for Approaches with a DA(H). The lowest permissible minima for all airplanes conducting straight in instrument approach procedures that have a DA(H) are HAT 200 and RVR 550m. The lowest permissible minima for rotorcraft is 1/4 statute mile (400m) visibility or RVR 350m. These minima are the lowest authorized for approaches that have a DA(H) and are normally restricted to runways that are equipped with a lighting system consisting of touchdown zone and centerline lights and MALSR, SSALR, and ALSF-1 or ALSF-2 approach lighting systems. RVR less than 750m is authorized when HGS/HUD or coupled autopilot is used in lieu of touchdown zone and centerline lights for ALSF-1 and ALSF-2 only. An RVR of 550m is authorized without touchdown zone or centerline lighting for unrestricted ILS approach procedures with a HAT of 200 feet.

D. High Minimum Pilots-in-Command (PIC). The degraded seeing-conditions and increased difficulty in piloting tasks encountered during approach and landing operations make it necessary for PICs to acquire a certain amount of flight experience before operating to the lowest authorized CAT I minima. The objective of this flight experience requirement is to ensure that the pilot is fully aware of the aircraft's equipment capabilities and limitations, the available external visual cues, and the aircraft's handling characteristics.

1) The flight experience necessary to meet this objective is specified in GACAR § 91.193, as applicable. These rules require those PICs who do not meet these experience requirements (high-minimum PICs) to increase the published MDA/DA(H) by 100 feet and the published visibility/RVV by 1/2 statute mile (800m) or the RVR equivalent. The RVR that must be used when an RVR is published and available is the applicable high-minimum-PIC RVR value specified in OpSpec C54 (GACAR Part 121).

2) The increased operating minima for high-minimum PICs always result in operating minima that are higher than standard minima. Therefore, when dispatching or releasing a flight, the increased operating minima for high-minimum PICs and the reported and/or forecast weather conditions at the destination aerodrome must be considered.

a. GACAR § 91.193 applies to all aircraft operated under all GACAR parts. It raises high-minimum PIC operating minima by HAT 100 feet and visibility by 1/2 statute mile (800m) or by the RVR equivalent. The high-minimum PIC RVR landing minima equivalents are specified in the OpSpec C54. The rule specifies that the MDA or DA(H) and visibility minimum required for a high minimum PIC do not have to be raised above the conditions required to designate the aerodrome as an alternate aerodrome.

1. The new method for determining alternate minima, however, is to add a buffer to the HAT/height above aerodrome (HAA) and visibility or RVR authorized for landing. This method negates the provision of this rule since alternate minima will always be higher than the high minimum PIC’s landing minima. The landing minima for high-minimum PICs at destination aerodromes are always determined by adding 100 feet to the HAT/HAA and ½ statute mile (800m) to the visibility authorized for landing or by using the high-minimum-PIC RVR equivalents in OpSpec C54 when RVR is available.

2. This rule establishes HAT 300 feet and 1 statute mile (1600m) (or the RVR equivalent as low as RVR 1400mas the lowest straight-in operating minima for high-minimum PICs when conducting approaches that have a DA(H). This rule also establishes HAT 300 and 1 statute mile (1600m) (or the RVR equivalent as low as RVR 1500m as the lowest straight-in operating minima for high-minima PICs while conducting approaches that have an MDA. This rule also permits the 100-hour flight experience requirement to be reduced by up to 50 percent by substituting one landing for 1 required hour of flight experience, provided the PIC has at least 100 hours of PIC time in another type aircraft.

E. Basic Turbojet Minimum. A basic turbojet visibility/RVR operating minimum has been established for all turbojet airplanes operated under GACAR Part 121 and 135. The basic turbojet minimum for straight-in approaches is 3/4 statute mile (1200m) visibility or RVR 1200m. Any minimum less than the basic turbojet minimum is not authorized in turbojet aircraft until special requirements are met that relate to pilot qualification, the runway lighting/marking systems, and landing distance available. Complete details relative to the basic turbojet landing minima are specified in the OpSpec C54 (See eBook Volume 15, Chapter 3 for additional details).

5.2.5.7. EVALUATION AND APPROVAL. The process for evaluating and approving non-precision, APV and CAT I precision instrument approach operations follows the general process for approval or acceptance described in Section 8 of this chapter. The discussion in the following paragraphs provides specific criteria and direction related to the evaluation and approval of AWTA operations.

A. Straight-In Approach and Landing Operations. Before an operation can be authorized for the use of straight-in instrument approach procedures that have either an MDA or a DA(H), Inspectors must evaluate the proposed operation and determine that the operator is competent to safely conduct those procedures. Inspectors must ensure that the operator’s program specifies the conditions necessary for the safe conduct of proposed operations. The operator’s program should incorporate systems, methods, and procedures that meet the following criteria:

- Program restricts operations to aircraft that are properly equipped and airworthy for the straight-in approaches to be conducted

• Complies with regulatory requirements specified for the operations

• Meets the requirements of parts B, C, and R of the OpSpecs and the criteria of this handbook

• Provides for accepted, safe operating practices, such as altitude awareness and sterile cockpit procedures

• Requires the use of the stabilized approaches when turbojet, turbofan, or propfan airplanes are used

• Program restricts operations to pilots who are properly trained, experienced, qualified, and proficient for the particular operation being

• Program restricts operations to aerodromes and runways that meet the requirements applicable to straight-in instrument approaches

B. Approaches Requiring Circling Maneuvers. When an operator is authorized to conduct instrument approaches, the OpSpecs C75 (GACAR Part 121) automatically authorizes the conduct of circling maneuvers in VFR weather conditions (1,000 foot ceiling and 3 statute mile (4800m) visibility). A circling maneuver conducted under this authorization may be performed at the published HAA appropriate for the highest speed in the circling maneuver. Before circling maneuvers may be conducted with ceilings below 1,000 feet and/or visibilities below 3 statute miles (4800m), a GACAR Part 121 operator's approved training program must provide for training in the circling maneuver. If any operator intends to conduct circling maneuvers, Inspectors must evaluate the operator's training and checking programs and determine that they provide adequate instruction and checking of pilots on the circling maneuver. When a GACAR Part 121 operator does not provide training on circling maneuvers, the operator's operating policies and procedures must prohibit circling maneuvers when ceilings and/or visibilities are below 1,000 feet and 3 statute miles (4800m). Inspectors must also ensure that the operator's overall program specifies the necessary conditions (over and above those required for straight-in approaches) to safely conduct circling maneuvers. The operator's program should incorporate methods, procedures, and training that meet the following criteria:

• Meets the circling maneuver criteria in the OpSpecs

• Requires the circling maneuver to be performed in visual flight conditions

• Provides for safe missed approaches throughout the circling maneuver

• Requires the use of circling maneuver minima appropriate to the highest speed used in a particular circling maneuver

• Program restricts operations to those aerodromes and runways where circling maneuvers can be safely completed

• GACAR Part 121 programs restrict circling maneuvers with ceilings below 1,000 feet and/or visibilities below 3 statute miles (4800m) to those pilots who are properly trained and checked for the circling maneuver in those weather conditions

C. Visual Approaches. An operator is authorized to conduct visual approaches, provided the conditions specified in the OpSpecs are met. In both domestic and foreign operations, the operator must comply with the conditions specified in the operations specifications when conducting visual approaches. When authorized to operate in foreign countries, the operator's policies, procedures, and approved training program must ensure that the requirements for visual approaches in foreign countries are adequately addressed.

E. Special Instrument Approach Operations. Operators may be authorized to conduct special instrument approach and landing operations. When authorizing these types of special approaches, Inspectors must be assured that the aircraft are properly certificated, equipped, and maintained. In addition, approved training programs and operating policies and procedures must ensure that these operations can be safely conducted.

1) *Point-in-Space Approaches*. In certain cases, the instrument portions of an instrument approach procedure may deliver the aircraft to a predetermined "point-in-space" instead of to an aerodrome or runway. These types of approaches are intended to provide an IFR descent to a point where sufficient visual reference is available for the pilot to navigate visually for several miles to the aerodrome of intended landing. If the required seeing-conditions are not established before passing this point-in-space, a missed approach can be safely executed. Rotorcraft en route descent areas (REDAs) permit a single instrument procedure to serve many offshore heliports, and significantly reduce the burden of developing numerous standard instrument approach procedures for this dynamic situation. This is particularly useful in offshore operations where heliports frequently exist for short periods of time and the location of the heliport is frequently moved because of operational needs. REDA operations are authorized by OpSpec R104.

2) If the operator requests approval of other types of special instrument approach operations, the request should be forwarded to the Director, Flight Operations Division for direction and guidance related to the approval and conduct of the proposed special AWTA operation.

F. Required Airborne Equipment. This paragraph discusses the airborne equipment required for non-precision approach, APV and CAT I operations. Unless specifically stated otherwise, the criteria discussed in this paragraph are applicable to both rotorcraft and airplanes.

1) *Airborne Equipment Required for Standard Operating Minima*. When aircraft and avionics equipment are certificated under GACAR Part 21, the requirements in the various operating rules (i.e., GACAR Parts 91, 121, and/or 135, as appropriate), are taken into consideration. Therefore, aircraft and avionics combinations certificated under GACAR Part 21 for IFR flight are capable of supporting the conduct of AWTA operations using standard aerodrome operating minima. This applies to reciprocating and turbopropeller airplanes as well as turbojet, turbofan, and propfan airplanes and all rotorcraft. Therefore, for operations using IAPs based on ICAO standard NAVAIDs and standard aerodrome operating minima, the aircraft and avionics airworthiness certification basis and the operating rules define the required airborne systems and equipment.

2) *Airborne Equipment Required for Departure.* The "equipment rules" are met when the required equipment is installed and serviceable at the time a flight departs. The redundancy specified in these rules is intended to provide the capability to safely continue and complete an IFR approach and landing (at either a destination or alternate aerodrome) in the event an approach system fails or malfunctions in-flight.

3) *Airborne Equipment Required for Conducting Instrument Approach Procedures*. The "equipment rules" specifically address the airborne equipment that must be installed and serviceable before departure. Therefore,

additional requirements must be specified to address instances where some of the required equipment fails or malfunctions in-flight. This is particularly true in situations where the "equipment rules" require redundancy for the purpose of preserving an instrument approach capability in the event a failure occurs.

a) The equipment rules and the operations specifications do not specify in detail the equipment required to initiate an instrument approach procedure. However, the operational concepts and regulatory provisions clearly intend and require certain equipment to be serviceable to safely execute an instrument approach procedure. ICAO PANS-OPS criteria (which are incorporated into GACAR Part 172 by reference) for instrument approach procedure design, clearly require that specific airborne equipment must be serviceable in order to conduct the approach. GACAR § 91.191(a) and the OpSpecs require the use of an approved IAP for all instrument approach and landing operations conducted in IFR weather conditions. ICAO PANS OPS criteria identify instrument approach procedures by the airborne and ground-based or space-based equipment that must be serviceable for final approach guidance (for example VOR, VOR/DME, ILS/DME).

b) In general, the airborne equipment required to be serviceable in order to safely execute an IAP consists of both flight instruments and navigation equipment. As a minimum, the required flight instruments and navigation equipment must permit, under IFR weather conditions, an orderly transition from the en route environment through the initial approach fix to the DA(H) or MDA/MAP. Thereafter, if visual reference cannot be established, the flight instruments and navigation equipment must permit the execution of a missed approach and transition back to the en route environment for a diversion to an alternate aerodrome or for reinitiating the instrument approach, as circumstances dictate.

c) This required equipment also includes any flight instruments and navigation equipment necessary to define the courses or flightpaths to be flown and to determine the significant geographic points defined by the procedure (such as transition or step-down fixes, arrival at minima and/or MAPs). Obviously, the flight instruments and navigation equipment must provide usable information to the pilot flying the aircraft. This information must be located within that pilot's normal instrument scan pattern. Most instrument approach operations do not require redundant flight instruments and navigation equipment to execute an instrument approach procedure. For example, a single serviceable VOR/ILS system, a single marker beacon system, a single DME system, and a single set of flight instruments are normally sufficient to fly an ILS/DME instrument approach procedure. This example assumes that the initial approach, missed approach, and the route of flight to the alternate aerodrome are based on VOR or VOR/DME. Inspectors must determine that the operator's overall AWTA operations program provides the policies, procedures, training, and equipment necessary for conducting the instrument approach procedures authorized by the OpSpecs.

4) *Flight Guidance and Automatic Control Systems*. The minimum additional airborne equipment required for standard CAT I minima at the lowest visibility minima to runways with installed but inoperative TDZ lights and/or RCL lights, is either a single flight director, a single automatic approach coupler (autopilot), or a head up guidance equivalent to that of a single flight director to be used to DA(H) to operate at the lowest visibility minima. It is usually advantageous, however, to install redundant equipment because the airborne equipment used, the flight training conducted, and the dispatch or flight release requirements are inter related, especially when the probability of inflight failure is considered. As a result many operators use either dual flight directors with dual displays or a single flight director and a single approach coupler. See also the discussion on training and dispatch or flight release requirements in the following paragraphs.

G. Operator Manuals. Before granting approval by issuing OpSpecs, Inspectors must evaluate the ability of the operator's overall program to provide the policy guidance, methods, and procedures necessary for ensuring the safe conduct of instrument approach operations using basic operating minima. In conducting this evaluation, Inspectors must consider certain factors related to the manuals. After completing this evaluation, the Inspector must make a judgment concerning whether the operator's program as described in its manuals is able to meet the requirements of the GACARs and the OpSpecs. Inspectors must also make a judgment concerning the operator's ability to provide for safe, accepted operating practices and procedures. When conducting this evaluation and making an appropriate judgment, the Inspector should consider the following factors:

- Criteria and procedures for determining the suitability of runways, aerodrome facilities, services and ground-based equipment necessary for the types of aircraft used and the AWTA operation to be conducted

- Criteria and procedures for determining the airborne equipment required to be serviceable at departure

- Criteria and procedures for determining the airborne and ground-based equipment that must be serviceable before conducting AWTA operations at the destination and alternate aerodromes

- Criteria and procedures for determining the airworthiness status of the aircraft for the operation to be conducted

- Criteria and procedures to ensure that the minimum equipment list (MEL) requirements are met for the operation being conducted

- Criteria and procedures that ensure that dispatch or flight release requirements are met

- Criteria and procedures for determining the instrument procedures and operating minima authorized, including the equipment, training, and qualification requirements necessary for conducting the operations

- Specific and detailed operating procedures and crew duty assignments for the types of aircraft used and the instrument approach procedures authorized. (These policies and procedures must require all turbojet operations to be conducted in accordance with the "stabilized approach" concept.)

- Specific requirements and instructions concerning the operating restrictions and limitations associated with the types of aircraft and the instrument approach procedures to be used

H. The Operator's Training Program . Inspectors must evaluate training programs to determine that flight crews receive both ground and flight training on the instrument approaches the operator is authorized to conduct. (See Paragraph 5.2.5.9, below, for a discussion of training in support of AWTA operations.)

I. Maintenance Program. The airworthiness program for each of the operator's aircraft types and for avionics equipment must be structured to equip, configure, and maintain the operator's aircraft and systems to support AWTA operations. Principal operations inspectors (POIs) must coordinate closely with the principal maintenance inspectors (PMI) to ensure that the operator's aircraft are airworthy for the operations to be conducted.

J. Proving and Validation Tests. Since AWTA operations using basic operating minima are the foundation or basic "building block" for IFR operations, additional validation testing above the normal aircraft proving test requirements is usually not necessary or appropriate. Validation testing is not required if Non-Precision, APV or CAT I operations are evaluated during the aircraft proving tests required by GACAR Parts 121 or 135. Validation tests are required, however, if an operator has previously conducted "VFR Only" operations and is proposing to conduct AWTA operations for the first time with existing aircraft. Validation tests may also be required when a GACAR Part 135 operator or an applicant for a certificate proposes to conduct AWTA operations with an aircraft in which GACAR Part 135 does not require that a proving test be conducted.

5.2.5.9. FLIGHT CREW TRAINING PROGRAM, AWTA OPERATIONS. Because of procedural and design similarities, flight training on one type of instrument approach procedure often provides the necessary training for other types of instrument approach procedures. Inspectors observing training in progress should verify that the approved training and qualification curriculum segments ensure flight crew competency in the conduct of authorized instrument approach procedures. Possible training segments include the following:

A. Approaches That Have an MDA. Approaches that have an MDA are also referred to as non-precision approaches that only provide lateral guidance. Operator's flight crew training program must address approaches that have an MDA in order for the operator to be authorized to conduct those IFR operations. Ground and flight training as well as flight checking requirements must be met in accordance with the applicable operating regulation that applies to the certificate holder or operator. Use of the CDFA technique should be promoted for all straight-in non-precision approaches that support CDFA.

1) Ground training and flight training for approaches that have an MDA are required for certificate holders to be authorized to conduct those IFR operations. For GACAR Part 121 operations, flight crew ground training, flight training, and flight checking must be addressed in accordance with GACAR Part 121, Appendices B and C.

2) Flight training on VOR approaches satisfies flight training requirements for ILS Localizer (LOC) approaches.

3) Flight training on VOR/DME approaches satisfies flight training requirements for LOC/DME approaches.

4) Flight training on LOC back course approaches is required if the LOC back course approach is authorized.

5) RNAV (GNSS) instrument approaches that have an MDA may be credited during flight checking for other equivalent types of approaches. However, the demonstration of any other approaches that have an MDA may not be credited toward the authorization requirement to demonstrate at least one global navigation satellite system (GNSS) approach during the instrument check required by GACAR § 135.351 and the proficiency check required by GACAR § 121.797.

NOTE: Inspectors must ensure that each initial and/or recurrent pilot ground training program include information about aerodrome surface movement during night and low visibility environments and familiarization with aerodrome markings, signs, and lighting.

B. Approaches That Have a DA(H) (Precision and APV Instrument Approach Procedures). ILS, and RNAV (GNSS) approaches that provide lateral and vertical guidance have a DA(H).

1) The ground training curriculum segments for all categories of training must include instruction on the following factors as they relate to the use of standard operating minima for approaches that have a DA(H):

• Required ground based visual aids

• Authorized instrument approach procedures, and operating minima

• Additional required procedures and crew duties

• Seeing conditions associated with the transition from instrument to visual flight

• The necessity for maintaining a full time instrument reference by one pilot until passing 100 feet AGL

• Required additional airborne equipment

• Critical reasons for proper “eye reference” position (proper sitting height)

• Required pilot training and qualifications

• Methods for determining that the airplane is airworthy for performance based operations using standard operating minima, and the associated dispatch or flight release requirements

2) Flight training. Flight training is required on the following approaches:

• ILS approaches, if the conduct of ILS approaches is authorized

• Precision Approach Radar (PAR) approaches is required, if the conduct of PAR approaches is authorized

• RNAV approaches using GNSS with space-based augmentation systems (SBAS), if the conduct of RNAV approaches is authorized

3) The maneuvers on which pilots must be trained and checked depend on the equipment installed and the dispatch (or flight release) option selected by the operator. The appropriate maneuvers for each equipment installation and dispatch (or flight release) option are described in the following subparagraphs. The maneuvers must be accomplished in accordance with the policies, standards, procedures, and crew duties specified in the operator’s manuals and approved training program.

4) When the maneuvers are performed in a flight simulator that realistically reproduces the seeing conditions encountered and the required ground based visual aids, the transition from instrument to visual reference should begin at 200 feet as it would normally occur in actual operations. However, when these maneuvers are accomplished in an aircraft, the maneuvers (except for “raw data” approaches) must be conducted “under the hood” down to 100 feet. This lower height during training or checking in the actual aircraft is necessary to realistically simulate the difficulties encountered during the transition from instrument to visual reference at 200 feet in actual weather conditions even though the flight check is administered in much better seeing conditions.

5) For operations based on dual independent flight directors with dual displays (or equivalent head up guidance), pilots must be trained and demonstrate competence on at least the following maneuvers: ILS approach flown to 200 feet (100 feet in an airplane), using the flight director system followed by a transition from instrument flight to visual flight to complete a landing; and an ILS approach flown to 200 feet (100 feet in an airplane) using the flight director system, with or without a transition to visual flight, followed by a missed approach conducted by reference to instruments.

6) For operations based on a single flight director system with dual displays (or equivalent head up guidance) and on an automatic approach coupler (autopilot), pilots must be trained in and demonstrate competence on at least the following maneuvers: an ILS approach flown to 200 feet (100 feet in an airplane) using the flight director system; and an ILS approach flown to 200 feet (100 feet in an airplane) using the automatic approach coupler (autopilot). One of the approaches must be followed by a transition from instrument flight to visual flight to complete a landing while the other must be followed, with or without a transition to visual flight, by a missed approach conducted by reference to instruments.

7) For operations based on a single flight director system (or equivalent head up guidance) or a single approach coupler (autopilot), pilots must be trained in and demonstrate competence in at least the following maneuvers: an ILS approach using only "raw data" flown to 200 feet (200 feet in an airplane); an ILS approach flown to 200 feet (100 feet in an airplane) using either the flight director or the autopilot, as appropriate. One of the approaches must be followed by a transition from instrument flight to visual flight to complete a landing, while the other must be followed, with or without a transition to visual flight, by a missed approach conducted by reference to instruments.

8) For operators authorized to conduct PAR approaches, pilots must also be trained in and demonstrate competence in the PAR approach. Approaches using PAR procedures must be flown to 200 feet (100 feet in an airplane). The PAR approaches may be followed by either transition to visual flight to complete a landing or a missed approach conducted by reference to instruments.

C. Circling Approach Maneuvers (May Be Authorized in Optional OpSpec C75 For GACAR Part 121).

1) No GACAR Part 125 or 135 certificate holder authorized to conduct operations under IFR shall use, nor may any PIC execute a circling approach maneuver to minima published in the instrument approach procedure for the circling approach maneuver or the minima specified in OpSpec C75, whichever is higher, unless that PIC has within the last 6 months, satisfactorily demonstrated the circling approach maneuver to published minima to an approved check pilot or the President.

2) For GACAR Part 121, if the operator does not provide flight training and flight checking on the circling approach maneuver in accordance with GACAR Part 121, Appendices B and C, respectively, then the operator's Operations Manual (OM) and the manuals used by the flight crews must specifically prohibit conducting circling approach maneuvers when reported weather conditions are below 1000 feet ceiling-3 miles visibility (4800m).

3) Ground training must include instruction on procedures to be used to ensure that missed approaches executed during a circling approach maneuver will be conducted safely.

4) See Optional OpSpec C75 – Category I IFR Landing Minima – Circle-To-Land Maneuver (Volume 15, Chapter 3, Section 3), for details on the training and checking requirements for the circling approach maneuver authorization for Part 121 operators.

D. Visual Approaches. Ground training must include instruction on the requirements specified in the OpSpecs for acceptance of visual approaches.

5.2.5.11. LOWER THAN STANDARD CAT I OPERATIONS. Lower than Standard Category I Operation means a

Category I instrument approach and landing operation using Category I DH, with an RVR lower than would normally be associated with the applicable DH.

A. GACA Regulations and Authorizations.

1) *GACAR § 91.395*, *Low Visibility Operations*. Lower Than Standard Category I, addresses Category I Operations, and is excerpted here from GACAR Part 91:

a) No person may perform LTS CAT I operations in an aircraft unless—

1. The operator and the operator's aircraft comply with the minimum standards of Section II of Appendix D to this part;

2. The operator is authorized by the President or the state of registry to conduct LTS CAT I operations; and

3. The LTS CAT I operation is conducted in accordance with the operator's authorized procedures.

2) *From OpSpec C52*. OpSpec C52 authorizes Lower Than Standard (LTS) CAT I Operations. The certificate holder is authorized LTS CAT I with a DH as low as 150 feet and landing minima as low as RVR 425m to approved runways without TDZ, RCL and/or ALSF-2 lights, in accordance with the following requirements:

a) Only airplanes approved for CAT II operations are eligible for these operations. Those airplanes and equipment must be listed in Table 2 of OpSpec C59. The authorized airplane(s) must be equipped with a HGS/HUD that is approved for CAT II or CAT III operations.

b) The flight crew must be current and qualified for CAT II operations. The flight crew must demonstrate proficiency in ILS approaches and landings to this minimum or lower using the HGS/HUD.

c) The flight crew must use the HGS/HUD to DH in a mode used for CAT II or CAT III operations.

d) The flight crew must use the HGS/HUD to DH, or to the initiation of missed approach, unless adequate visual references with the runway environment are established that allow the safe continuation to a landing.

e) Should the HGS/HUD malfunction during the approach, the flight crew must execute a missed approach unless visual reference to the runway environment has been established and the aircraft is in a position to allow the safe continuation to a landing.

f) The crosswind component on the landing runway must be 15 knots or less unless the airplane's crosswind limitations are more restrictive.

g) TDZ RVR reports are controlling. The mid RVR report may NOT be substituted for the TDZ RVR report in SA CAT I operations.

B. Operator's Lower Than Standard (LTS) Operations Enhancements . The principal operations inspector (POI) should ensure that the operator has addressed the following items prior to authorizing LTS operations:

• LTS CAT I training

• Operations Manual addresses LTS CAT I requirements for conducting an approach

• MEL

• Maintenance Program

5.2.5.15. CONTINUOUS DESCENT FINAL APPROACH (CDFA).

A. Applicable Procedures and Operating Criteria. This paragraph provides the applicable procedures and operating criteria to permit use of Continuous Descent Final Approach (CDFA) techniques for applicable non-precision instrument approach procedures. These criteria define the manner in which the CDFA technique may be employed in conducting certain instrument procedures in accordance with OpSpec C52. These criteria are applicable to operators conducting operations in accordance with Part 121, 125 or 135.

B. Safety Benefits. Based on the safety benefits (CFIT-reduction) of using stabilized-approach criteria on a continuous descent with a constant, pre-determined vertical path to the runway, and the desire to move to three-dimensional (3-D) operations where possible, operators should be encouraged to apply the CDFA technique to all straight-in non-precision instrument approach procedures that support the CDFA technique.

1) GACA supports the safety initiative to use CDFA techniques to use stabilized approach criteria on a continuous descent with a constant, predetermined vertical path to the runway during completion of existing VOR, NDB, LOC, LOC-BC, and RNAV(GNSS) straight-in non-precision IAPs. Use of the CDFA technique will enhance landing safety by eliminating the potential vulnerability of two-dimensional (2-D) approach operations and the use of step-down fixes by providing a continuous descent to the runway. This both reduces exposure to un-stabilized approaches that lead to inappropriate landing performance and reduces vulnerability to controlled flight into terrain (CFIT) accidents.

C. CDFA Technique. Part 121, 125 or 135 operators should use the CDFA technique for all straight-in non-precision IAPs that support the CDFA technique. Non-precision IAP that supports the IAP technique includes IAPs with a published vertical descent angle (VDA) or barometric vertical guidance (GS) on the IAP chart.

1) The following definition of CDFA applies to the technique described in this Handbook. This definition has been harmonized between the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA), and is being implemented by both authorities.

NOTE: CDFA is a specific technique for flying the final-approach segment of a non-precision instrument approach procedure as a continuous descent, without level-off, from an altitude/height at or above the Final Approach Fix altitude/height to a point approximately 50 feet (15m) above the landing runway threshold or the point where the flare maneuver should begin for the type of aircraft flown.

D. CDFA Operating Technique. The CDFA operating technique is to fly non-precision instrument approach procedures as a continuous descent maintaining the published nominal vertical profile using vertical navigation (VNAV) guidance, altitude versus range (or DME) crosschecks, or altitude versus time crosschecks.

1) The eligible procedures include: VOR, VOR/DME, NDB, LOC, LOC-BC, and RNAV(GNSS) IAPs.

2) The preferred descent technique is flown using VNAV to a published DA(H) in a manner similar to flying an ILS approach to DA(H). When no DA(H) is published for the IAP, aircraft may only descend to a derived DA(H) that accounts for the height loss during the initiation of a missed approach in order to ensure that the MDA is respected.

3) When the use of approved VNAV path guidance is used for the CDFA technique and a VNAV path is used to fly to a published DA(H), a slight momentary descent below the published DA(H) is considered to be acceptable while arresting the descent during the initiation of a missed approach.

E. Equipment Requirements. Aircraft equipment requirements for the CDFA technique are as described below.

1) *CDFA Using VNAV Systems*. The installed FMS navigation equipment with VNAV must be certified in accordance with a TC, or STC, or other GACA equivalent approval if the VNAV system will be used for CDFA technique to the MDA or DA(H).

2) *CDFA Using RNAV Systems*. The installed FMS or RNAV system must be approved for RNAV approach operations under OpSpec B34 or C63 if RNAV distance will be used for altitude versus range crosschecks using the CDFA technique.

3) *CDFA Using DME Systems*. The installed DME must be approved for instrument approach operations if DME distance will be used for altitude versus distance crosschecks using the CDFA technique. The DME reading must be appropriate for the crosscheck indications that are used.

4) *Maintenance Requirements*. The operator must provide documentation that appropriate continuing airworthiness maintenance practices and procedures have been adopted for the applicable equipment.

5) *MEL Requirements*. The operator must review and revise the MEL, as necessary, to address any pertinent VNAV, FMS/RNAV or DME operating requirements.

F. Operational Use. Part 121, 125, and 135 operators are authorized (under OpSpec C52) to use the CDFA technique for all non-precision IAPs that include a published vertical descent angle (VDA) or barometric vertical guidance (GS) on the IAP chart subject to the following conditions and limitations:

- For all IAPs without a published DA(H), pilots must establish a derived DA(H) that accounts for the height loss during the initiation of a missed approach in order to ensure that the MDA is respected

- When the use of VNAV path guidance is used for the CDFA technique and a VNAV path is used to fly to a published DA(H), a slight momentary descent below the published DA(H) is considered to be acceptable while arresting the descent during the initiation of a missed approach

- VNAV path guidance for CDFA may only be used by certificate holders who have been authorized by this OpSpec C52 to perform approach and landing operations for APV IAPs

NOTE: Part 91 operators may use the CDFA technique without any specific authority.

1) Additionally, all operators under Part 121, 125 and 135 using the CDFA technique must be aware of the following requirements:

a) Initiating the missed approach at DA(H) or the derived DA(H) does not modify any lateral track requirements applicable to the path to the published missed approach point (MAP) for the procedure (e.g., MAP at a DME Distance, elapsed time, or NAVAID passage). Compliance with the published approach and missed approach lateral flight path instructions (e.g., course guidance to the MAP, or MAP headings or turns) is mandatory unless an amended air traffic clearance is obtained. Typically, published missed approach turns must not begin until the aircraft has passed the specified MAP.

b) Operator Obstacle Assessment. There are no unique obstacle assessment requirements for the use of the CDFA technique.

c) Instrument Approach Procedure Charting. The nominal descent profile for the CDFA should be identified by use of accepted charting conventions. The depiction of the vertical path and its angle (in degrees) should be contained in the profile view of the approach chart. The depiction of altitude distance/range or altitude/time crosscheck information should also be contained in the profile view of the approach chart.

d) Database. Waypoint and procedure data, including the runway threshold waypoint and the VNAV path angle, must be retrieved from the aircraft navigation-database. Source data or database providers must specify a vertical path that accommodates step-down fix altitudes, if any, between the threshold datum crossing height of 50 feet (preferred reference value) and the FAF altitude for a procedure to be eligible. FMS/RNAV range information should be based on the runway threshold waypoint; however, another appropriate waypoint from the database may be used.

2) *Training and Qualification.*

a) Pilot qualification for use of FMS, RNAV, and particularly VNAV should address appropriate VNAV use.

b) Additional training or qualification is not required for these VNAV approach operations if VNAV operations and corresponding FMS use and RNAV or RNP procedures are basic to the operation of the operator and aircraft and if the provisions below are met.

c) Existing training and qualification programs should be reviewed to ensure the subject areas listed below are adequately addressed if the operator uses them in the application of its CDFA technique. The initial and continuing training and qualification programs should address the characteristics, capabilities, and limitations of each appropriate aircraft system element applicable to non-precision approaches using CDFA as shown below:

1. Acceptable navigation modes applicable to the type aircraft and system (e.g., IRS/DME/DME, IRS/VOR/DME, IRS/localizer, IRS/GPS, VNAV Path, High Accuracy, Managed Nav).

2. Suitable accuracy checks using control/display unit (CDU) pages or flight instrument displays.

3. Pilot-flying (PF) and pilot-not-flying (PNF) duties and callouts regarding FMS, VNAV, DME or time to maintain the CDFA vertical profile during descent and a stabilized approach to a landing or go-around, as appropriate.

4. Understanding and interpretation of appropriate instrument procedures (e.g., DPs, STARs, or IAP approach plates).

5. Display use including deviation indications and display scaling for vertical deviation or appropriate range/distance indications.

6. Autopilot function, use, and limitations relative to VNAV or vertical speed descents.

7. FMS function, use, and limitations relative to VNAV or vertical speed descents.

8. Approved procedures, modes and configurations to be used.

9. Applicable monitoring and cross check requirements.

10. If applicable, RNP provisions and procedures.

11. Proper FMS selection and loading of procedures and transitions, stringing related waypoints, addressing discontinuities, entering and deleting associated data (path constraints, winds, etc.).

12. Proper techniques to fly VNAV procedures (e.g., acquiring and staying on the VNAV path, regardless of autoflight mode or FMS mode changes).

13. Proper techniques to fly CDFA vertical descent profiles using published altitude/range, altitude/distance or altitude/time crosschecks, as appropriate.

14. Understanding, interpretation, and proper response to appropriate VNAV-related failure indications prior to initiation of approach, or during approach (e.g., flight crews are expected to discontinue an approach if a failure of the VNAV function occurs during final approach).

15. Understanding, interpretation, and proper response to appropriate RNAV/FMS range, DME or time-related failure indications prior to initiation of approach (e.g., flight crews are expected to apply the appropriate higher visibility minima if the CDFA technique cannot be used due to an equipment failure prior to final approach).

16. Proper techniques to accomplish any special VNAV-related flight deck procedures specified by the operator for the approach type used or for the particular approach to be flown (e.g., perform any necessary VNAV verification checks using some acceptable method to the operator), to ensure suitable VNAV performance.

17. Any unique issues particular to a specific approach or family of approach procedures, or aircraft, or FMS system (e.g., any special actions or conditions necessary to use VNAV, such as for flight director or autopilot modes to be used, mode control panel altitude window settings, or FMS path or speed constraints to verify, set, adjust, or delete).

3) For flight training and proficiency checking purposes, if applicable, a flight technical error (FTE) [or pilot deviation from the desired vertical track] of +100/-50 feet is considered acceptable for adherence to the depicted VNAV path or CDFA vertical profile.

4) A validation flight is not generally required.

G. Approval of CDFA Operations. POIs of operator's intending to conduct instrument approaches using the CDFA technique (whether based on VNAV or not) as described above must ensure that training, and the associated procedures are consistent with the AFM and this handbook. When the POI determines that the appropriate requirements of this handbook, including training and qualification, have been satisfied, OpSpec C52 may be issued to authorize non-precision instrument approach operations using CDFA technique.

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CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 6. Category II

5.2.6.1. GENERAL.

A. Concepts, Direction, and Guidance. This section contains concepts, direction, and guidance to be used by aviation safety inspectors (Inspectors) for evaluating and approving or denying requests for authorization to conduct Standard Category II (CAT II) operations and Other Than Standard (OTS) CAT II instrument approach operations. This includes all CAT II operations at aerodromes and runways new to an operator, even though previously approved aircraft, airborne equipment, ground-based equipment, concepts and procedures are being used in these operations. This section contains an amplification of the general concepts, policies, direction, and guidance given in previous sections of this chapter. Specific standards are provided for evaluating CAT II operations with airborne and ground-based equipment, such as instrument landing systems (ILS), that have well understood operational characteristics and limitations.

B. Special Situations. All requests for approval to conduct CAT II operations using equipment, concepts, or procedures not addressed by these standards (such as microwave landing systems (MLS) or performance-based navigation (PBN) systems), a request for policy, guidance, and direction must be made to the Director, Flight Operations Division.

C. Definition of CAT II Operations. CAT II operations are defined, for the purpose of this handbook, as all approach and landing operations conducted under instrument meteorological conditions (IMC) in accordance with a CAT II instrument approach procedure (IAP) using CAT II operating minima. Other than Standard (OTS) Category II operations are defined as CAT II operation to a runway where some, or all, of the elements of the ICAO Annex 14 CAT II lighting system are not available. The FAA terms this type of CAT II operations “reduced lighting CAT II operations”.

1) Standard CAT II operating minima are those minima that specify a decision height (DH) lower than the equivalent of 200 feet (60 meters) above the touchdown zone but not lower than 100 feet (30 meters) above this elevation, and a controlling RVR below RVR 550m (below RVR 500m for rotorcraft) but not less than RVR 350m.

2) This section also includes information for CAT II operations authorized with a DH of 100 feet and RVR 300m. These operations are defined for the purposes of this section as special CAT II operating minima. These approvals are based on certain CAT II or CAT III facilities and the use of Autoland or Head-Up Guidance Systems (HGS) systems. All other instrument flight rules (IFR) all weather terminal approach (AWTA) operations with operating minima less than DH 100 (or no DH) and/or a controlling RVR below RVR 350m are CAT III operations.

3) OTS CAT II operations have higher RVR minima to account for the deficits in lighting.

D. Types of CAT II Operations. The only types of CAT II operations that can be currently authorized for use by Kingdom of Saudi Arabia (KSA) operators are ILS-based CAT II operations.

E. Objective of CAT II Operations. The essential difference between CAT II and CAT I operations is that a CAT II operation places greater reliance on the guidance provided by the airborne and ground-based equipment. This equipment must be capable of delivering the aircraft to a position from which the flight crew can accomplish a transition from instrument to visual flight at a height above touchdown (HAT) of 100 feet and complete the landing in the reduced (CAT II) seeing-conditions. The primary objective of CAT II operations is to provide a level of safety equivalent to CAT I precision instrument approach operations, even though the seeing-conditions in CAT II operations can be much worse than those encountered in CAT I operations. This objective (the equivalent level of safety) is achieved by the following:

- Enhanced reliability and precision in the airborne and ground-based equipment to increase the precision of flightpath control
- Enhanced flight crew training and qualifications to increase the precision of flightpath control
- Additional aerodrome visual aids to enhance seeing-conditions
- Additional criteria to ensure obstacle and terrain clearance
- Additional criteria to ensure ILS signal protection
- Special operational procedures
- Special air traffic control (ATS) procedures, limitations, or both

1) IAPs that ensure a safe and orderly transition from the en route phase of flight to a point on final approach at a HAT of 100 feet from which a visual landing can be made, or a missed approach can be safely executed with a transition through the missed approach segment back to the en route environment.

2) IAPs, operational flight procedures, and ATS procedures that ensure protection from obstacles near the landing surface (either fixed or mobile) and that also permit safe go-arounds from any point in the approach and landing before touchdown.

5.2.6.3. CAT II OPERATIONAL CONCEPTS. The weather conditions in a CAT II operation restrict seeing-conditions so that the external visual references necessary to manually control the aircraft are not acquired until the aircraft reaches a very low altitude (typically 100 to 200 feet above ground level (AGL)). Therefore, the flight crew must operate and control the aircraft by referring to instruments throughout most of the approach and to a combination of instrument and external visual information during the final stages of the approach, flare (deceleration for rotorcraft), and landing. Because of the reduced maneuvering capability resulting from CAT II seeing-conditions, the precision of the flight guidance system and the overall precision of flightpath control must ensure that the aircraft can be flown to a position that is closely aligned with the runway centerline, and the desired glidepath. The increased reliability and precision required of the airborne and ground based equipment is necessary to ensure that when the aircraft arrives at DH, it is on a flightpath that permits the pilot to complete the landing without any significant runway alignment maneuvers. All CAT II operations are conducted IAW the DH and RVR concepts used in CAT I operations. Because of the limited seeing-conditions available in CAT II weather conditions, however, the additional requirements outlined under the objective of CAT II operations are necessary to ensure that an adequate level of safety is maintained when an aircraft is being operated in these conditions. However, technologies such as HGS and automatic landing systems have resulted in additional operational capability of airborne avionics systems and the potential for additional landing minima credit. These airborne systems, coupled with modern reliable ILS and more restrictive performance requirements associated with procedures developed for low visibility operations, CAT II or lower-than-standard CAT I operations can now be authorized to approved runways that were originally programmed to just support basic CAT I operations.

A. Function of Visual Reference. Because of the limitations in the airborne equipment used in CAT II operations and the available instrument guidance, the pilot must have sufficient visual references to manually control and maneuver the aircraft from the DH to a full stop on the runway. These external visual references are required below DH for the pilot to control and maneuver the aircraft, align the aircraft with the runway centerline (CL), touch down within the touchdown zone (TDZ), and then roll out on the runway.

B. Decision Region. The decision region is that portion of the approach between 300 feet AGL and DH where the tracking performance must be critically evaluated to determine whether the overall system performance is sufficient for the aircraft to continue to DH. As previously discussed, the visual scene normally expands as the aircraft descends because of geometric and slant range effects. The pilot must integrate the instrument information with the visual cues, as they become available, and decide before passing DH to either continue the approach by visual reference or to execute a go-around. This information must be integrated and evaluated in the decision region and the pilot must make a definitive decision before the aircraft passes DH. While in the decision region, the flight crew should be especially aware of the maximum permissible excursions of the raw, ILS indications (deviations) from which a landing can be safely completed. The tracking performance parameters normally used within the decision region are ±1/3 dot localizer displacement (maximum) and ±1/2 dot glideslope displacement (maximum), with no sustained oscillations about the localizer or glideslope. If the tracking performance is outside of these parameters while within the decision region, a go-around should be executed because the overall tracking performance is not sufficient to ensure that the aircraft will arrive at the DH on a flightpath that permits the landing to be completed safely.

C. CAT II DH. The DH is the lowest height to which the approach can be conducted by instrument reference alone. The DH is the minimum height at which the flight crew must decide to either continue a CAT II approach by visual reference or to go-around. It is not the point at which the evaluation and decision process is begun. The evaluation and decision process must continue after passing the CAT II DH to ensure that sufficient visual references are maintained to manually control and maneuver the aircraft and to ensure that the aircraft remains aligned with the runway centerline and will safely touch down within the touchdown zone. The flight crew must immediately execute a missed approach if the required visual references are not maintained, or when the pilot cannot determine that a safe landing will be accomplished.

D. Purpose of CAT II Operating Minima. CAT II operating procedures and minima have been established to ensure that the desired level of safety is achieved when CAT II seeing-conditions exist. These operating minima are based on the DH and RVR concepts. The established operating minima (DH and RVR) determine the minimum safe heights for instrument flight and the minimum RVR at which the landing can be safely completed by external visual reference in a particular aircraft. These operating minima are based on established CAT II operational concepts and on the required CAT II airborne equipment, ground-based visual and electronic equipment, operating procedures, and pilot training and qualification. These operating minima, when combined with other CAT II requirements, ensure that the combination of information available from external visual sources and the aircraft instruments and equipment are sufficient to enable properly qualified pilots to safely operate the aircraft along the desired flightpath. As the quality and quantity of external visual information decreases due to reduced seeing-conditions (when operating minima are reduced), the quality and quantity of the instrument information and the proficiency of the flight crew must be increased to maintain the desired level of safety.

E. Establishing Operating Minima.

1) The operating minima (DH and RVR) for CAT II operations are usually determined by the tasks the pilot will be required to perform to complete the landing after passing the DH. When establishing operating minima, consideration is given to the degree of precision in flightpath control provided by the required electronic equipment and the enhanced seeing-conditions provided by the required visual aids.

2) Generally, the minimum required seeing condition (RVR) is higher-than-standard (e.g., RVR 500m) when the pilot is required to establish visual reference at a higher altitude (e.g., HAT 150) because of obstacles or limitations in the ground-based guidance. The RVR minimum is also higher if the pilot has to establish better seeing-conditions because of the complexity or difficulty of piloting tasks required to safely complete the landing (e.g., factors related to the design or handling characteristics of a particular aircraft).

3) Several sets of operating minima are established for CAT II operations. For Standard CAT II operations, minima are DH 150/RVR 500m, DH 100/RVR 1500m, and DH 100/RVR350m. For operations based on Autoland or HGS, minima can be as low as DH 100/RVR 300m, and for Other Than Standard (OTS) CAT II operations may be approved for RVR 350m at specially approved ILS facilities that do not meet ICAO standards for Approach Lighting System with Sequenced Flashing Lights (ALSF)/TDZ/CL lighting systems. Most runways that support CAT II operations permit the use of DH 100/ RVR 350m operating minima. Operating minima at some runways, however, are restricted to DH 150/RVR 500m because of limitations in the ground equipment (such as a single RVR reporting system), localizer signal reliability, limitations imposed by the pre-threshold terrain (radar altimeter not authorized) and/or obstacle clearance limitations in the final approach surface, the approach light surface, the touchdown area, and the missed approach area.

5.2.6.5. STANDARD CAT II OPERATIONS. Standard CAT II operating minima (DH 100/RVR 350m) are based on the building block approach. The building block approach is based on CAT I operations, including standard CAT I requirements, and includes the special aeronautical knowledge, experience, skill, training, and qualifications as well as the special airborne and ground-based equipment specified in FAA AC 120-29 (latest edition). The assumptions and criteria used in aircraft certification and CAT II IAP design must be compatible with the operational concepts in this handbook. These assumptions and criteria ensure that flight crews and aircraft that meet the requirements of this handbook and FAA AC 120-29, (as amended) can be used to safely conduct CAT II operations using standard CAT II minima. Any special equipment or procedures necessary for the safe conduct of CAT II operations must be specified in the airworthiness certification basis of the aircraft (type certificate or supplemental type certificate) and in the approved airplane flight manual (AFM). Any aircraft that cannot be safely operated to standard CAT II operating minima using flight crews that meet the minimum requirements of this Handbook and FAA AC 120-29, (as amended) shall not be certificated or otherwise approved for CAT II operations. The OpSpecs establish the lowest operating minima that can be used in any CAT II operation, even if the established initial approach fix (IAP) specifies minima lower than those values. Special airborne equipment, special ground-based equipment and special flight crew training required for CAT II operations are specified in this handbook, FAA AC 120-29, (as amended), and the approved AFM.

A. Standard CAT II Operating Minima. The standard CAT II operating minima for all aircraft are DH 100 and RVR350m. The DH must be based on the use of either the inner marker or radio (radar) altimetry. Usually the CAT II DH is based on the use of radio (radar) altimetry. Barometric altimetry is not an acceptable means of establishing the DH for CAT II operations using the standard CAT II minima (DH 100). Higher-than-standard CAT II minima for all aircraft are DH 100 and RVR 500m. These minima are usually applied as interim minima for a 6-month demonstration period for operators new to CAT II operations. The first 6 months are used to validate the effectiveness of the operator's maintenance program and operational procedures in order to support issuance of the standard CAT II minima. These minima are also applied when there are transmissometer limitations (only one installed), irregular underlying terrain, obstacle clearance requirements, or pre-threshold terrain limitations (radio (radar) altimeter not authorized—RA NA), which preclude the use of standard CAT II minima. DH 100 and RVR 500m are also the lowest minima that can be approved when the DH is based on barometric altimetry and has the note RA NA.

B. Operational Approval Basis. CAT II operations are approved for an operator by the issuance of OpSpecs that authorize the conduct of CAT II IAPs at specified aerodromes. The basis for this approval depends on the operating rules applicable to the operation (GACAR Part 121, 125 or 135), the complexity of aircraft (turbine-powered, reciprocating, or rotorcraft), the passenger capacity of the aircraft, and/or the size of the aircraft (large or small). The airman and aircraft certification, evaluation, and approval process for reduced visibility flight operations, including Category II/III operations are covered in depth in section 8 of this chapter.

1) All CAT II operations conducted under the GACAR are approved IAW this handbook, FAA AC 120-29, (as amended), and OpSpecs C59 and R108.

C. CAT II Flight Guidance and Control Systems. Standard CAT II operations are based on the use of special airborne and ground-based equipment that have capability, reliability, and redundancy superior to the equipment required for CAT I operations. Although CAT II airborne equipment provides increased capability, reliability, and redundancy, the flight control guidance systems used in these operations are not necessarily capable of automatically detecting all potential failures that could significantly disturb the aircraft's flightpath (e.g., single channel flight control systems). If such failures occur, the flight crew must be able to quickly detect the failure and to intervene manually to continue safely to the approach and landing or execute a missed approach. In other words, standard CAT II operations are based on the use of single channel flight directors, or single channel autopilots, or combinations of both. Even though some CAT II operations are based on dual independent flight directors, each of these systems is usually a single channel system that is not capable of detecting all potential failures. Therefore, even with dual independent flight directors, the flight crew must be able to detect failures and manually intervene in certain cases. Standard CAT II operations are also based on the use of: Type II (redundant) ILS ground equipment; dual ILS airborne equipment; radio altimeters (to identify DH); instrument failure detection and warning systems; special missed approach guidance equipment; and rain removal equipment.

D. Airworthiness of CAT II Airborne Equipment.

1) Throughout the history of CAT II operations, two processes have existed for showing that the airborne equipment of the aircraft is airworthy for CAT II operations. One process is the type design approval process in which approval is obtained during aircraft certification testing. The other is the operational demonstration and approval process in which approval is obtained after the operator demonstrates satisfactory airworthiness of the equipment in actual flight operations. The GACARs require that all CAT II operations use airborne equipment that has already been qualified for CAT II during the type certification process under GACAR Part 21. The operator is responsible for providing official written documentation to the GACA showing that the aircraft is CAT II certified.

2) Special design requirements and special maintenance programs are necessary to achieve the airborne system reliability required for the conduct of CAT II operations. The special maintenance programs necessary for CAT II operations are extensive and expensive and are usually the largest factors affecting an operator/program manager's

decision of whether to conduct these operations. When an operator requests authorization to conduct operations with aircraft equipped with standard CAT II equipment, and that operator is new to CAT II operations, CAT II operations are usually restricted (for at least 6 months) to higher-than-standard operating minima (DH 100 and RVR500m). This restriction must remain in place until the operator has successfully validated its maintenance program as outlined in Section 7, paragraph 5.2.7.17, and Section 11 of this chapter. However, if an aircraft has a type design approval for CAT III operations, it may be possible for the operator to be initially authorized for standard CAT II minima (DH 100 and RVR350m) with those aircraft if certain equipment restrictions and operating procedures are specified in the operator's OpSpecs.

E. Aerodromes and Runways.

1) All standard CAT II operations are restricted to aerodromes and runways that meet the special safety requirements necessary for CAT II operations. Even though a particular runway is approved for CAT II operations, an operator may not be authorized to conduct CAT II operations at that location until all requirements of this handbook are met and that particular CAT II operation is authorized in the operator's OpSpecs.

5.2.6.7. SPECIAL CAT II OPERATIONS. Special CAT II operations are those operations that require special airborne or ground-based equipment, or space-based equipment, and/or special procedures. Special CAT II operations include operations that are granted operational credit for the use of special airborne equipment capabilities, such as autoland or HGS. Special CAT II operations also include those operations that require special ground-based equipment, or space-based equipment and special procedures to conduct CAT II operations that could not safely be conducted with conventional aircraft using standard airborne equipment and procedures, or autoland or HGS engaged to touchdown, or performance based operations.

A. Operational Credit for CAT III Equipment.

1) The installation of CAT III airborne equipment in large aircraft is becoming common. As a result, in certain cases an operator can obtain operational credit in CAT II operations when these more capable systems are used. Airborne equipment that is type design approved for CAT III operations has special design features that increase the safety of operations in CAT II-seeing conditions. For example, the flightpath of the aircraft is not normally disturbed when failures occur in the flight guidance and control system. This is because the increased redundancy, reliability, and integrity built into the CAT III systems cause the system either to disconnect passively or to remain fully operational for the landing.

2) Due to these improvements in redundancy, reliability, and integrity, operational credit for the use of CAT III airborne systems may be granted to an operator by authorizing operating minima of DH 100 and RVR 350m for initial CAT II operations (first 6 months) with these aircraft. In this case, certain restrictions must be specified in the operator's OpSpecs. This operational credit eliminates the requirement to conduct the initial operations using DH 100 and RVR 500m and permits the operator to use standard CAT II minima (DH 100 and RVR 350m) at least 6 months earlier than usual. Additional operational credit for the use of CAT III airborne systems may also be granted to an operator by authorizing operating minima of DH 100 and RVR 300m for CAT II operations at aerodromes with ILS Type III facilities.

B. Basis for Eliminating the 6-Month Restriction (RVR 500m). In standard CAT II operations, the objective of the requirement for an operator to validate the CAT II maintenance program for at least 6 months with minima restricted to

DH 100 and RVR 600m is to ensure that the required level of airborne equipment reliability is achieved. This is to ensure that frequent malfunctions will not occur in standard CAT II operations (DH 100 and RVR 350m). The design features of CAT III airborne equipment significantly reduce the potential for failures that could adversely affect standard CAT II operations. As a result, validation of the CAT II maintenance program before conducting operations to DH 100/RVR 350m is not necessary if these operations are conducted under a restriction that requires the airborne equipment to operate to CAT III standards (e.g., fail passive or fail operational automatic landing). This permits the operator to conduct operations with standard CAT II minima during the 6-month period used to validate their maintenance program.

C. Requirements for Eliminating the Restriction.

1) If the operator requests to eliminate the 6 months restriction (DH 100 and RVR 500m) based on operational credit for the use of CAT III systems to conduct CAT II operations, the operator's OpSpecs must include a limitation that specifies all CAT II operations using DH 100 and RVR350m for ILS Type II facilities and DH 100 and RVR 1000/300m at ILS Type III facilities must be conducted with the airborne equipment operating to CAT III standards. This limitation should read, fail passive autoland only, or fail passive/fail operational autoland only, as appropriate, for aircraft equipped with CAT III automatic landing systems, or fail passive HGS only for aircraft equipped with CAT III HGSs. For DH 100 and RVR 300m operations, these restrictions must remain in the operator's OpSpecs until the CAT II maintenance program for that aircraft is successfully validated. These restrictions must remain in the OpSpecs for DH 100 and RVR 300m operations at aerodromes with ILS Type III facilities, even after the maintenance program is validated.

2) When the operator has successfully validated its maintenance program, the restriction that requires the airborne equipment to be operated to CAT III standards can be removed by amending the operator's OpSpecs to authorize the use of DH 100/RVR 350m minima with standard CAT II equipment (e.g., single channel autopilot, or manually flown (HGS) operations). The CAT III equipment would still be required to conduct any operations with operating minima of DH 100 and RVR 300m for CAT II operations at aerodromes with ILS Type III facilities.

D. Authorizing DH 100 and RVR 300m for Certain CAT II Operations. CAT II operations with DH of 100 feet and RVR /300m can only be authorized at specific aerodromes with ILS Type III facilities. These operations may only be authorized when conducting an autoland approach or using an HGS to touchdown. The limitation in the OpSpecs should read, fail passive autoland only, or fail passive/fail operational autoland only, as appropriate, for aircraft equipped with CAT III automatic landing systems, or fail passive HGS only for aircraft equipped with CAT III HGSs.

E. Operations Requiring Special Airborne Capabilities. Certain aircraft with unique handling characteristics or unique design features may be required to have special airborne capabilities to permit CAT II operations to be safely conducted. These special airborne capabilities are used to enhance handling characteristics during manual flight (stability augmentation systems), to enhance flightpath control during flare and touchdown (automatic landing systems), and to enhance flightpath control during automatic flight (auto-deceleration and hover systems). Stability augmentation systems are frequently necessary in rotorcraft to enhance low speed handling characteristics in CAT II seeing-conditions. Auto-deceleration and hover systems may be used in the future for certain rotorcraft. Currently, the B-747 is the only airplane that must have autoland capability to conduct standard CAT II operations (DH 100 and RVR 350m). All CAT II operations with the B-747 using operating minima below DH 100/RVR 500m must be predicated on the use of the automatic landing system. Either manually flown or autocoupled CAT II operations can be conducted with the B-747 using higher-than-standard operating minima (DH 100/RVR 500m). The airplane and its automatic flight control guidance system or manually flown guidance system must be approved for approach and landing operations as specified by OpSpec C60, C61, or C62, as applicable. Pilots must be trained in the use of the autoland system or HGS as applicable and demonstrate proficiency in ILS approaches to minima using this equipment on checks conducted to satisfy GACAR §§ 121.797 or 135.351.

5.2.6.8. OTS CAT II OPERATIONS. OTS CAT II operations means a Category II operation to a runway where some or all of the elements of the ICAO Annex 14 precision approach category II lighting system are not available. OTS CAT II operations generally have operating minima with an RVR of 350m as the lowest available to account for the deficits in lighting. OTS CAT II operations are authorized with OpSpec C59. See Volume 15 for full details on OpSpec C59 and OTS CAT II operations.

5.2.6.9. KSA CAT II INSTRUMENT APPROACH PROCEDURES (IAPs).

A. CAT II Operations Conducted in the Kingdom of Saudi Arabia (KSA). All CAT II operations conducted in the KSA must be conducted IAW an approved CAT II IAP authorized for use under GACAR Part 97. CAT II IAPs in the KSA are established IAW the criteria in ICAO PANS-OPS as prescribed under GACAR Part 172.

5.2.6.11. FOREIGN CAT II IAPs.

A. Degree of Equivalence. The CAT II ground-based systems and approach procedures at foreign aerodromes may not exactly be in accordance with KSA standards. As a result, it is critical that the information and functions necessary for CAT II operations (as provided by the ground-based systems and approval procedures at the foreign aerodromes) are consistent with the intent of KSA CAT II standards. All CAT II IAPs published by the FAA are accepted for use by KSA operators provided they are specifically included in the operator's CAT II OpSpecs. Additionally, all CAT II IAPs accepted for use by the FAA for US operators are accepted for use by KSA operators provided they are specifically included in the operator's CAT II OpSpecs. The FAA has published a list of foreign CAT II IAPs that are acceptable for use by US (and hence KSA operators) (Ref. FAA Order 8260.31B, Foreign Terminal Instrument Procedures). Operators desiring CAT II approvals at foreign aerodromes that are not on these lists should submit a request for approval through the POI to the Director, Flight Operations Division. The major factor considered by the GACA when approving foreign aerodromes and runways for CAT II operations by KSA operators is the degree of equivalence with ICAO CAT II standards. When determining whether a foreign CAT II operation is sufficiently equivalent to ICAO standards to permit approval for use by KSA operators, the GACA will evaluate the following for the degree of equivalence:

- High intensity approach lights
- High intensity runway edge lights
- TDZ and CL lights
- Runway markings
- Quality and integrity of the approach and landing ground-based guidance systems
- RVR reporting capabilities and procedures

- ILS critical area protection
- Obstacle clearance protection in the approach and missed approach, including the obstacle-free zone
- Aerodrome surface traffic control
- Terminal area air traffic control
- Weather reporting

5.2.6.13. FOREIGN CAT II OPERATIONS IN THE KSA. The airborne equipment, pilot training, and pilot qualification standards required for CAT II operations by foreign authorities and foreign operators may not be in exact accordance with KSA standards. For safety reasons, however, it is essential that foreign operators conduct CAT II operations in the KSA in a manner that is consistent with the intent of KSA CAT II standards. The foreign operator's aviation authority (State of the operator) has prime responsibility for determining that the operator complies with the special requirements that the foreign aviation authority has specified for CAT II operations at any aerodrome, including KSA aerodromes. The State of the operator also has prime responsibility for authorizing and restricting operating minima for any operation by the foreign operator. Therefore, the Inspector's prime responsibility related to foreign CAT II operations is to ensure that they are conducted in the KSA in a manner consistent with the intent of KSA (i.e. ICAO) standards and procedures.

A. General Policies. When evaluating a request by a foreign operator to conduct CAT II operations within the Kingdom of Saudi Arabia, Inspectors shall apply the following policies associated with the unique nature of these operations and with the responsibilities of the State of the operator:

- A foreign operator will not be authorized to conduct CAT II operations in the KSA unless that operator is authorized by its foreign aviation authority to conduct CAT II operations
- Foreign operators will not be authorized to use CAT II operating minima in the KSA that are lower than the CAT II operating minima authorized by the foreign aviation authority for CAT II operations
- Foreign operators will not be authorized to use CAT II operating minima in the KSA that are lower than the lowest minima authorized for a comparably equipped KSA operator
- All CAT II operations conducted by foreign operators in the KSA must be conducted IAW with the CAT II IAP authorized for use under GACAR Part 97
- The foreign aviation authority must confirm that the foreign operator is authorized to conduct CAT II operations with a particular aircraft type. Usually, this confirmation satisfies the Inspector's responsibility for determining whether the operator's aircraft are properly equipped and maintained, and whether the operator's flight crews are properly trained and qualified for CAT II operations

5.2.6.15. CAT II EVALUATION AND APPROVAL PROCESS. The approval process for ILS-based CAT II AWTA operations is generally the same as the general process for approval or acceptance described in this handbook. This paragraph outlines specific criteria related to the evaluation and approval of CAT II operations.

A. General Criteria. Before authorizing an operator to conduct CAT II operations, Inspectors must evaluate the operator's proposed operations and determine that the operator is competent to safely conduct these operations. Inspectors must also determine that the operator has specified the conditions necessary for the safe conduct of the proposed operations and that those conditions ensure that the following criteria are met:

- Operations are restricted to those aircraft properly equipped and airworthy for the CAT II operations being conducted
- Compliance with regulatory requirements for the operations
- Compliance with the requirements of Part C of the OpSpecs
- Compliance with the airworthiness and maintenance requirements for LM-equipped aircraft
- Compliance with the requirements of this handbook
- Accepted, safe operating practices are provided
- The use of the concepts of stabilized approach and decision region in all CAT II operations is required
- CAT II operations are restricted to those pilots who are properly trained, experienced, qualified, and proficient for CAT II operations
- CAT II operations are restricted to those aerodromes and runways that meet CAT II requirements

B. Aerodrome, Runway, and Ground-Based Equipment Requirements. The suitability of the aerodrome and runway for the type of aircraft and the operation being conducted is an integral part of an evaluation and approval of CAT II operations. The basic requirements for standard CAT I operations and the performance requirements in the applicable operating rules address the majority of the criteria required for CAT II operations. In the operating concepts and criteria for CAT II operations, however, it is required that certain other factors be considered. The Principal Inspectors must ensure that the operator fully understands CAT II operational requirements and that the company manuals, maintenance programs, and training programs provide the policy, guidance, maintenance, training, and procedures necessary to ensure that these other factors are adequately addressed. When evaluating an operator's overall CAT II operations program, the GACA must consider whether the program accounts for the following factors when designating aerodromes to support CAT II operations:

- Suitability of the runways, runway field lengths, taxiways, and other maneuvering areas on the aerodrome, considering the restricted seeing-conditions associated with CAT II operations
- CAT II IAPs and NAVAIDs to be used
- Procedures for CAT II protection of the runway safety areas, obstacle-free zones, and ILS/MLS critical areas, as well as runway and taxiway incursion prevention procedures in CAT II weather conditions
- ATS facilities and services required for CAT II operations
- Required safety facilities and services (such as crash, fire, and rescue) and any special procedures needed for the

CAT II operations

• RVR reporting and weather reporting and forecasting services

• Aeronautical information services related to these operations (such as Notices to Airmen (NOTAM) and Automatic Terminal Information Service (ATIS))

• Adequacy of lighting, marking, and other visual aids necessary to support CAT II operations

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Section 7. Category III

5.2.7.1. GENERAL.

A. Concepts, Direction and Guidance. This section contains concepts, direction and guidance to be used by aviation safety inspectors (Inspectors) for evaluating and approving or denying requests for authorization to conduct Category (CAT) III operations. All CAT III operations using aircraft, airborne equipment, ground-based equipment, or, concepts or procedures which are new to a particular operator require approval. In addition, all CAT III operations at aerodromes and runways new to a particular operator require approval even though previously approved aircraft, airborne equipment, ground based equipment, concepts and procedures are used in those operations. This section contains an amplification of the general concepts, policies, direction, and guidance covered in previous sections of this chapter. Specific standards are provided for Inspectors evaluating CAT III operations with airborne and ground based equipment, which have well understood operational characteristics and limitations.

B. CAT III Operations. CAT III operations are defined, for purposes of this handbook, as all approach and landing operations conducted in instrument meteorological conditions using CAT III approach procedures to CAT III operating minima. CAT III operating minima are those minima that specify a decision height (DH) lower than 100 feet above the touchdown zone and a controlling runway visual range (RVR) below RVR 350 meters. CAT III operating minima also include those operations conducted with an alert height (AH) of 100 feet or less above the touchdown zone (no DH) and a controlling RVR below RVR 350 meters.

C. Types of CAT III Operations. The only types of CAT III operations that can be currently authorized for use by Kingdom of Saudi Arabia (KSA) operators are instrument landing system (ILS) based.

D. Kinds of CAT III Operations. There are two different and distinct kinds of CAT III operations. These kinds of operations are fail passive operations and fail operational operations. Fail passive operations are restricted to CAT IIIa weather conditions (DH 50/RVR 200m). Fail operational operations can be conducted in either CAT IIIa or CAT IIIb weather conditions.

E. Objective of CAT III Operations. The essential difference between CAT III operations and CAT I and CAT II operations is that a CAT III operation places a greater reliance on the guidance provided by the airborne and ground based guidance equipment. The guidance provided by the equipment must continue through touchdown in CAT IIIa operations and through touchdown and rollout to a safe taxi speed in CAT IIIb operations. In contrast to other types of operations, CAT III operations do not ensure sufficient external visual cues for the pilot to manually control the aircraft during flare and landing. The primary objective of CAT III operations is to provide a level of safety equivalent to CAT I and CAT II operations without the use of these visual cues. To meet this objective, the instrument approach procedure must provide for a safe and orderly transition from the en route phase of flight to a landing or to a missed approach (which could include a momentary touchdown during the go-around maneuver), and then a transition back to the en route environment for diversion to an alternate aerodrome. CAT III instrument approach procedures and air traffic control (ATC) procedures must also include adequate protection from obstacles (mobile or fixed) near the landing surface to ensure that a go-around can be safely initiated from any point in the approach and landing before touchdown.

The desired level of safety for CAT III operations is achieved by the following enhancements:

1) The airborne equipment and ground based equipment must ensure increased precision in flightpath control. The increased reliability and precision of flightpath control (as compared to CAT I and CAT II systems) is achieved through highly reliable and precise ground based equipment and airborne systems. These systems are capable of guiding the aircraft with significantly increased precision to touchdown or through rollout, as appropriate.

2) Special flight crew qualification and training are also required to ensure that the aircraft is operated with the required degree of precision during these operations.

3) The aircraft performance and equipment requirements associated with a missed approach from very low altitudes are enhanced to ensure that these operations can be safely conducted even if a momentary touchdown occurs on the runway after the go-around is initiated.

4) Additional visual aids are required to enhance seeing-conditions during the final stages of landing, flare, rollout, and taxi operations.

5) Special criteria are established to provide additional obstacle and terrain clearance to accommodate missed approaches from very low altitudes, which may include a momentary touchdown on the runway after the go-around is initiated.

6) Special requirements are established to provide enhanced protection for the instrument landing system (ILS) signals during the final stages of landing, flare, and rollout to ensure that these signals are not disturbed during these critical phases of flight.

7) More stringent criteria are specified for the profile of the pre-threshold terrain to ensure that the flight guidance and control systems function properly during the final stages of approach, flare, and landing.

8) Special operational and ATC procedures and/or limitations are established to ensure the overall safety and efficiency of the operation.

5.2.7.3. CAT III OPERATIONAL CONCEPTS. The weather and environmental conditions encountered in CAT III operations severely restrict seeing-conditions. External visual reference is not acquired until the aircraft reaches a very low altitude. Typically, external visual references begin to become available below 100 feet in CAT IIIa operations and below 50 feet in CAT IIIb operations. Even though external visual references are usually available before touchdown, the seeing-conditions are not sufficient for the pilot to consistently perform a safe manual landing. Therefore, the aircraft must be controlled by instruments and special equipment throughout the approach, flare, and touchdown (deceleration for rotorcraft) in CAT IIIa weather conditions and through rollout to a safe taxi speed (air taxi or hover for rotorcraft) in CAT IIIb weather conditions. Due to the reduced seeing-conditions and the hazards associated with a pilot's attempts to manually maneuver the aircraft to landing in those seeing-conditions, the precision of the flight guidance and control system and the overall precision of flightpath control must have certain capabilities. These capabilities include the safe delivery of the aircraft to touchdown in CAT IIIa weather conditions and through touchdown and rollout to a safe taxi speed in CAT IIIb conditions.

A. Decision Height (DH) and Alert Height (AH). All CAT IIIa fail passive operations are conducted in accordance with the DH and RVR concepts. All CAT IIIa and CAT IIIb fail operational operations are normally conducted in accordance with the AH and RVR concepts. Decision heights are only used with fail operational systems in very unique situations (see Federal Aviation Administration (FAA) Advisory Circular (AC) 120-28, (as amended)). DH and AH are never used together in any operation since the DH requires that external visual reference be established before passing a specified point and AH does not. The very limited seeing-conditions available in CAT III operations require additional criteria to ensure that an adequate level of safety is achieved and maintained when operating in this environment.

B. CAT III Operating Minima. CAT III operating procedures and minima are established to ensure that the desired level of safety is achieved when aircraft are operated in CAT III seeing-conditions. These operating minima are based on the DH and RVR concepts for fail passive operations and the AH and RVR concepts for fail operational operations. These operating minima establish the minimum safe heights for instrument flight (DH 50 for fail passive operations and touchdown for fail operational operations) and the minimum controlling RVR necessary to safely complete the operation being conducted with a particular aircraft. These operating minima are established in full consideration of the required CAT III operational concepts; airborne equipment; ground based, visual and electronic equipment; operating procedures; and the pilot training and qualifications required for these operations. These operating minima, when combined with other CAT III requirements, ensure that the combination of information from external visual sources and the aircraft instrument and equipment is sufficient to enable properly qualified pilots to safely operate the aircraft along the desired flightpath, touchdown, and safely rollout. As the quality and quantity of external visual information decreases due to the reduced seeing-conditions (for example, going from CAT II to CAT IIIa to CAT IIIb), the quality and quantity of instrument information, the capability of the airborne and ground based CAT III system, and the proficiency of the flightcrew must be increased to maintain the desired level of safety.

C. Kinds of CAT III Operations. There are two different and distinct kinds of CAT III operations: fail passive operations and fail operational operations.

1) *Fail Passive Operations*. These operations are restricted to CAT IIIa and must use a DH of 50 feet and a controlling RVR of RVR 200m. Fail passive operations are also only authorized for aircraft smaller than a DC-10 or L-1011 due to approach geometry factors such as wheel to glideslope antenna height and wheel to pilot's eye height.. As the name implies, fail passive CAT III systems are permitted to fail below 100 feet above ground level (AGL), under certain remote circumstances, provided that the flight guidance and control system always fails passively (does not disturb the aircraft's flightpath when it fails) and the flight crew immediately receives an aural and visual warning of system failure. Since a fail passive system is permitted to fail, a DH must be used to ensure that, before passing 50 feet AGL, the flight crew establishes external visual reference with the touchdown zone to determine that the flight guidance and control system is functioning properly and to ensure that the aircraft is being properly delivered to the runway. Extensive research and operational experience have shown that pilots may not always have sufficient external visual cues in certain CAT III weather conditions to properly conduct this assessment before passing 50 feet AGL if the controlling RVR is less than RVR 200m. These research programs clearly show that a go-around is mandatory if the flight guidance and control system fails before touchdown during fail passive operations in CAT III weather conditions. These research programs also clearly show that, if the system fails below 100 feet AGL, the external visual cues are not sufficient to permit the pilot to use these cues to consistently and safely manually complete the landing in certain CAT III weather conditions when the controlling RVR is less than RVR 300m. Additionally, these research programs show that all missed approaches resulting from failures in the fail passive autoland system in CAT III weather conditions should be manually flown since automatic go-around capability is also lost in most aircraft if the fail passive automatic landing system fails.

2) *Fail Operational Operations*. These operations usually use an alert height (AH) instead of a DH (see FAA AC

120-28 (as amended)). Fail operational landing systems can be used for CAT IIIa operations. Fail operational landing systems can also be used in CAT IIIb operations if these systems have at least a fail passive rollout control capability. As the name implies, fail operational systems remain operational even if failures occur. In other words, the loss of CAT III capability is not permitted when the aircraft is in the critical phases of approach and landing (below 100 feet AGL). Fail operational systems are designed so that the system remains fully operational following any failure or combination of failures that are likely to occur after the aircraft passes 100 feet AGL. Fail operational systems have been shown to have the capability to safely deliver the aircraft to the touchdown zone if the system is still fail operational when the aircraft passes 100 feet AGL, even if failures occur in the system after passing this height. Therefore, there is no requirement to establish external visual reference before touchdown to confirm that the aircraft will land safely. The lowest minimum that may currently be approved for any CAT III operation by a KSA operator is a controlling RVR of RVR 75 m. This restriction is based on the difficulties associated with aircraft movement on the taxiways, ramps, and other maneuvering areas on the aerodrome and the on difficulties related to providing timely safety facilities and services (such as crash, fire, and rescue). In addition, fail operational landing systems and fail operational rollout control systems will be required if operating minima less than RVR 75m is approved in the future.

5.2.7.5. ESTABLISHING CAT III OPERATING MINIMA.

A. Operating Minima. The operating minima (DH and RVR or AH and RVR) for CAT III operations are usually determined by the tasks the pilot is required to perform to complete the landing and rollout (deceleration and air taxi for rotorcraft). Consideration must be given to the degree of precision and integrity in flightpath control provided by the required electronic equipment and the enhanced seeing-conditions provided by the required visual aids. The RVR minima are also higher if the pilot has to establish better seeing-conditions due to the complexity or difficulty of the tasks required to safely complete the landing (for example, factors related to the design or handling characteristics of a particular aircraft). As a general rule in CAT III operations, the minimum required seeing condition (RVR) is higher than RVR 75m in situations where the pilot is required to perform special tasks during the operation. Some examples of these situations and special tasks are as follows:

1) The pilot must establish visual reference before touchdown to confirm that the aircraft is being properly delivered to the runway (fail passive CAT IIIa).

2) The pilot must use external visual references to manually control the rollout (some CAT IIIa aircraft).

3) Situations where the localizer (azimuth) cannot be used for rollout guidance (the course structure fails to meet CAT IIIb flight inspection criteria for rollout).

4) Situations where the pre-threshold terrain profile at a particular runway creates abnormal but otherwise safe autoland performance in certain aircraft.

5) Situations where the aircraft has some other unique design feature or piloting task that requires enhanced seeing-conditions to safely perform a particular maneuver.

B. Levels. Three basic levels of operating minima have been established and are internationally agreed to for CAT III operations. These basic levels are: CAT IIIa (RVR 200m), CAT IIIb (RVR 150) and CAT IIIc (RVR 0). Currently, the lowest CAT III minima approved for any operator are RVR 75m. Many aerodromes are currently limited to RVR 175m operations due to limitations in the RVR reporting systems, inadequate CAT IIIb taxiway centerline lighting, and inadequate operational and ATC procedures to control and regulate aircraft and vehicular movement in RVR 75m seeing-conditions. A few aerodromes in the U.S. and many aerodromes in Europe, however, have all of the safety facilities and services necessary to safely conduct RVR 75m operations.

1) The RVR/300m level is normally used for initial CAT IIIa operations for an aircraft new to an operator, unless that operator has received operational credit for using the Special Process for Minima Reduction. Operators receiving this special operational credit may conduct initial CAT IIIa operations with RVR 200m minima.

2) The RVR 200m level is the basic level for CAT IIIa operations. This level is the lowest minimum that can be authorized for fail passive operations. RVR 200m is also the lowest minimum that can be authorized for operations with fail operational landing systems, which do not have a rollout control capability. Additionally, operations at runways which have ILS localizer restrictions (such as localizer unusable for rollout) are limited to the RVR 200m minimum.

3) The RVR 175m level is the current (2012) standard level for CAT III operations in the U.S., due to RVR reporting limitations, limitations to taxiway centerline lighting, and ground movement and control limitations. The RVR 175m level is also the lowest minimum that may be authorized at any U.S. aerodrome for fail operational landing systems, which does not have at least a fail passive rollout control system.

4) The RVR 0/75m level is the lowest minimum that may be authorized for operations at any foreign aerodrome. This limitation is due to major limitations associated with the ground movement of aircraft and vehicles and the provision of timely crash, fire, and rescue facilities and services when operating in seeing-conditions less than equivalent to RVR 75m. Operations below RVR 75m are not foreseen until all of these limitations are resolved.

5.2.7.7. FUNCTIONAL REQUIREMENTS FOR VISUAL REFERENCE. The function of external visual reference is dependent upon the kind of CAT III operation being conducted. During operations with a DH (all fail-passive and certain unique fail-operational operations), sufficient external visual reference must be obtained to determine (before passing 50 feet AGL) that the flight control and guidance system is properly delivering the aircraft to the touchdown zone. These visual references are necessary for the pilot to determine that the aircraft is aligned with the touchdown zone and tracking so as to touchdown within the lateral confines of the runway. These visual references are also essential during operations with a DH to permit the pilot to detect situations where the aircraft would not touchdown within the longitudinal confines of the touchdown zone. For operators with an AH (fail-operational operations only), however, the external visual references that become available as the aircraft descends serve as advisory information to the pilot. During operations with an AH, the pilot is not required to establish visual reference before touchdown. The visual references that are available to the pilot during operations with an AH are used primarily for: assessing the performance of the rollout control system; continuing the rollout manually if a fail-passive rollout control system fails; and for taxiing the aircraft once a safe taxi speed is reached.

5.2.7.9. DECISION REGION.

A. Decision Region. The decision region must be used in all CAT III operations. The decision region is that portion of the approach between 300 feet and 100 feet where the tracking performance of the flight guidance and control system is critically evaluated by the flight crew to determine if the overall system performance is sufficient for the aircraft to continue the approach to touchdown. Since the visual scene normally expands as the aircraft descends due to geometric and slant range effects, the pilot must integrate the instrument and airborne system information with the visual cues as they become available.

B. DH Operations. For operations that use a DH, the pilot must arrive at a decision before passing the DH to either permit the flight guidance or control system to be used to touchdown or to execute a missed approach. For a DH operation, the external visual information, the instrument information, and the airborne system information must be integrated in the decision region so the flight crew can make a definitive decision no later than arrival at the DH. The decision to permit the flight guidance and control system to continue to direct the aircraft to touchdown must be based on an assessment that the airborne system is still fail passive (fail operational for CAT IIIb operations), the instrument information confirms that the tracking performance of the airborne system meets the decision region tolerances, and the external visual cues confirm that the aircraft will touchdown within the touchdown zone.

C. AH Operations. For operations with an AH, the pilot must also arrive at a decision, before passing the AH, to either permit the flight guidance and control system to be used to touchdown or to execute a missed approach. In direct contrast to operations with a DH, however, this decision must be based on an assessment that the airborne system is still fail operational and the instrument information confirms that the tracking performance of the airborne system meets the decision region tolerances. External visual references are not required before touchdown in operations based on the AH concept.

D. Within the Decision Region. Within the decision region, the flight crew must be especially cognizant of the maximum permissible excursions of the raw ILS course and glidepath deviation from which a landing can be safely completed. The tracking performance criteria normally used for maximum displacements within the decision region are ±1/3 dot localizer (azimuth) deviation and ±1/2 dot glideslope (elevation) deviation with no sustained oscillations about the localizer (azimuth) or the glideslope (elevation). When the tracking performance is outside these parameters within the decision region during CAT III weather conditions, a go-around must be executed since the tracking performance is not sufficient to ensure that the aircraft will safely complete a landing within the touchdown zone. Also, when operating within the decision region, the flight crew must be especially alert for sudden, rapid oscillations of the localizer or glideslope deviations since these oscillations (the windshield wiper effect) may indicate that the ILS critical areas are not adequately protected. If any such oscillations occur below 100 feet AGL, a missed approach must be immediately executed unless adequate external visual cues are available to confirm that the aircraft is being properly delivered to the runway. A missed approach also must be immediately executed at any point in the approach before touchdown if the flight crew detects or strongly suspects abnormal airborne or ground-based system performance.

5.2.7.11. RADIO ALTIMETER AND PRE-THRESHOLD TERRAIN.

A. Pre-threshold Terrain. The profile of the pre-threshold terrain is important to all CAT III approach operations because the flight guidance and control systems in many aircraft use radio altimeter information to change the mode of operation and/or change the localizer or glideslope tracking sensitivity. At runways where the terrain beneath the approach flightpath is not approximately level, abnormal autopilot and/or flight director behavior may result from erroneous radio altimeter signals. Although these abnormalities may not be serious in CAT I or CAT II operations, irregularities in the pre-threshold terrain can have a major effect on the performance of the flight guidance and control systems required for CAT III operations. The profile of the pre-threshold terrain is also important to all CAT III approach operations which use an AH or a DH based on radar altimeter (RA) information because the terrain can affect the value used for AH or DH. In certain extreme circumstances, the pre-threshold terrain profile can have such an adverse effect on determining the AH or DH from the RA, that the use of this information must be prohibited (that is, use of RA is not authorized).

B. Operation. The operation of almost all CAT III landing systems is dependent on RA information during the latter stages of the landing. The flare profile, the rate of descent at touchdown, and the distance of the touchdown point from the threshold can be adversely affected by the profile of the terrain immediately before the landing threshold. The terrain, which is most critical, lies in an area approximately 200 feet (62.5m) on either side of the runway centerline extended from the threshold into the approach area to a distance of approximately 1000 feet (300m) before the landing threshold.

C. Pre-threshold Terrain Anomalies. As was previously stated in paragraph A, the pre-threshold terrain can have an effect on AH or DH since the AH or DH used in CAT III operations is normally based on radio altimeter information. The AH used in CAT III operations is either AH 100 or AH 50. The DH used in CAT III operations is either DH 50 for fail passive operations or a DH of 50 feet or less for fail operational operations. Therefore, the terrain profile within the last 3,000 feet (1000m), before the threshold, must be evaluated to establish the proper AH or DH and to ensure that the AH or DH can be accurately determined from radio altimeter information. This may be accomplished by conducting a special operational test and evaluation program on any runways having abnormal pre-threshold terrain profiles before approving any CAT III operations for any aircraft on these runways. This test/evaluation program is essential to ensure that CAT III operations can be safely conducted on these runways with a particular CAT III aircraft type (aircraft with similar flight characteristics and similar flight guidance and control systems). If the use of radio altimeter to determine AH or DH cannot be used reliably in certain runway approach environments then the use of radio altimeter must be prohibited (that is, RA not authorized) in those situations.

D. Inner Marker. Since the inner marker is normally beneath the CAT II DH (HAT 100); fail operational operations, which are authorized to use AH 100 can use the inner marker to define AH (in lieu of the RA) at runways where the use of RA information is not authorized. The CAT III OpSpecs must contain a specific limitation that the inner marker must be used to define AH at that runway. Furthermore, fail passive operations and those fail operational operations, which require the use of a DH cannot be conducted at such a runway unless RA information can be used to accurately and reliably define the CAT III DH being used.

E. DHs Used in CAT III. Since all DHs used in CAT III operations must be 50 feet or less, the inner marker cannot be used to define the CAT III DH. It may be possible, however, to use RA information to accurately and reliably establish the CAT III DH even though RA information cannot be used to define the CAT II DH (HAT 100). Since DH 50 is located very near the runway threshold and a DH less than DH 50 occurs over the runway, the terrain profile within these areas is generally adequate for CAT III RA based DHs. The pre-threshold terrain in unusual circumstances, however, can adversely affect the use of RA information to define a CAT III DH and CAT III operations based on a DH, and therefore must be prohibited in those cases.

F. Operating Rules. The operating rules prohibit the use of an autopilot or a heads-up guidance system (HGS) to touchdown in any operation unless the operator is specifically authorized to conduct autoland operations with that aircraft in OpSpecs C61 or R110, as appropriate, or OpSpecs C62 or (TBD for Rotorcraft OpSpec) for Heads-Up display (HUD) systems. It is the operator's responsibility to determine that the pre-threshold terrain profile and ILS course structures are adequate for operations at any runway where it conducts landing operations using these systems. Therefore, all operators approved to use autoland or HGS equipped aircraft should be encouraged to routinely use these systems at suitably equipped runways during operations in VFR and in CAT I instrument flight rules (IFR) conditions. They should also routinely monitor equipment performance.

5.2.7.13. APPROVAL OF CAT III OPERATING MINIMA. CAT III operating minima are established in accordance with the criteria in ICAO PANS-OPS criteria, and this handbook.

A. Aircraft New to an Operator. With each aircraft that is new to an operator, the operator's initial CAT III operations are usually restricted at all aerodromes for at least 6 months until the operator acceptably demonstrates its ability to satisfactorily maintain that aircraft for the various levels of CAT III operations. The actual process for introducing an aircraft that is new to an operator, obtaining reductions in operating minima for that aircraft, and the number of steps required to achieve the lowest possible operating minima for that particular operator and aircraft, depend on the operating policies and operational choices made by the operator. Although several alternatives will be discussed in subsequent subparagraphs, all alternatives must comply with the general GACA policy for reductions to operating minima.

B. Policy. GACA policy for reductions to minima requires that each operator of each CAT III type of aircraft (aircraft with similar flight characteristics and similar flight guidance and control systems) must follow a certain progression from CAT I operating minima through CAT II operating minima before achieving CAT III minima. Furthermore, each operator of each CAT III type of aircraft must progress through CAT IIIa operating minima to achieve CAT IIIb minima. The principal purpose of this progression requirement is to validate the maintenance program for the various categories of operation. At least 6 months of operation at each step of this reduction of minima process is necessary to properly validate the effectiveness of the AWTA operations maintenance program for that step.

C. Normal Approval Criteria. In accordance with the normal approval criteria for CAT II operations in FAA ACs 120-29 and the CAT III criteria in FAA AC 120-28 (as amended), the reduction process would require 6 months of operation at DH 150/RVR 500m to validate the maintenance program before receiving approval of operations at DH 100/RVR 350m.

D. Normal CAT IIIa Reduction. When operating minima of DH 100/RVR 350m are approved, the operator can apply for CAT IIIa operations and receive approval for operations with minima of RVR 300m. After 6 months of successfully maintaining the aircraft to CAT IIIa standards, the operator could be authorized standard CAT IIIa minima of RVR 200m.

E. Normal CAT IIIb Reduction. After receiving CAT IIIa approval, the operator could apply for a CAT IIIb authorization if the aircraft was suitably equipped. The operator could then be authorized minima as low as RVR 75m 6 months later if the CAT IIIb maintenance program was successfully validated.

F. Normal Reduction Schedule. Under the normal approval process, the lowest possible minima for a CAT IIIb capable aircraft (RVR 75m) would be approved at least 18 months after the initial application for CAT II operations. Although this lengthy process is necessary in certain circumstances, the operator can significantly reduce the time required to achieve the lowest minima by structuring its operations and maintenance validation programs to receive operational credit for use of the special process for minima reductions.

G. Special Process for Minima Reductions. Since airborne equipment that is type design approved for CAT III operations has special design features which increase the safety of operations in restricted seeing-conditions, it is possible for an operator to receive special operational credit for the use of these enhanced systems. Special operational credit is obtained by the GACA initially authorizing CAT II operations with operating minima of DH 100 and RVR 350m with special restrictions specified in the OpSpecs. The maintenance program is then validated in accordance with these special requirements.

H. Basic Approach. The basic approach used in this special approval process is to structure the operational requirements and the data collection requirements so that all approaches used to validate the maintenance program are conducted using the complete CAT IIIa or CAT IIIb airborne system, as appropriate. This approach permits the data collected during the CAT II validation to fulfill both the CAT II and the CAT IIIa requirements, and thereby bypassing the need for the RVR 500m and RVR 300m minima reduction steps. For an operator to receive this credit, however, it is essential that the aircraft be operated to full CAT III standards throughout the validation process and that the CAT II OpSpecs contain a restriction to operate the aircraft in the fail passive or fail operational configuration, as appropriate, for the first 6 months of CAT II operation. Further reductions in operating minima are obtained in accordance with the guidance and direction in the subparagraphs that follow.

I. Fail Passive Systems. For fail passive systems, the special reduction process would require 6 months of operation at DH 100 and RVR 350m with a restriction that requires the operator to operate in the fail passive mode to touchdown. After successfully completing this validation, the CAT II restriction to operate in the fail passive mode can then be removed and the operator authorized for CAT IIIa minima of DH 50 and RVR 200m. This means that the lowest minima for these aircraft could be achieved 6 months after the initial application for CAT II approval.

J. Fail Operational Systems. For fail operational systems, the first 6 months of operation must be conducted at DH 100 and RVR 350m with a restriction to operate in the fail passive or fail operational mode through touchdown and rollout. After successful completion of this validation, the CAT II restriction to operate in the fail passive or fail operational mode will be removed and the operator will be authorized for CAT IIIa minima of RVR 200m with a restriction to operate in the fail operational mode through touchdown and rollout for 6 additional months. After successful completion of this second validation period, the operator would be authorized to conduct CAT IIIb operations with the lowest possible minima. The lowest possible minima would be RVR 75m, unless the aircraft is restricted to higher minima by the CAT IIIb type design approval. The CAT IIIa restriction to operate in the fail operational mode will be removed for aircraft smaller than the DC-10/L-1011 if the operator requests approval to conduct fail passive CAT IIIa operations. This means that the lowest minima for these aircraft could be achieved 12 months after the initial application for CAT II operations is approved.

5.2.7.15. STANDARD CAT III OPERATIONS.

A. Building Block Approach. Standard CAT III operating minima must be based on a building block approach which uses the foundations provided by the special aeronautical knowledge, experience, skills, qualifications, training, and the special airborne and ground based equipment specified in FAA AC 120-29 (as amended) for CAT I and CAT II operations. The assumptions and criteria used in aircraft certification and CAT III instrument approach procedure design must be compatible with the operational concepts in this handbook. These requirements must also ensure that flight crews and aircraft which meet the requirements of this handbook and FAA AC 120-28 (as amended) can be used to safely conduct CAT III operations with standard CAT III minima. Any special equipment or procedures necessary to achieve this objective must be specified in the airworthiness certification basis of the aircraft (type certificate or supplemental type certificate) and/or the approved aircraft flight manual. Aircraft which cannot be safely operated with standard CAT III operating minima using flight crews which meet the minimum requirements of this handbook and FAA AC 120-28 (as amended) shall not be certificated or otherwise approved for CAT III operations. The OpSpecs establish the lowest operating minima which can be used in any CAT III operation even if the instrument approach procedure specifies minima lower than these values. Special airborne equipment, special ground based equipment and special flight crew training is required for CAT III operations. These requirements are specified in this handbook, FAA AC 120-28 (as amended), and the approved aircraft flight manuals.

B. Standard CAT III Operating Minima. Standard CAT IIIa operating minima are DH 50 and RVR 200m for fail passive systems and either AH 100 or AH 50 and RVR 200m for fail operational systems. Standard CAT IIIb minima for KSA operators are either AH 100 or AH 50 and RVR 75m. CAT III operations at most Unite States (US) aerodromes, however, are currently (2012) limited to RVR /175m until the safety facilities and services at these aerodromes are enhanced to support RVR 75m operations. The AH used in fail operational operations is normally based on RA information and must be based on either the inner marker or RA information. The CAT III DH used in all fail passive operations and some unique fail operational operations must be based on RA information. Barometric altimeter information is not an acceptable means of establishing AH or DH in any CAT III operation.

C. Higher Than Standard CAT III Operating Minima. Higher than standard CAT III minima are used in certain special cases. These minima are usually applied as interim minima for the first 6 months of CAT IIIa and CAT IIIb operations with an aircraft new to an operator until that operator's maintenance program for that aircraft is validated for standard minima. Higher than standard minima are also applied in special situations where RVR reporting system limitations, pre-threshold terrain limitations, or unique design features in a particular aircraft which preclude the use of standard CAT III minima.

D. Operational Approval Basis. All standard CAT III operations are approved by the issuance of OpSpecs, which authorize the conduct of CAT III instrument procedures at specified aerodromes. The basis for the approval of all CAT III aeroplane operations is FAA AC 120-28 (as amended).

E. CAT III Flight Guidance and Control Systems. Standard CAT III operations are based on the use of special airborne and ground based equipment, which provides increased capability, redundancy, integrity, and continuity of service. The overall performance of the CAT III airborne equipment must be superior to the equipment required for CAT I and CAT II operations. The very limited seeing-conditions available in CAT III operations and the piloting limitations associated with operating in these conditions do not permit the pilot to use visual cues to manually control and maneuver the aircraft during the final stages of approach, flare, and landing (deceleration and air taxi for rotorcraft). Therefore, the flight crew must rely on the airborne and ground based equipment to safely deliver the aircraft to the touchdown zone.

F. Generic Design Philosophy. The airborne system and the ground based system must be able to detect all potential failures, which could significantly disturb the flightpath of the aircraft. The ability of these systems to detect such failures requires special design practices and system redundancy. The airborne systems require at least two independent flight guidance and control computations (dual channel) for detecting significant errors. The airborne system detects errors by comparing the results of these computations. If the results of the calculations are not equivalent, the system knows that an error has occurred. Autoland systems are designed to prevent the autopilot from making control inputs, which would significantly disturb the flightpath when these errors occur. Autoland systems also provide the flight crew with an immediate aural and visual warning when these failures are detected when an immediate crew action is required (such as initiating a go-around). HGS systems must also detect significant failures and provide similar warnings when failures occur. Since the pilot is manually maneuvering the aircraft in HGS operations, HGS systems are generally designed to prevent undesired control inputs as a result of failures by denying the pilot any further access to the erroneous information and by clearly annunciating the failure.

G. Fail Passive Design Philosophy. Fail passive systems usually use only two independent sets of flight guidance and control computations (dual channel). If an error is detected during the comparison process, fail passive systems cannot determine which computation is erroneous since only two solutions are available. Since fail passive systems cannot determine which control computation is incorrect, the system fails (disconnects for autoland systems) and immediately provides an aural and visual warning. This warning notifies the flight crew that immediate action is required (for example, initiating a go-around). Fail passive capability is typically provided by either two autopilots (two black boxes) each of which has a single flight control computation capability (single channel) or one autopilot (one black box), which provides two independent flight control computations (dual channel).

H. Fail Operational Design Philosophy. Fail operational systems must use at least three independent sets of flight guidance and control computations (triple channel) to detect errors and determine which two calculations remain valid. If an error is detected during the comparison process, fail operational systems remain fully operational by comparing all of the calculations to determine which computation is erroneous. The calculation which disagrees with the rest of the computations is disregarded by the system and the commands from that computation channel are disabled (the bad calculation is voted out by majority rule). The fail operational system remains fully operational by continuing to use the remaining computations to provide flight guidance and control. Since the system remains fully operational when failures occur, there is no need for immediate crew action or intervention to safely complete the landing. The systems which remain functional following these failures provide adequate redundancy and integrity to safely complete the landing. Fail operational capability is typically provided by either three autopilots (three black boxes) each of which has an independent flight control computation capability (single channel) or two autopilots (two black boxes) each of which has a dual independent computation capability (dual channel).

I. Airworthiness of CAT III Airborne Equipment. There is only one acceptable means for demonstrating that the airborne equipment is airworthy for CAT III operations. This means of approval is CAT III type design approval which is normally reflected in the approved aircraft flight manual. Inspectors shall not approve CAT III operations with any aircraft for any operator unless the operator presents written evidence of CAT III type design approval for the particular aircraft.

J. Validation of the CAT III Maintenance Program. The reliability required in the airborne system to conduct CAT III operations is achieved by special design requirements and special maintenance programs. The extensive, special maintenance program necessary for CAT III operations is usually the largest economic factor affecting an operator's decision to conduct these operations. If the operator's aircraft are equipped with standard CAT III equipment, all CAT III operations with aircraft that are new to that operator are usually initially restricted (for 6 months) to higher than standard CAT IIIa operating minima until the operator successfully validates its maintenance program in accordance with FAA AC 120-28 (as amended). It may be possible for the operator to be initially authorized for standard CAT IIIa minima (RVR 200m), however, if the operator receives operational credit for using the special process for minima reductions.

K. CAT III Airports and Runways (KSA Operators). All CAT III operations are restricted to aerodromes and runways which meet the special safety requirements necessary for CAT III operations. (Note: For reference, all aerodromes and runways approved by the FAA for CAT III operations by US operators are specified in FAA Order 8400.8, Procedures for Approval of Facilities for FAR Part 121 and 135 CAT III Operations). Even when a particular runway is approved for CAT III operations, an operator shall not be authorized to conduct CAT III operations until all requirements of this handbook are met, and the particular CAT III operation is authorized in the operator's OpSpecs for the particular aircraft.

5.2.7.17. KSA CAT III TERMINAL INSTRUMENT APPROACH PROCEDURES.

A. Reserved.

NOTE: At the present time there are no CAT III IAP approved for use in the KSA.

5.2.7.19. FOREIGN CAT III INSTRUMENT APPROACH PROCEDURES.

A. Operations. All CAT III operations by KSA operators at foreign aerodromes must be authorized in accordance with the guidance and direction in this handbook.

B. Foreign Equivalence. Although it is recognized that the CAT III ground based systems and procedures at foreign aerodromes may not be in exact accordance with ICAO standards, it is critical for the foreign aerodromes to provide the information and functions that are necessary for CAT III operations in a manner consistent with the intent of ICAO CAT III standards.

C. General. The GACA has the responsibility for evaluating any runway at a foreign aerodrome which supports CAT III operations to be carried out by KSA operators certificated under the GACAR. Foreign runways that have been determined by the FAA to be equivalent to US CAT III standards and approval for US CAT III operators are identified in the list of runways in FAA Order 8400.8. KSA operators desiring CAT III approvals at foreign aerodromes that are not on this FAA approved list should submit a request for evaluation and approval through their POI to the Director, Flight Operations Division who will initiate an evaluation.

D. Determining Equivalence. The major factor, which is considered, by the GACA in approving foreign runways for CAT III operations by KSA operators, is the degree of equivalence with ICAO CAT III standards. This determination evaluates the equivalence of:

- High intensity approach lights
- High intensity runway edge lights
- Touchdown zone and centerline lights
- Taxiway edge lights
- High intensity, taxiway centerline lights
- Runway markings
- The quality and integrity of the approach and landing ground based guidance system
- The RVR reporting capabilities and procedures
- ILS critical areas, including signs and markings
- Obstacle clearance protection in the approach and missed approach, including the obstacle-free zone
- Aerodrome surface traffic control
- Terminal area air traffic control

- Procedures for regulating the ground movement of aircraft and vehicles during CAT III operations

E. Authorizing Foreign CAT III Runways. All CAT III operations conducted in foreign countries must be conducted in accordance with the operator's CAT III OpSpecs. The only means of approving these operations is through the issuance of OpSpecs, which specify the foreign runways and minima authorized for each aircraft used by the operator. OpSpec C60 specifies CAT III instrument approach procedures, runways, operating minima, limitations, and aircraft authorized for CAT III operations for a particular operator. These paragraphs also specify the CAT III airborne equipment, RVR equipment, pilot qualification, and missed approach requirements, which apply to the operator's CAT III operation. If the flight crew is properly qualified and the aircraft is properly equipped and maintained, an operator may, in general, be authorized to conduct CAT III operations to any foreign runway approved for CAT III operations.

5.2.7.21. CAT III EVALUATION AND APPROVAL PROCESS.

A. Approval Process. The approval process for CAT III operations is generally the same as the generic approval process for approval or acceptance. The CAT III approval process also closely parallels the CAT II process. The discussion in this paragraph contains specific criteria and direction related to the evaluation and approval of CAT III operations. An in depth discussion of the evaluation and approval process for CAT II/III operator qualification is contained in Section 8 of this chapter.

B. General. Conceptually, CAT III operations are based on the building block approach using the foundation provided by the CAT I and CAT II building blocks. Therefore, the discussion to follow includes only those factors that are unique to CAT III operations. When evaluating an operator's request to conduct CAT III operations, the Inspector must evaluate the factors addressed in this paragraph and make a judgment related to the operator's ability and competence to conduct these operations. The Inspector shall ensure that the operator specifies the conditions necessary to safely and competently conduct the proposed operations, and that those conditions ensure that the following criteria are met:

- Operations are restricted to those aircraft that are properly equipped and airworthy for the CAT III operation being conducted

- Compliance with the regulatory requirements for those operations

- Compliance with the CAT III requirements of Part C (Part R, if appropriate) of the OpSpecs

- Compliance with the CAT III requirements of this handbook

- Compliance with the CAT III criteria of FAA AC 120-28

- Accepted, safe CAT III operating practices are provided

- The use of the stabilized approach concept in all CAT III operations is required

- CAT III operations are restricted to those pilots who are properly trained, experienced, qualified, and proficient for CAT III operations

- CAT III operations are restricted to those aerodromes and runways that are approved for CAT III operations

- Fail passive CAT III operations are restricted to those aircraft approved for these operations
- CAT IIIb operations are restricted to those aircraft that meet the CAT IIIb requirements of FAA AC 120-28
- CAT IIIb RVR 75m operations are restricted to those aerodromes specifically approved for these operations
- Aerodrome/Runway and ground-based equipment requirements

C. General. The adequacy and suitability of the aerodrome/runway and the ground based electronic and visual aids for the type of aircraft and the kind of operation being conducted are an integral part of evaluating and approving CAT III operations.

D. Ground-Based Visual Aids. One of the primary factors in achieving CAT III operations is related to ground-based lighting aids. All CAT III operations are based on the use of serviceable high intensity approach lighting systems; high intensity runway edge lights; high intensity touchdown zone lights; high intensity runway centerline lights; and runway markings and. sequenced flashing lights. For CAT IIIb operations with operating minima below RVR 175m, high intensity taxiway centerline lights are required for the taxi routings used in CAT IIIb operations.

E. ILS Performance Requirements. The safety of CAT III operations is heavily influenced by several characteristics of the ground based electronic guidance system, which include: the course structure (ILS signal quality); the integrity (the degree of trust that can be placed on the precision of the guidance signals); and continuity of service (protection from loss of the guidance signals) of the system. CAT IIIa operations can only be conducted at locations where the ground based ILS provides acceptable glidepath angles, threshold crossing heights (TCHs), and acceptable lateral and vertical course structure down to touchdown. CAT IIIb operations can only be conducted if these requirements are met through rollout.

F. ILS Critical Areas. The operation of vehicles and aircraft on or near the runway or the ILS antennas can significantly disturb the course structure of the electronic signal radiated by these systems. Critical areas have been established to eliminate these undesirable disturbances. Vehicles and aircraft must not be permitted within these critical areas when an aircraft on approach is critically dependent on ILS guidance.

G. RVR Reporting Equipment. The restricted seeing-conditions and the short term variability in the weather conditions associated with CAT III operations require the use of RVR reporting systems to provide meaningful seeing condition reports to pilots. Three RVR reporting systems must be installed at all runways used for CAT III operations. The touchdown zone and mid RVR reports are controlling for all CAT IIIa operations. In CAT IIIa operations, the rollout RVR report provides advisory information to pilots. For CAT IIIb operations, the touchdown zone, mid, and rollout RVR reports are controlling. Although three RVR reporting systems must be installed at all runways used for CAT III operations, for CAT IIIb operations using fail operational landing systems that incorporate a serviceable fail operational rollout control system, CAT III operations may continue to be conducted in the event any one of these RVR reporting systems is unserviceable. In this case, both of the remaining RVR reports are controlling.

> **NOTE**: Additional information on RVR systems can be found in ICAO Doc. 9328 Manual for RVR Assessment and FAA AC 120-28 (as amended) and FAA AC 97-1 (as amended).

H. Obstacle Clearance Limitations. Standard CAT III operations can only be conducted to runways, which provide adequate obstacle clearance protection in the final approach area, the approach light area, the touchdown area, and the missed approach area. Obstacle protection must also be provided within the obstacle-free zone (OFZ) and the runway safety area, which encompasses and surrounds the CAT III runway.

I. Authorizing an Operator. Before authorizing an operator to conduct CAT III operations with a particular aircraft, the Inspector must ensure that the operator fully understands CAT III operational requirements and provides the policies, guidance, training, and procedures necessary to address these criteria in company manuals and training programs. The Inspector must also determine that the operator's overall CAT III program ensures that the following criteria will be met during the conduct of these operations.

1) Operations must be restricted to only those aerodromes and runways approved for CAT III operations.

2) CAT III operations must not be conducted at any aerodrome or runway unless the aerodrome facilities and services meet the following criteria for CAT III operations for the particular aircraft.

3) The runways used must provide an effective runway field length of at least 1.15 (1.3 for certain CAT IIIb operations) times the landing field length required by GACAR § 121.275(d) for the aircraft being used. These field lengths are necessary to account for the tendency to land long due to the characteristics of CAT III landing systems, and also to the pilot's increased difficulty in determining vertical height and in precisely assessing the flare and touchdown point in the reduced seeing-conditions associated with CAT III operations.

4) The runways must be equipped with serviceable approach, runway, touchdown zone, runway centerline and taxiway centerline lighting systems as required by this handbook, FAA AC 120-28 (as amended), and the standard CAT III OpSpecs.

5) The runway safety areas, obstacle-free zones, and ILS critical areas must be adequately protected for CAT III operations.

6) The ATC facilities and services must be compatible with the CAT III requirements.

7) The safety facilities and services (crash, fire, and rescue) must be adequate to support CAT III operations with that particular aircraft.

8) The weather reporting systems must support these operations and the required RVR reporting systems must be serviceable.

9) The aeronautical information system must be adequate for CAT III operations (NOTAMs and automated terminal information service (ATIS), as well as the status of the airfield, runways, NAVAIDs, lighting systems, and RVR reporting systems).

J. Approval of Aerodromes and Runways. The aerodromes and runways approved for CAT III operations for a particular operator and aircraft are authorized in OpSpec C60 of the standard OpSpecs, as applicable. Any restrictions or limitations related to the operation of a particular aircraft at a particular runway must also be specified in these paragraphs. Inspectors shall not authorize CAT III operations to any runway unless that runway is approved for CAT III operations for that aircraft type. When evaluating and approving an operator's overall CAT III program, an Inspector must consider the program's ability to account for at least the following factors in designating aerodromes and runways to support its CAT III operations.

• The suitability of the runways, runway field lengths, taxiways, and other maneuvering areas on the aerodrome considering the seeing-conditions associated with these operations

• The CAT III instrument approach procedures authorized, and the NAVAIDs required for these operations

• Procedures for CAT III protection of the runway safety areas, obstacle-free zones, obstacle critical areas, ILS critical areas, and the runway/taxiway incursion prevention procedures (This also includes procedures to control and regulate the ground movement of aircraft and vehicles in these restricted seeing-conditions.)

• The ATC facilities and services required for CAT III operations

• Safety facilities and services (for example, crash, fire, and rescue) required and any special procedures needed for these operations

• RVR reporting and weather reporting/forecasting services required

• Aeronautical information services (such as NOTAMs, ATIS) required for these operations

• Adequacy of lighting, marking, and other visual aids necessary to support these operations

K. Airborne Equipment Required for CAT III Operations.

1) The airborne equipment required for CAT III operations is based on the building block approach. The CAT III equipment requirements are based on the foundation provided by the basic CAT I and CAT II equipment requirements. This subparagraph only addresses the additional equipment, which must be serviceable for CAT III operations. The only acceptable means of obtaining airworthiness approval for CAT III operations is type design approval, which is usually obtained during aircraft certification testing.

2) The only aircraft, which are currently authorized to conduct CAT III operations, have been evaluated and approved for these operations during aircraft type certification testing. These aircraft have received type design approval for CAT III operations and further operational demonstration of airworthiness is unnecessary. The equipment required to conduct CAT III operations with these aircraft is determined by comparing the equipment specified by the approved aircraft flight manual for CAT III operations with the equipment specified in FAA AC 120-28 (as amended) for these operations. All of the CAT III equipment specified in the aircraft flight manual is required. Any additional equipment specified in FAA AC 120-28 (as amended) is also required for these operations. Therefore, both the approved aircraft flight manual and FAA AC 120 28 (as amended) must be considered in determining the required equipment.

L. CAT III Pilot Training Program. The operator's approved training and qualification program must provide the flight crews with the CAT III skills, knowledge, proficiency, and qualification necessary to safely conduct CAT III operations. The use of the stabilized approach concept is mandatory for all CAT III operations. The training and qualification curriculum changes necessary for CAT III operations are directly related to the need for increased precision in flightpath control due to the reduced seeing-conditions encountered in these operations.

1) The CAT III ground training curriculum segments must include the following:

• Required ground based visual aids

• Required ground based electronic aids

• Threshold crossing height (TCH) requirements for that particular aircraft

• Required airborne equipment

• Authorized minima

• Controlling RVR requirements

• Limitations and use of RVR information

• CAT III critical areas and the critical need to protect these areas

• Required crew duties and responsibilities

• Seeing-conditions associated with the transition from instrument to visual flight

• Essential nature of maintaining a full-time instrument reference by one pilot throughout the approach and landing

• Critical nature of proper eye reference position (proper sitting height)

• Required pilot training and qualifications

• Methods for determining that the aircraft is airworthy for CAT III operations, and

• Dispatch/flight release requirements

2) The flight training requirements depend on the equipment installed (autoland or HGS), the operating procedures used, and the kinds of CAT III operation authorized (fail passive or fail operational). The primary objective of the flight training is to ensure that the flight crew has the skills, knowledge, proficiency, and qualifications necessary to meet the operational concepts and criteria for CAT III operations. The flight crews must also be able to demonstrate in flight, or through an acceptable simulation, the competence necessary to safely conduct these operations. To satisfactorily demonstrate competence, the pilot must successfully accomplish the required maneuvers in accordance with the policies, criteria, procedures and crew duties specified in this handbook, FAA AC 120-28 (as amended), and the specific operator's operating manuals and approved qualification program. The CAT III flight training curriculum segment must include sufficient flight training to permit pilots to acquire the knowledge and develop the skills and abilities necessary to demonstrate competence in the following areas (see FAA AC 120-28 (as amended) for additional guidance):

• Determination of AH and/or DH, including the use of RAs and, if appropriate, the inner markers

• Recognition of, and proper reaction to, significant CAT III system failures before passing the AH or DH, as appropriate

• Proper missed approach techniques and the expected height loss as it relates to manual or automatic go-around and the go-around initiation altitude

• The use and limitations of RVR information, including determination of controlling RVR and the number and locations of the RVR reporting systems required

• The availability and limitations of external visual cues during the latter stages of the approach, flare, and landing

• Proper procedures to be used for unexpected deterioration of seeing-conditions (to less than the authorized RVR) during approach, flare, and rollout

• Achieving the proper eye reference position (proper sitting height) and the expected external visual references with the weather at authorized minima

• The appearance and expected sequence of visual cues during approaches and landings at the authorized minima

• The effects of vertical and horizontal wind-shear (in CAT III weather conditions) on system performance, the proper procedures to be used in these wind-shear encounters, and the wind limitations for these operations

• The proper procedures for transitioning from instrument to visual flight

• Recognition of the limits of acceptable aircraft position and flightpath tracking in the approach, flare, and landing with special emphasis on tracking performance in the decision region

• Recognition of, and reaction to, significant airborne or ground system faults or abnormalities during the approach, flare, and landing

3) Each pilot in command (PIC) and second in command (SIC) used in CAT III operations must satisfactorily demonstrate the ability to safely conduct CAT III operations to either a company check pilot or a GACA Inspector during initial and recurrent CAT III qualification. The events and/or maneuvers which must be demonstrated depend on the airborne equipment installed, the kinds of CAT III operations authorized, and the crew duties and responsibilities used by that operator. See FAA AC 120-28 (as amended) for a more detailed description of these requirements.

M. Operations Manuals, Crew Duties, and Responsibilities. The operator’s manuals must contain clear and concise policy, criteria, guidance, and direction to its flight crews and other persons involved in its CAT III operations. To be acceptable, these manuals must meet the criteria of the GACARs, this handbook, and the appropriate CAT III advisory circulars. These manuals must adequately address the following:

• Aerodrome and runway requirements, including the additional runway field length required

• Airborne and ground based equipment required for the various minima

• Methods for determining that the aircraft is airworthy for the intended operation, including MEL/CDL requirements

• Flight crew procedures, crew duties and responsibilities

• Instrument approach procedures and minima authorized

• Pilot training and pilot qualifications

• Any operating restrictions or limitations necessary to safely conduct these operations (see FAA AC 120-28 (as amended) for further information)

N. Maintenance Program. Before approving the operator's proposal, the Inspector must ensure that the operator's CAT III maintenance program includes the special airborne equipment and procedures required for CAT III operations. Close coordination with the principal maintenance inspector (PMI) is essential before granting operational approval. The Inspector shall not issue OpSpecs that authorize CAT III operations until all requirements are met. This includes approval of the operator's CAT III maintenance program for the particular aircraft involved.

5.2.7.23. OPERATIONS SPECIFICATIONS FOR CAT III OPERATIONS. CAT III AWTA operations approvals are granted by issuance or amendments to OpSpecs. The authorizations, limitations, and provisions applicable to CAT III operations for a particular aircraft's use by an operator must be specified in OpSpecs C60, as may be appropriate. Inspectors shall not, under any circumstances, issue OpSpecs approving any particular CAT III operation until all requirements are met (including the PMI's approval of the operator's CAT III maintenance program for that aircraft) and until the operator is currently capable of commencing safe CAT III operations.

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 8. Detailed CAT II and CAT III Approval Guidance

5.2.8.1. GACA ACTIVITY REPORT (GAR). Principal operations inspectors (POIs) shall make a GAR entry to record the actions directed by this section. The GAR entry shall be listed according to the applicable phase as annotated below. POIs should use the comments section to record comments of interaction with the operators. The applicable GAR codes for this task are as follows:

A. 1430 (OP) (Category II/III OPS Phase I)

B. 1431 (OP) (Category II/III OPS Phase II)

C. 1432 (OP) (Category II/III OPS Phase III)

D. 1433 (OP) (Category II/III OPS Phase IV)

E. 1434 (OP) (Category II/III OPS Phase V)

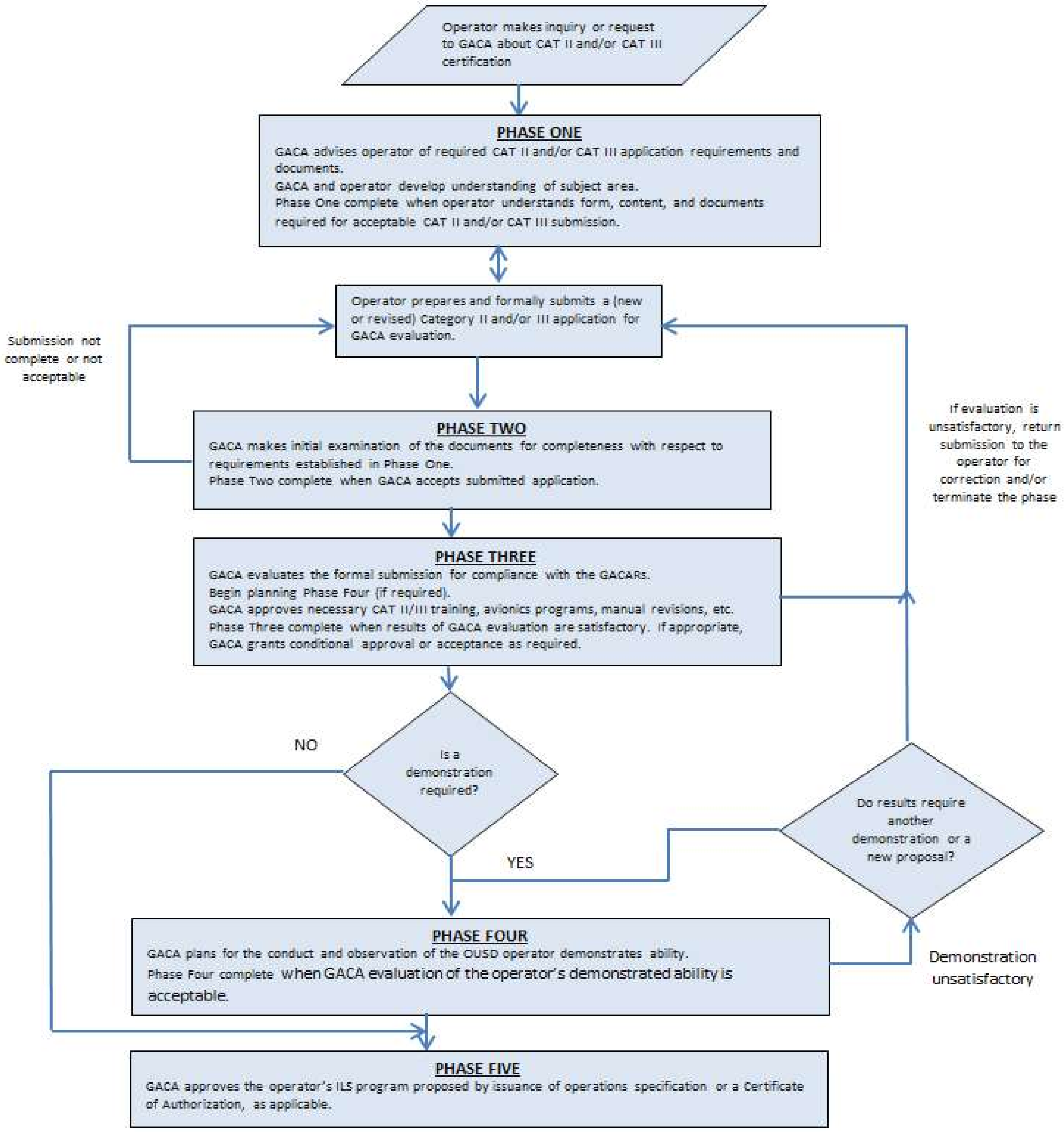
5.2.8.3. OBJECTIVE. The objective of this task is to evaluate an operator’s ability to conduct instrument Category (CAT) II and/or III approach operations, as applicable.

5.2.8.5. APPLICABILITY.

A. Purpose. The purpose of this section is to provide guidance to principal inspectors (PIs) on the authorization of operators to conduct ILS CAT II or CAT III approach operations. The POI authorizes ILS CAT II and III approvals through operations specifications (OpSpecs). This process applies to all Kingdom of Saudi Arabia (KSA) operators who pursue CAT II/III operational approval.

B. Background. The general process of approval or acceptance of certain operations, programs, documents, procedures, methods, or systems is an orderly method used by aviation safety inspectors (Inspectors) to ensure that such items meet regulatory standards and provide for safe operating practices. It is a modular, generic process that is ideally suited for the approval of CAT II/III programs that are solicited by operators from the General Authority of Civil Aviation (GACA). The process consists of five distinct yet related phases and can result in approving or not approving an operator’s CAT II and/or CAT III application. It is important for an Inspector to understand that the process described in this section is not all-inclusive, but rather a tool to be used with good judgment in conducting day-to-day duties and responsibilities. A flow diagram of the process is found below in Figure 5.2.8.1.

Figure 5.2.8.1. CAT II/III Evaluation and Approval Process Flow Diagram



C. Phase One. Phase One starts when an operator inquires about the requirements necessary for achieving CAT II and/or III certification. During initial inquiries, it is important for the operator to become familiar with the subject matter. An excellent means of accomplishing this is for the operator to be required to submit a Compliance Statement (see Figure 5.2.8.8) that addresses every pertinent section of the appropriate CAT II or CAT III Federal Aviation Administration (FAA) Advisory Circular (AC). The contents and structure of the compliance statement will be specifically covered in paragraph 5.2.8.15, of this section.

NOTE: It is essential (particularly in Phase One) for the operator to have a clear understanding that although the Inspector may provide advice and guidance to the operator, the development of the final product submitted to the GACA is solely the responsibility of the operator.

1) In Phase One the Inspector must ensure that the operator clearly understands the form, content, and documents required for the CAT II and/or CAT III submission to be acceptable to the GACA. The operator must be informed of the need and benefits of submitting required documents as early as possible and of its responsibility to advise the GACA, in a timely manner, of any significant changes in the proposal.

2) Phase One of the process is illustrated as follows:

• Operator makes inquiry or request to GACA about CAT II and/or CAT III certification

• GACA advises operator of required CAT II and/or CAT III application requirements and documentation

• GACA and operator develop understanding of subject area

• Operator understands form, content, and documents required for acceptable CAT II and/or CAT III submission

D. Phase Two. Phase Two begins when the operator formally submits a CAT II and/or CAT III application for GACA evaluation.

1) The Inspector's first action in Phase Two is to evaluate the operator's submission to ensure that the proposal is clearly defined, and the documentation specified in phase one has been provided. The required information must be complete and detailed enough to permit a thorough evaluation of the operator's capability and competence to fully satisfy the applicable regulations, national policy, and safe operating practices required to conduct CAT II/III operations.

2) Phase Two does not include a detailed operational and technical evaluation or analysis of the submitted information (see Phase Three). However, in Phase Two the submission must be examined in sufficient detail to assess the completeness of the required information. If the operator's submission is not complete or the quality is obviously unacceptable, it must be returned immediately with an explanation of the deficiencies, before any further review and evaluation is conducted. Normally, unacceptable submissions should be returned with a written explanation of the reasons for its return.

3) In complex cases, a meeting with the operator and its key personnel may be necessary to resolve issues and agree on a mutually acceptable solution. If mutual agreements cannot be reached, the Inspector must terminate the meeting, inform the operator that the submission is unacceptable, and return the submission. If all parties are able to reach agreement on measures to correct omissions or deficiencies, and the Principal Inspectors (Operation and Airworthiness) determine that the submission is acceptable, the operator will be so informed, and Phase Three begins.

4) Phase Two of the process is illustrated as follows:

• Operator submits application

• GACA makes initial examination of the documents for completeness with respect to requirements established in Phase One

• GACA returns submitted application

- or -

• GACA accepts submitted application

NOTE: It is important for the Inspector involved to keep the operator advised of the status of its proposal. If the Inspector takes no other action, or if the submission is deficient and not returned in a timely manner, the applicant may assume that the GACA has tacitly accepted the submission and is continuing with the process.

E. Phase Three. Phase Three is the GACA's detailed analysis, review, and evaluation of the operator's proposal. These actions may take place within the GACA office, at the operator's facilities, or at a combination of all these locations.

1) In Phase Three the GACA evaluation is focused on the form, content, and technical quality of the submitted application to determine that the information in the proposal meets the following criteria:

• Is not contrary to any applicable GACAR

• Is not contrary to the direction provided in this document or other safety-related documents

• Provides for safe operating practices

2) Criteria for evaluating the formal application is found in paragraphs 5.2.8.9 through 5.2.8.15 of this section, and follows the general guidance contained in the CAT II/III Job Aid. The Inspector must ensure that the documents adequately establish the operator's capability and competence to safely conduct CAT II/III operations in accordance with the submitted application.

3) During Phase Three the GACA Inspector must, in a timely manner, address any deficiencies in the submitted material before proceeding to subsequent phases. Discussion with the operator may be sufficient to resolve certain discrepancies or questions or to obtain additional information. It may be necessary to return certain sections of the submission to the operator for specific changes. However, when an Inspector determines that, for specific reasons, the material is grossly deficient or unacceptable; the Inspector must return the entire submission to the operator with an appropriate explanation and immediately terminate this phase.

4) An important aspect of Phase Three is for Inspectors to begin planning the conduct of Phase Four. While evaluating the operator's formal submission, Inspectors should begin to formulate plans to observe and evaluate the operator's ability to demonstrate their ability to conduct CAT II/II operations. These plans must be finalized before the actual demonstrations. Phase Three shall require that the GACA approve certain programs before conducting actual line operations in Phase Four. For example, in Phase Three the operator initiates GACA approved CAT II/III training and must have the avionics and airworthiness programs approved before conducting actual line operations.

NOTE: Most of the submitted materials evaluated during Phase Three (Training Programs, Manuals, etc.) shall be evaluated in accordance with the policy and guidance contained in Volume 5 of this handbook.

5) Phase Three is illustrated as follows:

• GACA evaluates the formal submission for compliance with the GACARs, compliance with the direction provided in this document, other safety-related documents and safe operating practices

• When results of the GACA evaluation are unsatisfactory, return submission to the operator for correction and/or terminate the phase

• Begin planning Phase Four (if required)

• GACA approves necessary CAT II/III training, manual revisions, etc.

• When results of the GACA evaluation are satisfactory, proceed with Phase Four and if appropriate, grant conditional approval or acceptance as required

F. Phase Four. Phase Four is referred to as the Operator Use Suitability Demonstration (OUSD) in FAA ACs 120-28 (as amended) and AC 120-29 (as amended), respectively. In the generic five-phase operational approval process it replaces the term "Validation Test". Phase Four is the line operational evaluation of the operator's ability to conduct CAT II/III operations in accordance with the application evaluated in Phase Three.

1) Criteria and procedures for evaluating the OUSD are described in paragraph 5.2.8.17 of this section. The Inspector responsible for overseeing the demonstration must evaluate any discrepancies in terms of its overall impact on the operator's ability and competency to conduct the proposed operation. The Inspector must stop the demonstration in Phase Four when gross deficiencies or unacceptable levels of performance are observed. The Inspector must identify the phase of the general process for approval or acceptance to which the applicant must return, or decide to terminate the process entirely when it is clear that continuation would not result in approval or acceptance. For example, if the demonstration is unacceptable because crew members were unable to perform their assigned duties, it may be appropriate to advise the operator that the process is terminated pending review and evaluation of the operator's CAT II/III training program, and that the operator may need to reenter the process at Phase Two (that is, submit a new proposal).

2) If the GACA evaluation of the operator's demonstrated ability is acceptable, the process continues. Phase Four of the process is illustrated as follows:

• GACA plans for the conduct and observation of the demonstration

• Operator demonstrates ability

• Demonstration unsatisfactory

- or -

• Demonstration satisfactory

NOTE: An operator shall not, under any circumstances, be authorized or otherwise approved to conduct any particular operation until all airworthiness and operations requirements are met and the operator is clearly capable of conducting a safe operation in compliance with the GACARs and safe operating practices.

G. Phase Five. In Phase Five the GACA approves the operator's program proposal. If the proposal is not approved or accepted, the operator is notified in Phase Three or Four. Approval is granted by issuance of operations specifications (OpSpecs).

5.2.8.7. REQUIREMENTS: PREREQUISITES AND COORDINATION.

A. Prerequisites. This task requires knowledge of air traffic services (ATS) operational requirements, knowledge of GACA certification rules, policies, operational system requirements, knowledge of reduced visibility flight operations, aircraft systems, and certification requirements.

B. Coordination. This task may require coordination with the operator, training vendors and aircraft/avionics manufacturers.

5.2.8.9. REFERENCES, FORMS, AND JOB AIDS.

A. References.

1) General Authority of Civil Aviation Regulation (GACAR):

- Part 91
- Part 97
- Part 121
- Part 135
- Part 172

2) FAA Advisory Circulars (ACs):

- FAA AC 120-28 (as amended), Criteria for Approval of CAT III Weather Minima for Takeoff, Landing and Rollout
- FAA AC 120-29 (as amended), Criteria for Approving CAT I and CAT II Landing Minima for 14 CFR Part 121 Operators

B. Forms.

- Figure 5.2.8.3, Sample Letter of Intent to Conduct CAT II or III Operations
- Figure 5.2.8.6, Sample Letter of Disapproval of a CAT II/IIIa Application
- Figure 5.2.8.8, Example Compliance Statement

C. Job Aids.

• Figure 5.2.8.1, CAT II/III Evaluation and Approval Process Flow Diagram

• Figure 5.2.8.2, CAT II/III Approval Job Aid (Operations)

• Figure 5.2.8.4, Flight Operations Job Aid Example

• Figure 5.2.8.5, Sample Letter of Disapproval of a CAT II/IIIa Application

• Figure 5.2.8.7, Autoland Messages on ACARS, Page 2 of Flight Summary

• Table 5.2.8.1, Typical Minima Step Down Approval Examples

NOTE: An example of the CAT II/III Job Aid is included in Figure 5.2.8.2, below. For the most recent version of both of the FAA's Job Aids (Operations and Airworthiness), refer to the FAA web site at: http://www.FAA.gov.

Figure 5.2.8.2. CAT II/III Approval Job Aid (Operations)

CAT II/III APPROVAL JOB AID			
OPERATOR NAME:			
GACAR PART: 121 _____ 125 _____			**Date:**
Previous CAT II: Yes o No o CAT III: Yes ____ No ____			
Check Mark	**FLIGHT OPERATIONS**		**Operator's Reference Document**
	1.	**OPERATOR PROCEDURES**	
	1.A	Type of Operation	
	1.B	CAT II and CAT III Instrument Approach Procedures	
	1.C	AFM/FOM/POH/QRH Provisions, as applicable	
	1.D	Crew Coordination and Monitoring Procedures	
	1.E	Callouts	
	1.F	Use of DA (H) and MDA (H)[Fail Passive])	
	1.G	Use of Alert Height (AH)[Fail Active]	
	1.H	Crew Briefings	
	1.I	Configurations	
	1.J	Non-Normal Operations and Procedures	
	1.K	Special Environmental Considerations (as applicable)	
	1.L	Continuing CAT II/ III Approaches in deteriorating Weather C	
	1.M	Dispatch Planning and MEL/CDL Requirements	
	1.N	Aircraft System Suitability Demonstration (as required)	
	1.O	Operator Use Suitability Demonstration	
	1.P	Data Collection/Analysis for Airborne System Demonstrations	
	1.Q	Operational Procedure for Return to Service	
	2.	**TRAINING AND CREW QUALIFICATION**	
	2.A	Initial Training	
	2.B	Recurrent Training/Qualification	
	2.C	Upgrade Training	
	2.D	Requalification Training	
	2.E	Recency of Experience	
	2.F	Differences Training	
	2.G	Simultaneous Training and Qualification for Cat II and III	
	2.H	Ground Training Curriculum Segment	
	2.I	SMGCS Training	
	2.J	Flight Training Curriculum Segment	
	2.K	Maneuvers and Procedures Document	

	2.L	Initial Qualification	
	2.M	Low Visibility Takeoff Qualification	
	2.N	Multiple Aircraft Type or Variant Qualification (as applicable)	
	2.O	Special Qualification Aerodromes (as applicable)	
	2.P	High Limit Captain Procedures	
	2.Q	Line Checks	
	2.R	Crew Records and Notification System	
	3.	**AIRCRAFT AND EQUIPMENT**	
	3.A	Airborne Systems for Cat II	
	3.B	Airborne Systems for Cat III	
	3.C	Automatic Flight control and Landing Systems	
	3.D	Flight Director Systems	
	3.E	Head up Guidance Systems	
	3.F	Enhanced/Synthetic Vision Systems	
	3.G	Hybrid Displays	
	4.	**OPERATIONS SPECIFICATIONS**	
	4.A	Approval of CAT II/III Minima and Issuance of Operations Specifications	
	4.B	Operations Specifications Amendments	
	5.	**OPERATOR'S DOCUMENT APPLICATION PACKAGE**	
	5.A	Aircraft Operations Manual (Pertinent parts)	
	5.B	Flight Operations Manual (Pertinent parts)	
	5.C	Compliance Documents	
	5.D	Flight Operations Training Manual	
	5.E	Requested Operations Specifications	
	5.F	Implementation Timetable	
	5.G	Minimum Equipment List (MEL)	
	5.H	Operator Use Suitability Demonstration (OUSD) Plan	
	5.I	Application Letter	

NOTE: Most of the submitted materials evaluated during Phase Three (Training Programs, Manuals, etc.) shall be evaluated in accordance with the policy and guidance contained in the applicable sections of this handbook.

5.2.8.11. INSPECTOR PROCEDURES.

A. Authorizing OpSpec for Operators to Conduct ILS CAT II. POIs authorize issuance of appropriate OpSpec for operators to conduct ILS CAT II and III procedures. The purpose of this task is for the POI to authorize issuance of the appropriate OpSpec (or a letter of disapproval of application for the OpSpec) for operators to conduct ILS CAT II and III operations.

1) It must be emphasized that the principal points of contact with the operator are the POI and the PMI. Any errors or corrections discovered during the evaluation must be channeled through those PIs back to the applicant. This process will ensure consistency and continuity.

2) The acceptable task performance standard is that the CAT II/III OpSpecs, as applicable, are issued in a timely manner.

B. Initial Inquiry (Phase One).

1) Upon initial inquiry, determine the type of operation proposed by the applicant and which of the following apply:

a) Type of operator: GACAR Part 121 or 125.

b) CAT II operations.

c) CAT IIIa, CAT IIIb operations.

d) Type of Operation (Autoflight/Autoland, HGS, etc.).

e) Previous CAT II/III experience (yes/no).

2) Advise the applicant to submit a letter of intent (Figure 5.2.8.3). The letter of intent (LOI) should be submitted before the formal application so the GACA can dedicate appropriate resources for the evaluation of the application.

Figure 5.2.8.3. Sample Letter of Intent to Conduct CAT II or III Operations

[Date]

[Address]

Dear Inspector:

ABC Airlines operates 26 B-737-800 aircraft as a GACAR Part 121 operator with our Operational Headquarters located in Riyadh, Saudi Arabia. We conduct scheduled operations throughout the Gulf Region. Because of the predominant inclement weather (fog) during certain months of the year, we find it necessary to conduct Instrument Landing System (ILS) approaches at many of our coastal stations.

During our last 2 years of operations, we have experienced an unacceptable rate of missed approaches especially during the fall and winter months.

Our aircraft are equipped with state of the art avionics system that is certified by the OEM (Boeing) to conduct CAT II/IIIa operations.

Please consider this ABC's letter of intent to apply for unrestricted CAT II and CAT IIIa flight operations. We look forward to your advice and guidance on this very important endeavor.

Sincerely,

Captain Bo Sharp,
Director of Operations

3) Provide the applicant with a copy of FAA AC 120-29 (as amended) (for CAT II applicants), and FAA AC 120-28 (as amended) (for CAT III applicants), or advise the applicant on how to obtain a copy of these ACs.

4) Provide the applicant with copies of the latest versions of CAT II/III Job Aids and advise the applicant of the information contained on the FAA web site at: http://www.FAA.gov. Explain the job aid to the applicant with particular emphasis on what the contents of the application include, what a compliance statement consists of (see paragraph 5.2.8.15), and what the Operator Use Suitability Demonstration (OUSD) entails (see paragraph 5.2.8.17). Advise the applicant that the application package should be distinctly divided into an airworthiness section and an operations section for evaluation purposes.

5) Advise the applicant of the importance of committing resources in developing the application package and that, even if a perfect package is submitted, the time line requirement (after package approval) will be a minimum of 6 months for CAT II and an additional six months for CAT III OpSpecs issuance due to the OUSD requirements.

NOTE: The time line may be significantly compressed for operators with CAT II/III experience if they are requesting approval of a different M/M/S of aircraft than has previously been approved for the operator.

6) Advise the applicant to name the company's central point of contact, and provide telephone and fax contact numbers as early as possible.

7) Make appropriate GAR entries. Note the date the letter of intent (if applicable) was sent for review.

C. Receipt of Application (Phase Two).

1) Upon receipt of the formal application, the first task is to inventory the contents of the package by referencing

the respective operations and airworthiness job aids sections entitled, Operator’s Document Application Package. If any of the documentation is missing or appears incomplete, the evaluation process may begin on the remaining documents.

2) Timely notification to the operator on the documents that or missing or incomplete should be made as soon as practical.

D. Evaluating the Formal Application Package (Phase Three).

1) Begin the evaluation of the applicant’s package by entering the operator’s name and applicable GACAR type of operation on the Job Aid.

2) Then following the Job Aid line by line, enter the appropriate page or section from the operator’s documents into the Operator’s Reference Document column. Note the Job Aid has linked references to ACs, regulations, and Orders that will provide additional guidance during the conduct of the evaluation. Figure 5.2.8.4, following, is a representative section of the Flight Operations Job Aid Illustrating how entries are made by the reviewing Inspector.

Figure 5.2.8.4. Flight Operations Job Aid Example

✓		FLIGHT OPERATIONS	Operator's Reference Document
	1	**OPERATOR PROCEDURES**	OM = Operations Manual
✓	1.A	Type of Operation	OM, 1.1.0 & 1.2.0
✓	1.B	CAT II and CAT IIIA Instrument Approach Procedures	OM, 1.4, 1.5 and 1.6
?	1.C	AFM/FOM/POH/QRH Provisions, as applicable	Need pertinent portions
✓	1.D	Crew Coordination and Monitoring Procedures	OM Chapter 1
✓	1.E	Callouts	OM Chapter 1
✓	1.F	Use of DA(H) and MDA (H)[Fail Passive])	OM Chapter 1
✓	1.G	Use of Alert Height (AH)[Fail Active]	Not applicable
✓	1.H	Crew Briefings	OM Chapter 1
✓	1.I	Configurations	OM Chapter 1
✓	1.J	Non-Normal Operations and Procedures	OM Chapter 1
✓	1.K	Special Environmental Considerations (as applicable))	Not covered
✓	1.L	Continuing CAT II/ IIIA Approaches in deteriorating Weather Conditions	OM Chapter 1
?	1.M	Dispatch Planning and MEL/CDL Requirements	No CAT II list (OM 3.1.3)
✓	1.N	Aircraft System Suitability Demonstration (as required)	Not applicable
?	1.O	Operator Use Suitability Demonstration	Need OUSD plan
?	1.Q	Operational Procedure for Return to Service	No clear procedure found
?	1.P	Data Collection/Analysis for Airborne System Demonstrations	Need OUSD plan

3) While the job aids provide a systematic, standardized approach to conducting the evaluation, they do not provide sufficient depth and scope to capture areas that are identified as needing additional work. These areas may be complex and need further clarification, or be as simple as typographical errors that require correction.

4) The Inspector should initiate and maintain a separate comment document list of findings while conducting the evaluation.

5) During the evaluation, if any documents or other relevant parts of the application require correction, are missing, or are incomplete, the applicant should be notified immediately. Normally documents should not be returned to the applicant unless so requested. This facilitates the ability to compare newly revised material with its earlier version. A log should be kept by the reviewing Inspector to maintain a historical record of telephone conversations, e-mails, or other forms of correspondence that occur during the evaluation period. However if the majority of the application package is deemed to be unacceptable to the Inspector, it should be returned with a letter of disapproval (Figure 5.2.8.5)

E. The Demonstration Phase (Phase Four). Phase Four is referred to as the Operator Use Suitability Demonstration (OUSD). This Phase begins after the POI has received concurrence from the AWOPM that the operator's application package is in order and has been approved. The OUSD plan submitted with the application is the primary vehicle used for conducting this phase. Guidance for the OUSD and an example of an acceptable OUSD plan are contained in paragraph 5.2.8.17.

F. The Approval Phase (Phase Five). OpSpec authorizations are issued in accordance with the guidance, direction and procedures found in Volume 15.

Figure 5.2.8.5. Sample Letter of Disapproval of a CAT II/IIIa Application

To: ABC Airlines

Subject: ABC Airlines Inc. B-737-800, CAT II/IIIa Operations

From: POI

This is to inform you that the CAT II/IIIA application package submitted on [indicate date] has been disapproved for the following reasons:

[list reasons for disapproval]

The application package is being returned in its entirety. Please make the corrections noted and resubmit to this office within 15 days of receipt of this letter. If you have any questions, please feel free to contact this office during regular business hours [indicate hours] at the following telephone number [indicate number].

If you have any further questions concerning this matter please contact Primary Operations Inspector [name] at [phone number].

Sincerely,

[POI's signature]

5.2.8.13. PREPARATION OF A COMPLIANCE STATEMENT.

A. Compliance Statement. Any operator that has no previous experience with ILS CAT II/III operations shall prepare a Compliance Statement. Operators with previous CAT II/III approved programs are not required, but are encouraged to submit a compliance statement or an amendment to a previously submitted compliance statement.

1) Preparation of the compliance statement benefits the applicant by systematically ensuring that all applicable areas are appropriately addressed during the evaluation process. The compliance statement shall be in the form of a complete listing of all appropriate FAA AC 120-29 (as amended) and/or AC 120-28 (as amended) sections pertinent to the operation the applicant is proposing.

2) Next to each listing, the applicant must provide a specific reference to a manual or other document in the application package, and may provide a brief narrative description that describes how the applicant will comply with each section. The compliance statement also serves as a master index to the applicant's manual system to expedite the GACA's review and approval of the operation and manual system. The compliance statement is an important source document during the evaluation process.

3) After the evaluation process is completed, the compliance statement should be kept current as changes are incorporated in the applicant's system. Compliance statements should be prepared as a two-volume application. Volume I should contain the AC reference by section (i.e., FAA AC 120-29 (as amended), Section 6.1.8) and provide the location in the operator's source document (i.e., AFM, Section 2.4, page 36, an example only). Volume II should contain all the relevant operator documents pertaining to the operator's application package.

NOTE: Examples of the compliance statement format are provided in Figure 5.2.8.6, below:

Figure 5.2.8.6. Compliance Statement Examples

Example 1. Compliance Statement, Table of Contents

> **NOTE: The table of contents in the operator's application package should mirror the table of contents contained in FAA ACs 120 29A and AC 120 28D, as follows**.

Lower Minimum Program (LMP) Application

CAT II and CAT IIIa Automatic Landing Operations

TABLE OF CONTENTS

Volume I

1. General
2. Related References and Definitions
3. Background
4. Operational Concepts
5. Airborne System Requirements
6. Procedures
7. Training and Crew Qualifications
8. Aerodromes, Navigation Facilities and Meteorological Criteria
9. Continuing Airworthiness/Maintenance
10. Approval of KSA Operators
11. Operator Reporting, and Taking Corrective Actions

Example 2. Compliance Statement: Section 1 (above), General

ABC Airlines, Inc. Lower Minimum Program (LMP) Application

CAT II and CAT IIIa Automatic Landing Operations

GENERAL

1. The ABC Airlines, Inc. Lower Minimum Program (LMP) Application Volumes I and II are prepared, and hereby submitted to demonstrate compliance with the GACA directives pertaining to CAT II, IIIa and Autoland operations for the purposes of

receiving GACA approval via Operations Specifications.

2. Per the requirements contained in GACAR §§ 91.397 (Standard CAT II), 91.399 (OTS CAT II), 91.401 (Standard CAT III) and FAA AC 120 28D and AC 120 29A, ABC Airlines, Inc. requests the issuance of Operations Specifications (OpSpecs) C59, C60, and C61 for the B 737 800. Samples of these OpSpecs are included at the end of this General section. These Operations Specifications are necessary to authorize automatic landings and CAT II operations to a decision height (DH) of 100 feet and a corresponding RVR 350m. CAT IlIa operations to a DH of 50 feet and RVR 200m are simultaneously applied for and here incorporated. FAA Advisory Circular 120 28D section 10.12, page 81, Initiating New Combined CAT II and CAT IIIA programs, sets forth the acceptable provisions for the ABC Airlines combined LMP application methodology.

3. The Compliance Table (Section 1, Page 2, Table 1) sets forth each prerequisite on the following pages. FAA AC 120 29A and AC 120 280 are referenced throughout.

4. This application is constructed in a manner that demonstrates compliance with each applicable paragraph of FAA AC 120 29A and section of AC 120 28D. ABC Airlines, Inc. compliance statements begin in Volume 1, Section 2, and page 1 of this application. Paragraphs/sections listed under the Advisory Circular Reference column describe how ABC Airlines, Inc. has achieved compliance with FAA AC 120 29A and AC 120 28D. A Source Document column lists the reference document title, section/chapter and page numbers.

WEATHER MINIMA OBJECTIVES

1. ABC Airlines, Inc. seeks an initial automatic landing authorization with CAT I landing weather minima or better and decision height. After a satisfactory number of autolands have been demonstrated, ABC Airlines Inc. seeks CAT II minima (100 DH/RVR 350m).

2. After a minimum of 6 months and 100 landing demonstrations, ABC Airlines, Inc. seeks provisional CAT IIIA minima of not less than 100 feet above the touchdown zone and not less than RVR 300m.

3. Pending completion of the Provisional CAT IIIa demonstration period (minimum 6 months/100 landing demonstrations) ABC seeks CAT IIIA landing weather minima of not less than 50 feet above the touchdown zone and not less than RVR 200m.

4. For CAT II, Provisional CAT IIIa, and CAT IIIa a reduction in the required number of landing demonstrations may be requested in accordance with FAA AC 120 28D, Section 10.5.2.

Example 3. Compliance Statement: Compliance Statement Format (Operations)

SECTION 3. BACKGROUND (Operations)

Advisory Circular Reference	Source Document	GACA Comments
Major Changes Addressed in this Revision (FAA AC 120-29A & AC 120-28D) ABC Airlines, Inc. does not seek approval for low visibility approaches using: Head-up Displays, Use of Required Navigation Performance (RNP), Satellite based Navigation, Engine Inoperative CAT II or IIIA approaches, or Wide-body Fail Passive operations.	AC 120-29A, Paragraph 3.1, page 2 AC 120-28D, Section 3.1, page 2 B-737-800 FOTM, page 4.19	
Relationships of Operational Authorizations for CAT I, II or IIIa and Airborne System Demonstrations (FAA AC 120-29A & AC 120-28D) The B737-800 is Type Certified (TC) by the Original Equipment Manufacturer (OEM) as a CAT IIIA aircraft. No initial airworthiness demonstration of airborne equipment and systems is required.	AFM, Section 1, page 15 AFM, Section 3, pages 4A, 5, 5A, 6	
Applicable Criteria (FAA AC 120-29A & AC 120-28D) ABC Airlines, Inc. will comply with FAA AC 120-29A and AC 120-28D criteria.	AC 120-29A, Paragraph 3.3, page 2 AC 120-28D, Section 3.3, page 3	
CAT I, II. and IIIa Terminology (FAA AC 120-29A) ABC Airlines, Inc. CAT I, II, and IIIA definitions are consistent with GACA Operations Specifications,	AC 120-29A, Appendix 1, pages 1-18	

SECTION 4. OPERATIONAL CONCEPTS (OPERATIONS)

Advisory Circular Reference	**Source Document**	**GACA Comments**
Classification and Applicability of Minima (FAA AC 120-29A & AC 120-28D) ABC Airlines, Inc. is seeking CAT IIIa operations. ABC Airlines, Inc. will be conducting operations using approved autoland systems and procedures. There is no Proof of Concept (POC) required. The airplane and its associated systems have demonstrated the necessary level of accuracy, integrity, and availability. This was shown initially during airworthiness demonstrations during the type certification process. Compliance will be confirmed during the Operator Use Suitability Demonstration (OUSD) and will be monitored by ABC Airlines, Inc. on a continuing basis.	AFM, Section 1, page 18 AFM, Section 4, pages 4A, 5, 5A, 6, 7	
Takeoff Minima (FAA AC 120-29A & AC 120-28D) ABC Airlines, Inc. takeoff minima are in accordance with Operations Specifications C56 and C78 – Standard IFR Takeoff Minimums - Airplane Operations - All Airports and IFR Lower Than Standard Takeoff Minima, GACAR part 121 Airplane Operations - All Aerodromes, respectively.	OpSpec C56 OpSpec C78	
Landing (FAA AC 120-29A & AC 120-28D) Approach and Landing Concepts and Objectives (FAA AC 120-29A) ABC Airlines, Inc. is currently a CAT I operator. By this application and approval process, ABC Airlines, Inc. is seeking authorization for CAT II approaches to a Decision Height (DH) of not less than 100 feet with a Runway Visual Range (RVR) of not less than 350m.	AC 120-29A, Paragraph 4.3.1, pages 4-5 AC 120-28D, Section 10.9, pages 79-80. AC 120-28D, Section 10.12, page 81.	

Example 4. Compliance statement: Format (Maintenance)

SECTION 9. CONTINUING AIRWORTHINESS/MAINTENANCE (AVIONICS)

Advisory Circular Reference	Source Document	GACA Comments
(15) Land Verify Test is required every 30 days to remain in CAT IIIa operational status	LLMCMP, page 5, Paragraph E.1.b.3 LLMCMP, pages 10-11, Paragraph F.1.b	
9.3 Initial and Recurrent Maintenance Training (FAA AC 120-29A)		
(a) ABC's CAT II/IIIa Personnel Maintenance Training program defines the LLMCMP policies and procedures for low visibility and lower landing minima operations. Personnel qualifications, syllabi, and recurrent training are outlined in the Maintenance Training Manual.	LLMCMP, page 9-10, Paragraph E.1.j TSAA Maintenance Training Manual, Section 6-02, page 22 TSAA maintenance Training Manual, Section 7-02, page 37	

NOTE: A detailed explanation of evaluating maintenance and inspection programs for low approach landing minima is found in Figure 5.2.8.1.

5.2.8.15. OPERATOR USE SUITABILITY DEMONSTRATION.

A. Introduction.

1) The purpose of the Operator Use Suitability Demonstration (OUSD) is to demonstrate and validate the reliability and performance of lower minimum programs (LMP) in line operations consistent with the operational concepts specified in FAA AC 120-29 (as amended) and AC120-28 (as amended), as applicable. Demonstration requirements are established considering any applicable FAA Flight Standards Board (FSB) Report criteria, applicability of previous operator service experience, experience with a specific aircraft type by other operators, experience of crews of that operator and other such factors. The demonstration period is six months long for each phase (CAT II and CAT III) to permit the GACA to evaluate the ability of the operator to maintain and operate its proposed LMP system. During the demonstration period at least 10 percent of the required number of landings should be observed by an appropriately qualified GACA Operations Inspector.

2) For CAT II, at least 100 landings should be accomplished, at least a 90 percent success rate, in line operations using the CAT II or CAT III system installed in each aircraft type, unless the Director, Flight Operations Division determines that fewer approaches are appropriate. Examples of situations where fewer approaches than 100 may be authorized by the GACA include credit for an operator also experienced in CAT II or III operations, addition of a different or new aircraft type for an operator when that aircraft type already has successful CAT II or III experience with a similar operator, or where the GACA has determined that fewer approaches may apply (e.g., certain long range aircraft using CAT III procedures and training, but with interim limitations to use CAT II minima). The demonstration period should not be less than 6 months for operators seeking CAT II authorization. Experienced CAT II operators may operate new or upgraded aircraft types/systems, or derivative types, using reduced length

demonstration periods (e.g., less than 6 months/100 landings) when concurrence is received by the POI from the Director, Flight Operations Division.

3) For CAT III, at least 100 successful landings should be accomplished in line operations using the low visibility landing system installed in each aircraft type applicable to the CAT III authorization. Demonstrations may be conducted in line operations, during training flights, or during aircraft type or route proving runs. The demonstration period should run for six months. Therefore, if an operator seeks CAT II initially and then CAT III subsequently, the total demonstration period will be 12 months.

4) CAT II and CAT III programs may be initiated simultaneously for new operators or for existing operators currently approved for CAT I. Appropriate provisions of both FAA AC 120-29 (as amended), as amended, and FAA AC 120-28 (as amended) are used. Operational Suitability Demonstration programs may be simultaneously conducted as long as procedures and systems applicable to both CAT II and CAT III minima are assessed (e.g., use of CAT II DH vs. CAT III AH). The total demonstration period in this case should be no less than six months for the operator to gain CAT II and CAT III authorization.

5) If an excessive number of failures (e.g., unsatisfactory landings, system disconnects) occur during the landing demonstration program, a determination should be made for the need for additional demonstration landings, or for consideration of other remedial action (e.g., procedures adjustment, wind constraints, or system modifications).

6) During the period following the issuance of new or revised operations specifications for CAT III (typically 6 months), the operator must successfully complete a suitable operations demonstration and data collection program in line service for each type aircraft, as the final part of the approval process.

B. Sample OUSD PLAN. What follows is an example of an OUSD plan that is acceptable to the GACA:

1) This Operator Use Suitability Demonstration (OUSD) Plan contains direction, and guidance to be utilized by ABC Airlines, Inc. personnel responsible for conducting and managing demonstration ILS coupled approach and automatic landings required for GACA issuance of OpSpec C59. It shall also provide applicable guidance and direction for required follow-on demonstration landings to be required for GACA issuance of OpSpec C60.

a) The Director of Operations is responsible for implementation of all operational procedures required by this OUSD plan. The Director of Maintenance is responsible for implementation of all maintenance procedures required by this OUSD plan. They are jointly responsible for providing routine and regular updates and feedback to ABC's POI and PMI. Operational/Airworthiness Demonstrations, Aircraft System Suitability and Operational Use Suitability demonstrations must be completed as described in FAA AC 120-29 (as amended): Criteria for Approving CAT I and CAT II Landing Minima for Approach, paragraphs 10.5.1 and 10.5.2, unless otherwise specified by the GACA. FAA AC 120-28 (as amended): Criteria for Approval of CAT III Weather Minima for Takeoff, Landing and Rollout, specifies similar OUSD requirements for CAT III approval. Once ABC is approved for CAT II operations this plan will be updated with the appropriate CAT III OUSD requirements. The purpose of these operational demonstrations is to determine or validate the use and effectiveness of the applicable aircraft flight guidance systems, training, flight crew procedures, maintenance program, and manuals applicable to the program being approved. ABC's B-737-800 approved AFM references both ACs as the criteria used as the basis for both CAT II and CAT III airworthiness demonstrations, therefore our B-737-800 fleet is already considered to meet the provisions of 10.5.1. This OUSD Plan is designed to address provisions of 10.5.2., requiring verification of operational use suitability for initial CAT II approval.

b) For CAT II authorization, at least 100 successful landings will be accomplished in line operations using the autoland system.

NOTE: It is a good practice to conduct at least one approach using the autoland system to each runway intended for CAT II operations in weather better than that requiring use of CAT II minima. Such demonstrations may be conducted in line operations, or during training or ferry flights. In any case every demonstration autoland must be conducted in weather equal to or greater than ABC's current CAT I operating minima; 200 feet DA, RVR 550m.

1. If an excessive number of failures (e.g., unsatisfactory landings, system disconnects) occur during the landing demonstration program, a determination will be made for the need for additional demonstration landings, or for consideration of other remedial action (e.g., procedures adjustment, wind constraints, system modifications).

2. The system must demonstrate reliability and performance in line operations consistent with the operational concepts specified in and required by OpSpec C59.

3. Landing demonstrations will generally be accomplished at KSA facilities or international facilities acceptable to the GACA.

4. At ABC's discretion, demonstrations may be made on other runways and facilities if sufficient information is collected to determine the cause of any unsatisfactory performance (e.g., critical area was not protected). No more than 50 percent of the demonstrations may be made on such facilities.

C. Documentation.

1) ABC monitors aircraft maintenance performance trends through the Continuous Analysis and Surveillance System (CASS). CASS is designed to assist in detection and correction of recurring problems in the B-737-800 fleet. CASS action is predicated on the Inbound Boeing ATA/IATA codes entered in the logbook. Should any ATA/IATA code be entered in the logbook three times or more in any 20-day period, the item will be flagged and analyzed for systemic corrective action by the Engineering department. Therefore it is extremely important for crewmembers to enter the correct ATA/IATA code when making logbook entries, particularly when related to the aircraft autoflight system and autoland performance. Flight crews will use form ABC OUSD-1 (sample below) to record all unsatisfactory autoland approaches. A logbook entry is also required for any unsatisfactory autoland. Forms ABC OUSD-1 will be left with the aircraft logbook for scanning into the maintenance tracking system (retained for one year). This information will also be retrieved by the CASP and published monthly in the Fleet Maintenance CASP Report. All autoflight system history is also available in the maintenance tracking system by the applicable ATA chapter.

NOTE: The crew is responsible to notify dispatch of all autolands by ACARS message at the end of each flight. Dispatch will ensure that Maintenance Control is notified of all autolands in a timely manner so that appropriate recordkeeping and maintenance action can be taken.

2) Autoland messages are accessed through ACARS page 2 of the FLT SUMMARY page, AUTOMATIC APPROACH, as illustrated in the following Figure 5.2.8.7 below:

Figure 5.2.8.7. Autoland Messages on ACARS, Page 2 of Flight Summary

FLIGHT SUMMARY Page 2: AUTOMATIC APPROACH

(1) Enter required information as follows:

1. Select YES;
2. Enter RUNWAY used;
3. Enter reported RVR visibility in feet
4. Enter SAT or UNSAT as appropriate for the Autoland;
5. Enter DISC ALT disconnect altitude in feet or enter 0 (zero) for full Autoland;
6. SEND when all required fields are filled.

(2) Reporting Requirements. Upon receipt of an ACARS, FLIGHT SUMMARY, AUTOMATIC APPROACH message in dispatch, Maintenance Control will enter all data on a CAT II OUSD tracking spreadsheet and forward the message to the following management personnel:

1. Director of Operations, Captain Bo Sharp
2. Director of Maintenance, Ken Johnson

3) During each Morning Meeting for the duration of this OUSD, Maintenance Control will brief all attendees as to the current status of OUSD landings including the following statistics:

• Autolands attempted: previous 24 hours

• Satisfactory autolands previous 24 hours

• Unsatisfactory autolands with preliminary reasons

• Total satisfactory autolands to date

• Total unsatisfactory autolands to date

• GACA feedback if any

a) Should there be any unsatisfactory autolands reported, the Director of Maintenance and the Director of Operations are jointly responsible to determine whether maintenance factors, operational factors, or some combination thereof are responsible for the unsatisfactory autoland and to develop appropriate remedial procedures.

b) Additionally, Maintenance Control is responsible for maintaining a current and OUSD file (which is subject to inspection by the GACA) of all relevant email messages and B-737-800 Autoland Discrepancy Forms. This file may be maintained in electronic format or by the maintenance tracking system with scanned B-737-800 Autoland Discrepancy Forms.

4) Form ABC OUSD-1, B-737-800 Autoland Discrepancy Form. Flight crews will use form ABC OUSD-1 to

record all unsatisfactory autoland approaches. An unsuccessful autoland is defined as follows:

• Aircraft fails to maintain runway track satisfactorily

• Drift rate is excessive

• Aircraft does not touch down within the touchdown zone

• Auto Flight system does not maintain the aircraft within required performance parameters when within the Decision Region

• Any other performance abnormality, e.g., early Auto Flight disconnect, failure to ALIGN, failure to FLARE, failure to RETARD autothrottles, or failure to ROLLOUT properly

a) A logbook entry is required for any unsatisfactory autoland. Forms ABC OUSD 1–B-737-800 will be left with the aircraft logbook for scanning into the maintenance tracking system (retained for 1 year). This information will also be published monthly in the Fleet Maintenance Report.

b) All Auto flight system history is also available in the maintenance tracking system by the applicable ATA/IATA chapter. The crew is responsible to notify dispatch of all autolands by ACARS message at the end of each flight.

c) Figure 5.2.8.8, below illustrates a Sample Autoland Discrepancy Form.

Figure 5.2.8.8. Sample Autoland Discrepancy Form

ABC OUSD-1–B-737-800 Autoland Discrepancy Form (Front of Form)

This form will be completed whenever an approach is attempted using the airborne low approach system, regardless of whether the approach is abandoned or concluded successfully.

CAT II/IIIa APPROACH EVALUATION

CAT II o CAT IIIa o Autoland Yes o No o

Pilot-in-Command (PIC) ______________________

Second-in-Command (SIC) ____________________

Date _________ Registration No. _______________________ Airport ID_____ Rwy_________ Wx_____ _________ Wind _______________

APPROACH EVALUATION:

Was the approach successful? Yes ______ No _____

Flight control guidance system used:

Auto-coupler ________

Flight director _______

Airspeed at middle marker ± at ______ 100' ± _______ from programmed speed?

If unable to initiate ______ or complete _______ approach (indicate which), indicate the cause:

Airborne equipment _______ Identify and describe nature of deficiency.____

____ Ground equipment _______ Identify and describe nature of deficiency.____

____

ATS ____ .

Other _______ State reason:

------See Criteria on rear of this form-----

ABC OUSD-1–B-737-800 Autoland Discrepancy Form (Back of Form)

AUTOLAND CRITERIA:

An unsuccessful autoland is defined as follows:

1. Aircraft fails to maintain runway track within +/- 22 feet of centerline;
2. Drift rate exceeds 2 feet per second;
3. Aircraft does not touch down within the touchdown zone;
4. Auto Flight system does not maintain the aircraft within required performance parameters when within the Decision Region;
5. Any other performance abnormality, e.g., early Auto Flight disconnect, failure to ALIGN, failure to FLARE, failure to RETARD autothrottles, or failure to ROLLOUT properly.

A logbook entry is required for any unsatisfactory autoland.

5) *Data Collection Requirements and Miscellaneous Considerations*. Form ABC OUSD 1–B-737-800 Autoland

Discrepancy Form was developed to allow the flight crew to record unsatisfactory approach and landing performance. The resulting data and a summary of the demonstration data will be made available to the GACA office for evaluation. The data provided by ABC OUSD 1–B-737-800 forms include the following information:

a) Information regarding the inability to initiate an approach or identify deficiencies related to airborne equipment.

b) Information regarding abandoned approaches, stating the reasons the approach was abandoned and the altitude above the runway at which the approach was discontinued or the automatic landing system was disengaged.

c) Information regarding any system abnormalities, which required manual intervention by the pilot to ensure a safe touchdown or touchdown and rollout, as appropriate.

d) Data Analysis. Unsatisfactory approaches using facilities approved for CAT II or CAT III where landing system signal protection was provided should be fully documented. The following factors should be considered:

1. ATS Factors. ATS factors that result in unsuccessful approaches should be reported. Examples include situations in which a flight is vectored too close to the final approach fix/point for adequate localizer and glide slope capture, lack of protection of ILS critical areas, or ATS requests for the flight to discontinue the approach.

2. Faulty NAVAID Signals. NAVAID (e.g., ILS localizer) irregularities, such as those caused by other aircraft taxiing, over flying the NAVAID (antenna), or where a pattern of such faulty performance can be established should be reported.

3. Other Factors. Any other specific factors affecting the success of CAT II operations that are clearly discernible to the flight crew should be reported. An evaluation of reports discussed above will be made to determine system suitability for authorization for CAT II operations.

e) Use of Autoland at KSA Type I Facilities or Equivalent. For CAT I, Autoland may typically be used at runways with facilities other than those with published CAT II or III Instrument approach procedures. This is to aid pilots in achieving stabilized approaches and reliable touchdown performance to improve landing safety in adverse weather; for CAT II or III training; to exercise the airborne system to ensure suitable performance; for maintenance checks; or for other such reasons. Use of this capability may be particularly important for: pilot workload relief in stressful conditions of fatigue after long international flights; night approaches; cross winds or turbulence; when there may be other aircraft non-normal conditions being addressed; or to aid safe landing performance in otherwise adverse weather, restricted visibility, or with cluttered runways. This is true even though reported visibility may be well above minima (e.g., heavy rain distorting view out the windshield, snow covered runways where markings are not easily visible).

f) The following precautions must be observed when conducting autolands:

1. The runway and associated instrument procedure should have no outstanding NOTAMs or other applicable Notes concerning the procedure precluding the use of the autoland system (e.g., it should not have notes such as Localizer unusable inside the threshold, or Glide Slope unusable below xxx ft.).

2. Suitable ILS Critical Area protection (or equivalent) should be requested from ATC, if applicable. Similar to precautions for a CAT II or III procedure, the crew should remain alert to detect any evidence of unsuitable system performance, whether or not critical protection is being provided.

3. The published ILS glide slope threshold crossing height (or equivalent) should be at least equal to or greater than 47 feet (15m).

4. The particular runway or procedure should not be precluded for autoland operations by the operator due to known performance anomalies (e.g., not on a list of runways ineligible for or precluded from autoland operations as determined by ABC).

g) Eligible Aerodromes and Runways. For CAT II, an assessment of eligible aerodromes, runways, and aircraft systems must be made in order to list appropriate runways on OpSpecs.

5.2.8.17. ISSUANCE OF CAT II/III LANDING MINIMA.

A. OUSD Phase. For the OUSD Phase: Validation of CAT II/III Maintenance Programs.

1) *The OUSD phase consists of two sub-phases*:

a) The first sub-phase is referred to as the OUSD landing phase. During this period the operator conducts the number of landings (normally 100) using the CAT II or CAT III systems approved in the previously submitted OUSD plan. The weather minima used by the operator is prescribed as one step higher than the CAT II/III authorization being applied for. In other words a CAT II applicant must conduct 100 landings in CAT I (or better) weather conditions. A CAT III applicant must conduct 100 landings in CAT II or better weather. A success rate of 90 percent is required.

b) The first sub-phase is completed after a success rate of 90 percent has been achieved during the OUSD landing phase. The second phase, the OUSD Demonstration phase, begins after completion of the first sub phase when the POI issues the appropriate OpSpecs/COA with the appropriate restricted lower minima and any other required restrictions. After successful completion of the OUSD demonstration sub-phase unrestricted minima are issued by the POI.

c) The second sub-phase, referred to as the OUSD Demonstration phase begins after the completion of the landing phase for a period of 6 months. To initiate this phase, the POI/ issues the appropriate OpSpecs/COA with the appropriate lower minima and any other required restrictions. After successful completion of the OUSD demonstration sub phase unrestricted minima are issued by the POI with concurrence from the Director, Flight Operations Division.

2) *Special Requirements*. Special design requirements and special maintenance programs are necessary to achieve the airborne system reliability required for the conduct of CAT II/III operations. The special maintenance programs necessary for CAT II/III operations are extensive and expensive and are usually the largest factors affecting an operator’s decision of whether to conduct these operations.

a) When an operator/program manager requests authorization to conduct operations with aircraft equipped with standard CAT II equipment, and that operator is new to CAT II operations, CAT II operations are usually restricted (for at least 6 months) to higher-than-standard operating minima (DH 100 and RVR 500m). These are the minima issued after successful completion of the OUSD landing phase outlined above. This restriction must remain in place until the operator has successfully validated its maintenance program (the OUSD Demonstration phase outlined above) in accordance with FAA AC 120-29 (as amended) and the low minima (LM) maintenance program outlined in this section. However, if an aircraft has a type design approval for CAT III operations, it may be possible for the operator to be initially authorized for standard CAT II minima with those aircraft if certain equipment restrictions and operating procedures are specified in the operator's OpSpecs/COA.

b) If the operator requests to eliminate the 6-month restriction (DH 100 and RVR 500m) based on operational credit for the use of CAT III systems to conduct CAT II operations, the operator OpSpecs/COA must include a limitation that specifies all CAT II operations using DH 100 and RVR 350m for U.S. ILS Type II facilities and DH 100 and RVR 300m at ICAO compliant aerodromes and U.S. ILS Type III facilities must be conducted with the airborne equipment operating to CAT III standards. This limitation should read fail passive autoland only, or fail passive/fail operational autoland only, as appropriate, for aircraft equipped with CAT III automatic landing systems, or fail passive HGS only for aircraft equipped with CAT III HGSs. For DH 100 and RVR 350m operations, these restrictions must remain in the operator OpSpecs/COA until the CAT II maintenance program for that aircraft is successfully validated. These restrictions must remain in the OpSpecs/COA for DH 100 and RVR 300m operations at foreign aerodromes and U.S. ILS Type III facilities, even after the maintenance program is validated.

c) When the operator has successfully validated its maintenance program, the restriction that requires the airborne equipment to be operated to CAT III standards can be removed by amending the operator's OpSpecs/COA to authorize the use of DH 100/RVR 350m minima with standard CAT II equipment (e.g., single channel autopilot, or manually flown (HGS) operations). The CAT III equipment would still be required to conduct any operations with operating minima of DH 100 and RVR 300m for CAT II operations at ICAO compliant CAT II aerodromes and U.S. ILS Type III facilities. In standard CAT II operations, the objective of the requirement for an operator to validate the CAT II maintenance program for at least 6 months with minima restricted to DH 100 and RVR 500m is to ensure that the required level of airborne equipment reliability is achieved. This is to ensure that frequent malfunctions will not occur in standard CAT II operations (DH 100 and RVR 350m). The design features of CAT III airborne equipment significantly reduce the potential for failures that could adversely affect standard CAT II operations. As a result, validation of the CAT II maintenance program before conducting operations to DH 100/RVR 350m is not necessary if these operations are conducted under a restriction that requires the airborne equipment to operate to CAT III standards (e.g., fail passive or fail operational automatic landing). This permits the operator/program manager to conduct operations with standard CAT II minima during the 6-month period used to validate its maintenance program.

3) *Authorizing DH 100 and RVR 300m for Certain CAT II Operations*. CAT II operations with DH of 100 feet and RVR 300m can only be authorized at specific aerodromes. These operations can only be authorized when conducting an autoland approach or using an HGS to touchdown. The limitation in the OpSpecs/COA should read fail passive autoland only, or fail passive/fail operational autoland only, as appropriate, for aircraft equipped with CAT III automatic landing systems, or fail passive HGS only for aircraft equipped with CAT III HGSs.

4) *New CAT II operators*. New operators should follow the demonstration period provisions (normally 6 months) in the approved OUSD plan. Additionally, typical acceptable minima step down provisions approvable by GACA are as follows:

a) Starting from CAT I to CAT II: First DH 100/RVR 500m, then DH 100 and RVR 350m (FAA AC 120-29 (as amended), Section 10.9, Page 132)

5) *Experienced operators Seeking CAT II/III Authorization*.

a) The 6-month initial higher-than-standard CAT II minima described above, and in FAA AC 120-29 (as amended), Criteria for Approving CAT I and CAT II Landing Minima for part 121 Operators applies to all CAT II operations by KSA operators and foreign operators.

b) Higher than standard CAT II minima were established as a validation of the operator’s CAT II maintenance program. Experience has indicated that the validity of approved CAT II maintenance programs is high, particularly with established operators and applying higher than standard minima for 6months to experienced CAT II operators is not warranted in all cases.

c) Inspectors issuing OpSpecs authorizing CAT II operations to KSA operators shall continue to use the guidance provided in this section and FAA AC 120-29 (as amended). However, the 6-month initial higher-than-standard minima validation period described in this section and in FAA AC 120-29 (as amended), paragraph 14, may be reduced for experienced operators. DH 100/RVR 500m shall be applied as the initial minima for new operators.

d) Experienced operators are those having current OpSpecs for a minimum of 3 years or foreign authority approval from an ICAO member State, authorizing use of lowest applicable or intended CAT II minima. Examples of typical minima step-down approvals for new operators are in Table 5.2.8.1, below.

Table 5.2.8.1. Typical Minima Step Down Approval Examples

Starting from CAT I	For CAT II - First DH-100/RVR 500m, then RVR 350m
Starting from CAT I	For CAT IIIa - First DH 100/RVR 350m, then RVR 200m
Starting from CAT I	For CAT IIIb - First RVR 300m, then RVR 175m or 75m, as applicable.

NOTE: Each runway procedure used must be successfully demonstrated by a line service or an evaluation landing using the CAT III system and procedures, in CAT II or better conditions, for each CAT III aircraft/system type (B-777, A-330, etc.) In addition, the operator must address special aerodromes/runways as noted in the CAT II/CAT III status checklist.

e) Inspectors issuing OpSpecs authorizing GACAR Part 129 foreign operators to conduct CAT II operations in the KSA, shall continue to use the guidance provided in this chapter with the exception of the 6-month initial higher than standard minima validation period. However, in no case shall the minima authorized in OpSpecs C59 be lower than those authorized by the foreign operator's civil aviation authority.

6) *New CAT III operators*. New operators should follow demonstration period (6 months) provisions provided for in the approved OUSD. Additionally, typical acceptable minima step down provisions approvable by GACA are as follows:

a) Starting from CAT I:

• Fail-Passive Landing System 100 ft. DH/RVR 300m, then 50 ft. DH/RVR 175m

• Fail-Operational Landing System 100 ft. DH/RVR 300m then RVR 175m, then RVR 75m

b) Starting from CAT II:

• Fail-Passive Landing System 50 ft. DH/RVR 175m

• Fail-Operational Landing System RVR 175m, then RVR 75m (FAA AC 120 28 (as amended), Section 10.9, Page 77)

7) Experienced CAT II operators Seeking CAT III Authorization. Operators with previous CAT II experience may warrant a reduction in the OUSD requirements based on their previous experience. All approach/autolands should be conducted using the operator's approved CAT III procedures.

a) If the operator is seeking CAT III approval on the same make/model aircraft it was previously authorized CAT II approval, the OUSD should require a minimum of 50 approaches/autolands (OUSD landing sub-phase) at CAT II or better minima. Then the CAT III minima are issued as follows:

• Fail – Passive Landing System 50 ft. DH/RVR 175m

• Fail – Operational Landing System RVR 75m

NOTE: The operator is still required to report their CAT III approach/landing information (OUSD Demonstration sub phase) for a 6 month period commencing with the first CAT III approach/autoland.

b) If the operator is seeking CAT III approval on a different make/model series aircraft than it was previously authorized CAT II approval, the OUSD should require a minimum of 50 approach/autolands (OUSD Landing sub-phase) at CAT I or better minima. Then the CAT II minima are issued as follows:

- Fail-Passive Landing System 100 ft. DH/RVR 350m
- Fail-Operational Landing System 100 ft. DH/RVR 300m

c) Following successful completion of the OUSD Demonstration sub-phase, which commences for a 6-month period with the first CAT III approach/autoland, the operator will be issued the CAT III minima as follows:

- Fail – Passive Landing System 50 ft. DH/RVR 175m
- Fail – Operational Landing System RVR 75m

NOTE: The operator is still required to report their CAT III approach/landing information (OUSD Demonstration sub-phase) for an additional 6-month period (for a total of 12 months) commencing with the first CAT III approach/autoland.

B. After the OUSD Phase.

1) *Approval of Landing Minima*. When the data from the operational demonstration has been analyzed and found acceptable, an applicant may be authorized the lowest requested minima consistent with this order and applicable OpSpecs. Several examples are provided below:

a) For CAT III, fail passive operations where the operator was initially authorized RVR 300m to begin a demonstration program, following successful demonstration, that operator may be authorized to operate to minima of RVR 175m.

b) For CAT III fail operational operations, where the operator was initially authorized RVR 300m to begin a demonstration program, following successful demonstration that operator may be authorized to operate to minima of RVR 175m or RVR 75m as applicable.

c) If the CAT III rollout control system has been shown to meet the appropriate provisions of Appendix 3 of FAA AC-120-28 (as amended), and the airborne and ground systems including applicable ILS, or GLS, Surface Movement Guidance and Control (SMGCS), and weather reporting (e.g., RVR) are each suitable, then operational approvals for operations below RVR 75m may be authorized. Such authorizations are considered only for specific facilities on a case-by-case basis.

2) Ops Specs /Certificates of Authorization (COAs).

a) All standard CAT II/III operations are restricted to aerodromes and runways that meet the special safety requirements necessary for CAT II/III operations. KSA CAT II/III operations shall only be conducted in accordance with an approved GACAR Part 97, CAT II/III IAP. In foreign countries, CAT II/III operations conducted by KSA operators are restricted to those runways approved in accordance guidance found in Section 7. Even though a particular runway is approved for CAT II/III operations, an operator cannot be authorized to conduct CAT II/II operations at that location until that particular CAT II/III operation is authorized in the operator's OpSpecs/COAs.

b) OpSpecs authorizations are issued in accordance with the guidance, direction and procedures found in Volume 15 of this handbook.

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 9. Use of Enhanced Vision Systems

5.2.9.1. APPLICATION. This section provides guidance and information to aviation safety inspectors (Inspectors) concerning the use of Enhanced Vision Systems (EVS) to gain an operational advantage.

5.2.9.3. BACKGROUND. EVS have been developed and work is currently progressing on EVS to improve the capability for aircraft and flight crews to execute approaches and land safely in fog, rain, snow and other reduced visibility conditions. Benefits from this developing technology include:

- Reduction in risk factors associated with Controlled Flight into Terrain (CFIT) Accidents
- Improvements in Situational Awareness during ground operations by reducing runway incursions

A. Enhanced Vision System. For the purposes of this section an EVS means an installed airborne system comprised of the following features and characteristics:

1) An electronic means to provide a display of the forward external scene topography (the natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, such as a forward-looking infrared, millimeter wave radiometry, millimeter wave radar, and low-light level image intensifying.

2) The EVS sensor imagery and aircraft flight symbology (i.e., at least airspeed, vertical speed, aircraft attitude, heading, altitude, command guidance as appropriate for the approach to be flown, path deviation indications, and flight path vector, and flight path angle reference cue) are presented on a head-up display, or an equivalent display, so that they are clearly visible to the pilot flying in his normal position and line of vision and looking forward along the flight path, to include:

a) The displayed EVS imagery, attitude symbology, flight path vector, and flight path angle reference cue, and other cues, which are referenced to this imagery and external scene topography, must be presented so that they are aligned with and scaled to the external view.

b) The flight path angle reference cue must be displayed with the pitch scale, selectable by the pilot to the desired descent angle for the approach, and suitable for monitoring the vertical flight path of the aircraft on approaches without vertical guidance.

c) The displayed imagery and aircraft flight symbology do not adversely obscure the pilot's outside view or field of view through the cockpit window.

3) The EVS includes the display element, sensors, computers and power supplies, indications, and controls. The system may receive inputs from an airborne navigation system or flight guidance system.

4) The display characteristics and dynamics are suitable for manual control of the aircraft.

B. System Capability. These systems allow pilots to view forward scene topography, i.e.:

- Detect lights and ground features (runways, aircraft, buildings) at night and in low visibility conditions
- Identify visual cues such as approach lights, runway threshold, etc., at the runway threshold or MDA
- See required cues when reduced visibility prevents detection with the naked eye

5.2.9.5. AUTHORIZATION TO USE ENHANCED VISION SYSTEMS (EVS).

A. Regulations. GACAR § 91.403 authorizes the use of EVS by an operator to gain an operational credit (advantage) on landing minimums prescribed under GACAR § 91.191. Additionally, operators with the authority to use EVS in low visibility approach and landing operations may descend below MDA or DA/DH (but not lower than 100 feet above the touchdown zone elevation (TDZE)) without the required visual reference provided they are authorized for such operations.

B. Approach Past the Final Approach Fix Without Required Visibility/RVR. Notwithstanding GACAR § 91.191(c) an operator equipped with an EVS approved under GACAR Part 21 and authorized for use under operations specification (OpSpec) C48 or an equivalent Certificate of Authorization (for GACAR Part 91 only) may continue an approach past the final approach fix, or where a final approach fix is not used, begin the final approach segment of an instrument approach procedure using visibility minima lower the published minima in accordance with the reduced visibility minima prescribed in Table 5.2.9.1, below:

Table 5.2.9.1. Reduced Visibility Minima

Published Visibility Minima (meters)	Reduced Visibility Minima for Approach Flown Utilizing EVS (meters)
550	350
600	400
650	450
700	450
750	500
800	550
900	600
1 000	650

1 100	750
1 200	800
1 300	900
1 400	900
1 500	1 000
1 600	1 100
1 700	1 100
1 800	1 200
1 900	1 300
2 000	1 300
2 100	1 400
2 200	1 500
2 300	1 500
2 400	1 600
2 500	1 700
2 600	1 700
2 700	1 800
2 800	1 900
2 900	1 900
3 000	2 000
3 100	2 000
3 200	2 100
3 300	2 200
3 400	2 200
3 500	2 300
3 600	2 400

3 700	2 400
3 800	2 500
3 900	2 600
4 000	2 600
4 100	2 700
4 200	2 800
4 300	2 800
4 400	2 900
4 500	3 000
4 600	3 000
4 700	3 100
4 800	3 200
4 900	3 200
5 000	3 300

C. Descending Below DA/DH or MDA. An operator equipped with an EVS approved under General Authority of Civil Aviation Regulation (GACAR) Part 21 and authorized for use under OpSpec C48 or an equivalent Certificate of Authorization (for GACAR Part 91 only), may, subject to (1), (2) and (3) below, continue an approach below DA/DH or MDA to 100 feet above the threshold elevation of the runway provided that the provisions of 4, 5, and 6 occur:

1) The authority to descend below MDA or DA/DH may only be used for precision and APV IAP (precision like) operations with a DH no lower than 200 feet or a non-precision IAP flown using approved vertical flight path guidance to a MDH or DH no lower than 250 feet.

2) A pilot may not continue an approach below 100 feet above runway threshold elevation for the intended run-way, unless at least one of the visual references specified below is distinctly visible and identifiable to the pilot without reliance on the EVS:

a) The lights or markings of the threshold; or

b) The lights or markings of the touchdown zone.

3) Callout heights below 200 feet above the aerodrome threshold must be determined by means of a radio altimeter; and the flight crew must consist of at least two pilots.

4) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and the descent rate will allow touchdown to occur within the

touchdown zone of the runway of intended landing.

5) The pilot determines that the enhanced flight visibility observed by use of the EVS is not less than the visibility prescribed in the initial approach point (IAP) being used.

6) The following visual references for the intended runway are distinctly visible and identifiable to the pilot using the EVS:

a) The approach light system (if installed); or

b) The following visual references:

1. The runway threshold, identified by at least one of the following:

a. The beginning of the runway landing surface.

b. The threshold lights.

c. The runway end identifier lights.

2. The touchdown zone, identified by at least one of the following:

a. The runway touchdown zone landing surface.

b. The touchdown zone lights.

c. The touchdown zone markings.

d. The runway lights.

D. Required Visual References. The required visual references in using EVS to descend below DA/DH or MDA are different from those required by GACAR § 91.191(c) using natural vision. Table 5.2.9.2, Required Visual References, For EVS (under) GACAR §§ 91.191(c) and 91.403, provides a comparison of visual reference requirements for both natural vision and EVS. Generally, the visual reference requirements for EVS are more stringent than those for natural vision. For example, GACAR § 91.191(c) allows descent below DA/DH or MDA using natural vision when only one of the visual references listed can be seen. For EVS, under GACAR § 91.403, it is required that a pilot either see the ALS or at least one visual reference listed for the threshold environment and one visual reference listed for the TDZ environment. When natural vision is used, the Visual Approach Slope Indicator (VASI) is permitted to be used as a required visual reference for descent below DA or MDA. However, under GACAR § 91.403 using EVS, the visual approach slope indicator (VASI) cannot be used as a visual reference for descent below DA or MDA using EVS because the EVS display is monochromatic. For descent below 100 feet above TDZE using natural vision, GACAR § 91.191(c) permits the approach lights to be used as a reference only if the red terminating bars or the red side row bars are visible and identifiable. For EVS operations below 100 feet above TDZE, the approach lights with red side row bars are not permitted to be used as a visual reference, even though the pilot is required to rely only on natural vision to descend below 100 feet above TDZE. The only visual references permitted to be used for EVS operations below 100 feet above TDZE are the lights or markings of the threshold or the lights or markings of the TDZ.

NOTE: See Table 5.2.9.2, Required Visual References for EVS, GACAR §§ 91.191(c) and 91.403.

E. Conditions of Approval. Before issuing OpSpec C48 (or COA C48) based on aircraft equipment and operation, Inspectors shall ensure that each operator meets the following conditions:

1) The authorized aircraft must be equipped with an EVS certified for conducting operations under GACAR § 91.403 and must either have a General Authority of Civil Aviation (GACA)/Federal Aviation Administration (FAA) type design approval (TC or STC) under GACAR Part 21. An EVS is an installed airborne system and must include the following components and attributes:

a) A head-up display (HUD) or equivalent system display.

1. EVS sensor imagery and aircraft flight symbology must be presented so that they are clearly visible to the Pilot Flying (PF) in his normal position, line of vision, and looking forward along the flightpath.

2. The EVS display must be conformal. That is, the sensor imagery, aircraft flight symbology, and other cues that are referenced to the imagery and external scene must be aligned with and scaled to the external view.

b) Sensors that provide a real-time image of the forward external scene topography.

c) Computers and power supplies.

d) Indications and controls.

e) Aircraft flight symbology that includes at least the following:

1. Airspeed.

2. Vertical Speed (VS).

3. Aircraft attitude.

4. Heading.

5. Altitude.

6. Command guidance as appropriate for the approach to be flown.

7. Path deviation indications.

8. Flight Path Vector (FPV) cue.

9. Flight Path Angle (FPA) reference cue.

NOTE: The FPA reference cue must be displayed with the pitch scale and must be selectable by the pilot for the appropriate approach descent angle.

NOTE: It is important that the EVS systems required for operations under GACAR § 91.403 must not be confused with an enhanced or vision system that simply provide an electronic means to provide the flight crew with a sensor derived or enhanced image of the external scene (e.g., millimeter wave radar, Forward Looking Infrared (FLIR)) but does not necessarily provide the additional flight information/symbology required by OpSpec C48 (or COA C48).

f) It should be noted that the rule does not require the EVS to be turned off or the sensor image to be removed from the HGS/HUD in order to continue to a landing without reliance on the EVS sensor image. In keeping with the requirements of the regulations, however, the decision to continue descending below 100 feet above the TDZE must be based on seeing the visual references required by the rule through the HGS/HUD by means of natural vision. An operator may not continue to descend beyond this point by relying on the sensor image displayed on the HGS/HUD.

g) EVS equipage may vary. Some aircraft may be equipped with a single EVS display. Others may have an EVS display and a separate repeater display located in or very near the primary field of view (FOV) of the non-flying pilot. Still others may be equipped with dual EVS displays. The regulations do not require a repeater display or a separate EVS display for the non flying pilot, but neither do they preclude it. Operators should develop procedures for EVS operations appropriate to the equipment installed and the operation to be conducted. In establishing these procedures, both normal and abnormal or failure modes must be addressed for the various phases of the approach (e.g., before final approach fix (FAF), FAF to DA or MDA, and after reaching DA or MDA).

h) Procedures should support appropriate levels of crew coordination with special emphasis on the transition to and reliance on natural vision. Each EVS has a specified limit to the FOV. An offset final approach or crosswinds may affect use of the EVS as well as when the decision is made to rely on natural vision for the primary reference. Also, specific pilot/crew decision making and coordination must be addressed in the segment from FAF to DA or MDA (or point that a decision to rely on natural vision is made) and the EVS segment (from DA or MDA down to 100 feet height above TDZE). The transition from enhanced vision to natural vision for landing is an especially important segment. Operators should describe how common situational awareness will be achieved—either procedurally when a single EVS is used or through a combination of procedures and equipment when a repeater display or dual EVSs are used.

2) Training requirements with respect to aircraft type (make, model, and series (M/M/S)) and EVS model/version shall be accomplished in accordance with the FAA's Flight Standardization Board (FSB) report for the aircraft and EVS equipment to be used. If an FSB report was not issued for a specific aircraft type and EVS model/version, initial EVS training shall be accomplished in the aircraft type and EVS model/version to be used, and additional training shall be accomplished when a different EVS model/version is used on the same aircraft type or when the same EVS model/version is used on a different make aircraft. It should be noted that the sensor image, fidelity, characteristics, and symbology may differ, necessitating additional training. The flight crew must be trained in the use of EVS and demonstrate proficiency conducting straight-in IAPs, other than CAT II or CAT III (e.g., Category I Approach (CAT I) instrument landing system (ILS), non-precision, approach procedures with vertical guidance (APV), etc.). GACAR Part 121, 125 and 135 operators must have approved training programs. GACAR Part 91 operators must comply with Part 91, Appendix D, Section II, d (Approved Syllabus).

5.2.9.7. AUTHORIZATIONS For EVS. The use of Electronic Vision Systems in operations may be authorized by the

GACA by the issuance of OpSpec C48 or a COA C48. See Volume 15 for further details.

5.2.9.9. FURTHER GUIDANCE. Further guidance on enhanced vision systems may be found in FAA AC 90-106, Enhanced Flight Vision Systems.

Table 5.2.9.2. Required Visual References for EFVS, GACAR §§ 91.191(c) and 91.403

Required Visual References Using ***Natural Vision*** **[GACAR 91.191(c)]**	**Required Visual References Using an** ***Enhanced Flight Vision System*** **[GACAR 91.403]**
For operation below DA or MDA: At least **one** of the following visual references: Approach light system Threshold Threshold markings Threshold lights Runway end identifier lights Visual approach slope indicator Touchdown zone Touchdown zone markings Touchdown zone lights Runway Runway markings Runway lights	**For operation below DA or MDA:** The following references, using the EFVS: Approach light system ***OR*** <u>BOTH</u> paragraphs A and B -- A. The runway threshold, identified by at least one of the following – ▪ beginning of the runway landing surface, ▪ threshold lights, or ▪ runway end identifier lights **AND** B. The touchdown zone, identified by at least one of the following – ▪ runway touchdown zone landing surface, ▪ touchdown zone lights, ▪ touchdown zone markings, or ▪ runway lights.
Descent below 100 feet height above TDZE: At least **one** of the following visual references: Approach light system, as long as the red terminating bars or red side row bars are also distinctly visible and identifiable Threshold Threshold markings Threshold lights Runway end identifier lights Visual approach slope indicator Touchdown zone Touchdown zone markings Touchdown zone lights Runway Runway markings Runway lights	**Descent below 100 feet height above TDZE:** The following references, using natural vision: The lights or markings of the threshold ***OR*** The lights or markings of the touchdown zone

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Section 10. RNP AR APCH

5.2.10.1. INTRODUCTION. The Required Navigation Performance (RNP) Authorization Required (AR) Approach (APCH) specification represents the International Civil Aviation Organization (ICAO) global standard for developing instrument approach procedures to aerodromes where limiting obstacles exist and/or where significant operational efficiencies can be gained. These procedures require additional levels of scrutiny, control and authorization. The increased risks and complexities associated with these procedures are mitigated through more stringent RNP criteria, advanced aircraft capabilities and increased aircrew training. RNP AR APCH approaches are characterized by a navigation specification of RNP 0.3 or better and straight or curved segments (including descending, constant radius, curved segments).

> **NOTE**: Authorizations to conduct RNP APCH approaches including RNP APCH operations to Lateral Navigation (LNAV)/Vertical Navigation (VNAV) minima and Localizer Performance (LP)/Localizer Performance with Vertical Guidance (LPV) minima are addressed in Section 5.

5.2.10.3 KSA IMPLEMENTATION. Full details concerning implementing RNP AR APCH in the Kingdom of Saudi Arabia (KSA) can be found in Chapter 6 of Volume II of the ICAO PBN Manual (ICAO Doc. 9613). As RNP AR APCH approach operations are an evolving subject area, all requests for GACA authorization to conduct RNP AR APCH approaches should be forwarded to the Director, Flight Operations Division for further action.

5.2.10.5. POI FOCUS. Principal operations inspectors (POIs) should ensure that operators pay particular attention to Section 6.3.4, Operating Procedures and Section 6.3.5, Pilot/Dispatcher Knowledge and Training, of the above mentioned document, as those are the sections where the opportunity to reduce program variability and therefore, program risk, exists.

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Section 11. Maintenance/Inspection Programs for All Weather Terminal Area (AWTA) Operations

5.2.11.1. GACA ACTIVITY REPORT (GAR).

A. 3435 (AW)

5.2.11.3. OBJECTIVE. This section provides guidance for evaluating maintenance/inspection programs required to support certain All Weather Terminal Area (AWTA) operations.

5.2.11.5. GENERAL.

A. Responsibilities.

1) Aviation safety inspectors (Inspectors) (Airworthiness) are primarily responsible for providing technical support to the Inspector (Operations) during the approval of AWTA operations. The responsibility for monitoring all applicants during the evaluation period should be coordinated between the Inspectors, to include:

- Approvals
- In process evaluations and observations
- Surveillance

2) The applicant is responsible for obtaining and submitting all documents that establish the eligibility of its aircraft, such as:

- The required maintenance/inspection program necessary for the AWTA operation;
- The applicant's minimum equipment list (MEL), with the limitations for AWTA operations, if applicable
- An acceptable means for maintaining the reliability of the flight guidance control and associated systems

5.2.11.7. CONTINUOUS AIRWORTHINESS MAINTENANCE PROGRAM (CAMP) FOR AWTA OPERATIONS.

A. Requirements. This section outlines the requirements for the evaluation of a CAMP in support of low minima (LM) AWTA operations. This type of operation will need a detailed evaluation supported by well-defined maintenance, training, and reliability programs. All maintenance and reliability supporting documents become part of the accepted program. A monthly utilization/reliability summary will be established for the applicable aircraft and is given to the General Authority of Civil Aviation (GACA) for the initial data collection/demonstration period of 1 year. Quarterly reporting after the initial period will be accomplished in accordance with the certificate holder's reliability.

B. Initial Program. The initial program should also include appropriate programs identified in the Maintenance

Review Board (MRB) document. The frequency of maintenance actions may be revised when sufficient experience has been gained to justify a change and when there is no conflict with the certification requirements. MRB-specified tasks and/or other approved maintenance procedures may be revised to ensure the required airborne equipment will continue to meet total system performance, accuracy, availability, reliability, and integrity for the operation.

C. Reliability. The reliability of systems and/or components set forth as substantiation for LM AWTA operations becomes the performance criteria for the program.

1) Controlled monitoring of the LM AWTA system reliability will require that the operator, after initial evaluation, incorporate the pertinent systems and components into the approved reliability program. If the LM AWTA operations system reliability does not meet the approved program, the operator will be allowed a reasonable time period in which to improve the reliability.

D. Maintenance Manual. The maintenance manual (MM) will identify all special techniques, maintenance/inspection frequencies, and test equipment requirements to support the program. It will also specify the method of controlling the operational status of the aircraft. Those technicians qualified to release an aircraft for LM AWTA operations (especially CAT II/III) must be identified.

E. Procedures. The operator's procedures must include a method for manual distribution to assure availability to the appropriate maintenance facility.

F. Method of Approval. Operators will show the method of approval of required equipment as listed in the maintenance portion of the manual.

G. Approved Training. The operator must provide an approved training and recurrent training program. The list of personnel must be current. All maintenance personnel authorized to carry out this approved maintenance program must have training on the applicable aircraft systems and the approved policy and procedures of the operator's approved LM aircraft maintenance program authorization. Only those persons trained and qualified should be permitted to perform LM maintenance/inspections.

H. Airborne Systems. The operational demand for LM airborne systems with exposure to numerous hidden functions requires that the aircraft be either periodically exercised or functionally checked. This is to ensure that all systems are operational and that no dormant failure has occurred. The initial program will provide either a periodic LM approach or periodic system functional check.

I. Experience. Until sufficient experience and data is available (excluding the 6 month demonstration), it is recommended the aircraft status period not exceed 35 days. Failure to exercise the system by simulated LM approach or functionally checking the system within 35 days should automatically place the aircraft in a non-LM AWTA operational status. The aircraft must maintain this status until the required functional check is made.

5.2.11.9. PROGRAM DEVELOPMENT.

A. Initial Development. At the time of formal application, the Inspector will begin to monitor development activity. It is important for the operator to include all key personnel in any meetings.

B. The Operator's Lower Minimums Program . The operator's lower minimums program must be developed and the procedures used during the evaluation period. Part D operations specifications (OpSpec) must reflect all special LM maintenance requirements that were developed to support repetitive evaluation of LM systems and equipment.

5.2.11.11. MAINTENANCE/INSPECTION PROGRAMS. The proposed maintenance/inspection programs must be tailored to the applicant's operations and maintenance organization. All maintenance and reliability supporting documents become part of the accepted program.

A. Requirements for Maintenance/Inspection Programs. Maintenance/inspection programs will provide for the proper maintenance and inspection of equipment and aircraft systems.

B. Control and Accountability. Emphasis will be placed on control and accountability of all areas associated with LM approvals. These areas primarily encompass the following:

- Initial and recurrent training on flight guidance control systems
- The use of test equipment
- The differences in aircraft systems between aircraft in an operator's fleet
- Special procedures for airworthiness release and control of the aircraft approach status
- Initial and recurrent training in all areas of the lower minimums program
- Training for new personnel and equipment types

C. Operational Status of the Aircraft. The method for controlling the operational status of the aircraft lower minimum required equipment must ensure that flight, dispatch, and maintenance personnel are kept aware of the current status.

D. Purchase of Avionics Equipment Package Installations. Some manufacturers and repair stations may develop general aviation maintenance/inspection programs in conjunction with their Category II avionics equipment installation "package." The contents of such programs should be thoroughly evaluated for compliance and maintainability with LM AWTA operations regulations.

E. Requalification Procedures. The program must include procedures for requalification of an aircraft for lower minimums following maintenance on any required system. This must include tests after replacements, resetting in rack, and interchange of components.

F. Approval. The Inspectors will indicate approval of the LM maintenance/inspection program in the same way they indicate approval of any amendment to the maintenance/inspection program.

5.2.11.13. MAINTENANCE TRAINING PROGRAMS. Inspectors will, during the course of normal surveillance, evaluate the maintenance facilities performing Category II/III equipment maintenance to ensure that the training provided meets the requirements of lower minimum standards.

5.2.11.15. EXISTING MAINTENANCE/INSPECTION PROGRAMS.

A. Develop Programs. Programs can be developed to be compatible with the existing maintenance/inspection program, as long as there is a clear distinction between normal and lower minimum requirements.

B. Proposal. When an operator's proposal is based on an existing maintenance/inspection program, the ASI must ensure that all procedures will provide for the lower minimums program requirements. Caution will be exercised when an applicant has used a program approved for use by another operator for developing its own.

C. Proposal/Existing Program Areas for Close Review. The following areas of the proposal and or existing programs will be closely reviewed:

- The existing maintenance or inspection program
- The existing reliability program
- The training program
- The initial evaluation checks for existing aircraft and for new aircraft
- The existing parts pool, borrowed parts procedure, and control of spare parts
- An operator's existing reliability program may be accepted when shown to be adequate for its lower minimum operations

5.2.11.17. TEST EQUIPMENT AND STANDARDS.

A. Performance Standards, Tolerances, and Calibration Procedures.

1) Performance standards, tolerances, and calibration procedures applicable to ILS equipment have been adequately covered by:

- Technical Standard Orders (TSO)
- RTCA, Inc. documents
- Manufacturers' instruction manuals

2) These standards or their equivalent are generally considered acceptable for inclusion in maintenance/inspection programs for equipment operated to landing minimums of Category I. Such standards may not be adequate for Category II/III. Those, which will not provide category system performance, will be revised to provide the required level of performance.

B. Lower Minimum (LM) Tolerances. In many cases, the tolerances for Category II/III airborne equipment are more rigid than those for Category I. Therefore, the equipment used to inspect, test, and bench check Category II/III equipment may require more frequent test and calibration.

C. Established Standards and Tolerances. Standards and tolerance established in the maintenance/inspection program for testing and calibrating airborne equipment and systems that are required for Category II/III operations will not be relaxed following program approval without adequate substantiation that system performance will not be degraded.

D. Built-In Test Equipment (BITE) Test and Return to Service (RTS).

1) The BITE test is a maintenance tool that can be used for RTS if certified by the aircraft manufacturer. The proper procedure for RTS is to perform an operational ground or functional flight check. The procedures in the manufacturer's maintenance manual, including the provisions of BITE, the fault isolation manual, the aircraft maintenance manual, and the operator's GACA approved MEL are all essential portions in the process for an aircraft to be returned to service.

2) For those aircraft for which BITE is minimal or nonexistent or that have a mix of digital and analog equipment, then a more comprehensive functional test using test procedures and equipment prescribed in the manufacturer's maintenance manual must be accomplished before approval to RTS. On repeat discrepancies, the functional test must consist of the most comprehensive test in the maintenance manual for aircraft that have different levels of test complexities.

3) The Category II/III maintenance manual will address the procedures for RTS.

5.2.11.19. MAINTENANCE PERIOD EXTENSIONS – PART 91 OPERATORS.

A. Applications for Extensions.

1) GACA will consider applications for extensions of maintenance periods for Part 91 operators at the completion of one maintenance cycle of at least 12 calendar-months.

2) The GACA will consider the following factors in granting an extension:

- Records of Category II approaches (CAT II) due to malfunctioning equipment
- Number of CAT II approaches completed (actual and simulated)
- Maintenance records of Category II equipment failures
- Service history of known trends toward malfunctioning
- Unit mean time between failures
- Records of functional flight checks

B. Check, Test, and Inspection Extensions. Extensions to the check, test, and inspection periods may be granted if factors indicate that the performance and reliability of the Category II/III instruments and equipment will not be adversely affected. General aviation extension periods, in most cases, would be one calendar-month for tests, inspections, and functional flight checks, and four calendar-months for bench checks. The operator's program should include procedures for obtaining the extensions.

5.2.11.21. FUNCTIONAL FLIGHT CHECKS. Some operators have submitted programs that provide for functional flight checks. This procedure must not be approved unless all airworthiness requirements have been satisfied before the flight is released i.e., dispatch. In no instance can a functional flight check be substituted for the certification of complete systems or equipment operation.

5.2.11.23. REPORTS AND RECORDS.

A. Responsibilities of Recordkeeping. The owner/operators organization will provide training to persons responsible for these reports in appropriate parts of the proposed LM program.

B. Category III or Any Autoland Category. Operators authorized for any Autoland category will provide reports of airborne equipment malfunctions during actual approaches. They will submit the reports on a yearly basis to the GACA or at any time the malfunctions significantly affect the Autoland capability.

5.2.11.25. COORDINATION REQUIREMENTS. This task requires coordination with the Airworthiness and Operations Inspectors, the applicant, and Airworthiness Engineers, if necessary.

5.2.11.27. REFERENCES, FORMS, AND JOB AIDS.

A. References:

- FAA AC 120-28 (as amended), Criteria for Approval of Category III Weather Minima for Takeoff, Landing, and Rollout
- FAA AC 120-29 (as amended), Criteria for Approval of Category I and Category II Weather Minima for Approach.

B. Forms. GAR.

C. Job Aids:

- Figure 5.2.11.1, Category II/III Approval Job Aid (Airworthiness Inspector with an Avionics Rating

5.2.11.29. PROCEDURES.

A. Review the Maintenance/Inspection Program. Review the applicant's maintenance/inspection program to ensure that it contains control and accountability over the following:

- All maintenance accomplished on lower minimum required systems and equipment
- All alterations to systems and equipment
- Approach status of each aircraft at all times
- RTS procedures to upgrade aircraft to Category II/III status
- Spare equipment
- Maintenance calibration, use of test equipment, records/reporting requirements

• Repetitive and chronic discrepancies to ensure the affected aircraft remains out of lower minimums approach status until positive corrective actions is made

• All aircraft in the fleet that have not been evaluated for lower minimums approaches

B. Review the Existing Maintenance/Inspection Programs. Ensure that the existing maintenance/inspection program has procedures for the following:

• Identifying chronic discrepancies and corrective action follow-up

• Keeping aircraft with chronic and/or repetitive discrepancies out of a lower minimum status until positive corrective action is taken

• Training maintenance personnel assigned to reliability analysis

• Conducting initial evaluation checks for existing aircraft and for new aircraft to the fleet before inclusion in the operator's lower minimum operations

• A means for identifying all Category II/III components used in the applicable aircraft systems in the existing parts pool, parts borrowing procedure, and control of spare parts

• Ensuring that calibration standards for all test equipment used for maintaining lower minimum systems and equipment are met

• Ensuring that each flight crew and persons with operational dispatch authority are aware of any equipment malfunction that may restrict lower minimum operations

• Submitting any changes to the LM maintenance program to the GACA for acceptance and approval by the principal maintenance inspector (PMI) before any changes are adopted

C. Review the Functional Flight Checks. If a functional flight check has been submitted, ensure that the following information is included:

• Maintenance clearance and/or concurrence before an aircraft is returned to a lower minimum status, even if the functional flight check was found to be satisfactory

• Request for a flight check by maintenance in the aircraft log

• Maintenance entry acknowledging the results and the action taken

D. Review the MEL. Appropriate sections of the MEL must be revised to identify Category II/III required systems and special procedures, if applicable.

E. Review the Personnel Training Requirements. Ensure there are procedures for the following:

1) All maintenance personnel involved and authorized to carry out this approved maintenance program must have initial and recurrent specialized training on the applicable aircraft systems and the approved policy and

procedures of the certificate holder’s approved LM aircraft maintenance program authorization.

2) Ensuring personnel contracted to perform Category II/III related maintenance are qualified and the program requirements are made available to these persons.

3) Personnel not qualified to perform maintenance on Category II systems and equipment, including flight crew and dispatch, will be trained in the airworthiness release requirements of the lower minimums program.

5.2.11.31. TASK OUTCOMES.

A. Complete the GAR.

B. Complete the Task. The principal operations inspector (POI) has the primary responsibility to grant the operator approval for lower minimums after concurrence from the principal maintenance inspector (PMI). It is the PMIs responsibility to evaluate and approve the Category II/III maintenance requirements and associated support programs. Successful completion of this task will therefore consist of coordination with the POI for review and concurrence.

Figure 5.2.11.1. Category II/III Approval Job Aid (Airworthiness Inspector with an Avionics Rating)

For the most recent version of both the Operations and Airworthiness Job Aids refer to the FAA's Flight Operations Branch (AFS-410) web site at: http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs400/afs410/policy_guidance/media/mxjobaid.doc			**Seeking Authorization for:** CAT II ___ CATIIIA ___ CATIIIB ___
CAT II/III APPROVAL JOB AID: Airworthiness			
OPERATOR NAME:			
GACAR PART: 121 o 135 o 125			Date:
Previous CAT II: Yes o No o CAT III: Yes o No o			
✓	**Doc Ref**	**AIRWORTHINESS:**	**Operator's Reference Document**
	1	**OPERATOR CAMP**	
	1.A	Type of Operation :	
	1.B	Integrated Program o Specific Program o	
	1.C	Lower Minimums (LM), Specific Procedures in Maintenance Manual (MM)	
	1.D	Revision and Update LM, MM Procedures	
	1.E	LM Personnel Records System	
	1.F	LM system and configuration status/compliance for each aircraft	
	1.G	LM mods, additions and changes	
	1.H	Mx. Requirements/log entries necessary to change LM status	
	1.I	Specific LM discrepancy reporting procedures (minimum equipment list (MEL))	
	1.J	LM quality control (QC) and Analysis (quality assurance (QA)) Program	
	1.K	Procedures to ensure Non-LM Qual. Aircraft remain off status	
	1.L	Placarding/Logbook Procedures	
	1.M	LM Downgrade Procedures if Mx. performed by unqualified personnel	
	1.N	Return to Service (RTS) Procedures	
	1.O	LM continued status procedures	
	1.P	Periodic Performance Sampling Procedures	
	1.Q	LM Parts Identification procedures	
	1.R		
	2	**INITIAL AND RECURRENT MAINTENANCE TRAINING**	
	2.A	LM Initial Training Curriculum Document	
	2.B	LM Certification/Qualification requirements	
	2.C	Training Records System for LM Personnel	

Figure 5.2.11.1. Category II/III Approval Job Aid (Airworthiness Inspector with an Avionics Rating), Continued

	2.D	Training Equipment Description	
	2.E	Curriculum subject areas	
	2.F	Vendor or Vendor's outside Parts procedures and LM program compatibility	
	2.G	Component Tracking and Control procedures	
	2.H	Component mods and changes (ADs, Engineering Orders (EO), etc.) tracking procedures	
	2.I	LM recording and reporting procedures for system malfunctions	
	2.J	LM software install, test, update, evaluate, control procedures	
	2.K	MEL procedures (remarks section, limitations, upgrade/downgrade)	
	2.L	LM Required Inspection Items (RII) components, systems and software	
	2.M		
	3	**TEST EQUIPMENT/CALIBRATION STANDARDS**	
	3.A	Required accuracy and reliability primary/secondary standards	
	3.B	Contract Maintenance or Vendor Test Equipment Reliability procedures	
	3.C	Dedicated LM test equipment listing	
	3.H		
	4	**RTS PROCEDURES**	
	4.A	LM Upgrade/Downgrade Procedures	
	4.B	Interdepartmental LM aircraft status notification procedure	
	4.C	Component/System Testing Level requirements	
	4.D	Built-in test equipment (BITE) Procedures	
	4.E	Contractor/Vendor Training and Authorization for RTS	
	4.F		
	5	**PERIODIC AIRCRAFT SYSTEM EVALUATIONS**	
	5.A	Logbook entry procedures	
	5.B	Recordkeeping procedures	
	5.C	Avionics/Airframe manufactures procedures	
	5.D	Engineering Analysis Procedures	
	6	**RELIABILITY REPORTING AND QUALITY CONTROL**	
	6.A	"Operator Use Suitability Demonstration" (OUSD) Report	
	6.B	Monthly Summary Report (following OUSD to GACA office) Format	
	6.C	Reliability and Reporting Requirements after one year Period (6.B above)	

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CHAPTER 2. ALL WEATHER TERMINAL AREA OPERATIONS

Section 12. Miscellaneous All Weather Terminal Area (AWTA) Operational Approvals

5.2.12.1. GACA ACTIVITY REPORT (GAR). Principal operations inspectors (POIs) shall make a GAR entry to record the actions directed by this section. The GAR entry shall be listed according to the applicable phase as annotated below. POIs should use the comments section to record comments of interaction with the operators. The applicable GAR codes for this task are as follows:

A. XXXX (OP) (Automatic Landing Operations Other than Categories II and III)

B. XXXX (OP) (Manually Flown Flight Control Guidance System for Landing Operations Other than Categories II and III)

5.2.12.3. GENERAL. This section addresses several additional topics related to All Weather Terminal Area (AWTA) operations not formally addressed in the earlier sections of this chapter. Aviation safety inspectors (Inspectors) are reminded to consult with the Director, Flight Operations Division when unconventional AWTA operations are being considered.

5.2.12.5. SPECIAL APPROACH AND LANDING OPERATIONS. Many operators have chosen to use airborne equipment exceeding the minimum capabilities required for instrument flight and conventional AWTA operations. A means of granting operational credit for using equipment with these increased capabilities has been established. The operations specifications (OpSpecs) provide the method to approve approach and landing operations using such airborne equipment. Examples of airborne equipment with increased capabilities include automatic landing systems (autoland) and manually flown approaches using head-up guidance systems (HGS). The following subparagraphs briefly discuss these systems.

A. Autoland.

1) Many transport category airplanes are equipped with autoland systems; and a few rotorcraft are equipped with automatic deceleration and hover systems. As technology evolves, the trend of using autoland systems is increasing. Autoland systems are already standard features on many new aircraft. An operator, however, is not authorized to use autoland systems to touchdown in General Authority of Civil Aviation Regulation (GACAR) Part 121 and 135 operations unless the particular flight control guidance system is authorized for autoland by the operations specifications. GACAR § 91.69 prohibits the use of most autopilots below certain heights (50 feet or greater) during approach and landing operations, even during VFR weather conditions. The intent of these rules is to provide pilots with the terrain or obstacle clearance and the reaction time necessary to safely intervene if the autopilot malfunctions.

2) This is especially critical if the autopilot abruptly commands a hard over, nose down condition. Many autopilots (“single channel” autopilots) used in GACAR Part 121 and 135 operations are not designed to provide the redundancy necessary to automatically detect all failure combinations. If such failures occur, the pilot must intervene, disconnect the autopilot, and recover manually. Since an aircraft will lose altitude if a hard over, nose down condition occurs, the autopilot must be routinely disengaged before descending below the height above terrain specified by GACAR § 91.69. Failure to disconnect the autopilot before descending below these

heights could lead to ground contact during a recovery attempt if a malfunction occurred. Many aircraft are now equipped, however, with an automatic flight control guidance system designed to provide the performance, redundancy, and reliability necessary to detect all significant failure combinations and to prevent the autopilot from failing in a hard over, nose down condition (zero height loss). With these aircraft and equipment combinations, the safety objective of GACAR § 91.69 may be met even if the system is used to touchdown. "Fail passive" and "fail operational" automatic landing systems provide this capability and can be approved for use to touchdown. The operator's approved training curriculum must include training on autoland operations and the autoland equipment must be properly certificated and maintained. Principal operations inspectors (POIs) shall authorize the use of autoland to touchdown by issuing OpSpec C61, "Flight Control Guidance Systems for Automatic Landing Operations Other Than Categories II and III," in accordance with GACAR § 91.69(c).

3) Use of Autoland To Meet Recency of Experience Requirements for Landings Required by GACAR § 121.769. OpSpecs C61 states that the operator is authorized to conduct automatic approach and landing operations (other than CAT II and III) at suitably equipped aerodromes. The operator shall conduct all automatic approach and landing operations in accordance with the provisions of this paragraph. POIs shall observe and adhere to the following direction and guidance involving the granting of landing credit for the use of autoland to meet recency of experience requirements:

a) Only one autoland may be used toward satisfying the three landing currency requirements.

b) Credit for one landing each may go to both the pilot in command (PIC) and to the second in command (SIC).

B. Manually Flown Flight Control Guidance Systems Certificated for Landing Operations. Historically, pilots have not had flight director systems and other instrument information that enabled safe manual control of an aircraft to touchdown in instrument conditions. The development of flight control guidance systems such as HGS provides the pilot with instrument information in a manner that enables safe manual control of the aircraft through touchdown and rollout. The flight guidance provided by these systems enables a pilot to duplicate the performance and functions of an autoland system. Although the provisions of GACAR § 91.69 does not specifically address the use of manually flown flight control guidance systems, the safety objective of these rules is clearly applicable to their use. These systems provide flight guidance information equivalent to the performance, redundancy, reliability, and the hard over, nose down protection provided by autoland systems, which are approved for use to touchdown. Manually flown flight control guidance systems certified for landing operations can be approved for use to touchdown. The operator's approved training curriculums must include training on such manually flown operations, and the equipment must be properly certificated and maintained. Use of these manually flown systems to touchdown can be authorized by the issuance of OpSpecs C62 in accordance with this handbook.

5.2.12.7. FLIGHT CONTROL GUIDANCE SYSTEMS FOR AUTOMATIC LANDING OPERATIONS OTHER THAN CATEGORIES II AND III (OpSpec C61). When issued OpSpec C61, the operator is authorized to conduct automatic approach and landing operations (other than Categories II and III) at suitably equipped aerodromes. The operator must conduct all operations authorized by this paragraph in accordance with applicable sections of the GACAR and the limitations of the automatic flight control guidance system used as established under GACAR Part 21.

A. General. OpSpec C61 authorizes an operator to use a flight control guidance system with automatic landing capabilities to touchdown. GACAR § 91.69(c) specifies that this type of operation must be authorized by OpSpecs. Before issuing OpSpec C61, the POI must determine the following:

1) The Aircraft Flight Manual (AFM) permits use of the flight control guidance system (autoland system) to touchdown.

2) Training on the use of the flight control guidance system and autoland procedures to touchdown is provided to flight crew members.

3) The operator continually maintains flight control guidance and autoland systems in accordance with an approved maintenance program for autoland operations.

B. Listing Flight Control Guidance Systems. The airplanes (make/model) and the flight control guidance systems (manufacturer/model) authorized for this type of operation must be listed in OpSpec C61.

C. Additional Information. FAA AC 120-67 (as amended), Criteria for Operational Approval of Auto Flight Guidance Systems, as amended, provides additional information.

5.2.12.9. MANUALLY FLOWN FLIGHT CONTROL GUIDANCE SYSTEM FOR LANDING OPERATIONS OTHER THAN CATEGORIES II AND III (OpSpec C62). When issued OpSpec C62, the certificate holder is authorized to conduct approach and landing operations (other than Categories II and III) at suitably equipped aerodromes using manually flown flight control guidance systems approved for landing operations. The operator must conduct all approach and landing operations authorized by this paragraph in accordance with the provisions of this paragraph.

A. General. OpSpec C62 is optional for Part 121, and 135 operators to use manually flown flight control guidance systems to conduct approach and landing operations to fly a Category (CAT) I instrument landing system (ILS) using a head-up guidance system (HGS). C62 is issued to use an HGS just as OpSpec C61 is issued to use an autoland system for other than CAT II or CAT III operations.

1) This authorization is independent of CAT II/III authorizations. Typically this authorization is issued prior to CAT II/III authorizations and is kept after the issuance of CAT II/III authorizations.

2) It is required to list series of aircraft in addition to make/model due to the distinct differences in series of models (especially in the newer aircraft). The aircraft listed must have a manual flight control guidance system installed and certified for manually flown landings (HGS).

B. Exceptions to Issuance of OpSpec C62. OpSpec C62 is not required to be issued to fly a CAT I ILS when the HGS CAT III guidance is not used to touchdown. Neither OpSpec C61 nor C62 is required when the autoland or HGS are disconnected before, or not used to, touchdown.

C. Requirements for Operators Conducting Operations in MD-11 Aircraft. The U.S. National Transportation Safety Board (NTSB) recommends that principal operations inspectors (POIs) ensure MD 11 training programs provide simulator instruction in the proper procedure for autopilot disengagement and the subsequent manual control of the airplane."

D. Rotorcraft Authorization. See OpSpec R111 for the rotorcraft equivalent of this authorization.

5.2.12.11. IFR RNAV 1 DEPARTURE PROCEDURES AND STANDARD TERMINAL ARRIVALS (OPSPEC B34). Upon issuance of OpSpec B34 with RNAV 1 and RNP 1 as approved navigation specifications, GACAR Part 121, 125 and

135 operators are authorized to conduct IFR area navigation Instrument Departure Procedures (DPs) and Standard Terminal Arrivals (STARs) published in accordance with GACAR Part 97, or other foreign procedures developed in accordance with International Civil Aviation Organization (ICAO) Document 8168; Procedures for Air Navigation Services-Aircraft Operations (PANS-OPS).

A. General. The authorization provided by OpSpec/Certificate of Authorization (COA) B34 is applicable to operators conducting operations under GACAR Part 121, 125 and 135.

1) OpSpec B34 may be used to authorize operators to conduct operations using RNAV 1 and/or RNP 1 departure procedures (DP) and RNAV 1 and/or RNP 1 Standard Terminal Arrival Routes (STAR). This guidance addresses RNAV 1, RNP 1, and other RNAV flight operations. GACAR Part 91 operators do not need to obtain a COA for RNAV 1 or RNP 1 approval.

2) The term "RNAV 1 DP" or "RNP 1 DP" includes Standard Instrument Departures (SID) and Obstacle Departure Procedures (ODP).

NOTE: If an operator's aircraft are not eligible (properly equipped) and/or their flight crews are not appropriately trained to conduct RNAV 1 and/or RNP 1 DPs and STARs, then the OpSpec B34 authorization should not be issued for IFR area navigation Instrument Departure Procedures (DPs) and Standard Terminal Arrivals (STARs) published in accordance with GACAR Part 97 . RNP 1 requires GNSS and additional requirements for operating on procedures that contain RF legs, as outlined in the current edition of ICAO Doc. 9613.

3) RF legs are an optional capability rather than a minimum requirement for RNP 1 operations. For RNP 1 systems incorporating RF leg capability, the systems must comply with the requirements in FAA AC 90-105, appendix 2, for RNP 1 terminal operations, and FAA AC 90-105 (as amended), Appendix 5, for RNP 1 operations with RF leg capability.

B. RNAV 1 and/or RNP 1 DPs and STARs. FAA AC 90-100 (as amended), U.S. Terminal and En Route Area Navigation (RNAV) Operations, provides detailed guidance for operators regarding operations on RNAV 1 DPs and STARs.

1) ICAO Doc. 9613 provides guidance for system and operational approval for conducting RNP 1 DPs and STARs.

C. Designation of RNAV 1 RNP 1. RNAV DPs and STARs are designated as RNAV 1 and published in accordance with GACAR Part 172.

D. Definitions Related to This Authorization. Some important definitions as they relate to this authorization are as follows:

1) *Instrument Departure Procedure (DP).* Instrument DPs are published IFR procedures that provide obstruction clearance from the terminal area to the en route structure. There are two types of DPs: SIDs and ODPs.

a) A SID is a published IFR air traffic control (ATC) DP that provides obstacle clearance and a transition from the terminal area to the en route structure. SIDs are primarily designed for air traffic system enhancement to expedite traffic flow and to reduce pilot/controller workload.

b) An ODP is a published IFR DP that provides obstruction clearance via the least onerous route from the terminal area to the appropriate en route structure. ODPs are recommended for obstruction clearance unless an alternate DP (such as a SID or radar vector) has been specifically assigned by ATC. The RNAV 1 or RNP 1 ODP must be retrievable from the flight management system (FMS) database and included in the filed flight plan.

2) *Climb Via*. An ATC instruction that will be issued to pilots flying RNAV 1 DPs and RNP 1 DPs. The instruction is issued to enable pilots to vertically and laterally navigate (i.e., climb in accordance with published speed and/or altitude constraints) on a DP as published.

a) The “Climb Via” phraseology is used to issue clearances to pilots for route transitions, standard instrument departures (SIDs), and area navigation (RNAV) SIDs containing speed and altitude restrictions. “Climb Via” phraseology is consistent with the previously used “descend via” phraseology and procedures. This phraseology defines responsibility for adherence to published altitude and speed restrictions when issued a “climb via” or descend via” clearance.

3) *Descend Via*. An ATC instruction issued to pilots flying RNAV 1 STARs, RNP 1 STARs, or Flight Management System Procedures (FMSP). The instruction is issued to enable pilots to vertically and laterally navigate (i.e., descend in accordance with published speed and/or altitude constraints) on an arrival procedure as published.

4) *Flight Management System Procedure (FMSP).* An RNAV arrival, departure, or approach procedure developed for use by aircraft equipped with an FMS.

NOTE: The number of FMSPs in the NAS is limited and FMSP criteria are no longer preferred for the design of RNAV procedures.

5) *Standard Terminal Arrival Route (STAR).* An RNAV STAR is a published IFR ATC arrival procedure that provides a transition from the en route structure to the terminal area.

6) *Area Navigation 1 (RNAV 1) DPs and STARs*. RNAV 1 terminal procedures require that the aircraft’s track-keeping accuracy remain bound by + 1 nautical mile (NM) for 95 percent of the total flight time. RNAV 1 terminal procedures require, at a minimum, a distance measuring equipment (DME)/DME/Inertial Reference Unit (IRU) based and/or GNSS-based RNAV system satisfying the criteria of FAA AC 90-100.

7) *Required Navigation Performance 1 (RNP 1) DPs and STARS*. RNP 1 procedures meet a specific navigation accuracy performance value for a particular phase of flight or flight segment for 95 percent of the total flight time, and incorporate associated onboard performance monitoring and alerting features to notify the pilot when the RNP for a particular phase or segment of a flight is not being met. GNSS is required for RNP 1 (RNAV) flight operations.

E. Training. An operator’s GACA approved training program should include subject areas and frequency in accordance with the following:

NOTE: Operators not required to have approved training programs must include an RNAV 1 or RNP 1 DP, or an RNAV 1 or RNP 1 STAR, on each GACAR Part 61 qualification check.

5.3.12.13. OPSPEC C50, SPECIAL PILOT IN COMMAND AIRPORT QUALIFICATIONS.

A. General. OpSpec C50 is used to authorize GACAR Part 121 operators to conduct instrument flight rules (IFR) operations into special airports requiring special airport qualification in accordance with the provisions and limitations of the OpSpec and GACAR § 121.777. For detailed information refer to Volume 5, Chapter 3, Section 5, paragraph 5.3.5.15.

B. Operations into Special Pilot in Command (PIC) Qualification Aerodromes. Operators require the PIC to be qualified for operations into special PIC qualification airports. These PICs must be qualified in accordance with GACAR § 121.777.

1) OpSpec C50 is used to authorize special PIC qualification aerodromes for GACAR Part 121 Operators.

C. PIC Requirements. If both the ceiling and the visibility minimums are not satisfied as detailed in GACAR § 121.777(c), then the qualification requirements of GACAR § 121.777(b) apply. GACAR § 121.777(b) specifies that for a pilot to serve as PIC on a flight to a special qualification aerodrome, the PIC must have the benefit of one of the following:

1) The PIC, within the preceding 12 calendar-months, has made a takeoff and landing at that aerodrome while serving as a pilot flight crew member.

2) The second in command (SIC), within the preceding 12 calendar-months, has made a takeoff and landing at that aerodrome while serving as a pilot flight crew member.

3) Within the preceding 12 calendar-months, the PIC has qualified by using pictorial means acceptable to the President for that aerodrome.

D. Operator Assessment of Aerodrome Factors. The operator assesses the nature and complexity of certain factors associated with the aerodrome (e.g., high altitude, foreign aerodrome, specific terrain features, unique weather patterns may be present singly or in combination). This assessment determines whether the airport should be included in the operator's aerodrome listing in OpSpec C67 or the provisions of OpSpec C50 apply. For instance, an aerodrome with an approved IFR and or visual flight rules (VFR) approach/departure procedure and an unusual characteristic, such as a nearby politically sensitive international boundary or high terrain, may require designation as a special PIC qualification aerodrome. In this case, the aerodrome would need to be listed in OpSpec C67 and the provisions of OpSpec C50 also apply. Refer to Volume 5, Chapter 3, Section 5, paragraph 5.3.5.15, and OpSpec C67.

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 3. AIRCRAFT PERFORMANCE AND AERODROME DATA

Section 1. Airplane Performance Computation Rules

5.3.1.1. GENERAL. This chapter contains direction and guidance to be used by Principal Operations Inspectors (POIs) for reviewing and approving performance data sections of company flight manuals (CFMs). The chapter also contains guidance for accepting or approving an operator's system for acquiring aerodrome data.

A. Chapter Contents. Section 1, of this chapter is intended to be used as background and reference material. It contains basic explanations of the terms and concepts used in airplane performance computations. Section 2, contains detailed information on the rules applicable to specific airplanes. Section 3, contains specific direction and guidance for the review and approval of performance data sections of company flight manuals. These sections typically discuss the tabulated data that an airline uses to prepare their aircraft performance computations. Section 4 contains specific information, direction and guidance for Inspectors relative to the review and approval of aerodrome data acquisition systems. An aerodrome data acquisition system is a subset of the performance data system described in Section 3 of this chapter. Section 5 contains background information and guidance for Inspectors on selected related topics and practices associated with airplane performance and data acquisition systems for General Authority of Civil Aviation Regulation (GACAR) Part 121 and 135 operators. Sections 6 and 7 are currently held as placeholders for rotorcraft performance information, which will be developed at a later date.

NOTE: The material in this chapter is also helpful to and applicable to GACAR Part 125 operations.

B. How To Use This Chapter. POIs should first determine the specific make and model of aircraft involved. In addition, they will also need to know whether any modifications have been performed by supplemental type certification (STC), which affects aircraft performance. Next, POIs should determine which specific paragraphs of Table 5.3.1.1 in this section apply to the airplane in question. A POI who is generally familiar with the terms and concepts involved can then consult the specific paragraph in Section 2 of this chapter, Airplane Performance Rules. POIs who are not familiar with the terms and concepts involved will find it useful to review the background material contained in this section before proceeding to Section 2.

5.3.1.3. OVERVIEW OF AIRPLANE PERFORMANCE RULES. Aircraft performance requirements are contained in General Authority of Civil Aviation Regulations (GACAR) Part 91, 121, 125 and 135, as applicable. Airplane performance requirements are also found in GACAR Part 25, Airworthiness Standards – Transport Category Airplanes, and in GACAR Part 23, Airworthiness Standards: Normal, Utility, Acrobatic and Commuter Category Airplanes.

NOTE: In the United States (US), design standards (which include performance standards) use the term "Weight". The GACARs uses the term "Mass". Therefore, the term "mass/weight", will be used throughout this chapter.

NOTE: GACAR Part 125 operators should comply with the applicable performance requirements in this chapter, that are applicable to the aircraft or aircraft type being utilized in GACAR Part 125 operations.

A. Certification Limitations. GACAR § 91.13 requires that all flight operations (both commercial and non-commercial operations) be conducted within the limitations approved for that aircraft. These limitations are determined at the time of type certification of the airplane and are published in an approved aircraft flight manual (AFM). Historically, these limits could also be presented as placards or by other means. Specific limitations are presented as maximum and minimum values, such as the maximum certificated takeoff mass.

B. Performance Limits. Subparts F, Airplane Performance Operating Limitations, of GACAR Part 121 and 135 require operators to conduct those operations within specified performance limits. Operators must use General Authority of Civil Aviation (GACA) approved data to show this compliance. The aircraft certification rules require the manufacturer to determine the aircraft's performance capabilities at each weight, altitude, and ambient temperature within the operational limits of the aircraft. The performance section of the AFM presents variable data in tabular or graphic format. Operators must use data extracted from the performance data section of the AFM to show compliance with the operating rules of GACAR Part 121 or 135. For those aircraft certified without an aircraft flight manual, GACA approved data may be placed on placards or placed in an approved Company Flight Manual (CFM). Instances where an aircraft has been certificated without an aircraft flight manual are unusual.

C. Advisory Information. Aircraft manufacturers occasionally publish advisory information in flight handbooks that is not required for certification and which has not, therefore, been placed in the limitations section of the AFM. For example, manufacturers of light, multiengine aircraft certified under GACAR Part 23, frequently publish accelerate-stop distances as advisory information. This type of advisory information contributes greatly to aviation safety. In that regard POIs should note that operators who do not incorporate such advisory information in their CFMs are not exhibiting good judgment and may be in violation of GACARs. It may be noted that POIs should ensure that operators delineate which information in a CFM is a limitation and which information is advisory, by placing appropriate statements in their operations manual (OM) that identifies both limitations and advisory material. Operators should ensure that this information is readily available to their flight crews.

D. Date of Aircraft Certification. As aircraft performance and complexity have increased, more stringent certification limitations and operating limitations have become necessary in order for operators to maintain an acceptable level of safety. Certification and operating rules have also become correspondingly more complex. Once an airplane is certificated, however, it normally remains in production and in service under the original certification rules for many years, even though those rules may have been superseded. When determining which performance rules apply to a specific airplane, Inspectors must determine the airplane certification category, the aircraft size, and whether the aircraft has been modified by an STC. This information can be found on the FAA type certification data sheet. Inspectors should consult with GACA Airworthiness Engineers if they require further assistance in these matters. Table 5.3.1.1, contains a summary of the categories into which airplanes have been divided for purposes of performance computations under GACAR Part 121 and 135 within the Kingdom of Saudi Arabia (KSA).

Table 5.3.1.1. Airplane Categories for Performance Computation Purposes

AIRPLANE GROUPING	CHARACTERISTICS
LARGE TRANSPORT CATEGORY • Operated under GACAR Part 121 or 125	• More than 5700 kg (12,500 lbs.) MTOM. • Certified under Part 25
COMMUTER CATEGORY • Operated under GACAR Part 121 or 125	• Up to 8635 kg (19,000 lbs.) MTOM, 19 Passenger seats • Certified under GACAR Part 23 • Defined as a small airplane for performance computation purposes and a large airplane for purposes of pilot certification
NORMAL CATEGORY OVER 5700 KG (12,500 LBS.) **NOTES:** • These airplanes are no longer permitted to be certificated in the normal category with a MTOM > 5700 kg (> 12,500 lbs.) • These airplanes are only eligible for operation under Part 135 and they must be configured with no greater than 9 passenger seats.	• Certified under Part 23 and US SFAR 41.1(b) Originally certificated by the FAA with up to 19 passenger seats • Up to 8635 kg (19,000 lbs.) MTOM • Defined as a small airplane for performance computation purposes and a large airplane for pilot certification.
NORMAL CATEGORY, 5700 KG (12,500 LBS.) OR LESS • These airplanes are only eligible for operation under Part 135 and they must be configured with no greater than 9 passenger seats.	• 5700 kg (12,500 pounds) or less MTOM • Originally certificated by the FAA with up to 19 passenger seats • Certified under Civil Air Regulation (CAR) 3 or Part 23 and one of the following (including STC's): ➢ Special conditions of the FAA Administrator, SFAR 23, & SFAR 41.1(a)

Note: MTOM means maximum certificated take off mass

5.3.1.5. LARGE AIRPLANE CERTIFICATION. From an historical perspective in the United States, on July 1, 1942, Civil Air Regulation (CAR) 4 became effective, establishing the transport category for the certification of large airplanes. Large airplanes were first defined in this rule as airplanes of more than 5700 kg (12,500 pounds) MTOM.

A. Turbine-Powered Transport Category Airplanes. Effective August 27, 1957, Special Regulation (SR) 422 was the basis for certification of the first turbine-powered transport airplanes, such as the Boeing 707, the Lockheed Electra, and the Fairchild 27. SR 422A became effective July 2, 1958 and was superseded by SR 422B effective August 29, 1959. Only a few airplanes were certified under SR 422A, such as the Gulfstream I and the CL44. The majority of the turbine-powered transport category airplanes in service after this period, such as the DC-8, DC-9, and B-727, were originally certified under SR 422B. Later, SR 422B was re-codified with minor changes to become 14 Code of Federal Regulations (CFR) Part 25, which became effective in February 1965, and is the current Airworthiness (certification) Standard for Transport Category Airplanes in the United States.

5.3.1.7. DETERMINING APPLICABLE OPERATING RULES. POIs should use the guidance that follows when determining rules that apply to specific operations.

A. GACAR Part 121 Operations. Scheduled and unscheduled commercial operations using multi-engine turbine-powered aircraft (airplanes and rotorcraft) certificated in the Transport or Commuter Category.

B. GACAR Part 135 Operations. Scheduled and unscheduled commercial operations using aircraft (airplanes and rotorcraft) not referred to under GACAR Part 121. Maximum seating capacity is limited to 9 or less passenger seats.

Normal category rotorcraft must be operated under GACAR Part 135.

5.3.1.9. SMALL AIRPLANE CERTIFICATION. 14 CFR Part 1 defines a small airplane as one of not more than 5700 kg (12,500 pounds) MTOM. Historically, under the US CAR 3 and currently under 14 CFR Part 23, an airplane can only be certified as a small airplane in the normal category with a MTOM of not more than 5700 kg (12,500 pounds) and 9 passenger seats. Through the use of special conditions approved by the FAA Administrator in the U.S., (14 CFR § 21.16), SFAR 23 and SFAR 41 modified this definition to include airplanes which were modified by STC and certified as small airplanes with up to 19 passenger seats. SFAR 41 further modified the definition to define airplanes meeting the requirements of SFAR 41, paragraph 1(b) and having up to 8635 kg (19,000 pounds) MTOM as small airplanes. Under the GACARs, all of these airplanes may be used in GACAR Part 135 operations with 9 seats or less. Additionally, amendment 34 to 14 CFR Part 23 established the commuter category and defined airplanes of up to 8635 kg (19,000 pounds) certified in that category as small airplanes. Under the GACARs, these airplanes that are certificated in the commuter category are operated under GACAR Part 121 or 125.

A. Small Transport Category Airplanes. A small transport category airplane is an airplane 5700 kg (12,500 pounds) or less MTOM certified in the transport category. While Part 25 permits certification of small airplanes in the transport category, manufacturers have rarely chosen this option. For example, the Cessna Citation 501 and the Learjet 23 are certified in the normal category under Part 23. Other models of Citations and Learjets over 5700 kg (12,500 pounds) MTOM (large airplanes, as defined in 14 CFR Part 1) are certified in the transport category under Part 25. Small turbojet airplanes certified in the normal are operated in commercial service under GACAR Part 135. Small turbojet airplanes certificated in the commuter or transport category must be operated in commercial service under GACAR Part 121, but they are so disadvantaged due to size of payload that they are rarely operated in this manner. Owing to their lack of utilization in revenue service for several decades, this category of airplanes are not included in Table 5.3.1.1.

B. Normal Category Airplanes. Since deregulation occurred in the United States (circa 1984), small reciprocating and turbo-propeller executive airplanes have been stretched and passenger seats have been added. These airplanes were primarily redesigned versions of existing designs. These aircraft were originally certified under Part 23 because it was considered impractical to redesign them to Part 25 standards. To address this issue, Special Federal Aviation Regulation (SFAR) 23, SFAR 41, and Appendix A to 14 CFR Part 135 were additional airworthiness standards developed to allow for the certification of a Part 23 airplane with more than nine passenger seats. Within the U.S. system, all of these rules except Appendix A of 14 CFR Part 135 have since been superseded. The production of airplanes certified under these rules ended in 1991. Currently in the KSA, airplanes certified under SFAR 23 are limited to a MTOM of 5700 kg (12,500 pounds) and no greater than 9 passenger seats Ref. GACAR § 135.111(b)). In the U.S. 14 CFR, SFAR 41.1(b) provided for certification of airplanes with up to 8635 kg (19,000 pounds) MTOM and 19 passenger seats in the normal category. Under the GACAR, these airplanes are prohibited for operations under GACAR Part 135 (Ref. GACAR § 135.111(a)).

C. Commuter Category. In January 1987, Amendment 34 to 14 CFR, Part 23, became effective and established the commuter category. Multiengine airplanes with up to 19 passenger seats and 8635 kg (19,000 pounds) MTOM may be certified in the commuter category. Commuter category airplanes of over 5700 kg (12,500 pounds) MTOM are defined as small airplanes by Part 23 for the purposes of Parts 21, 23, 36, 121, and 135. They are defined as large airplanes for the purposes of Parts 61 and 91. As has been previously stated, Commuter Category airplanes are operated under GACAR Part 121 or 125 in the KSA.

D. Determining Allowable Takeoff Mass. Depending on the specific rule under which an airplane was certified, the calculations that must be performed to determine allowable takeoff mass can include any of the following:

1) *AFM maximum certificated mass/weight limitations (structural).*

• Maximum taxi mass/weight

• Maximum takeoff mass/weight

• Zero fuel

• Landing

2) *Aerodrome elevation and temperature.*

• Departure point

• Destination

• Alternate

3) *Runway limit mass/weight.*

• Accelerate-stop distance

• Accelerate-go (one-engine inoperative)

• All-engines takeoff distance

4) *Takeoff climb limit mass/weight.*

• First segment

• Second segment

• Transition segment (divided into 3rd and 4th segments under some rules)

5) *Takeoff obstacle limit mass/weight.*

6) *En route climb limit and terrain clearance mass/weights.*

• All-engines operative

• One-engine inoperative

•Two-engines inoperative

7) *Approach climb limit mass/weight.*

8) *Landing climb limit mass/weight.*

9) *Destination landing distance mass/weight.*

10) *Alternate landing distance mass/weight.*

E. Application of Flight Handbook Performance Limits. Many of the requirements of Subpart F of GACAR Part 121 and 135 apply only until the aircraft takes off from the departure point. Other requirements from these subparts apply at all times, as do the AFM limitations. For example, GACAR § 121.275 prohibits a large, turbine airplane from takeoff unless, allowing for en-route fuel burn, the airplane will be capable of landing on 60 percent of the available runway at the planned destination. The regulations do not, however, prohibit the airplane from landing at the destination when, upon arrival, conditions have changed and more than 60 percent of the runway is required. In this case, the airplane must only be able to land on the effective runway length as shown in the flight manual performance data.

5.3.1.11. V SPEED DEFINITIONS. POIs should be knowledgeable in the terminology and definitions that apply to V speeds. The following definitions apply to speeds used in airplane performance computations.

A. V_{MC} Speed. V_{MC} is the minimum speed at which the airplane is directionally controllable with the critical engine inoperative.

1) V_{MCG} is the minimum speed at which the airplane can be demonstrated to be controlled on the ground using only the primary flight controls when the most critical engine is suddenly made inoperative. Throttling an opposite engine is not allowed in this demonstration. Forward pressure from the elevators is allowed to hold the nosewheel on the runway, however, nosewheel steering is not allowed.

2) V_{MCA} is the minimum speed at which directional control can be demonstrated when airborne with the critical engine inoperative. Full opposite rudder and not more than five degrees of bank away from the inoperative engine are permitted when establishing this speed. V_{MCA} may not exceed 1.2 V_S.

B. V_{EF} Speed. V_{EF} is the airspeed at which the critical engine is assumed to fail. V_{EF} is selected by the aircraft manufacture for purposes of certification testing, primarily to establish the range of speed from which V_1 may be selected. V_{EF} may not be less than V_{MCG}.

C. V_{MU} Speed. V_{MU} is defined as minimum unstick speed. V_{MU} is the minimum speed demonstrated for each combination of weight, thrust, and configuration at which a safe takeoff has been demonstrated.

D. V_R Speed. V_R is defined as rotation speed and is applicable to transport category airplanes certified under SR 422A and later rules and to commuter category airplanes. V_r is determined so that V_2 speed is reached before the aircraft reaches 35 feet (10.6 m) above the runway surface. V_R may not be less than V_{MU} or 1.05 V_{MCA}.

E. V_1 Speed. V_1 speed is the takeoff decision speed (formerly the critical engine failure speed). V_1 may be selected from a range of speeds. V_1 may be selected as low as V_{EF} but cannot exceed any of the following speeds:

- V_R

• Refusal speed (the maximum speed the aircraft can be brought to a stop at the selected weight and flap setting on the remaining runway)

• V_{MBE} (brake energy limit speed)

• Limiting tire speed (if one has been established)

F. V_{LOF} Speed. V_{LOF} is the speed at which the aircraft becomes airborne.

G. V_S, V_{SO}, and V_{S1} Speeds. V_S is power-off stalling speed or the minimum steady speed at which the aircraft is controllable. V_{SO} is stalling speed in the landing configuration. V_{S1} is the stalling speed or minimum controllable speed in a specified configuration.

H. V_2 Speed. V_2 is the takeoff safety speed. V_2 is used in multiengine transport, commuter category, and large non-transport category airplanes. V_2 is the speed at which the airplane climbs through the first and second takeoff segments. V_2 must be greater than V_{MU} and 1.1 V_{MCA}. V_2 must also be greater than the following:

• 1.2 V_{S1} for two-engine and three-engine reciprocating and turbo-propeller-powered airplanes

• 1.2 V_{S1} for turbojet airplanes without the capability of significantly reducing the one-engine inoperative stall speed (no flaps or leading edge devices)

• 1.5 V_{S1} for turbojet airplanes with more than three engines

• 1.5 V_{S1} for turbojet airplanes with the capability for significantly reducing the one-engine inoperative stall speed

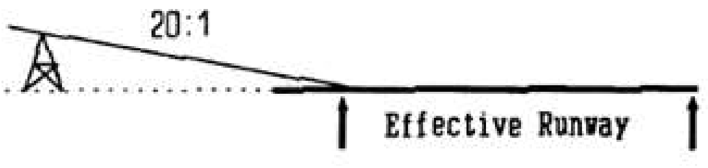
I. V_{REF} Speed. V_{REF} is 1.3 V_{SO}. V_{REF} is the speed used on approach down to 50 feet (15.25 m) above the runway when computing landing distances.

NOTE: All V speeds are measured and expressed as calibrated airspeeds, but may be considered as indicated airspeeds for purposes of general discussion.

5.3.1.13. RUNWAY LENGTH. The usable runway length may be shorter or longer than the actual runway length due to stopways, clearways, and obstacle clearance planes.

A. Takeoff Runway Length: Non-Transport Category Airplanes. The effective takeoff runway length for non-transport category airplanes is defined by obstacle clearance planes. When a 20:1 obstacle clearance plane does not intersect the runway, the effective runway length is defined as the distance from the start of the takeoff roll to the far end of the runway. When the obstacle clearance plane does intersect the runway, the effective runway length is defined as the distance from the start of the takeoff roll to the point at which the obstacle clearance plane intersects the far end of the runway. (See Figure 5.3.1.1. below)

Figure 5.3.1.1. Effective Runway Length



B. Takeoff Runway Length: Transport Category Airplanes. For transport category airplanes, the usable runway is not determined by the obstacle clearance plane. An obstacle clearance analysis must be made for each runway. For transport category airplanes certified under SR 422A and subsequent rules, the actual runway length may be extended by clearways and stopways. Clearways and stopways are defined in GACAR, Part 1.

C. Obstructions. An obstruction is a man-made or natural object which must be cleared during takeoff and landing operations. While fixed towers and buildings can be readily identified as possible obstructions, obstruction heights over roadways, railroads, waterways, and other traverse ways are not so apparent. Unless the aerodrome authority or the operator determines with certainty that no movable objects will project into the airspace over the following passageways when an airplane flies over, then obstructions are considered to exist on them to the following heights:

• Over highways: 17 feet (6 meters)

• Over other roadways: 15 feet (5 meters)

• Over railroads: 25 feet (9 meters)

• Over waterways and other traverse ways, the height of the tallest vehicle or vessel that is authorized to use the waterway or traverse way

D. Line-Up Distance. Takeoff distance is measured from the position of the main landing gear on the runway to the same point as it passes the runway crossing height (RCH). The distance required to place the airplane in position for takeoff is not available for the takeoff run. A significant error may be introduced if this distance in not subtracted from the available runway distance when takeoff performance is computed. Large airplanes can use several hundred feet of runway when turning into position on the runway. Also, rolling starts from a taxiway can reduce effective runway by an additional increment because of slow acceleration while takeoff thrust is being set. The allowance may be included in the published data or published as a correction in the AFM. Inspectors should ensure that operators have appropriate guidance for flight crews.

5.3.1.15. RUNWAY LIMIT MASS/WEIGHT—TRANSPORT AND COMMUTER CATEGORIES The required takeoff distance is the longest of three takeoff distances: accelerate-stop, accelerate-go, and all-engines operating. Since the available runway length is a fixed value, allowable takeoff mass/weight for any given runway is determined by the most restrictive of the applicable distances.

A. Accelerate-Stop Takeoff Distance. The accelerate-stop distance is the total distance required to perform the following actions:

• Accelerating, with all engines operating at takeoff thrust, from a standing start to VEF speed at which the critical engine is assumed to fail

• Making a transition from takeoff thrust to idle thrust, extending the spoilers or other drag devices, and applying wheel brakes (no credit may be taken for reverse thrust)

• Decelerating, and bringing the airplane to a full stop

B. Accelerate-Go Takeoff Distance. The accelerate-go (with one-engine inoperative) takeoff distance is the total distance required to perform the following actions:

• Accelerating with all engines operating to V_{EF} speed with recognition of the failure by the flight crew at V_1

• Continuing acceleration with one engine inoperative to V_r speed at which time the nose gear is raised off the ground

• Climbing to the specified RCH, crossing the RCH at V_2 speed

C. All-Engines Takeoff Distance. All-engines takeoff distance is the total distance required to accelerate, with all engines at takeoff thrust, to V_R or V_2 speed (appropriate to the airplane type), and to rotate and climb to a specified RCH. For airplanes certified under SR 422A and subsequent regulations (i.e. Part 25), this distance is 1.15 times the measured distance.

5.3.1.17. TAKEOFF CONDITIONS. Takeoff performance data published in the AFM is based on takeoff results attainable on a smooth, dry, hard runway with a specified flap setting and a specific mass/weight. The GACARs do not require that data for compensating takeoff performance due to the effects of wet or contaminated runways be published in an AFM. These factors, however, must be accounted for during revenue operations (see paragraph 5.3.1.21 for more information on wet or contaminated runways).

A. Aerodrome Elevation. Aerodrome elevation is accounted for in takeoff computations because the true airspeed (groundspeed in no-wind conditions) for a given takeoff increases as air density decreases. As aerodrome elevation increases, the takeoff run required before the airplane reaches V_1, V_{LOF}, and V_2 speeds increases; the stopping distance from V1 increases; and a greater air distance is traversed from lift-off to the specified RCH because of the increased true airspeed at the indicated V_2 speed.

B. Temperature. As air temperature increases, airplane performance is adversely affected because of a reduction in air density which causes a reduction in attainable takeoff thrust and aerodynamic performance.

C. Density Altitude. Takeoff performance is usually depicted in an AFM for various elevations and temperatures. The effect of variations in barometric pressure, however, is not usually computed or required by the regulations. Some airplanes with specific engine installations, however, must have corrections in allowable weight for lower-than-standard barometric pressure.

D. Mass/Weight. Increasing takeoff mass/weight increases the following:

• V_1 of and the ground-run distance required to reach the lift-off point

• The air distance required to travel from the lift-off point to the specified RCH

• The distance required to bring the aircraft to a stop from V1 speed and the energy absorbed by the brakes during the stop

E. Flap Selection. Many airplanes have been certified for takeoff with variable flap settings. The effect of selecting more flap (within the allowable range) reduces VR, VLOF, and the required ground-run distance to reach lift-off. All of these increase the accelerate-stop distance limit weight, the accelerate-go distance limit mass/weight, and the all-engines operating limit mass/weight. The additional flap extension increases aerodynamic drag and also decreases the climb gradient the airplane can maintain past the end of the runway. In the case of a short runway, it may not be possible to take off without the flaps set at the greatest extension allowed for takeoff. In the opposite case, at a high elevation and a high ambient temperature, it may only be possible to climb at the required gradient with the minimum allowable takeoff flap extension. See the following table for an example of the effect of flaps on required runway length and climb gradient. (See Table 5.3.1.2, below)

Table 5.3.1.2. Example of the Effect of Flaps on Required Runway Length and Climb Gradient

Wing Flaps Operating Position	Runway Length Required for Takeoff	One-Engine Climb Gradient
25 degree	6,350 feet (1900 meters)	2.9 percent
15 degree	7,000 feet (2100 meters)	4.5 percent
5 degree	7,950 feet (2400 meters)	5.3 percent

F. Accounting for Effects of Runway Slope. The effect of runway slope on the acceleration, stopping distance, and climb-out to the end of runway crossing height (RCH) must be accounted for. Uphill grades increase the ground run required to reach the points at which V1, VR, and VLOF are attained; but they also improve stopping distance. An airplane climbing over an uphill grade runway will require more distance to reach the specified RCH. The reverse is true of downhill grades. Gradient corrections are computed for both runway length and takeoff speeds and the average runway gradient is normally used. The average gradient is determined by dividing the difference in elevation of the two ends of the runway by the runway length. For large variations in runway height (+5 feet (2 meters)), the retarding effect on the uphill segment is proportionally greater than the acceleration gained on the downhill portion. In such a case, the slope used for computations should be proportionately greater than the average slope.

5.3.1.19. WIND CONDITIONS DURING TAKEOFFS AND LANDINGS. Runway performance computations for both takeoffs and landings must always account for the effect of wind conditions in a conservative manner.

A. Headwinds. Although it is not required, the beneficial effect of a headwind on takeoff and climb distances may be used to compute performance. Only one half of the reported steady-state headwind component (parallel to the runway) may be used.

B. Tailwinds. For a downwind takeoff or landing, at least 150 percent of the reported steady-state tailwind component must be used to compute the performance effect. While most airplanes are certified for takeoff with not more than 10 knots of tailwind component, some airplanes have been certified with higher limits.

C. Crosswinds. The maximum-gust velocity must be used in the most unfavorable direction for computing the effective crosswind component. Inspectors should be aware of the following guidance.

1) Crosswind values in most AFMs are stated as ***demonstrated*** values rather than as limits.

2) While a crosswind may not directly limit an operation from a specific runway, crosswinds and runway conditions affect V_{MCG}. Under some runway conditions, an increase of 1 knot of crosswind component may raise V_{MCG} by as much as 4 knots. Inspectors should be aware that the flight manual may contain different V_{MCG} values for wet and dry conditions and crosswind components.

NOTE: V_1 may not be less than V_{MCG}.

5.3.1.21. WATER AND CONTAMINATION OF RUNWAYS. AFM performance data is based on a dry runway. When a runway is contaminated by water, snow, or ice, charted AFM performance values will not be obtained. Manufacturers typically provide guidance material to operators so that appropriate corrections for these conditions may be applied to performance calculations. These calculations may indicate that a reduced payload capability will exist under these conditions. Inspectors should be aware of the following guidance when operating under these conditions.

A. Any runway which is not dry is considered to be wet. Standing water, puddles, or continuous rain are not necessary for a runway to be considered wet. Runway braking friction can change when there is a light drizzle. In some cases, even dew or frost which changes the color of a runway will result in a significant change in runway friction. The wet-to-dry stopping distance ratio on a well-maintained, grooved, wet runway is usually around 1.15 to 1. On a runway where the grooves are not maintained and rubber deposits are heavy, the stopping distance ratio could be as high as 1.9 to 1. On un-grooved runways, the stopping distance ratio is usually about 2 to 1. In the case of a runway with new pavement or where rubber deposits are present, the ratio could be as high as 4 to 1. Some newly-surfaced asphalt runway surfaces can be extremely slippery when only slightly wet.

B. POIs should consult FAA, Advisory Circular (AC) 91-6 (as amended), Water, Snow, and Slush on the Runway, for operations on runways which have snow, slush, ice, and standing water.

Such conditions typically require corrections for takeoff calculations because of two factors. The first factor is the reduction of runway friction which may increase stopping distance in the case of a rejected takeoff. The second factor is the impingement drag of water or slush on the landing gear or flaps which could cause a retarding force and a deceleration force during takeoff.

5.3.1.23. TIRE SPEED AND BRAKE LIMITS. POIs should be aware that allowable takeoff mass/weight may be limited by either tire speed limits or the ability of the brakes to absorb the heat energy generated during the stop. The energy the brakes must absorb during a stop increases by the square of the speed at which the brakes are applied. Accelerate-stop distances are determined with cold brakes. When the brakes are hot, they may not be able to absorb the energy generated, and the charted AFM stopping distances may not be achieved. The heat generated by the stop may cause the wheels or tires to fail. The peak temperature is usually not reached until 15 to 20 minutes after the stop, which can result in the wheel assemblies catching on fire. The wheels of most large airplanes are protected by frangible plugs, which are designed to melt and allow air to escape from the tires before they explode. Short turnaround times and rejected takeoffs present a potential hazard in terms of heat build-up in tires and in brake assemblies. Most manufacturers publish short turn-around charts to provide for a minimum cooling period for subsequent takeoffs. Inspectors should ensure that operators include these charts and procedures in the operator's OMs or CFMs.

5.3.1.25. TAKEOFF CLIMB LIMIT MASS/WEIGHT. The climb limit is the mass/weight at which the airplane can climb at a specified minimum climb gradient or specified minimum climb rate in still air through the segments of the takeoff flightpath.

A. Transport Category and Commuter Category Airplanes. Climb performance for airplanes in these categories is measured in terms of a gradient (height gained divided by distance traveled, expressed as a percentage) in specified climb segments. The gradients for each group of airplanes are provided in Section 2 of this chapter.

B. Other Airplanes. All airplanes other than turbine-powered, transport category, and commuter category airplanes must be able to maintain a specified rate of climb throughout the takeoff climb segments. Rates of climb are expressed as multiples of VS. The required rates of climb for various categories of airplanes are given in Section 2 of this chapter.

5.3.1.27. TAKEOFF MASS/WEIGHTS LIMITED BY OBSTACLES. To obtain obstacle clearance throughout the takeoff flightpath, operators of transport category and commuter category airplanes must identify obstacles and limit takeoff mass/weight. Obstacles in the takeoff path that are not cleared horizontally must be cleared vertically by at least the amount specified in the certification rule.

A. Definition of Obstacle. Any object inside the aerodrome boundary which is within a horizontal distance of 200 feet (60 meters) of the flightpath or outside the aerodrome boundary within 300 feet (75 meters) of the flightpath, must be considered to be an obstacle for takeoff computations.

B. Net Flightpath. A net flightpath for takeoff is derived by subtracting a specified percentage from the actual demonstrated climb gradient. This has the effect of adding a progressively larger clearance margin as the airplane travels away from the runway. Specified percentages for airplanes certified under different rules are listed in Section 2 of this chapter.

C. Conditions for Computing Net Flightpath. The takeoff weight limited by obstacle clearance is computed in a manner similar to the runway takeoff mass/weight limit as follows:

1) One engine is assumed to fail at VEF. The remaining engines are at takeoff thrust.

2) Landing gear retraction is assumed to begin immediately after lift-off. The airplane should climb out at a speed as close as practical to, but not less than, V2 speed until the selected acceleration height is reached. The acceleration height is chosen by the operator but may not be less than 400 feet (135 m).

3) After the airplane reaches the acceleration height, the final segment begins with the transition to en route climb configuration (which is to accelerate to climb speed, retract wing flaps, and reduce to maximum continuous thrust (MCT)). The operator has considerable latitude in choosing the transition method. The operator may choose the flightpath for any runway that gives the best results for the particular height and distance of the obstacles. One extreme is to climb directly over the obstacle at V2, with takeoff flaps and takeoff thrust. The opposite extreme is to level off at the selected acceleration height, accelerate in level flight (negative slope not allowed) to the flaps-up climb speed, and then to continue climbing and reducing thrust to MCT. An infinite variety of flightpaths between

these two extremes may be used. In any event, the flightpath chosen to show obstacle clearance must extend to the end of the takeoff flightpath. The takeoff flightpath ends not lower than 1,000 feet (300 m)for SR 422 airplanes and not lower than 1,500 feet (450 m) for SR 422A, SR 422B, Part 25 and commuter category airplanes.

D. Turns. For analysis purposes, it may be assumed that the airplane turns to avoid obstacles; but not before reaching 50 feet (15 m) above the runway and by not more than a 15-degree bank. When a turn is used, the rate of climb or gradient must be reduced by the increment of climb performance lost. See FAA AC 120 – 91, Airport Obstacle Analysis (as amended).

E. Takeoff Minimums. Airspace and instrument procedure design criteria, such as International Civil Aviation Organization (ICAO) Procedures for Aircraft Navigation Services-Aircraft Operations (PANS-OPS) (the FAA uses Terminal Instrument Procedures (TERPS) criteria), are usually based on the assumption that the airplane can climb at 200 feet (61 m) per nautical mile (NM) (approximately 30:1) to the minimum en-route altitude through the takeoff flightpath.

1) When obstacles penetrate the obstacle clearance plane, the airplane must be able to climb at a steeper gradient to clear the obstacle or one must use higher than standard takeoff minimums to allow the obstructions to be seen and avoided under visual conditions. Authorizations for lower-than-standard takeoff minimums are based on the operator adjusting airplane takeoff mass/weight to be able to avoid obstacles in the takeoff flightpath should an engine fail on takeoff. POIs shall not authorize operators who do not prepare an aerodrome analysis and perform obstacle climb computations, to use lower-than-standard takeoff minimums. Inspectors may approve a system in which the operator makes obstacle clearance computations and performs lower-than-standard visibility takeoffs on specified runways, as opposed to all runways.

2) Airspace and instrument procedure design criteria, such as ICAO PANS-OPS performance criteria, do not take into account whether or not the aircraft is operating on all engines. Operators must either show compliance with PANS-OPS criteria with an engine out or have an alternate routing available for use in case of an engine failure during takeoff.

5.3.1.29. EN-ROUTE PERFORMANCE LIMITS. There are a number of en-route performance rules which may limit the mass/weight at which an airplane can be dispatched or released.

A. Part 121 En-route Obstacle Clearance. Subpart F of GACAR Part 121 contains en-route obstacle limitations for all airplanes operated under GACAR Part 121. In general, all airplanes must be operated at a mass/weight at which single-engine failure (two-engine airplanes) or multiple engine failures (3- and 4- engine airplanes) can be experienced and the airplane continued on to destination (GACAR §§ 121.267. 12.271) or diverted to an alternate aerodrome. After the engine failure, the airplane must be capable of clearing all obstructions by a specified margin. Driftdown or fuel dumping may be used to comply with these requirements (see subparagraph E that follows for a discussion of driftdown).

B. Part 135 En-route Obstacle Clearance. GACAR § 135.145 places en-route performance limitations on all GACAR Part 135 IFR passenger carrying operations.

1) GACAR § 135.145(a)(1) effectively prohibits the release of passenger-carrying flights under IFR conditions in single-engine airplanes. The rule does permit over-the-top operations under limited circumstances.

2) GACAR § 135.145(a)(2) prohibits the release of multiengine airplanes in passenger-carrying IFR operations or VFR over-the-top operations unless specific conditions are met. The airplane must be able to sustain a failure of the critical engine and climb at a rate of 50 feet (15.2 m) per minute at the minimum en-route altitude (MEA) or 5,000 feet (1500 m) mean sea level (MSL), whichever is higher. The other circumstance in which a multiengine airplane can be released in IFR conditions or VFR over-the-top conditions is when, after an engine failure, a descent or continuance of the flight under VFR if its critical engine fails can be made.

NOTE: POIs must be aware that small airplanes of 2735 kg (6,000 pounds) or less MTOM are not required to have the capacity to climb or maintain altitude with an engine failed at any altitude for certification.

C. Part 121 Extended Overwater Operations.

1) GACAR § 121.81 prohibits the release of 2- and 3-engine airplanes (except 3-engine turbojet airplanes) of more than 19 passengers seats or 45500 kg (100000 pounds) MTOM for operations more than 1-hour distance from an acceptable alternate aerodrome measured at one-engine inoperative cruise speed. The only exceptions to this rule are provided under extender operations (ETOPS) approvals, which apply to extended overwater operations of turbojet airplanes (ETOPS) and which, after a great deal of study, may be approved by the POI with prior concurrence of the Director, Flight Operations Division. When such approval is granted to an operator, these authorizations are contained in OpSpec B42. (See FAA AC 120-42 (as amended), Extended Operations (ETOPS and Polar Operations).

2) GACAR § 121.271 limits the release of 4-engine, transport category airplanes. The limitations of these rules vary with the rule under which the aircraft was certified. In general, the airplanes must be dispatched at a mass/weight which will allow the loss of two engines simultaneously at the most critical point of the flight, while still allowing the airplane to maintain a specified altitude and reach an alternate aerodrome. The two means by which operators may choose to show compliance are by limiting the takeoff mass/weight or by fuel dumping (see subparagraph E below). Two points on a route that are frequently critical are the point at which the airplane reaches the top of climb and the point at which the airplane is furthest from an alternate aerodrome.

D. Part 135 Overwater Operations. GACAR § 135.143 prohibits operators from operating a land airplane overwater (except for takeoff and landing) at a mass/weight at which a positive rate of climb of 50 feet (0.25 m/s) per minute cannot be maintained at 1,000 (300 m) feet above ground level (AGL). There are no provisions in GACAR Part 135 for the use of fuel dumping to comply with this requirement.

E. Part 121 Fuel Dumping and Driftdown. GACAR Part 121 operators may use driftdown or fuel dumping procedures to comply with certain en-route performance rules.

1) Driftdown can be defined as a procedure by which an airplane with one or more engines inoperative and the remaining engines at maximum continuous thrust (MCT), while maintaining a specified speed (usually best L/D X 1.01%), descends to the altitude at which the airplane can maintain altitude and begin to climb (this altitude is defined as the driftdown height).

2) Many modern airplanes can be dispatched or released at takeoff mass/weights which place the driftdown height below the minimum altitude that the airplane is required to maintain by Part 121. In this case, the takeoff mass/weight must be limited or fuel dumping must be used to comply with the en route limit. Compliance must be demonstrated at all points in the en route segment of the flight.

3) Before approving driftdown or fuel dumping procedures for GACAR Part 121 operators, POIs shall carefully evaluate the operator's proposed data, procedures, and training program. The data must either come from the AFM or from the manufacturer. Unapproved data must be reviewed by the GACA, either during an exemption process or prior to the Inspector's approval. The CFM must contain specific flight crew driftdown and/or fuel dumping procedures. The operator's training program must provide adequate initial and recurrent training in these procedures. Operators must provide for the POI's evaluation of each route; route segment or area; an analysis of the reliability of wind and weather forecasting; the means and accuracy of navigation; prevailing weather conditions, particularly turbulence; terrain features; air traffic control facilities; and the availability of suitable alternate aerodromes. The operator must provide flight crews with adequate weather briefings.

5.3.1.31. APPROACH AND LANDING CLIMB LIMITS. Approach and landing climb limit mass/weights limit the allowable takeoff mass/weight. To compute the maximum allowable takeoff mass/weight, the predicted mass/weight of the airplane after arrival at the intended destination and alternate aerodromes must be computed by subtracting the estimated en route fuel burn. The resulting mass/weight must allow the airplane to climb at a minimum specified gradient (rate of climb) in both the approach and landing configurations.

A. Approach Climb. This requirement is intended to guarantee adequate performance in the go-around configuration after an approach with an inoperative engine (gear up, flaps at the specified approach setting, the critical engine inoperative and remaining engines at go-around thrust).

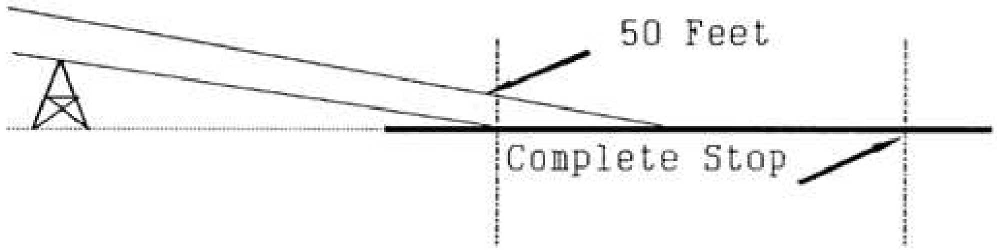
B. Landing Climb. This requirement is intended to guarantee adequate performance to arrest the descent and allow a go-around from the final stage of a landing (gear down, landing flaps, and go-around thrust).

5.3.1.33. LANDING DISTANCE. The maximum mass/weight for an airplane landing on any runway must be limited so that the landing distance required by the performance rules will be less than the effective landing length available.

A. Effective Landing Runway Length. Effective landing runway length for all categories of airplanes is the distance from the point on the approach end of the runway at which the obstruction plane intersects the runway to the roll-out end of the runway. The obstruction plane is a plane that is tangent to the controlling obstruction in the obstruction clearance area that slopes down toward the runway at a 1:20 slope from the horizontal. The area in which the obstruction clearance plane must clear all obstacles is 200 feet (60 meters) on each side of the runway centerline at the touchdown point, which expands to a width of 500 feet (150 meters) on each side at a point 1,500 feet (450 meters) from the touchdown end and beyond. The centerline of the obstruction clearance area may curve at a radius of not less than 4,000 feet (1200 meters), but the last 1,500 feet (450 meters) to the touchdown point must be straight in. Stopways are not usually considered, and clearways may not be considered, as available landing areas.

B. Required Landing Distance. The required landing distance is the distance needed to completely stop from 50 feet (15 m) above the point at which the obstacle clearance plane intersects the runway. (See Figure 5.3.1.2) In establishing landing performance data, the airplane must approach in a steady glide (or rate of descent) down to 50 feet (15 m) at a speed not less than 1.3 times the landing stall speed. After touchdown, the stopping distance is based on the drag from the landing flaps, and fully extended speedbrakes.

Figure 5.3.1.2. Landing Distance


50 Feet
Complete Stop

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 3. AIRCRAFT PERFORMANCE AND AERODROME DATA

Section 2. Specific Airplane Performance Rules

5.3.2.1. GENERAL. This section contains detailed information and guidance for Inspectors on the performance rules applicable to specific airplanes. In many cases, tables and figures are provided in this section for the POI's reference.

A. Historical Development of Climb Gradient Requirements as a Part of the Evolution of Certification Requirements. In an attempt in the 1950s to impose rational performance requirements during the advent of the development of Turbine Powered Airplanes; the United States (US), the United Kingdom (UK), and other states cooperated at International Civil Aviation Organization (ICAO) to identify requirements for climb gradients, i.e., requiring that an airplane reach a given height at a certain distance from lift off, or takeoff. As a result of these efforts, during the time period of 1958-1960, the Federal Aviation Administration (FAA) developed Special Regulation (SR) 422, 422a, and 422b, each with slightly different and more exacting performance requirements for these airplanes. Later on, this material was revised and refined and then incorporated into 14 Code of Federal Regulations (CFR) Part 25. Airworthiness Standards: Transport Category Airplanes; and Operating Performance requirements were also referenced in Part 121 and other operating rules in the US. While this work did not necessarily lead to an internationally accepted ICAO Performance Code at that time; the result was valuable and the certification criteria for aircraft certificated in the US, the UK, and other states were largely identical. These efforts paved the way for continual harmonization of certification requirements to the point where airworthiness standards for Transport Category Airplanes throughout the world are now largely identical.

5.3.2.3. TRANSPORT CATEGORY AIRPLANE PERFORMANCE. Turbine-powered (turbojet and turboprop) transport airplanes must be operated under the performance rules in General Authority of Civil Aviation Regulation (GACAR) §§ 121.255 through 121.279 or 125.127 through 125.139 (see Table 5.3.2.1 below).

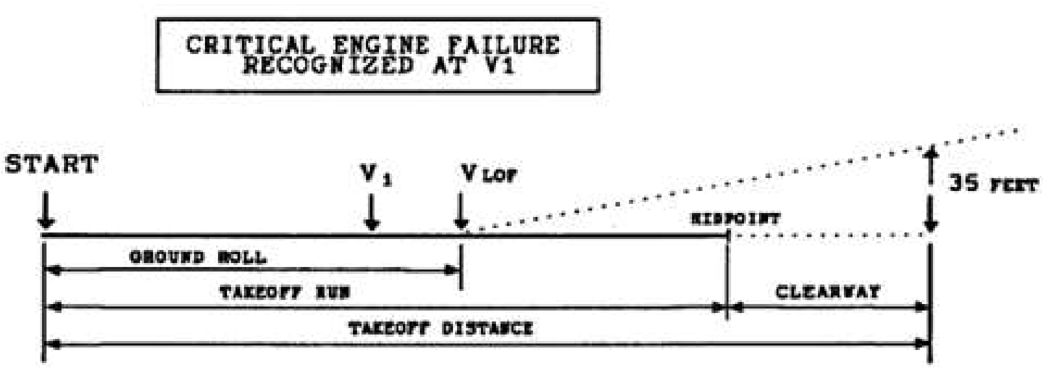
Table 5.3.2.1. Summary of Dispatch Rules for Turbine Powered Transport Category Airplanes

Temp. Correct.	No	Data at Ambient Temp.
STRUCTURAL LIMITS		
Maximum Taxi	Yes	AFM Limit
Maximum Takeoff	Yes	AFM Limit
Zero Fuel Mass/Weight	Yes	AFM Limit
TAKEOFF MASS/WEIGHT		
Accelerate/Stop	Yes	GACAR §§ 121.263 and 125.131
All-Engines	Yes	GACAR §§ 121.263 and 125.131
Accelerate/Go	Yes	GACAR §§ 121.263 and 125.131
Obstacle Limit	Yes	GACAR §§ 121.263 and 125.131
Climb Limit	Yes	GACAR §§ 121.263 and 125.131
EN ROUTE LIMITS		
All-Engines	No	
One-Eng. Inoperative	Yes	GACAR §§ 121.267 and 125.133
Two-Eng. Inoperative	Yes	GACAR §§ 121.271 and 125.133
Approach Climb	Yes	GACAR §§ 121.275, 125.137 and 25.121(d)
Landing Climb	Yes	GACAR §§ 121.275, 125.137 and 25.119
Max. Landing Mass/Weight	Yes	AFM Limit
RUNWAY LIMIT		
Destination	Yes	GACAR §§ 121.275 and 125.137
Alternate	Yes	GACAR §§ 121.279 and 125.139

A. Runway Limits for Part 25 Airplanes. The takeoff distance for airplanes certified under Part 25 is the longer distance among the accelerate-stop distance, the accelerate-go distance and the 115 percent all-engines takeoff distance. The nose wheel is lifted off the ground at V_R which is calculated so that V_2 is reached as the aircraft becomes airborne. Clearways may be used but stopways are not allowed. A clearway under Part 25 is an area beyond the runway that is centrally located around the extended centerline (CL) and is under the control of airport (aerodrome) authorities. A clearway extends 300 (92 m) feet on either side of the extended runway CL at the runway elevation, and into which only frangible runway lights of 26 inches (.67 m) or less in height may intrude. The maximum clearway distance may not exceed one half of the takeoff run distance. The terminating point for measuring the accelerate-go distance is 35 (10.7 m) feet for a dry runway and 15 feet (4.6 m) for a wet runway. The difference is due to the fact that an amendment to Part 25, amendment 25 - 92, effective February 1998, allowed for the reduced screen height for a wet runway condition along with other changes to Part 25 and the operating rules at that time.

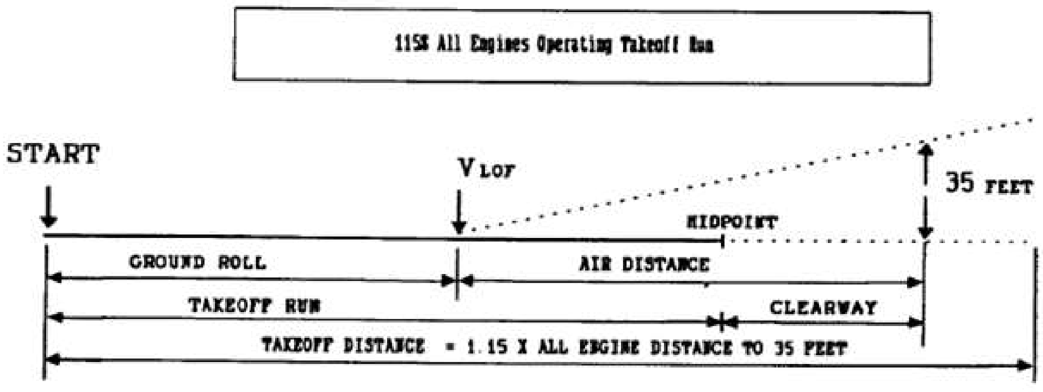
B. Special Regulation SR 422B and Part 25 Accelerate-Go Distance. The accelerate-go distance is measured from the start of the takeoff roll to the point at which the aircraft reaches an elevation of 35 feet (10.7 m) above the runway. This point may be over the clearway. Failure of the critical engine is recognized at V1. (See Figure 5.3.2.1, below)

Figure 5.3.2.1. SR 422B and Part 25 Accelerate Go-Distance



C. SR 422B and Part 25, 115 percent All-Engines Takeoff Distance. The 115 percent all-engines takeoff distance is the distance from the start of the takeoff run to the point the airplane reaches 35 feet (10.7 m) above the runway elevation, plus an additional 15 percent. This point must be over the runway or the clearway. (See Figure 5.3.2.2, below)

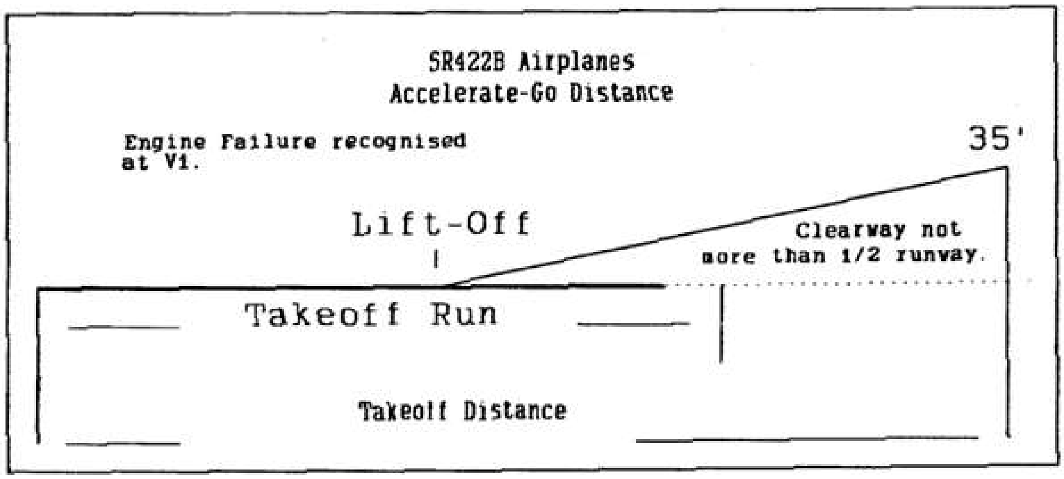
Figure 5.3.2.2. SR 422B and Part 25 Takeoff Run



D. SR 422B and Subsequently Certificated Airplanes, Takeoff Run. If the takeoff distance is computed using a clearway, the takeoff run is the longer of two distances, either the accelerate-go takeoff run distance or the 115 percent all-engines takeoff run distance.

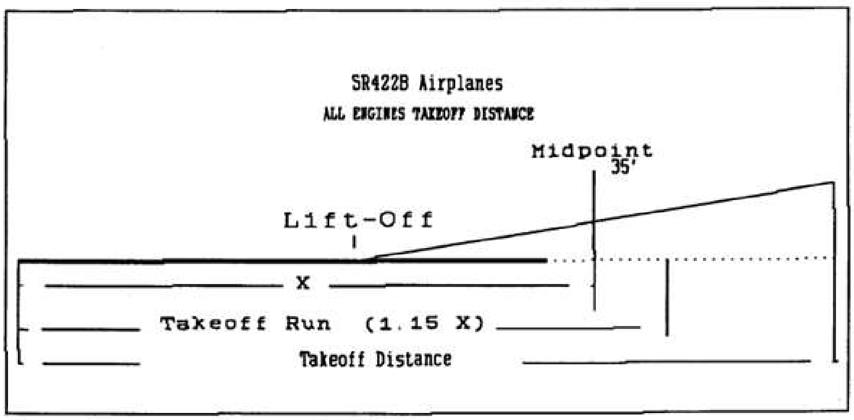
1) The accelerate-go takeoff run distance is measured from the start of the takeoff roll to a point equidistant from the point at which lift-off occurs to the point at which the airplane reaches 35 feet (10.7 m) AGL. The critical engine is assumed to fail at critical engine failure speed (V_{EF}) with recognition V_1. The end of the takeoff run must be on or over the runway. (See Figure 5.3.2.3, below)

Figure 5.3.2.3. SR 422B and Part 25 Accelerate Go Distance



2) The 115 percent all-engines takeoff run is calculated by measuring from the start of the takeoff roll to the point midway between the lift-off point and the point at which the airplane reaches 35 feet (10.7 m) above the runway surface and by then adding 15 percent. The takeoff run must be on or over the runway surface. (See Figure 5.3.2.4, below)

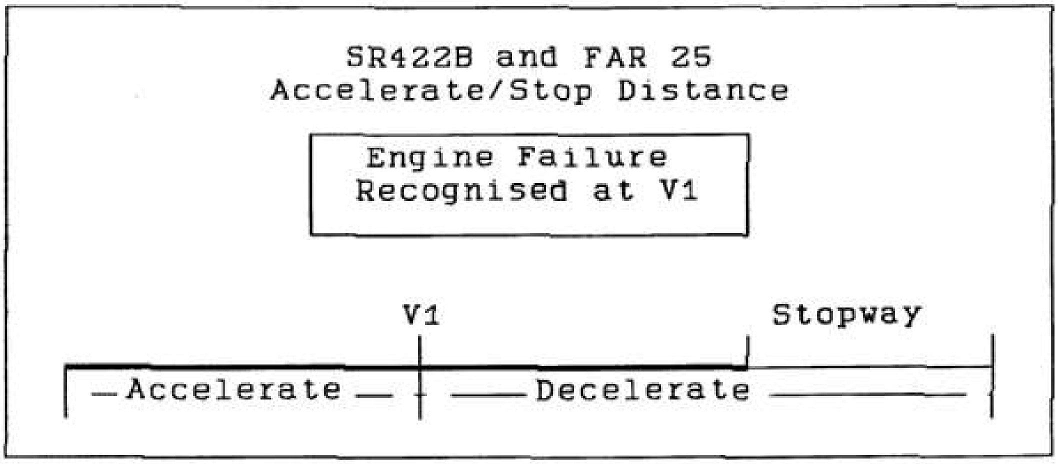
Figure 5.3.2.4. SR 422b and Part 25 All Engines Takeoff Distance



NOTE: To simplify clearway computations, the maximum allowable clearway is normally stated by the manufacturer as a specified number of feet for a given runway length.

E. Stopways. For Part 25 airplanes, a stopway may be used to extend the effective runway length when computing the mass/weight limited by the accelerate-stop distance. A stopway is an area beyond the runway, at least as wide as the runway, which is centrally located about the extended CL of the runway, and is designated by the aerodrome authorities for use in decelerating the airplane during a refused takeoff. A stopway must be capable of supporting the airplane without inducing structural damage. The surface characteristics of the stopway may not differ substantially from those of a smooth, dry, hard surface runway. The airplane must be able to accelerate to V1, experience an engine failure, and then lift-off on the actual runway surface. (See Figure 5.3.2.5, below)

Figure 5.3.2.5. SR 422B and Part 25 Accelerate/Stop Distance



F. Unbalanced Field Length. The 115 percent all-engines takeoff distance is usually the controlling distance for Part 25 airplanes. A V_1 selected to achieve a balanced field length usually exceeds V_R, a condition not allowed by regulations. For these airplanes, V_1 is normally selected as identical to V_R and the balanced field length concept is not applicable.

G. Climb Limit Mass/Weights. The takeoff mass/weight of large, turbine-powered airplanes must be limited to allow the aircraft to climb at a specified gradient through each of the defined climb segments of the takeoff flightpath. The climb segments are defined as follows:

1) *First Climb Segment*. The first climb segment starts from lift-off to the point at which the landing gear is retracted, but not less than 35 feet above the runway. Airplanes certified under Part 25 must attain V2 speed before exceeding 35 feet above the runway surface.

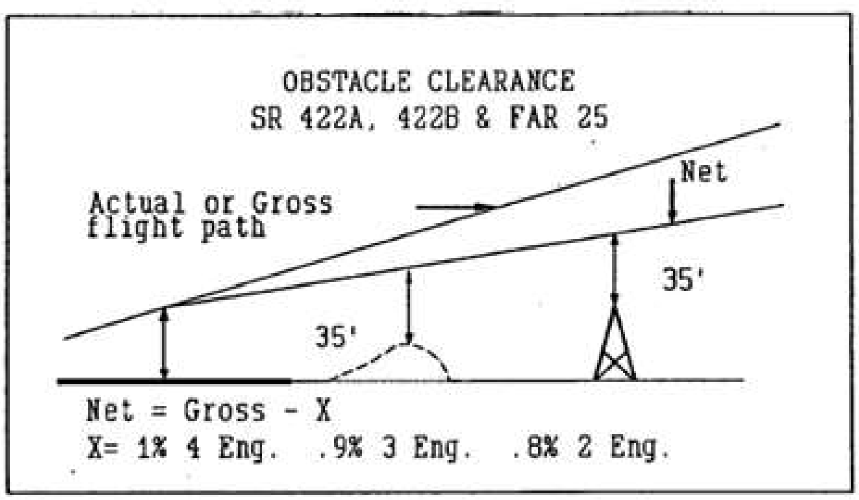
2) *Second Climb Segment*. The second climb segment starts when the gear is retracted or at 35 feet, whichever is later, and continues at V2 until the selected acceleration height (not less than 400 feet above the runway).

3) *Third Climb Segment*. The third and final climb segment starts at the acceleration height and continues until the transition to the en route configuration is complete (not lower than 1,500 feet above the runway surface for Part 25 airplanes). The en route speed at the end of the transition segment may not be less than 125 percent of Vs. The final

segment (at the operator's option) may be divided into third and fourth segments. The aircraft may fly level in the third segment (no negative slope allowed), and then accelerate and resume the climb in the fourth segment. The overall gradient, however, is measured from the end of the second segment to the end of the final segment.

H. Obstacle Clearance Net Flightpath SR 422B and Part 25 Airplanes. The net takeoff flightpath for these airplanes is derived by subtracting an increment from the actual path the airplane can fly (gross flightpath). The increment is 1 percent for four-engine airplanes, 0.9 percent for three-engine airplanes, and 0.8 percent for two-engine airplanes. The net flightpath begins at the point the airplane reaches 35 feet above the runway and must pass not less than 35 (10.7 m) feet over each obstacle. The use of a net flightpath has the effect of adding 10 feet for four-engine airplanes, 9 feet for three-engine airplanes, and 8 feet for two-engine airplanes with obstacle clearance for each 1,000 feet (300 meters) of distance traveled from the end of the runway. (See Figure 5.3.2.6, below)

Figure 5.3.2.6. Obstacle Clearance SR 422B and Part 25 Airplanes



I. One-Engine Inoperative En Route Performance. Turbine-powered, transport category airplanes must, at all points along the intended route after an engine fails, be able to clear all terrain and obstructions by 1,000 feet that are within 5 statute miles (8000 meters) on either side of the intended track. This requirement must be met at the forecast temperature for the required altitudes at the planned time of the flight.

1) One means of complying with this rule is to limit the takeoff gross mass/weight so that, considering fuel burn, the aircraft will be light enough to ensure the necessary performance over the most critical point on the route. When the rule is applied in this way, it must be shown that the airplane can at least fly level with one engine inoperative at an altitude of at least 1,000 feet AGL and 1,500 feet above the destination aerodrome, using net flightpath data. In this case, the net flightpath is derived by subtracting 1.6 percent gradient for four-engine airplanes, 1.4 percent for three-engine airplanes, and 1.1 percent for two-engine airplanes from the actual climb performance the airplane can produce. Thus, the net climb gradient capability remains a performance margin at the weight, altitude, and temperature anticipated at the critical point on the route.

2) Takeoff gross mass/weights higher than those obtained by the method in subparagraph 1) may be achieved by

fuel jettison or driftdown. When fuel jettison or driftdown is used, the operator must show that the net flightpath available after engine failure would permit the airplane to clear all terrain by at least 2,000 feet while cruising, or when drifting down to an alternate aerodrome within range of the fuel remaining after jettison. A Part 25 airplane must have enough fuel after jettison to reach the alternate aerodrome and to then fly an additional 15 minutes. The airplane must be capable of maintaining a positive climb gradient at an altitude of 1,500 feet above the designated aerodrome. The prevailing wind and temperature forecast must be taken into account in the area. An en route alternate aerodrome to which the airplane is assumed to divert (at which the weather is forecasted to meet the prescribed weather minimums), must be specified on the flight plan and clearance forms.

3) Inspectors should be aware that the engine-out, en route performance limit is particularly critical for two-engine airplanes operated in mountainous terrain. Inspectors must exercise particular care when evaluating this element of an operator’s program.

J. Two-Engines Inoperative En Route. Any flight during which the airplane is not at all times within 90 minutes of a suitable landing area (measured at normal, all-engines cruise speed), must be assumed to have had a double-engine failure occur at the most critical point along the route. The airplane must be able to reach an alternate aerodrome from this point. Any aerodrome that has sufficient runway length to accommodate the 60 percent alternate landing requirements may be considered suitable. When establishing the mass/weight limitations to comply with this rule, the takeoff mass/weight is reduced by the normal en route fuel consumption of all engines. Then, at the critical point, two-engines are assumed to fail simultaneously.

NOTE: Twin-engine, extended range jet transport operations will be included at a later date.

1) For Part 25 airplanes, the airplane must be able to clear all obstructions for 5 miles (8 km) on either side of the intended track by 2,000 feet (600 meters) vertically.

2) When the planned airplane takeoff weight exceeds that determined according to the preceding subparagraphs 1), 2), or 3), fuel jettison may be used. The net flightpath must have a positive slope at 1,500 feet for Part 25 airplanes.

3) Part 25 airplanes must have sufficient fuel after jettison to be able to reach the en route alternate aerodrome and they must be able to fly for 15 minutes at cruise power after reaching the designated alternate aerodrome. Designated en route alternate aerodromes must be listed on the dispatch release and flightplan.

K. Approach Climb. Airplane mass/weight during approach must be planned so that a specified gradient of climb is available with one-engine inoperative, at takeoff thrust, and at the temperature forecasted to exist on arrival. The flap angle used to establish approach climb-out performance must be chosen so that the stall speed with this flap setting will not exceed 110 percent of the stall speed with landing flaps. The climb speed used must not exceed 150 percent of the approach stall speed. The specified climb gradient must be the following:

- 2.7 percent or better for four-engine airplanes
- 2.4 percent or better for three-engine airplanes
- 2.1 percent or better for two-engine airplanes

L. Landing Climb. For dispatch release, the mass/weight of the airplane (allowing for normal en route fuel and oil consumption) must result in a landing approach mass/weight at which the airplane can climb at a gradient of 3.2 percent or better. Landing climb gradient is measured with all engines operating at the thrust available 8 seconds after the initial moving of the throttles from idle to takeoff position. The flap setting used to establish landing climb-out performance is usually the full-down position. The speed used must not exceed 130 percent of the stall speed in this configuration.

M. Landing Distance Limitations. For release, turbine airplanes must conform to the following limitations:

1) Turbojets must be able (allowing for normal en route fuel and oil consumption) to land within 60 percent of the effective runway at both the destination and the alternate aerodromes.

2) Turbo-propeller airplanes must be able to land within 60 percent of the effective runway at the destination and 70 percent at the alternate aerodrome.

3) A flight may be dispatched which cannot meet the 60 percent runway requirement at the destination if an alternate aerodrome is designated where the flight can land within the distance specified for an alternate aerodrome.

4) When a runway is forecast to be wet or slippery at the destination, 15 percent must be added to the required landing runway length. A correction is not applied to the alternate landing runway length for preflight planning.

5.3.2.5. RULES FOR DISPATCH RELEASE OF COMMUTER CATEGORY AIRPLANES. Commuter category airplanes must be operated under the performance rules in GACAR Part 121, specifically GACAR §§ 121.255 through § 121.279. (See Table 5.3.2.2 below)

Table 5.3.2.2. Summary of Dispatch Rules for Commuter Category Airplanes

Temperature Correction	No	(Ambient temp. in AFM data.)
STRUCTURAL LIMITS		
Max. Taxi Mass/Wt.	Yes	AFM
Max. Takeoff Mass/Wt.	Yes	AFM
Zero Fuel Mass/Wt.	Yes	AFM
TAKEOFF MASS/WEIGHT		
Accelerate/Stop	Yes	Part 121, Subpart F and GACAR §§ 23.25(a) and 23.55
All-Engines	Yes	Part 121, Subpart F and §§ 23.25(a) and 23.1583(c)(3)(i)
Accelerate/Go	Yes	Part 121, Subpart F and §§ 23.25(a) and 23.1583(c)(3)(i)
Obstacle Mass/Wt.	Yes	GACAR § 121.263
EN ROUTE LIMITS		
All-Engines	No	
One-Eng. Inoperative	Yes	GACAR § 121.267
Overwater	Yes	GACAR § 121.271
Approach Climb	Yes	GACAR § 121.275(a)
Landing Climb	Yes	GACAR § 121.275(a)
Max. Landing Mass/Wt.	Yes	AFM
RUNWAY LIMITS		
Destination	Yes	GACAR § 121.275(b), (c), or (d)
Alternate	Yes	GACAR § 121.279

A. Runway Takeoff Mass/Weight Limits. These rules parallel the rules for large, turbine powered transport category airplanes certified under Part 25. Takeoff mass/weight must be limited to the lowest mass/weight allowed by the following:

- Accelerate-go
- Accelerate-stop
- 115 percent all-engines

B. Climb-Limit Mass/Weights. The climb-limit mass/weight requirements for a commuter category airplane with the critical engine inoperative are as follows:

1) In the first climb segment (until the landing gear is retracted, but not less than 35 feet), the following airplane types must maintain the following gradients:

• Two-engine airplanes - a positive gradient

• Three-engine airplanes - a 0.3 percent gradient

• Four-engine airplanes - a 0.5 percent gradient

2) The second climb segment begins at gear retraction and extends to 400 feet. During the second climb segment, the landing gear is retracted and the propeller on the failed engine is windmilling or auto-feathered (no pilot action allowed), and the following airplane types must be able to climb-out at the following gradients:

• Two-engine airplanes - at a 2.0 percent gradient

• Three-engine airplanes - at a 2.3 percent gradient

• Four-engine airplanes - at a 2.6 percent gradient

3) In the third and final climb segment (400 feet to 1,500 feet above the runway), the following airplane types must be able to climb at the following gradients:

• Two-engine airplanes - at a 1.2 percent gradient

• Three-engine airplanes - at a 1.5 percent gradient

• Four-engine airplanes - at a 1.7 percent gradient

C. Obstacle Limits. Commuter category airplanes must be able to clear all obstacles in the takeoff path either by 200 feet (60 meters) horizontally or by 35 feet vertically within the aerodrome boundaries and 300 feet (75 meters) outside the aerodrome boundary. A net flightpath must be used. The aircraft's actual climb-out path capability must be reduced by the following: .8 percent for two-engine airplanes, .9 percent for three-engine airplanes, 1.0 percent for four-engine airplanes.

D. En-Route. The airplane must be operated at a mass/weight, such that it is capable of maintaining a specific climb gradient at the ambient, temperature, at the minimum en-route altitudes (MEAs) of the route to be flown, with one engine inoperative. The en route limitation must be considered as a part of determining takeoff weight.

E. Approach Climb. Takeoff mass/weight must be limited so that, upon arrival at the destination or alternate aerodrome, and with the critical engine inoperative, the following airplane types must be able to climb at the following gradients:

• Two-engine airplanes - at a 2.1 percent gradient

• Three-engine airplanes at a 2.4 percent gradient

• Four-engine airplanes at a 2.7 percent gradient

F. Landing Climb. Takeoff mass/weight must be limited so that upon arrival at the destination or alternate aerodrome in the landing configuration, and with full power available, the airplane is able to climb at a 3.3 percent gradient.

G. Landing Runway Requirements. Takeoff mass/weight must be limited so that, at the planned mass/weight upon arrival at the destination aerodrome, the airplane may land within 60 percent of the available runway. At the planned weight upon arrival at the alternate aerodrome, the airplane must be able to land within 70 percent of the available runway.

5.3.2.7. TURBOJET AIRPLANES OPERATED UNDER PART 135. Normal category turbojet airplanes that are certified under the provisions of the special performance conditions in Part 23. (See Table 5.3.2.3, below)

Table 5.3.2.3. Summary of Release Rules for Part 135 Turbojet Airplanes

Temperature		(Ambient temperatures must be used in AFM data.)
Correction	No	
STRUCTURAL LIMITS		
Max. Taxi Mass/Wt.	Yes	AFM & GACAR § 135.137
Max. Takeoff Mass/Wt.	Yes	AFM & GACAR § 135.137
Zero Fuel Mass/Wt.	No	(Not an AFM limit)
TAKEOFF		
Accelerate/Stop	Yes	GACAR §§ 23.55 and 135.137
All-Engines Dist.	No	
Accelerate/Go	No	
T/O Climb Limit	Yes	GACAR §§ 23.66 and 135.137
Obstacle Limit Mass/Wt.	No	
EN ROUTE LIMIT		
All-Engines	No	
One-Eng. Inoperative	Yes	GACAR § 135.145
Overwater	Yes	GACAR § 135.143
Approach Climb	No	
Landing Climb	No	
MAX. LANDING MASS/WT.		
SFAR 23	Yes	AFM Limit
RUNWAY LIMITS		
Destination	Yes	GACAR § 135.139
Alternate	Yes	GACAR § 135.141

A. Applicable Performance Rules. GACAR § 135.135 requires that these airplanes be operated within the takeoff and landing mass/weight limitations of the AFM. A brief summary of these takeoff and landing mass/weight limits follows:

1) The takeoff mass/weight for each runway and temperature is limited by:

- Accelerate stop-distance

2) Takeoff mass/weight must be limited so that the following capabilities of the airplane are required:

a) The airplane must be capable of climbing with all engines operating, at the aerodrome elevation, in the takeoff configuration.

b) The airplane must be capable of a positive rate of climb at V_1 with the gear extended and the critical engine failed.

c) The airplane must be capable of the certificated climb gradient at V_2 with the gear retracted and the critical engine failed.

d) The airplane must be capable of climbing to a height of 1,000 feet (300 meters) above the runway at V_2 speed, in the takeoff configuration, with the critical engine failed.

e) The airplane must be capable of maintaining the certificated climb gradient percent at 1,000 feet (300 meters) above the runway elevation, in the en route configuration, with the critical engine failed.

NOTE: In the case of the loss of an engine, these airplanes are not required to be able to clear obstacles in the takeoff path.

3) GACAR §§ 135.143 and 135.145 en route and overwater restrictions apply to passenger-carrying operations.

4) The takeoff mass/weight must be limited so that upon arrival at the destination and the alternate aerodrome, assuming normal fuel burn and with all engines operating, the airplane is able to climb at a 3.3 percent gradient.

5.3.2.11. RULES FOR RELEASE OF PART 135 RECIPROCATING AND TURBOPROPELLER-POWERED AIRPLANES. Reciprocating or turbo-propeller-powered airplanes certified in the normal category and operated under GACAR Part 135 need only comply with the performance requirements in GACAR § 135.135(e) and (f), 135.143 and 135.145 (see Table 5.3.2.4 below).

Table 5.3.2.4. Summary of Release Rules for Part 135 Reciprocating and Turbopropeller-Powered Airplanes

TEMPERATURE CORRECTION	**NO**	**AFM LIMITATION:**
STRUCTURE LIMITS		
Max. Taxi Mass/Wt.	Yes	AFM or Placard
Max. Takeoff Mass/Wt.	Yes	AFM or Placard
Max. Landing Mass/Wt.	Yes	AFM or Placard
Zero Fuel Mass/Wt.	No	
TAKEOFF		
Accelerate/Stop	No	
All-Engines	No	
Accelerate/Go	No	
Obstacle	No	
T/O Climb Limit	No	
EN ROUTE LIMITS		
All-Engines	No	
One-Eng. Inoperative	Yes	GACAR § 135.145
Overwater	Yes	GACAR § 135.143
Approach Climb	No	
Landing Climb	No	
Max. Landing Mass/Wt.	Yes	AFM or Placard
RUNWAY LIMIT		
Destination	No	
Alternate	No	

A. Mass/Weight Limit. There are no takeoff mass/weight limits in Part 135 for these airplanes. There are both takeoff and landing mass/weight limits in the AFM. The regulations that make the AFM limitations apply to Part 135 operations are GACAR § 91.13.

B. Takeoff Runway Limits. There are no runway performance limits specified in either the AFM or in Part 135. Many of these airplanes have accelerate stop-distances expressed in AFMs as advisory information. An accelerate stop-distance is a limitation only when expressed as such by the AFM. Some airplanes of the same make and model have such limitations, while others do not, depending on the airplane's date of manufacture.

C. Climb Limits. There is no requirement that the airplane must be able to maintain a positive gradient in case of an engine failure. These airplanes are not required to be able to clear obstacles in the takeoff path in case of the loss of an engine.

D. En Route. The provisions of GACAR § 135.145 for IFR operations with passengers and the provisions of GACAR § 135.143 for overwater operations with passengers apply to these airplanes. Most airplanes with less than 2725 kg (6,000 pounds) takeoff mass/weight are unable to meet the GACAR § 135.145 restriction, which effectively precludes their use in planned instrument flight rules (IFR) passenger operations. Multiengine airplanes with over 2725 kg (6,000 pounds) MTOM must be able to climb at a rate (depending on temperature) specified in Part 23 with one engine out at 5,000 feet MSL. Many of these airplanes are not able to meet the requirements of GACAR § 135.145 over any surface higher than sea level.

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CHAPTER 3. AIRCRAFT PERFORMANCE AND AERODROME DATA

Section 3. Approval of Performance Data Sections of CFMs

5.3.3.1. GENERAL. This section contains information and guidance that Principal Operations Inspectors (POI) may use for reviewing and approving the presentation of performance data in company flight manuals (CFMs). For additional guidance on the approval of manuals, see Volume 4, Chapter 12, Section 2.

A. Performance Data Computation Systems. A performance data computation system is defined as the system the operator uses to produce the data required to operate an airplane within the performance limitations specified in the aircraft flight manual (AFM) and Subpart F of either GACAR Part 121 or Part 135, as applicable. The performance data computation system consists of at least the following components:

1) An aerodrome data acquisition, maintenance, and dissemination system (a necessary subsystem for all airplanes operated under GACAR Part 121 and 135).

NOTE: The majority of this data is available from commercial and government aeronautical charting services. Operators of transport and commuter category aircraft, however, require obstacle data for takeoff computations that are more detailed than those usually supplied by a standard charting service. Operators may contract for obstacle data from commercial sources or may collect the data themselves. Specific guidance for the acceptance or approval of aerodrome data acquisition systems may be found in Section 4 of this chapter.

2) Performance data for each variant aircraft the operator operates in a format readily usable by the flight crew. This data may be obtained from the AFM directly or purchased in a digital format suitable for computer processing.

3) Manual computation procedures or a computer algorithm for converting aircraft performance data from the AFM format to the format used by the flightcrew. (The system must make all necessary computations for determining the maximum allowable weight for takeoff and for determining the V speeds to be used at the selected mass/weight.)

B. Current Industry Practices. There are a wide variety of methods for: collecting aerodrome and obstacle data; preparing aerodrome analyses; and, for preparing, publishing, and distributing the performance data sections of CFMs. To implement each or all of these functions, operators may either establish a department within the company or contract the work out. Operators may contract for the collection of aerodrome and obstacle data but produce the aerodrome analysis in-house. Other operators may supply aerodrome data to aircraft manufacturers or other contractors who prepare the aerodrome analysis. Generally, major airlines do more of this process in-house, while smaller operators contract for these services. Some service contractors provide services tailored specifically to GACAR Part 121 and to Part 135 operators.

C. Approval Criteria. Inspectors may approve any method of performance data computation and presentation that meets the following criteria:

1) The system must accurately make all of the computations required in the AFM and in the pertinent operating rules (see Section 2 of this chapter for a description of these factors for specific aircraft).

2) Provisions must be made in the system for all makes, models, and variations of aircraft used by the operator.

3) The system must account for all pertinent variables, such as temperature, mass/weight, thrust, runway condition, and obstacles.

4) The system must be appropriate to the operator's requirements. Large, highly-complex aircraft usually require very different systems from those required for small, simple aircraft.

5) The system must be reliable in that identical answers must be generated each time the process is entered with identical parameters.

6) The system must be accurate in that it generates performance data that agrees with AFM data within the degree of accuracy inherent in the original AFM data. For example, when the AFM data is accurate to + 2 percent, the operator's system must produce results that do not deviate from the AFM data by more than + 2 percent.

7) The system should be relatively simple, easy to use, and not prone to error.

8) When simplifying assumptions are made, those assumptions must be clearly and completely stated in the operator's CFM or operations manual (GOM) as operator-imposed limitations [for example a maximum field elevation of 4,000 feet (1200 meters) and minimum runway length of 5,000 feet (1500 meters)]. When the assumptions cannot be met, the actions to be taken by the flight crew, and dispatchers must be clearly specified and subsequent operations must be prohibited or alternate procedures specified.

9) The flight crew procedures for generating, obtaining, and verifying data must be thoroughly described in the procedures section of the CFM. In the case of the same procedure applying to all aircraft, the flight crew procedures must be described in a section of the OM.

5.3.3.3. MANUAL COMPUTATION SYSTEM FROM AFM DATA. Operators may choose to have flight crew members, or dispatchers conduct manual data computations from the AFM performance section for each takeoff. Equipment is not necessary to establish the manual computation system. This system is flexible because it can be used for any runway for which the required input parameters can be obtained. The disadvantage of such a system is that computations can be difficult, complex, time-consuming, and prone to error. Flight crew members, and dispatchers must be carefully and thoroughly trained in such a system. Flight crews must be supplied with the location of the controlling obstacle for each runway used. While this system is widely used for small airplanes, it is impractical for the routine operations of large airplanes because of the complexity of the required computations and the high probability of human error. The system is, however, available to the operator as a backup in the case of computer failure and for special one-time requirements.

5.3.3.5. TABULATED DATA METHOD. AFM data may be combined with aerodrome and runway data and published in tabular format. The product of this tabulated data method is usually termed an aerodrome analysis. Typically, the flight crew is provided with a table for each runway and flap setting. The flight crew member enters the temperature on the table to determine maximum allowable takeoff mass and then enters the actual mass to determine the V speeds. Additional corrections are required for factors such as wet or contaminated runways and winds.

A. Tabulated Data. Tabulated data is easier to use, less prone to error, and requires less training than is required for AFM data. A properly designed CFM system retains most of the operating flexibility of the AFM system. A tabulated data system reduces, but does not eliminate, human error. A disadvantage of the tabulated data system is that crew members must maintain an up-to-date chart for each runway from which operations are authorized. A means must be available to transmit current charts to the flight crew before they are needed. Provisions must be made for temporarily shortened runways.

B. Generating Performance Data Tables. The operator must be capable of generating performance data tables which retain the degree of accuracy inherent in the AFM data. Generally, this must be done manually by carefully picking data points from a graph, entering the data into a computer, and carefully verifying the generated points. The amount of work required to prepare tabulated data from an AFM often precludes operators from generating their own data packages. Most often, the operator will be required to buy a digital data package from the manufacturer from which to generate the required tables. Inspectors may approve other sources when the operator can adequately establish the accuracy of the data.

C. Performance. The operator's system must be capable of performing all of the required computations for each takeoff situation, including the selection of the correct controlling obstacle for each flap setting.

5.3.3.7. SIMPLIFIED DATA METHOD. A simplified data system is based on a specified set of assumptions about the conditions under which the aircraft will be operated. For example, takeoffs might be limited to runways longer than 5,000 feet (1500 meters) and less than 4,000 feet (1200 meters) in elevation. In this system, the crew is supplied with a simple chart or set of cards which gives the V speeds at specified weight increments. This chart is used on all runways. The operator performs an aerodrome analysis for each aerodrome served and demonstrates that when the aircraft is operated in accordance with the specified set of assumptions, it will perform either equal to, or better than, the performance required in the applicable regulations on all runways the crew is authorized to use.

A. Some of the system's advantages are: its relative simplicity, the lack of crew error, the ease of crew training, and the speed with which the crew can determine V speeds.

B. Some of the system's disadvantages are: it often imposes severe performance penalties on operators, it is inflexible, and operations must either be terminated or an alternate system used when the simplifying assumptions cannot be met (for such conditions as: construction, part of runway closed, ice, rain, or shortened runways).

C. The system is best suited for operators who serve a limited number of locations regularly and who operate either at a large aerodrome near sea level, or at moderate temperatures.

5.3.3.9. REAL TIME METHOD. A real time data system is one in which the required computations are made immediately before takeoff for every flight. Usually the data is relayed to the flight crew by radio or through the Aircraft Communications Addressing and Reporting System (ACARS). The advantages of such a system are that it is extremely flexible, up-to-date, efficient, and places little workload on the flight crew. Changes in obstacles due to construction, mass/weight, temperature, and runway can be handled immediately. Also, the operator can take maximum advantage of the performance capabilities of the airplane, which is advantageous to the operator. Some disadvantages of the system are that it is expensive, it requires extensive equipment and highly trained personnel to operate, and an adequate backup system must be available should the main computer go offline. The operator must be able to collect all of the required data, process it, and transmit it to the crew quickly, accurately, and reliably.

5.3.3.11. EVALUATION OF AN OPERATOR'S SYSTEM. Generally, aviation safety inspectors (Inspectors) do not have the capability to verify each data point when approving the performance data section of a CFM. The validity and reliability of the computation system itself, however, can be evaluated.

A. Provide Analysis. Inspectors shall require the operator to provide an analysis, with documentation, of the following:

- Source of the computer program
- Assumptions on which the computer program is based (for example, they must determine if the correct factors are used for each type of aircraft; see Section 1)
- Source and accuracy of the databases used
- Operator's capability for handling data
- Results of parallel manual calculations made with AFM data to confirm results

B. Coordinate. The Inspector (Operations) should coordinate with the Inspector (Airworthiness) to ensure that the operator's airplanes meet the specifications of the operational certification regulations. For example, a small airplane may have been modified to install more than the original nine seats, if it was operated by an operator residing in another nation. Since General Authority of Civil Aviation (GACA) requires that these airplanes be operated with 9 seats or less, that operator may need to perform several modifications that require supplemental type certificates in order to qualify that aircraft under the additional airworthiness standards of General Authority of Civil Aviation Regulation (GACAR) Part 135. Unless all of the required modifications have been completed, the airplane may not qualify for the proposed operation in the Kingdom of Saudi Arabia (KSA).

C. Responsible. When the operator contracts for data or computation, the operator is responsible for the validity of the results. An Inspector may find that the contractor has been previously evaluated and approved for another operator. The Inspector may approve reputable sources for these services that have been previously evaluated without the much of the documentation discussed above in subparagraph A. Inspectors who are concerned about a specific contractor's qualifications should contact the Office Manager, who may, in turn, coordinate with senior management. If the contractor's capabilities and qualifications have not been previously established, the Inspector shall require the operator to fully substantiate the contractor's qualifications before granting approval for that particular data/computation system.

D. Procurement. Operators should procure computer programs from a reliable source. The computer programmers should be qualified in both education and experience. The validity of the computer program should be validated by aeronautical engineers and computer specialists.

E. Performance. All of the calculations required in the regulations for the type of airplane involved (as discussed in Section 1) must be performed, including en route and destination calculations.

F. Obtaining Data. For real time systems, the operator's method of obtaining data for a specific flight and for transmitting that data to and from the individual performing the calculations must be shown to be accurate and timely.

G. Review. The principal operations inspector (POI) or a designated individual should review the verification process conducted by the operator. Several runways at different aerodromes should be selected for verification with the AFM data. Short runways with obstacles should be checked by manual calculation, particularly at aerodromes with higher temperatures and elevations.

1) The operator should be able to identify all of the obstacles evaluated by the computer and the one selected as the limiting obstacle in each case. The Inspector must be aware that under different temperature and mass/weight conditions, a different flap setting may be required, and different obstacles may be controlling. The inspector should ensure that the operator has verified the limiting obstacle under various conditions and flap settings.

2) The reviewing Inspector should contact the Director, Flight Operations Division who may coordinate with senior management for assistance when unforeseen technical problems arise.

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CHAPTER 3. AIRCRAFT PERFORMANCE AND AERODROME DATA

Section 4. Aerodrome Data Acquisition Systems

5.3.4.1. GENERAL. This section contains specific information, direction, and guidance to aviation safety inspectors (Inspectors) for the review and approval of aerodrome data acquisition systems. An aerodrome data acquisition system is a subsystem of the performance data system described in Section 3 of this chapter. Most of the data required for flight operations can be obtained by a subscription to a standard government or commercial aeronautical navigation charting service, such as the General Authority of Civil Aviation (GACA) Air Navigation Services (ANS) Sector in the Kingdom of Saudi Arabia (KSA), National Oceanic and Atmospheric Administration (NOAA) in the United States (US), or the Jeppesen/Sanderson Company in Denver, Colorado or Frankfurt, Germany. Operators of transport category airplanes and commuter category airplanes require obstacle information for takeoff performance analysis, which is more detailed than information provided by standard navigational charting services.

A. Regulations. General Authority of Civil Aviation Regulation (GACAR) § 121.77(c) require a GACAR Part 121 operator's system of obtaining, maintaining, and distributing aerodrome information be approved. A GACAR Part 135 operator's system must be acceptable. The criteria for approval and acceptance for both GACAR Parts 121 and 135 are largely identical.

B. Approval or Acceptance. The process for approval or acceptance of the operator's system of obtaining aeronautical data by the GACA is described in Operations Specifications (OpSpecs) A9. All operators should list one or more standard charting services in OpSpec A9. For operators requiring obstacle data and who maintain a department to collect and process that data, a statement that the operator shall maintain the aerodrome data acquisition system in accordance with a specified document should be entered in OpSpec A9. For operators who contract from another party for obstacle data, both the contracting party and the contract containing the specific responsibilities of both the operator and contractor shall be identified in OpSpec A9 or the document itself should be identified in OpSpec A9.

5.3.4.3. OBSTACLE DATA SOURCES. There are several data sources that an operator or contractor may use to acquire obstacle data. Inspectors should be aware that no one source of data is sufficient and a combination of the following sources is required.

A. Aerodrome Obstruction Charts (OCs). In the KSA, aerodrome obstruction charts (OC) are produced by the GACA ANS Sector. In foreign countries, aerodrome obstruction charts (OCs) are produced by State's authorized aeronautical information services (AIS) providers. An aerodrome analysis must be based on an OC if one has been published for the aerodrome being analyzed. However, OCs must be augmented with other information sources for the following reasons:

1) OCs are expensive to produce and they are typically produced for aerodromes with precision instrument approaches before other aerodromes are considered. For example, only approximately 750 of 10,000 public-use airports (aerodromes) in the United States have now been charted, and there are 700–800 aerodromes which have only non-precision approaches for which there have not been any OCs prepared.

2) Terrain surrounding the aerodrome, which can have a significant impact on allowable takeoff mass/weight, may not be shown on an OC. The coverage of OCs is limited to 10,000 feet (3000 meters) from a non-precision runway

and 52,000 feet (15,800 meters) from a precision runway.

3) Chart revision is usually conducted every 3 years. For many aerodromes, however, the most recent chart revisions may be considerably older.

B. Obstruction Data Sheets (ODSs). ODSs are digital derivatives of the OC which contain runway and obstruction data in a tabular format. ODSs are issued to supplement the OC before its publication. When OCs are ordered for a particular aerodrome from an obstruction clearance charting service, the ODSs should also be obtained. As an example, the National Oceanic Service (NOS) in the US, publishes quarterly notices that provide the dates of the latest editions of the OC and the ODS.

C. Terrain Charts. Terrain or quad charts are produced for aviation usage as well as various other uses. The quad chart accurately depicts all terrain surrounding an aerodrome; however, man-made obstruction data is not depicted. Terrain charts are primarily used for mountainous aerodromes where the obstacles consist of terrain rather than man-made objects.

D. Local Layout Plans. Local layout plans may be used when OCs are not available. Since local layout plans must be prepared as a condition of funding from the government to aerodromes in many localities, the layout plans are often available for many of the aerodromes that do not have an OC. Local layout plans contain depictions of obstructions and terrain that penetrate the GACAR Part 77 obstruction planes. The layout plans may be as much as 3 to 5 years old so local surveys must be made. Local layout plans should be obtained from aerodrome owners, where available.

E. Reserved.

F. Digital Aerodrome Database. The digital aerodrome database consists of the information from the Saudi Arabian AIP for all KSA aerodromes.

G. Digital Obstruction Database. Most charting services maintain an obstruction database. These databases are revised periodically. These databases contain all known man-made objects that penetrate a GACAR Part 77 obstruction plane. However, not all databases contain all the obstacles, which may be significant when computing takeoff performance.

H. Foreign Government Publications. Runway and obstacle data, similar to KSA publications, is available for most (but not all) foreign aerodromes. Access to this information must be obtained through the appropriate governmental entity.

I. International Civil Aviation Organization (ICAO) Aeronautical Information Publications. ICAO publishes several forms of aeronautical data in forms similar to KSA publications in format, purpose, and coverage. This information is available by subscription.

J. Station Managers. Most domestic and international operators give station managers the tasks of maintaining surveillance of aerodromes, gathering obstruction data, and reporting any actual or potential changes. Managers do this through personal observation, liaison with the aerodrome management, and participation in groups, such as an aerodrome use committee or a snow removal committee in Northern climes. Before such information may be used, it must be verified by an official source. For example, one operator performs this verification by sending the aerodrome manager a copy of the OC and requesting the aerodrome manager to plot the new obstacle and then sign and date the chart.

K. Air Transportation Association (ATA). The Air Transportation Association (ATA) in the US, and the International Air Transportation Association (IATA), maintains an aerodrome data exchange committee through which members exchange aerodrome and obstacle data.

L. NOTAMs. Temporary and immediate changes to aerodrome information are published as Notices to Airmen (NOTAMs).

M. Customer Interaction. Large commercial services selling aerodrome obstruction data are rapidly alerted to changes in obstacles by their customers. The commercial service then verifies the data from an official source and publishes the change.

5.3.4.5. APPROVAL OF DATA ACQUISITION SYSTEMS. Principal Operations Inspectors (POIs) may approve data acquisition systems using the following information and guidance.

A. Characteristics of Approvable Systems. An approvable or acceptable system for the acquisition of obstruction data must have the following characteristics:

1) The system must include all aerodromes and runways on which operations are conducted. The original data should be based on Aerodrome Obstruction Charts (OCs) or the ICAO equivalent. Data must be updated by active surveillance. When an operator serves aerodromes where OCs are not available, other systems based on other data sources may be approved. The operator must show that the data is complete and accurate. To ensure accuracy, the data must be maintained. In individual cases, the POI may approve the use of data from an operator-conducted survey.

2) The operator must demonstrate the capability of maintaining continuous surveillance on the aerodromes and runways served. Subscribing to a government publication is not sufficient surveillance because of the previously stated limitations of the data in these publications. Updated data must be actively validated and documented. The operator must have an active and timely revision process with sufficient personnel and physical resources to collect, process, and revise the data.

B. Contractors and Commercial Sources. POIs may approve or accept data systems that are operated by a contractor for the operator and that meet the criteria of subparagraph A, above.

1) The primary issue in approving a contractor-operated system is the contractor’s ability to maintain the required aerodrome surveillance. The contractor may do this by demonstrating that their client base adequately performs this function. Further, most legitimate contractors have access to ATA/IATA data through their clients. A contractor who cannot demonstrate adequate surveillance capabilities cannot be approved.

2) POIs do not have to require that operators provide extensive documentation of the contractor’s capabilities if the contractor is well established, has a wide client base, and provides a standardized service. However, when the POI has concerns about the contractor’s capabilities, or when the operator proposes that the contractor provide a unique service, the POI shall require that the operator conduct a full analysis of the contractor’s competence and then submit the analysis to the POI. When the Inspector is unsure of which course of action to take, he should seek guidance from the Director, Flight Operations Division.

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CHAPTER 3. AIRCRAFT PERFORMANCE AND AERODROME DATA

Section 5. Selected Performance Practices

5.3.5.1. GENERAL. This section contains general background information and guidance for Inspectors on selected topics and practices relating to aircraft performance and data acquisition systems for General Authority of Civil Aviation Regulation (GACAR) part 121 and 135 operators.

5.3.5.3. APPROVAL OF DRIFT DOWN AND FUEL DUMPING PROCEDURES. Operators may request General Authority of Civil Aviation (GACA) approval of drift down or fuel dumping to show compliance with GACAR terrain clearance requirements. The Principal Operations Inspector (POI) may approve the drift down and fuel dumping procedures in accordance with the guidance in this paragraph.

A. Approval Procedures. POIs should grant approval of driftdown and fuel dumping procedures by means of a nonstandard paragraph in part B of the Operations Specifications (OpSpecs). (See section 1 of this chapter, paragraph 5.3.1.29). The Inspector may enter the entire procedure into the OpSpecs paragraph. The preferred procedure, however, is for the Inspector to enter a reference to the section of the operator's general operations manual (GOM) which contains the procedure, the limitations, and the data.

B. Drift Down Data and Procedures.

1) Operators should base their proposals on manufacturer data and recommended procedures. In the absence of such data and procedures, the operator must develop the necessary data and procedures.

2) The POI should require the operator that creates drift down procedures to validate the procedures and data through validation tests.

3) Because of the complexities involved, the Inspector should coordinate with the Office Manager, who may then coordinate with senior management.

4) The Inspector should also request that the Office Manager coordinate the operator's proposal with air traffic services (ATS) to avoid possible air traffic conflicts.

C. Training Programs and Manuals. When the operator adopts drift down or fuel dumping procedures, the procedures, limitations, and performance data must be included in the operator's manuals and training program.

5.3.5.5. EN ROUTE OPERATIONS WITH LANDING GEAR EXTENDED. This paragraph contains direction and guidance to be used by Inspectors when reviewing and accepting an operator's procedures for en route operations with the landing gear extended. There are two gear down situations for which operators may seek approval. In the first situation, the operator may seek approval to dispatch an aircraft with the landing gear secured in the down position. In the second situation, the flightcrew may not be able to retract the landing gear after takeoff. In most circumstances, an operator cannot comply with the performance requirements of part 121, Subpart F or part 135, Subpart F when the landing gear remains extended in flight. The pilot in command (PIC) of such a flight is normally forced to return to the departure aerodrome or to divert to a takeoff alternate aerodrome. Operators may, however, operate a revenue flight with the gear down when the operator can show compliance with regulatory requirements. Inspectors should review the following:

A. Procedures and Data. Operators must provide flight crewmembers with procedures and approved airplane performance data for gear extended operations. The procedures must include speed limitations and fuel consumption data sufficient to show compliance with regulatory requirements. Inspectors should ensure that the operator has included this information in the operator’s company flight manual (CFM). Instruction on procedures must be included in the operator’s training program.

B. Amended Release. POIs should verify that the operator’s GOM contains adequate direction and guidance to both PICs and flight control personnel for amending the dispatch or flight release. POIs should coordinate review of manual material with an Airworthiness Inspector.

5.3.5.7. HIGH SPEED TAXI STARTS WITH ONE POWERPLANT INOPERATIVE. GACA’s safety policy is to not accept high speed taxi start procedures due to the increased risk involved with these operations. When an operator makes a compelling case for approval for such procedures, the Inspector should coordinate with the Office Manager.

5.3.5.9. APPROVAL OF UNPAVED RUNWAYS FOR TURBOJET OPERATIONS. This paragraph contains direction and guidance to POIs for approval of the use of unpaved runways for GACAR Part 121 and 135 operators. Although the GACA discourages the operation of turbojet equipment on other than hard-surfaced runways, operation of such equipment from a well compacted, non-paved surface is possible. Unpaved runways can be certified in accordance with GACAR Part 139 and GACAR § 121.1117 in order to meet the requirements of GACAR Part 121 operators. Aerodrome requirements for GACAR Part 135 operators are contained in GACAR § 135.57.

A. Approval of Landing Surface. POIs must approve the use of an unpaved runway surface for turbojet operations. Approval for this type of operation must be based on actual flight test performance data. Before the POI approves turbojet operations at any aerodrome with other than paved runways, the POI will determine that the following conditions are met:

1) Takeoff and landing field lengths must be based on approved flight test data for the particular type aircraft on the type of runway surface to be used.

2) Flight testing must show that foreign object ingestion into the engines and gravel impingement upon the aircraft structure are not significant factors.

3) The surface of the runway to be used must be reasonably stable throughout the various weather seasons; otherwise, the operations must be restricted to particular seasons.

B. Approval Procedures. An aerodrome with unpaved runways is required to have special operational procedures and flight crew member training. Approval of operations at an aerodrome with unpaved runways is granted in OpSpec C67. POIs may reference the appropriate section of the operator’s manuals in OpSpec C67.

5.3.5.11. AIR OPERATOR WINTER OPERATIONS. This paragraph contains guidance to be used by POIs for reviewing those portions of manuals, procedures, and training programs concerning operations in winter weather conditions. The POI must ensure that the operator’s manuals contain specific instructions and information to flight crews for operating each type of aircraft operated in adverse weather conditions or prohibit such operations. The POI should also review the content of the operator’s training program to ensure adequate coverage of adverse weather operations.

A. Training Requirements. The following subject areas should be considered in the operator's training program that is related to winter operations. These items are neither comprehensive nor exclusive, and the Inspector may require additional criteria.

- The requirement for a thorough preflight inspection in extreme temperatures
- A description of the performance and control problems that will differ from normal conditions during takeoff and landing with water, slush, or wet snow on the runway
- The speed, mass, and runway length adjustments that must be made when operating on contaminated runways
- Criteria for takeoff, en-route, and destination weather conditions
- The causes and effects to the aircraft from hydroplaning or aquaplaning
- The effects of increased viscosity of fluids in cold temperatures
- Adverse effect of cold temperatures on hydraulic fittings and seals
- The effects of cold weather conditions to fuel pumps and fuel filter drains
- Fuel contamination, fuel leaks caused by cold weather operations
- The hazards associated with wet snow or slush in wheel wells when entering freezing temperatures
- Ice on tail and recovery techniques in stall
- Techniques and procedures for braking, steering, and reversing with water, slush or snow on taxiways and runways
- Deicing and anti-icing procedures and equipment for frost, ice, or snow removal from airfoils, control surfaces, and static ports
- Proper adjustment of cables and rods used to manipulate flight controls
- A description of landing surface conditions and appropriate braking action

B. Pertinent References. POIs should be aware of the following advisory circulars and booklet, and should bring them to the attention of operators:

- AC 91-6, as amended, Water, Slush, and Snow on the Runway; for guidelines concerning the operation of turbojet aircraft with water, slush, wet or dry snow on runways
- AC 91-13, as amended, Cold Weather Operation of Aircraft; for discussion of aircraft cold weather preparation and operations

• AC 91-51, as amended, Airplane Deice and Anti-Ice Systems; for information on ice protection system approval and the results of inflight icing

• AC 135-9, as amended, FAR Part 135 Icing Limits; for guidance concerning compliance with GACAR §§ 91.197 and 135.671

• Winter Operations Guidance for Air Carriers; booklet prepared by FAA Flight Standards Service (FSS)

5.3.5.13. FLIGHT CREW PROCEDURES REQUIRING A CROSS-CHECK OF ENGINE PARAMETERS DURING COLD WEATHER. This paragraph contains direction and guidance to be used by POIs when reviewing those portions of manuals, procedures, and training programs addressing operations with engine anti-ice systems on the ground.

A. Background. A past accident and a series of past takeoff incidents, indicate that there may be a lack of understanding concerning the proper use of engine anti-ice equipment during cold, or adverse weather conditions. Most reports involve the operation of JT8D engines, though the basic principles may apply to many other types of turbojet engines found in use today. For example there have been reported incidents of rejected takeoffs because exhaust pressure ratio (EPR) indications failed to reach takeoff value, or because of a loss of engine power during the takeoff roll. In one accident, evidence indicates that the selected takeoff EPR value may have been indicated; when in fact a much lower thrust value was being produced during takeoff and climb. These engine indications usually occur when the nacelle/engine anti-icing system has not been selected on during icing conditions, as required in the AFM.

B. POI Approval Procedures. When reviewing all manuals, procedures and training programs, for all GACAR Part 121 and 135 operators, the POI shall:

1) Determine that emphasis is placed upon use of engine anti-ice, both on the ground and in flight, when engine icing potential exists. Abnormal engine instrument indications, such as EPR, fuel flow, or compressor speeds (N1)/(N2) should be addressed, with crews instructed on the use of engine heat whenever any doubt exists as to its possible need.

2) Determine that their operator’s procedures have the flight crew's cross-check all engine parameters during takeoff with provided data. This cross-check may include such items as fuel flow or compressor speeds (N1)/(N2) being compared with thrust setting or EPR commanded.

3) Determine that crews are trained to recognize abnormal engine indications, even when they are symmetric (e.g., all engines are indicating the abnormal value), and be instructed as to what actions are to be taken when such indications occur.

4) Determine that takeoff data cards are modified to include a ready reference to cross-check an additional engine parameter with EPR such as, fuel flow, N1 or N2 during takeoff.

5.3.5.15. SPECIAL AERODROMES REQUIRING SPECIAL PIC AERODROME QUALIFICATION. GACAR § 121.777 requires that the pilot in command (PIC) in GACAR Part 121 operations must be qualified for operations into aerodromes determined to be Special PIC Qualification aerodromes. GACAR § 121.777 also allows pictorial means to be used as a method of qualifying PICs for operations into Special PIC Qualification aerodromes. OpSpec C50, Special PIC Qualification Aerodromes, is used to authorize GACAR Part 121 operators to conduct instrument flight rules (IFR) operations into special aerodromes requiring special aerodrome qualification for the PIC.

A. PIC Qualifications. Crew member qualification requirements in GACAR Part 121, Subpart K, prescribe the PIC qualifications required for operations to each aerodrome and terminal area. This guidance and OpSpec C50, focuses on the PIC's qualifications to operate into and out of special PIC qualification aerodromes. Two sections of GACAR Part 121, Subpart K are particularly relevant to this guidance, GACAR §§ 121.773 (a) and (c) and 121.777(a) and (b). GACAR § 121.777(c) relieves the PIC and the operator from the qualification requirements in GACAR § 121.777(b) if the weather conditions at a specific special PIC qualification aerodrome are above the values specified in that section. GACAR § 121.777(d) is specific to PIC qualifications to fly between terminals over a route or area that requires a special type of navigation qualification. This section of this chapter does not address the requirements of GACAR § 121.777(d).

1) GACAR § 121.773(a) requires each operator to provide a system acceptable to the President for disseminating certain specific information (as set forth in GACAR § 121.773(c)) to the PIC and appropriate flight operations personnel. In addition, the operator must provide current information to its PICs on the subjects identified in GACAR § 121.773(c). The operator is also responsible under GACAR § 121.773(c) for ensuring that those persons have adequate knowledge of, and the ability to use, the information.

2) GACAR § 121.777(a) through (c) sets forth the PIC's qualifications for landing and takeoff at aerodromes that the GACA has designated as special PIC qualification aerodromes. Accordingly, if an operator uses a special PIC qualification aerodrome in its operations, regardless of whether it is a provisional, regular, refueling, alternate, or Extended Twin Engine Operations (ETOPS) alternate aerodrome, then (except as provided in GACAR § 121.777(c)) the PIC qualification requirements in GACAR § 121.777(b) apply. The PIC may obtain qualification within the preceding 12 calendar-months in one of two ways:

a) The PIC or SIC has made an entry to that aerodrome (including a takeoff and landing) while serving as a pilot.

b) The PIC has qualified by using pictorial means acceptable to the President for that aerodrome.

3) Approved pictorial means may include, but is not limited to videotapes, slide presentations, and still photos, when approved by GACA. Whatever means are presented to GACA for approval must assure a realistic depiction of the aerodrome and significant surrounding features.

B. Identifying Special Aerodromes. GACAR § 121.777(a) states that the President may determine that certain aerodromes (due to items such as surrounding terrain, obstructions, or complex approach/departure procedures) are special aerodromes that require the PIC to hold special aerodrome qualifications prior to landing or taking off from that aerodrome. The GACA evaluates aerodromes and determines whether an aerodrome should be identified as a special qualification aerodrome.

C. Aerodrome Assessment and Designation of Special Aerodromes.

1) *Methodology*. The Manager, Flight Operations Division maintains a list of special PIC qualification aerodromes. The GACA determines that an aerodrome should be listed as a special PIC qualification aerodrome through one of two methods:

a) It independently assesses the aerodrome using the criteria contained in the Aerodrome Assessment Aid and determines whether or not the aerodrome should be listed as a special PIC qualification

aerodrome; or

b) A GACAR Part 121 operator assesses an aerodrome using the Aerodrome Assessment Aid below and submits the assessment to their POI or to the address at the top of the form. Subsequently, the

Director, Flight Operations Division uses that assessment to determine whether the aerodrome should be listed as a special qualification aerodrome for that operator. This aid also can be used by a GACAR Part 121 operator to request that an aerodrome be removed from the special qualification aerodrome list. The criteria contained in the Aerodrome Assessment Aid are not all-inclusive, and may be supplemented by additional information.

2) *Assessment Guidelines*. An assessment of an aerodrome must be conducted by a GACA Inspector (Operations) or GACAR Part 121 operator. Usually, assessments are conducted because an operator wishes to operate into an aerodrome that has not been previously included in its route structure. Further discussion on the requirements for an assessment is found in subparagraph 4) below. The operator should refer to the updated aerodrome list to determine if the aerodrome has been assessed previously and requires listing as a Special Pilot Qualification Aerodrome. If the aerodrome is shown as a special qualification aerodrome but the operator disagrees with that determination, the operator may request a reassessment in accordance with subparagraph 3) below.

a) OpSpec C50 *Only* Applies. The extent of the assessment conducted by the operator depends on the nature and complexity of certain factors associated with the aerodrome (i.e., high altitude, foreign aerodrome, specific terrain features, unique weather patterns may be present singly or in combination). When considering the aerodrome assessment, a determination should be made whether to include the aerodrome in OpSpec C67 or C50. For instance, an aerodrome surrounded by high, fast-rising terrain may require designation as a special PIC qualification aerodrome. In this case, OpSpec C50 would be used for authorization.

b) Provisions of OpSpec C50 apply and the aerodrome should be listed in C67. An aerodrome that is already classified as a special PIC qualification aerodrome may be unique, as determined by the POI, especially when used with certain types of aircraft because of the unique safety issues raised by the use of that type of aircraft at the particular aerodrome. This uniqueness means that the POI has determined that operators should develop and their pilots should comply with specific procedures for conducting operations at that aerodrome. The GACA may require the use of these procedures through OpSpec C67, even though the provisions of OpSpec C50 may apply if that aerodrome is also listed as a special PIC qualification aerodrome.

3) *Aerodrome Assessment Aid*. Upon completion, the completed Aerodrome Assessment Aid (see Figure 5.3.5.1) should be forwarded to the Director, Flight Operations Division. The Director, Flight Operations Division will make the final determination to list or remove the aerodrome as a special PIC qualification aerodrome.

4) *Aerodromes Without an Assessment or Prior GACAR Part 121 Service.* An operator and their POI will jointly decide whether or not an assessment is necessary for aerodromes that have not been served by the operator and have not been assessed previously. For example, an aerodrome located in a country for which limited information is available and for which an assessment has not been completed will likely be a candidate for assessment and for inclusion in the Special Aerodromes Requiring Special PIC Qualification list. Additionally, an aerodrome located in a country for which appropriate information is available, such as Aeronautical Information

Publication (AIP) information, or other equivalent information, and where GACAR Part 121 operations have been previously conducted, will most likely not be a candidate for an assessment.

Figure 5.3.5.1. Aerodrome Assessment Aid

This aid (associated with OpSpec C50) should be completed and submitted to the Manager, Flight Operations Division for review and action:

<table>
<tr><td>Name & Title</td><td rowspan="2">Address:</td><td>Phone/Fax/Internet:</td></tr>
<tr><td>Date:</td><td>Operator:</td></tr>
<tr><td colspan="3">Aerodrome Name, ICAO Identifier, City, State, Country:</td></tr>
<tr><td colspan="3">Type(s) of Aircraft Addressed In This Assessment: M/M/S:</td></tr>
</table>

<table>
<tr><th colspan="2">Key Elements</th><th>Please enter the requested information:</th></tr>
<tr><td>1.</td><td>Terrain/Obstructions:

Is there high terrain located in the immediate vicinity of the aerodrome? <u>YES</u> / <u>NO</u>

List the terrain within the vicinity of the aerodrome that might affect operations:

Other remarks regarding the local terrain:

Attach a copy of a topographical map depicting the location of the terrain mentioned above.

List obstructions located in the approach/departure corridor or in the vicinity of the aerodrome:</td><td></td></tr>
</table>

2.	Approach/Missed Approach/Departure Procedure Attach a copy of the chart depicting the approach/departure procedure. State the degree of complexity of the procedure (terrain/obstacle/other) and any unique local procedures: Does the approach have a nonstandard descent (greater than a 3-degree glide slope)? YES / NO Climb gradient: If there is a climb gradient requirement shown please write that requirement.	
3.	Limited Maneuvering Airspace State the limitations (e.g., political, terrain) to maneuvering airspace.	
4.	Limited Aerodrome Information (accuracy/currency) Example: There is mountainous terrain in close proximity of the aerodrome with no indication of an arrival or departure procedure that takes the terrain into account.	
5.	Unique Country Rules—Different than ICAO	
6.	Communication, Navigation, and Surveillance Anomalies—Specific to Approach and Departures (Approach Control Radar or lack of ATS)	
7.	Additional information in support of pictorial requirements:	
8.	Recommend C50 (Special PIC Qualification Aerodrome) or C67 (Special Aerodrome)	
Recommend Special Pilot Qualification Aerodrome Designation (Yes or No)		

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Section 6. Operating Performance, Normal Category Rotorcraft

NOTE: This guidance to be developed at a later date.

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CHAPTER 3. AIRCRAFT PERFORMANCE AND AERODROME DATA

Section 7. Operating Performance, Transport Category Rotorcraft

NOTE: This guidance to be developed at a later date.

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 4. MINIMUM EQUIPMENT LIST (MEL) AND CONFIGURATION DEVIATION LIST (CDL)

Section 1. Approve/Revise a Minimum Equipment List (MEL) for Part 91 Operators

5.4.1.1. GACA ACTIVITY REPORT.

A. 1425 (OP) (Initial Approval)

B. 1426 (OP) (Revision)

C. 3312 (AW) (Initial Approval)

D. 3313 (AW) (Revision)

5.4.1.3. OBJECTIVE. The objective of this task is to determine whether an operator meets the regulatory requirements for safe and appropriate flight with certain instruments and equipment inoperative under General Authority of Civil Aviation Regulation (GACAR) Part 91. Successful completion of this task results in the issuance or denial of a Certificate of Authorization (COA) to operate under GACAR Part 91 with a Minimum Equipment List (MEL).

5.4.1.5. GENERAL. In accordance with GACAR Part 21 the General Authority of Civil Aviation (GACA) type certificates most aircraft by way of the type acceptance of the type certificate issued by the United States (US) Federal Aviation Administration (FAA). In a similar fashion, the GACA also accepts the Master Minimum Equipment List (MMEL) approved by the FAA as the MMEL applicable for Saudi Arabian-registered aircraft. This section discusses the approval of a MEL for GACAR Part 91 operations. It contains definitions and a general overview of the MEL system, as it applies to GACAR Part 91 operations. Section 2 contains the approval of a MEL for General Authority of Civil Aviation (GACAR) Part 121, 125, 133 or 135 operators. Section 3 contains information on the development and approval process for master minimum equipment lists (MMELs) by the Federal Aviation Administration's (FAA's) Flight Operations Evaluation Board (FOEB). Section 4 contains information about the development, approval, and usage of the configuration deviation list (CDL) for GACAR Part 121 and 135 operators. Section 5 contains information for Inspectors relative to the Non-essential Equipment and Furnishings (NEF) Program, which accompanies the MMEL/MEL programs.

NOTE: FAA MMELs may be reviewed and downloaded from the FSIMS web site: http://fsims.faa.gov/home.aspx.

A. Authority. GACAR § 91.309 authorizes flight with inoperative equipment under specific conditions.

B. Definitions.

1) *The Aircraft Evaluation Group* (AEG) is the FAA office responsible for the development and publication of an approved MMEL for those aircraft within its area of responsibility.

2) *The aircraft Maintenance Manual* (AMM) is the source document for maintenance procedures for an aircraft.

3) *The Air Transportation Association* (ATA) and the International Air Transportation Association (IATA) numbering system refer to systems on different aircraft in a standardized manner. MMELs use the ATA numbering

system.

4) The term *calendar days* includes all days, with no exclusion for weekends and/or holidays.

5) *Deactivation* means to make a piece of equipment or an instrument unusable by the pilot/crew or by maintenance, thus, preventing its operation.

6) *Deferred maintenance* is the postponement of the repair or replacement of an item of equipment or an instrument.

7) *Equipment list* is an inventory of equipment installed by the manufacturer or operator on a particular aircraft.

8) The *Flight Operations Evaluation Board* (FOEB) is a review board composed of FAA personnel who are operations, airworthiness, avionics, and aircraft certification specialists. The FOEB develops an MMEL for a particular aircraft type under the direction of the FAA's Aircraft Evaluation Group (AEG).

9) *Inoperative* means a system and/or component malfunction to the extent that it does not accomplish its intended purpose (function) and/or is not consistently functioning normally within approved operating limits or tolerances.

10) The *kinds of operations list* (KOL) specifies the kinds of operations (e.g., visual flight rules (VFR), instrument flight rules (IFR), day, or night operations, in which the aircraft may be operated. The KOL also indicates the installed equipment that may affect any operating limitation. Although the certification rules require this information, there is no standard format; consequently, the manufacturer may furnish it in various ways.

11) *Master Minimum Equipment List*. A MMEL contains a list of items of equipment and instruments that may be inoperative on a specific type of aircraft (e.g., BE-200, Beechcraft model 200). It is also the basis, the foundation document, used in the development of an individual operator's MEL.

12) *Minimum Equipment List*. The MEL is the specific inoperative equipment document for a particular operator's make and model aircraft by serial and registration marks, e.g., BE-200, HZ-12345. A GACAR Part 91 MEL consists of the MMEL for a particular type aircraft, the preamble for GACAR Part 91 operations, the procedures document, and a Certificate of Authorization (COA). The MEL permits operation of the aircraft under specified conditions with certain equipment inoperative, under the operating rule.

13) The *next required inspection* is the inspection required under either a GACA approved inspection program, a 100-hour inspection, or an annual inspection, as appropriate.

14) *"O" and "M" procedures*in the MMEL refer to specific operating conditions and limitations, as appropriate, and to the specific maintenance procedures the operator uses to disable or render inoperative items of equipment.

a) An *O* symbol in column 4 of the MMEL indicates that a specific operations procedure must be accomplished before or during operation with the listed item of equipment inoperative. Normally, the flight crew accomplishes these procedures; however, other personnel, such as maintenance personnel, may be qualified and authorized to perform the procedure.

b) An *M* symbol in column 4 of the MMEL indicates that a specific maintenance procedure must be accomplished before beginning operation with the listed item of equipment inoperative. Normally, maintenance personnel accomplish these procedures; however, other personnel, such as the flight crew, may be qualified and authorized to perform certain functions. Qualified maintenance personnel must perform procedures requiring specialized knowledge, skills, or the use of tools or test equipment.

15) A *placard* is a decal or label with letters at least 3.125 mm (1/8-inch) high. The operator or mechanic must place the placard on or near inoperative equipment or instruments so that it is visible to the pilot or flight crew and alerts them to the fact that the equipment is inoperative.

16) The term *preventive maintenance* refers to simple or minor preservation operations and/or the replacement of small standard parts not involving complex assembly. GACAR Part 43, Appendix A(c), contains a list of preventive maintenance items. Qualified mechanics or certificated pilots may accomplish preventive maintenance and approve the aircraft for return to service.

17) *Procedures document* pertains to a separate document containing the O and M procedures. The Procedures Document may be developed by the operator, or it may be developed by the manufacturer; and it contains any other operating information applicable to operation with an MEL, such as the “as required by 14 CFR” or “as required by GACAR” items that list the regulation by part and section or stipulate the operating conditions.

18) *Preliminary Master Minimum Equipment List* (PMMEL). The PMMEL is the working document used as the basis for development of the MMEL. Normally, the manufacturer proposes it during the certification process. However, an operator of a unique type aircraft, for which an MMEL does not exist, may submit a PMMEL for FAA approval at an FOEB meeting.

19) *Type certificate data sheets and specifications* (TCDS) is a document issued by the FAA which describes the aircraft’s airworthiness requirements relating to a specific type and make and model of aircraft. These documents are available on web site: www.faa.gov.

5.4.1.7. BACKGROUND. Except as provided in GACAR § 91.309, all instruments and equipment installed on an aircraft must be operative before its operation. The GACA recognized that safe flight can be conducted under the MEL concept and under specific conditions with inoperative instruments and equipment.

GACAR Part 43 and 91 provide a regulatory basis for the operation of aircraft with inoperative instruments and equipment. Operators conduct these operations within a framework of a controlled program of maintenance inspections, repairs, and parts replacement. However, operators must exercise good judgment and have, at each required inspection, any inoperative instrument or equipment repaired or inspected or the maintenance deferred, as appropriate.

5.4.1.9. APPLICABILITY. This section does not apply to operators holding certificates issued under GACAR Part 121, 125 133 and 135. This section provides guidance for the operation of the following aircraft under GACAR Part 91 only:

5.4.1.11. MEL VS. GACAR § 91.309(d). Although GACAR Part 91 provides relief to operators under the MEL concept, some operators may find it less burdensome or less complicated to operate under the provisions of GACAR § 91.309(d). The aviation safety inspector (Inspector) should discuss the requirements of each method with the applicant to help the applicant decide which method of compliance better suits the particular operation. Figure 5.4.1.2 contains a list of commonly asked questions which may assist in that decision making process.

A. Listing of Equipment. An MEL is a precise listing of instruments and equipment and procedures that allow an aircraft to be operated under specific conditions with inoperative equipment. The MMEL, as a component of the GACAR Part 91 MEL, by nature, does not cover equipment installed or modified under other STCs, unless the equipment installed under the STC has been added to the MMEL. Any STC or other major modification may make the MMEL for a particular modified aircraft invalid, unless the FAA FOEB or GACA has reviewed and approved the use of the MMEL/MEL under the STC.

B. Regulatory Requirements. The regulations require that all equipment installed on an aircraft in compliance with the airworthiness standards and operating rules be operative. The MMEL includes those items of equipment and other items which the regulatory authority finds may be inoperative and yet maintain an acceptable level of safety. The MMEL does not contain obviously required items such as wings, flaps, rudders, etc. When a GACAR Part 91 operator uses an MMEL as an MEL, all instruments and equipment not covered in the MMEL must be operative at all times regardless of the operation conducted, unless:

1) They are newly installed and are not a safety of flight item such as passenger convenience (NEF) items, etc.

2) The operator has developed appropriate procedures for disabling or rendering them inoperative.

C. Operational Options. If GACA has not yet authorized operation with a MEL for an operator's specific aircraft, the operator may apply for a MEL. However, the operator can always elect to operate without a MEL under the provisions of GACAR § 91.309(d).

5.4.1.13. RELATIONSHIP BETWEEN THE PMMEL, MMEL, AND MEL. When an aircraft is first manufactured, the FAA's FOEB determines the minimum operative instruments and equipment required for safe flight in that particular aircraft or aircraft type in each authorized operating environment. During the type certification process, the manufacturer submits a PMMEL to the FOEB. Based on its determinations, the FOEB reviews the PMMEL and develops an MMEL from it. Once the FOEB approves the MMEL, a copy is available to operators via either an automated system that allows interested persons to download the MMEL.

A. MMEL Revisions. As technology changes and new equipment becomes available, the FOEB will reconvene to develop new MMELs or the FOEB will revise and update existing ones.

B. Notification of Changes. Operators should maintain close contact with the FAA MMEL web site and/or the manufacturer of their aircraft to ensure they have access to the most up-to-date MMEL available.

5.4.1.15. SINGLE AND MULTIENGINE MMEL.

A. The FAA has developed MMELs for most of the FAA type-certificated aircraft in general service today. All multiengine airplanes have an MMEL that is specific to the type design, e.g., Beech Baron, BE-58. The FAA has developed a generic single engine MMEL to provide to operators of single engine aircraft that do not have a specifically designed MMEL.

B. This generic Single Engine MMEL referred to above, may be used in lieu of a specifically designed MMEL for a specific single engine airplane. The Single Engine MMEL may be found at web site: http://fsims.faa.gov/.

5.4.1.17. AIRCRAFT FOR WHICH NO MMEL HAS BEEN DEVELOPED.

A. General. If the FAA FOEB has not developed an MMEL for a certain type of rotorcraft, non-turbine powered airplane, glider, or lighter-than-air aircraft, that aircraft may be operated with inoperative equipment under the provisions of GACAR § 91.309(d).

5.4.1.19. MEL RESTRICTIONS. Operators of small rotorcraft, non-turbine powered small single- and multiengine airplanes and other aircraft for which an MMEL has been developed may elect to operate with an MEL or under the provisions of GACAR § 91.309(d). However, the latter option does not apply if the aircraft has an MEL approved under GACAR Part 121, 125, 133, or 135. For example, an owner has leased an aircraft to an operator, and the operator has applied for and received an approved MEL for GACAR Part 135 operations. Compliance with that MEL is mandatory, even during GACAR Part 91 operations. If the operator wants to operate under GACAR § 91.309(d), the operator would have to surrender the previous MEL authorization.

5.4.1.21. REMOVAL OR DEACTIVATION. When an operator elects to operate without a MEL, any inoperative instrument or equipment must either be removed (GACAR § 91.309(d)(3)(i)) or deactivated (GACAR § 91.309(d)(3)(ii)), then placarded.

A. Removal. Removal of any item of equipment that affects airworthiness of an aircraft requires that one follows an approved procedure. A properly certificated maintenance person must record the removal in accordance with GACAR § 43.11. A person authorized by GACAR § 43.9 must make the appropriate adjustments to the aircraft's mass and balance information and the equipment list, fill out and submit the applicable GACA form and approve the aircraft for return to service.

B. Deactivation. The operator must evaluate any proposed deactivation to assure there is no adverse effect that could render another system less than fully capable of performing its intended function.

1) A certificated pilot may accomplish a deactivation when the deactivation involves routine pilot tasks, such as turning off a system. However, for a pilot to deactivate an item or system, that task must come under the definition of preventive maintenance in GACAR Part 43, Appendix A(c).

2) If the deactivation procedures do not fall under preventive maintenance, a properly certificated maintenance person must accomplish the deactivation. The maintenance person must record the deactivation according to GACAR § 43.11.

C. Placarding. Placarding can be as simple as writing the word inoperative on a piece of masking tape and attaching it to the inoperative equipment or to its cockpit control. Placarding is essential since it reminds the pilot that the equipment is inoperative. It also ensures that future flight crews and maintenance personnel are aware of the discrepancy.

5.4.1.23. INOPERATIVE EQUIPMENT AND REQUIRED INSPECTIONS. An operator may defer maintenance on inoperative equipment that has been deactivated or removed and placarded as inoperative.

A. Inspection Due. When an aircraft is due for inspection in accordance with the regulations, the operator should have all of the inoperative items repaired or replaced.

B. Indefinite Deferral. If an owner does not want to repair a certain specific item that is inoperative, then the maintenance person must check that item, or items, to see if it conforms to the requirements of GACAR § 91.309(d). The operator and maintenance personnel should also assess how permanent removal of the item could affect safe operation of the aircraft.

1) The repair interval categories (A, B, C, D) that are included in the MMEL *do not apply* to GACAR Part 91 MELs. (Recognizing that the repair interval categories listed in the MMEL drive safety concerns associated with commercial operations, they may be ignored under GACAR Part 91 operations.)

2) The maintenance person must furnish the owner/operator with a signed and dated list of all discrepancies not repaired.

3) The maintenance person must ensure that each item of inoperative equipment that is to remain inoperative is placarded appropriately.

5.4.1.25. CONDUCTING OPERATIONS WITHOUT AN MEL.

A. Applying GACAR § 91.309(d). Operating under GACAR § 91.309(d) does not require an application or an approval from the GACA. An operator, after operating under GACAR § 91.309(d), may elect at any time to apply to GACA for an authorization to operate under an MEL.

B. Decision Sequence. Figure 5.4.3.3 is a flowchart depicting the typical sequence of events that a pilot or operator, operating under GACAR § 91.309(d), should follow when the pilot or operator discovers inoperative equipment. For example, during a preflight inspection for a day VFR cross-country flight, the pilot discovers that the No. 2 automatic direction finding (ADF) head is inoperative.

1) The pilot checks the aircraft's equipment list or KOL to see if the No. 2 ADF is a required item (GACAR § 91.309(d)(2)(ii)). If the No. 2 ADF is required in the equipment list or KOL, the aircraft is not airworthy. The operator must have the No. 2 ADF replaced or repaired before operating the aircraft. In this example, the No. 2 ADF is not a required item on the equipment list.

2) Next, the pilot checks the airworthiness regulation under which the aircraft was certificated to determine if the No. 2 ADF is required (GACAR § 91.309(d)(2)(i)). If the No. 2 ADF is required as part of the VFR day type certification, the aircraft is not airworthy. The operator must have the No. 2 ADF replaced or repaired before operating the aircraft. In this example, the No. 2 ADF is not required by type certification.

3) Next, the pilot checks to see if an airworthiness directive (AD) requires the No. 2 ADF. The pilot can accomplish this by checking the aircraft's maintenance logs to see if the No. 2 ADF was installed as a result of an AD. However, it may be necessary for the pilot to consult with a qualified maintenance person to determine AD compliance. If an AD requires the No. 2 ADF to be operative, the aircraft is not airworthy. The operator must have the No. 2 ADF replaced or repaired before operating the aircraft. In this example, there are no ADs requiring the No. 2 ADF to be operative.

4) Next, the pilot checks to see if the No. 2 ADF is required by GACAR § 91.303. The pilot can accomplish this by checking those sections of the regulations or by consulting with a maintenance technician or GACA personnel. If any of those sections of the regulations require a No. 2 ADF, then the aircraft would not be airworthy with the No. 2 ADF inoperative. The operator must have the No. 2 ADF replaced or repaired before operating the

aircraft. In this example, those sections of the regulations do not require the No. 2 ADF to be operative.

5) At this point, the inoperative No. 2 ADF must either be removed from the aircraft (GACAR § 91.309(d)(3)(i)) or deactivated (GACAR § 91.309(d)(3)(ii)). The person removing or deactivating the No. 2 ADF must placard it as inoperative in the appropriate location. (A pilot should consult with maintenance personnel before deactivating or have maintenance personnel remove any item of equipment that needs to be removed.)

6) Finally, the pilot should decide whether the inoperative No. 2 ADF creates a hazard for the anticipated conditions of the flight, e.g., Day VFR.

5.4.1.27. OPERATING AIRCRAFT WITH A MEL.

A. Applying for MEL Approval. The GACA has only one procedure for the issuance of GACAR Part 91 MEL authorizations. The operator who wishes to conduct operations with an MEL must contact the GACA and make an appointment. The process is as follows:

1) GACA will assign an Inspector to advise the applicant about regulatory requirements pertinent to using an MEL. During the initial appointment, the applicant will likely be dealing with both Inspectors (Operations) and (Airworthiness).

a) The operator must develop the O and M procedures using guidance contained in the manufacturer’s aircraft flight and/or maintenance manuals, the manufacturer’s recommendations, engineering specifications, and other appropriate sources. An operator may consult the Inspectors for advice or clarification, but the operator is responsible for preparing the document.

b) The Inspector must discuss with the operator the following considerations for preparing the procedures document:

1. The operator’s procedures document may be more restrictive than the MMEL either by the applicant’s choice or because of ADs or operating rules; however, it may not be less restrictive than the MMEL.

2. The title page of the procedures document must contain the following statement: “This MEL is applicable to GACAR Part 91 operations only and may not be used for operations conducted under GACAR Parts 121, 125, 133, or 135”.

3. The operator must use the Air Transport Association (ATA) or the International Air Transport Association (IATA) numbering system for equipment and instruments, as is used in all MMELs. The operator must use the ATA numbering system in sequence when describing O and M procedures, including the numbers for equipment installed in the aircraft. When equipment is not installed in a specific aircraft, the applicant need not develop O and M procedures for those items of equipment.

4. Operators must ensure that the procedures document lists the items of equipment that are actually installed on the specific aircraft (except those items over and above the type design or previously approved by the FAA’s AEG or GACA). This provides guidance to a pilot as to which items of equipment may be inoperative for a particular operation.

5. Equipment specifically required by the airworthiness rule under which the aircraft is type certificated, by equipment required through an AD, and by equipment required for specific operations under GACAR § 91.309(b)(1) through (3) must be operative. It is important to note that all items related to the airworthiness of the aircraft that are not included on the MMEL must be operative.

6. The repair interval categories (A, B, C, and D) listed in column 1 of the MMEL apply only to operations conducted under GACAR Parts 121, 125, 133, and 135.

7. Where the MMEL states “As required by 14 CFR” or “As required by GACAR”, the procedures document should list the particular regulation or regulations by part and section or describe the actual GACAR requirement applicable to the operator’s particular operation. For example, where the regulation requires a clock for IFR flight, the operator’s procedures document should say, May be inoperative for VFR.

8. The procedures document must specify suitable limitations in the form of placards, maintenance procedures, crew operating procedures, and other restrictions to ensure an acceptable level of safety.

9. The procedures document must specify those conditions under which an item may be inoperative. The remarks must also identify required maintenance or operational tasks. The symbol *O* or *M*, placed in column 4 of the MMEL, indicates that an *O* or *M* procedure is applicable to that item. Indicating the *O* and *M* procedures in the procedures document provides flight crews and ground support personnel with a single procedural reference document.

10. If the *O* and *M* procedures are already stated in the AFM, the maintenance manual, or other available GACA approved source, the operator needs only to show the reference; e.g., O: AFM, pp. 3-8 through 3-10, paragraph 3-47. If the operator uses this reference format in the procedures document, the referenced source must be readily available to the ground support personnel and a copy of the references source must be carried in the aircraft and be readily available to the flight crew.

11. If *O* and *M* procedures are not in the AFM, maintenance manual, or other available GACA approved source, or if the operator wishes to use a different procedure, then the operator must list the procedure in the procedures document.

12. The procedures document may not conflict with AFM limitations, emergency procedures, ADs, or the aircraft maintenance manual.

2) A GACAR Part 91 operator may begin operations before completion of the procedures document. If the operator has not yet developed a procedure for an item, that item must be operative. When an instrument or item of equipment becomes inoperative, the operator must follow the procedure indicated in the procedures document or the operator could be in noncompliance with the regulations.

B. MEL Authorization. The MEL applies only to a particular aircraft make, model, serial number, and registration mark and only to the operator who received the authorization.

1) When more than one person has operational control of a specific aircraft, all of the operators must meet with GACA to discuss MEL operational considerations. The GACA may find it appropriate to list all operators on the

Certificate of Authorization (COA). Each operator must sign the Statement of Operator on the COA.

2) The GACA may issue operators who use several aircraft of the same type, a single Certificate of Authorization that lists each aircraft by serial and registration numbers. The GACA will issue separate COAs for different types of aircraft.

a) When operators add or delete aircraft of the same type from their fleet, they must notify the GACA within 10 calendar-days following the change. The GACA will reissue the COA containing the new information. Again, the operator must sign the new COA.

b) The operator must surrender the previous COA upon reissuance of a new one. The old COA should be placed in the operator's file.

3) An operator may elect to operate under GACAR § 91.309(d) at any time after operating with a GACAR Part 91 MEL. The operator must surrender the COA to the GACA and must conform to all provisions of GACAR § 91.309(d) during operations.

C. Revisions. The operator may have to revise the procedures document under several conditions: The FAA may revise the MMEL, the operator may add equipment, or the FAA may develop a type-specific MMEL for a single-engine aircraft.

1) Operators should maintain close contact with the FAA MMEL web site and/or the manufacturer of their aircraft to ensure they have access to the most up-to-date MMEL available. Within 30 calendar days of any notification that an MMEL has been revised (which includes a self-review program), the operator must replace the superseded revision of the MMEL with the current revision and add or delete procedures to their procedures document, as applicable. The operator should advise the GACA that they have revised their MEL with the current MMEL revision.

2) Should an operator wish to install items of equipment that are not safety related that qualify for inclusion in the Non-essential Equipment and Furnishings (NEF) List, that operator may petition the GACA for inclusion of that equipment on the NEF for that aircraft.

3) Although the FAA has developed a generic MMEL for operators of single-engine aircraft, it may be decided that a complex, turbine-powered single-engine aircraft requires a type specific MMEL. For example, the FAA has developed a type specific MMEL for the Cessna 208 Caravan.

a) When the FAA develops a specific MMEL for a single engine aircraft, the holders of MELs for that aircraft under a generic MMEL must apply to the GACA to have a new MEL approved based on the specific MMEL. The GACA will permit time for this conversion process to occur but this time period should not normally extend beyond 60 days.

D. Conducting Operations with an MEL. In addition to carrying the documents that comprise the MEL on board the aircraft, the operator must have on board any technical manuals needed to accomplish *O* and *M* procedures. Figure 5.4.1.4 illustrates the sequence of events involved in applying the MEL to inoperative equipment.

1) *Items Inoperative Before Flight*. Assume that during a preflight inspection for a day VFR flight, the pilot discovers that the navigation lights are inoperative.

a) The pilot checks the aircraft's MEL to determine under what, if any, flight conditions the aircraft could be operated without operable navigation lights. The MEL indicates that the aircraft may be operated during daylight hours without operable navigation lights.

b) The pilot checks the procedures document and finds that the O procedure is to deactivate the navigation lights by pulling the correct circuit breaker and having it collared by an appropriately certificated person.

c) The pilot places a placard, which indicates that the lights are inoperative, near the navigation light control.

d) The pilot examines the conditions of the proposed flight and determines that the flight can be conducted safely without navigation lights.

2) *In-flight failures*. An MEL applies only to the takeoff of an aircraft with inoperative instruments or equipment. The pilot's operating handbook (POH) or the AFM indicates procedures to follow for instrument or equipment failure in flight. The pilot-in-command (PIC) should handle the in-flight failure in accordance with those procedures. As soon as possible after landing safely, the PIC must enter a notation of the inoperative equipment in the aircraft's maintenance records, logbooks, or discrepancy record. Before the next takeoff, the pilot must apply the MEL to inoperative equipment as per the procedures in subparagraph D.1, above). An MEL allows the PIC to defer maintenance on items under the following conditions:

a) The aircraft is in condition for safe flight.

b) For the inoperative item, the pilot has followed the specific conditions, limitations, and procedures in the procedures document.

E. Correcting MEL Inoperative Items. The MEL permits operations with inoperative equipment for the minimum period of time necessary for equipment repair. It is important that Inspectors encourage operators to have repairs done at the earliest opportunity in order to return the aircraft to its design level of safety and reliability. In all cases, inoperative equipment must be repaired or the maintenance deferred at the aircraft's next required inspection.

1) Operators shall establish procedures to correct those inoperative items authorized within specified time requirements.

2) Owners of aircraft operated under GACAR Part 91 may opt to use one of several types of airworthiness inspection systems, depending upon how the operator uses the aircraft. Therefore, the time between required inspections or inspection segments will vary.

3) Items of inoperative equipment authorized by the MEL to be inoperative must be inspected or repaired by qualified maintenance personnel or maintenance deferred at the next 100-hour, annual, progressive, or unscheduled inspection. However, if GACAR § 91.309 requires that an item be repaired, the item cannot be deferred.

F. Recordkeeping Requirements. A record of inoperative equipment must remain in the aircraft so pilots will be aware of all discrepancies.

1) Since some operators do not carry aircraft logbooks in the aircraft, a discrepancy record or log is a good alternative. When an operator uses this type of discrepancy log in lieu of the aircraft's maintenance records, the

operator must retain the log as a part of the aircraft's records as per GACAR § 91.457(b).

2) If the operator elects to use the aircraft maintenance record to log inoperative items, that portion of the record must be carried on board the aircraft during all operations.

3) Maintenance procedures and corrective actions shall be accomplished and recorded according to GACAR §§ 43.11, 91.445 and 91.457.

4) Failure to record an inoperative item may result in operation of the aircraft contrary to the regulations because subsequent pilots would not be able to determine the airworthiness status of the aircraft.

G. Aircraft Used in Multiple Operations. GACAR § 91.309(c) allows a person who has an approved MEL under GACAR Part 133 or 135 to use that MEL for GACAR Part 91 operations. A GACAR Part 133 or 135 MEL must specify requirements for authorized GACAR Part 91 operators to comply with the more restrictive provisions established in the approved MEL. It is important that operators be capable of conducting operations in accordance with the MEL. This includes, but is not limited to, accomplishing required maintenance in accordance with the operator's requirements.

1) The use of a leased aircraft creates a situation where several persons may be operating the same aircraft under different regulations. For example, a Cessna 340 could be operated by an approved school under GACAR Part 141, an operator under GACAR Part 135, and by a rental pilot under GACAR Part 91. The GACA will not approve multiple MELs, which would create pilot confusion with multiple discrepancy lists and multiple sets of procedures for the same aircraft. In the example, the aircraft would operate under the GACAR Part 135 MEL, including the repair interval categories, with approval from the GACA, for other users to conduct operations under other regulations.

2) GACA does allow multiple operator use of a GACAR Part 133 or 135 MEL subject to the following conditions:

a) The operator is responsible for training all persons in the MEL's use, including the logging and clearing of discrepancies and the use of the repair interval categories.

b) Operators shall maintain a complete, current list of all persons trained and authorized to use the MEL.

c) The operator is responsible for determining the aircraft's maintenance status on its return from a GACAR Part 91 operation. The operator must accomplish this before the aircraft returns to GACAR Part 133 or 135 services.

d) GACA principal operations inspector (POI) shall verify that operators have established procedures that ensure an acceptable level of safety before authorizing persons to use the MEL under GACAR Part 91.

5.4.1.29. OFFICE FILES. In order to track MEL authorizations and operator revisions, GACA must keep an office file on each GACAR Part 91 operator with an MEL COA. The file should contain, but is not limited to, the following:

• A copy of the current revision of the MMEL

• A copy of the COA

• Any petitions from the operator for revisions to the MMEL

• Any negative responses to petitions or requests for MMEL revisions

• Inspection reports

• Any other correspondence from or to the operator concerning MEL authorization

5.4.1.31. INSPECTION OF THE PROCEDURES DOCUMENT. Since the GACA does not approve procedures documents for GACAR Part 91 operators with an MEL authorization, Inspectors must take advantage of any opportunities to examine those documents and to check that the operator is using the current revision of the MMEL.

A. Surveillance. During GACAR Part 91 ramp inspections or base inspections of any operator or air agency, Inspectors shall examine the procedures documents for content and appropriateness. (Refer to Volume 12, Chapter 5, Section 1, Inspection of a Part 91 Operator.

B. Investigations. While investigating any incident, accident (when in conjunction with the Aviation Investigation Bureau (AIB), or case of noncompliance, the Inspector should review the operator's COA and procedures document.

C. Airman Certification. When conducting airman certification functions, an Inspector should remind the pilot to have the MEL, on board the aircraft when arriving for the practical test. The Inspector should examine the procedures document, the COA and the MEL before conducting the practical test.

D. Results. The Inspector must document the results of checking an operator's MEL authorization under any of the above circumstances.

1) The Inspector should place the results of examining the procedures document in the office file on the operator.

2) If an Inspector encounters any problems with the procedures outlined in the document, the Inspector should describe to the operator how they can be fixed and follow up in writing to the operator. Again, the Inspector should place this record in the GACA office file.

3) The Inspector should note the revision number of the MMEL used by the operator and then compare it with the most current revision. If the operator does not have the current revision, the Inspector must contact the operator and inform the operator of the current revision's availability.

5.4.1.33. PREREQUISITES AND COORDINATION REQUIREMENTS.

A. Prerequisites. This task requires knowledge of the regulatory requirements of GACAR Part 91 and GACA policies.

B. Coordination. This task requires coordination with Airworthiness Division and possibly with the appropriate FAA AEG or FOEB through approved GACA coordination procedures.

5.4.1.35. REFERENCES, FORMS, AND JOB AIDS.

A. References.

- GACAR Part 43 and 91, 121, 125, 133 and 135

B. Forms. GAR.

C. Job Aids.

- Figure 5.4.1.1, MMEL Preamble for GACAR Part 91 Operations
- Figure 5.4.1.2, Commonly Asked Questions About MELs
- Figure 5.4.1.3, Flowchart - Operating Without an MEL
- Figure 5.4.1.4, Flowchart - Operating With an MEL

5.4.1.37. PROCEDURES.

A. Initial Inquiry. Upon inquiry from an operator concerning operation with an MEL, determine the make and model aircraft for which the operator is seeking MEL authorization.

1) Schedule an appointment for a meeting with the operator.

2) Coordinate with the Airworthiness Division for representation at the meeting.

3) Open the GACA Activity Report (GAR).

B. Meeting with the MEL Applicant.

1) At the meeting, provide the applicant with the following:

a) A copy of the appropriate MMEL with the preamble applicable to GACAR Part 91 operations (see Figure 5.4.1.1).

b) A sample title page.

2) Discuss the differences between operating under GACAR § 91.309(d) and operating with an MEL.

a) If the operator elects to continue with the MEL process, continue the briefing.

b) If the operator elects to operate under GACAR § 91.309(d), reiterate the process for operating with inoperative equipment (see Figure 5.4.3.3). Close out the GAR with an appropriate comment.

3) Discuss with the applicant the MMEL and how it reflects the equipment installed on the applicant's particular aircraft.

a) If the operator has installed items of equipment that are not on the MMEL, inform the operator that those items must operate normally, or he must request that his MEL authorization be amended to include those items of equipment, which may require an amendment or revision to the MMEL.

b) Explain that the repair interval categories on the MMEL are applicable only to GACAR Part 121, 125, 133 and 135 operations.

4) Discuss the requirements for the procedures document.

a) See paragraph 5.4.1.27, A.1, b, 1-12.

b) Explain that the provisions of the procedures document may not be less restrictive than those of the MMEL.

5) Discuss the operator’s responsibilities when operating with an MEL:

a) What type of operations will be authorized.

b) Operations with inoperative equipment.

c) Repair or replacement of items at the next inspection.

d) Deferral of repairs or replacements.

e) Removal and deactivation.

f) Placarding.

g) Record keeping requirements.

h) Multiple operations, if applicable. (See paragraph 5.4.1.27, G.)

i) Revisions.

6) Based upon the discussion with the applicant, determine if the applicant understands the requirements for operating with an MEL authorization.

a) If it is apparent the operator requires further study of the responsibilities involved with MEL authorizations, schedule a meeting at a later date. Remind the operator that the operator must conduct operations under GACAR § 91.309(d).

b) If the operator fully understands what is required for operation with an MEL authorization, proceed with the issuance of the COA.

7) *Issue the Certificate of Authorization*. Ensure that a COA issued to management companies indicates the name of the management company and NOT the individual owners. When preparing the COA, insert the name of the management company only in each instance where the sample says, [name of operator].

a) Explain that the COA, the MMEL, and its Preamble become the MEL for the particular aircraft.

b) Explain that the COA is issued to the applicant under the applicant's legal name and to the address of the operator's principal base of operations.

c) Explain that the operator is now responsible for developing the procedures document.

1. Explain that the operator may begin operations under the MEL authorization while developing the procedures document.

2. Remind the operator that if the operator has not yet developed a procedure for an item of equipment, that item of equipment must be operative until the procedure is developed.

3. Remind the operator that once the operator has developed a procedure for an item of equipment and that item of equipment becomes inoperative, the operator must follow the appropriate procedure in the procedures document.

d) Sign the COA and have the operator (or the operator's bona fide representatives) sign it.

C. GAR. Close out the GAR.

5.4.1.39. MEL REVISIONS.

A. MMEL Revisions.

1) Provide the operator with the revised MMEL.

2) Inform the operator that the operator must incorporate the applicable changes to the procedures document.

B. Operator Installation of Equipment Not on the MMEL.

1) Inform the operator that the operator must apply to the GACA for an MEL amendment within 10 days of installing the equipment

2) Inform the applicant that once the GACA approves the addition to the MEL, the operator must amend the procedures document.

3) If the GACA denies the amendment to the MEL, inform the operator that the equipment cannot be added to the procedures document. Remind the operator that the equipment must be operative when conducting operations.

C. Issuance of Type-Specific Single Engine MMELs.

1) Upon receipt of notification of the type specific MMEL, inform the operator that:

a) GACA must issue a new COA, and

b) The operator must develop a new procedures document based on the type-specific MMEL.

2) Follow the procedures in paragraph 5.4.1.37 above for issuing the new COA

3) Make appropriate GAR entries.

5.4.1.41. TASK OUTCOMES.

A. Issuance of a COA.

B. Issuance of a new COA based on a revision to an MMEL.

5.4.1.43. FUTURE ACTIVITIES.

A. Discussing MMEL revisions with applicants.

B. Issuance of a new COA after revision of an MEL.

C. Surveillance of GACAR Part 91 holders of MEL authorizations.

D. Non-Compliance. Possible non-compliance investigation if operators do not operate in accordance with the MEL authorization.

E. Cancellation. Cancellation of a GACAR Part 91 MEL may occur because of change of ownership, because of the operator's failure to comply with MEL requirements, or at the operator's request.

Figure 5.4.1.1. MMEL Preamble for GACAR Part 91 Operations

GENERAL AUTHORITY OF CIVIL AVIATION

MASTER MINIMUM EQUIPMENT LIST

(INSERT AIRCRAFT TYPE)

Preamble - GACAR PART 91 ONLY

(Effective Date: ___________)

This preamble is applicable to, and will be included in, master minimum equipment lists (MMEL) authorized for use under the provisions of GACAR § 91.309(a)(2). It is not applicable to MMELs issued under the provisions of GACAR Parts 121, 125, 133 and 135.

Except as provided in GACAR § 91.309(d), or under the provisions of an approved MMEL, all equipment installed on an aircraft in compliance with the airworthiness standards or operating rules must be operative. Experience has shown that with the various levels of redundancy designed into modern aircraft, operation of every system or component installed may not be necessary when the remaining equipment can provide an acceptable level of safety.

The MMEL and GACA-issued Certificate of Authorization (COA) are used as an MEL by an operator and permit operation of the aircraft with inoperative equipment.

The MMEL includes all items of installed equipment that are permitted to be inoperative. Equipment required by the GACAR, and optional equipment in excess of the GACAR requirements, is included with appropriate conditions and limitations. For each listed item, the installed equipment configuration considered to be normal for the aircraft (except for passenger convenience items such as galley equipment and passenger entertainment devices), such as ACAS, wind shear detection devices, and terrain awareness and warning systems (TAWS) that are in excess of what is required, and are not listed on the MMEL, must be operational for dispatch unless MEL relief is sought through the GACA. If MEL relief is sought, the operator must notify the GACA who will make a determination considering adding the equipment to the MMEL. The operator may then dispatch with the equipment disabled, or rendered inoperative, in accordance with all GACAR. It is incumbent on the operator to endeavor to determine if O and/or M procedures for that equipment must be developed. If so, any procedures developed must comply with all of the GACAR. Procedures developed to use the MMEL must not conflict with either the aircraft flight manual limitations, emergency procedures, or with airworthiness directives (AD), all of which take precedence over the MMEL and those procedures. Suitable conditions and limitations in the form of placards, maintenance procedures, crew operating procedures, and other restrictions, as necessary, are required to be accomplished by the operator to ensure that an acceptable level of safety is maintained. Those procedures should be developed from guidance provided in the manufacturer's recommendations, engineering specifications, and other appropriate sources. Procedures must not be contrary to any GACAR. Wherever the statement as required by the GACAR appears in the MMEL, the operator must either list the specific GACAR by part and section and carry the GACAR on board the aircraft or specify the requirements and/or limitations to conduct the flight in accordance with the appropriate GACAR.

The MMEL is intended to permit operations with inoperative items of equipment for the minimum period of time necessary until repairs can be accomplished. It is important that repairs be accomplished at the earliest opportunity in order to return the aircraft to its design level of safety and reliability. Inoperative equipment in all cases must be repaired, or inspected and deferred, by qualified maintenance personnel at the next required inspection [GACAR § 91.445(c)]. The repair intervals indicated by the Letters A, B, C, and D inserted adjacent to column 2 are NOT applicable to this MMEL.

The MMEL provides for release of the aircraft for flight with inoperative equipment. When an item of equipment is discovered to be inoperative, it is reported by making an entry in the aircraft maintenance records. The item is then either repaired or deferred per the MMEL or other approved means acceptable to the Administrator prior to further operation. In addition to the specific MMEL conditions and limitations, determination by the operator that the aircraft is in condition for safe operations under anticipated flight conditions must be made for all items of inoperative equipment. When these requirements are met, the aircraft may be considered airworthy and returned to service. Operators are responsible for exercising the necessary operational control to ensure that an acceptable level of safety is maintained. When operating with multiple inoperative items, the interrelationship between those items, and the effect on aircraft operation and crew workload, must be considered. Operators are expected to establish a controlled and sound repair program, including the parts, personnel, facilities, procedures, and schedules to ensure timely repair.

When using the MMEL, compliance with the stated intent of the preamble, definitions, conditions, and limitations specified in the MMEL is required.

Figure 5.4.1.2. Commonly Asked Questions about MELs

1. Can an operator make changes to an MEL document without changes having been made to the MMEL? How do they get approved?

> **No**. To make changes to the MEL, the operator must contact the GACA and state, in writing, that it wishes to have the MEL revised. This would apply to newly installed equipment that is not required by type certification rules, operating rules, and/or is in excess of what is required and is not listed on the MMEL.

2. What happens if my aircraft is destroyed in an accident? Do I need to return the MEL and Certificate of Authorization to GACA?

> If the MEL and Certificate of Authorization survive in a readable form, they must be surrendered to GACA, with an official notification of the aircraft's destruction in an accident. An official AIB indication of the aircraft's destruction is sufficient evidence if the aircraft was destroyed.

3. What if an Inspector asks to see my MEL, procedures document, and Certificate of Authorization?

> Because the regulations require that the MEL, procedures document, and Certificate of Authorization be carried on board the aircraft, the operator must show an Inspector, or other authorized representative of the President, the documents when requested to do so.

4. What happens when an original MEL is no longer appropriate?

> This would depend on the conditions that caused the MEL to become inappropriate, since an MEL must be revised when an MMEL is revised.

5. Does the GACA perform any type of surveillance after approval of an MEL? If so, how often?

> Inspectors do not specifically survey or inspect operators using an MEL. However, as part of a ramp inspection, Inspectors will check to determine if an aircraft is operating with an MEL or under the provisions of GACAR § 91.309(d).

6. What happens to the MEL if the aircraft is sold?

> The MEL and Certificate of Authorization are not transferable. The MEL and Certificate of Authorization must be surrendered to the GACA. The new owner must decide if they want to operate with an MEL or under the provisions of GACAR § 91.309(d). If the owner elects to operate with an MEL, they must apply at the appropriate GACA.

7. Can an operator request withdrawal of an approved MEL and elect to operate under GACAR § 91.309(d)?

> Both provisions of GACAR § 91.309 offer relief to operators. Operators will find more relief operating with an MEL. However, an operator may surrender an MEL and Certificate of Authorization by submitting them to the issuing GACA office along with a letter indicating that the operator no longer wishes to operate with an MEL. As of the date the MEL and Certificate of Authorization were surrendered, the aircraft must be operated under GACAR § 91.309(d), provided it can meet the requirements of GACAR § 91.309(d). If the GACA determines it cannot, the operator must continue to

operate under the MEL.

8. Can an applicant operate an aircraft under GACAR § 91.309(d) while awaiting approval for a proposed MEL?

Under the regulation, the operator would have no choice except to operate under GACAR § 91.309(d), to whatever extent he can, until authorization to operate under an MEL is received and the Certificate of Authorization issued.

9. There are a number of items on the Beech 58P Baron MMEL that need clarifying. For example, the MMEL states that you can take off with one fuel quantity indicator inoperative provided that an approved reliable means is established to determine there is enough fuel required by regulation. What is an example of an approved means?

The pilot can visually check the fuel and, if it is full, know how much fuel is on board for the flight. A dipstick calibrated for that aircraft, or any other means that provides a positive measurement, would be acceptable.

10. Since I no longer have to submit my (O) and (M) procedures to the GACA for approval prior to receiving the Certificate of Authorization, can I do this by mail?

No. It is important that Inspectors from the issuing Office meet with you (or a bona fide representative of you or your organization/company, etc. having signature authority) to discuss MEL operating procedures prior to issuance of the Certificate of Authorization. This is necessary to ascertain your ability to operate in accordance with the provisions of an MEL. All MEL Certificate of Authorization, therefore, can only be issued in person.

11. Who is a bona fide representative?

It can be anyone with signature authority, i.e.: the chief pilot, director of operations, director of maintenance, or other company officer. In the event that none of the above is applicable, a letter on company letterhead introducing the individual as a bona fide representative and signed by a company officer may suffice.

12. Must I make my request for a meeting with the Inspectors in writing?

There is no specified requirement that the request be made in writing; however, it is the prerogative of the GACA to make such a request at their option.

13. Must Inspectors from both disciplines (Operations and Airworthiness) be available for the meeting to discuss MEL operating procedures?

It is preferred that both disciplines be represented; however, it is not necessary if due to work constraints they will not be available within a reasonable period of time. It is important that an operations Inspector be involved in the discussion since the MEL is an operating document.

Figure 5.4.1.3. Flowchart - Operating Without an MEL

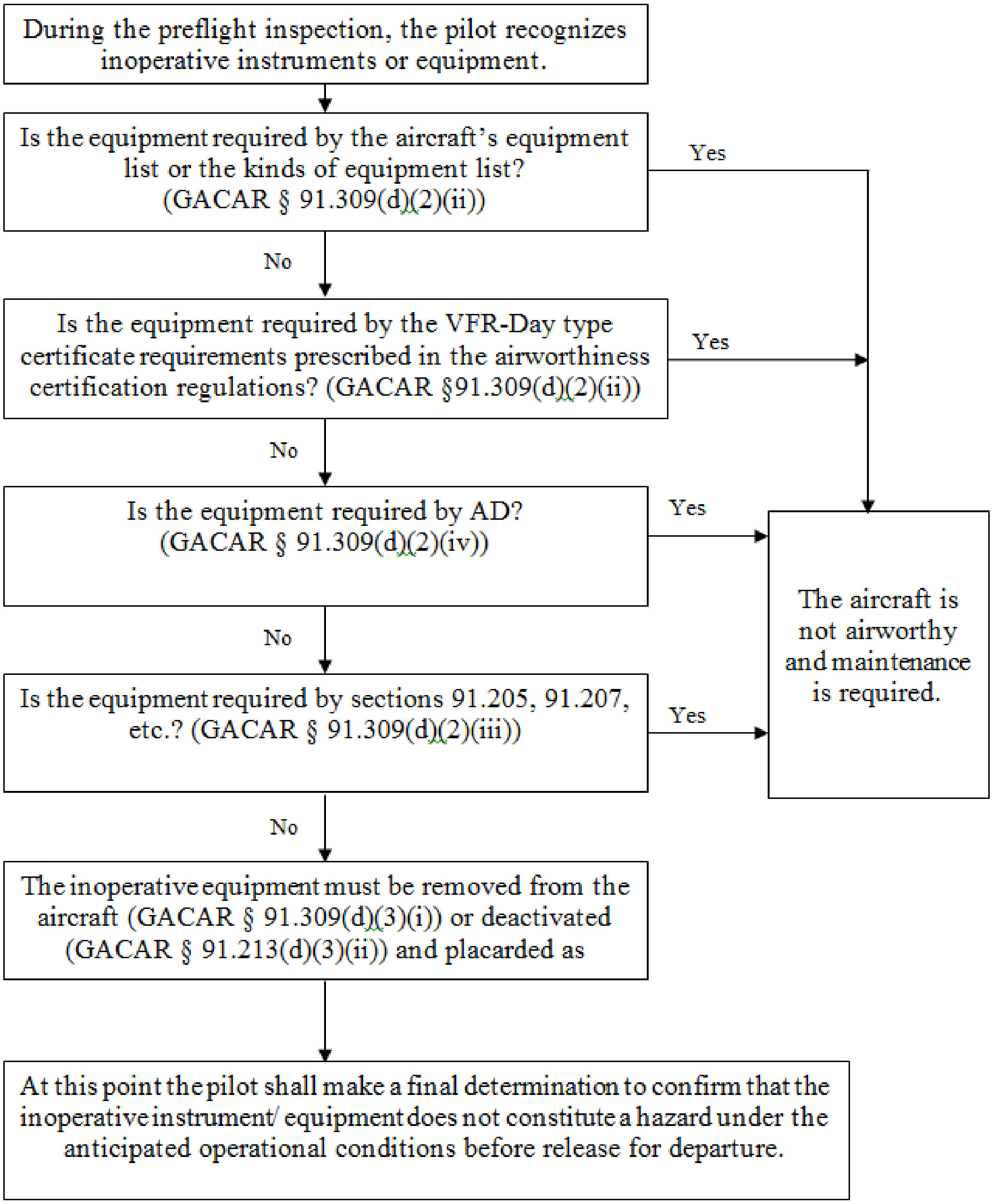
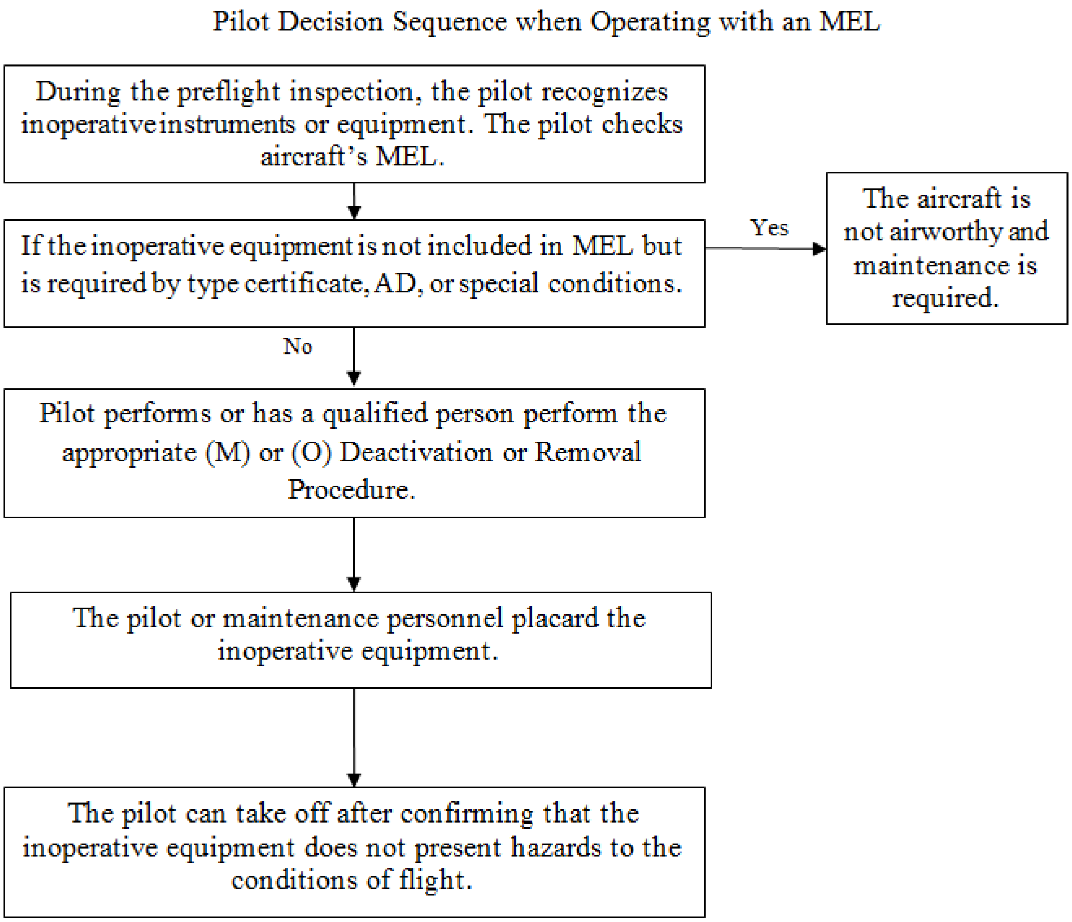


Figure 5.4.1.4. Flowchart - Operating With an MEL



VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 4. MINIMUM EQUIPMENT LIST (MEL) AND CONFIGURATION DEVIATION LIST (CDL)

Section 2. Approve/Revise a Minimum Equipment List (MEL) for Part 121, 125, 133 and 135 Operators

5.4.2.1. GACA ACTIVITY REPORT (GAR).

A. 1425 (OP) (Initial Approval)

B. 1426 (OP) (Revision)

C. 3312 (AW) (Initial Approval)

D. 3313 (AW) (Revision)

5.4.2.3. BACKGROUND. Minimum equipment list (MEL) procedures were developed to allow the continued operation of an aircraft with specific items of equipment inoperative under certain circumstances. The General Authority of Civil Aviation (GACA) has found that for particular situations, an acceptable level of safety can be maintained with specific items of equipment inoperative for a limited period of time, until repairs can be made. The MEL document describes the limitations that apply when an operator wishes to conduct operations when certain items of equipment are inoperative.

5.4.2.5. GENERAL. This section discusses the approval of a MEL for General Authority of Civil Aviation (GACAR) Part 121, 125, 133 or 135 operators. It contains definitions and a general overview of the MEL system, as it applies to GACAR Part 121, 125, 133 and 135 operations. It also includes detailed procedures for the evaluation and initial approval of an operator's MEL, the authorization to use the MEL and the evaluation and approval of subsequent MEL revisions.

5.4.2.7. INSPECTOR RESPONSIBILITIES. The aviation safety inspector (Inspector) (Operations) is the primary GACA official responsible for the overall process of administering, evaluating, and approving an operator's MEL document. It is essential that the Inspector (Operations) work with the Inspector (Airworthiness) and other individuals or groups involved in this process. Should the Inspector require additional *technical* information related to a specific MMEL *item*, he should consult the Director, Flight Operation Division for guidance. When necessary, GACA may contact the FAA Flight Operations Evaluation Board (FOEB) chairman responsible for the aircraft for further details concerning the MMEL.

5.4.2.9. DEFINITIONS. The following definitions are used throughout this section and referenced in the MMEL:

A. Administrative Control Item (ACI). An ACI is listed by the operator in the MEL for tracking and informational purposes. An ACI may be added to an operator's MEL by approval of the Inspector provided no relief is granted, or provided conditions and limitations are contained in an approved document (Structural Repair Manual, airworthiness directive). If relief other than that granted by an approved document is sought for an ACI, a request must be submitted to the GACA.

B. Aircraft Evaluation Group (AEG). The AEG is the United States (US), Federal Aviation Administration (FAA), Flight Standards (Operations) point of contact with aircraft certification and is responsible for the development, revision and publication of an MMEL for those aircraft within its area of responsibility.

C. Aircraft Maintenance Manual (AMM). The AMM is the source document for aircraft maintenance procedures. The AMM is required to be produced in order for the aircraft to be eligible for a type certificate.

D. Flight Standards Information Management System (FSIMS) MMEL Web Site. A Web site established by the FAA's Air Transportation Division (AFS-200) that provides the public with the latest approved MMELs, and MMEL policy information for public review and use. The Web site is updated on a continuing basis and can be accessed at web site: http://fsims.faa.gov/home.aspx. For further, more detailed information, contact the FAA's Flight Standards, Program Management Branch, AFS-260, at 1- (202) 267-8166.

E. Air Transport Association of America (ATA) Specification 100 (International Air Transport Association (IATA). ATA Specification 100, Manufacturer's Technical Data, is an international industry numbering standard developed to identify systems and components on different aircraft in the same format and manner.

F. As Required by CFR (Code of Federal Regulations, US). When the MMEL states "As Required by CFR", the listed item is subject to certain provisions (restrictive or permissive) expressed in 14 CFR (FAA) operating rules. The number of items required by CFR must be operative. When the listed item is not required by CFR, it may be inoperative for the time specified by its repair category.

NOTE: For Saudi Arabian operators using GACA approved MELs, this phrase should be interpreted to mean "As required by the GACAR".

G. Configuration Deviation List (CDL). Aircraft may be approved for operations with missing secondary airframe and engine parts. The aircraft source document for such operations is the CDL. The FAA grants approval of the CDL under an amendment to the type certificate. The GACA accepts this FAA approved CDL for use in the Kingdom of Saudi Arabia (KSA). The CDL is incorporated into the limitations section of the approved flight manual as an appendix. The CDL is normally presented alongside of the MMEL for ease of use by the operators.

H. Day of Discovery. Is the calendar day an equipment/instrument malfunction was recorded in the aircraft maintenance log and/or record. This day is excluded from the calendar days or flight days specified in the MMEL for the repair interval of an inoperative item of equipment. This provision is applicable to all MMEL items, i.e., categories A, B, C, and D.

I. Deactivated or Secured. When the MMEL refers to an item as deactivated or secured, the specified component must be put into an acceptable condition for safe flight. An acceptable method of securing or deactivating will be established by the operator.

J. Deleted. Items previously allowed to be deferred, but later revised, will have a note in the remarks column after a sequence item indicates that the item was previously listed but is now required to be operative if installed in the aircraft.

K. Electronic Fault Alerting System. New generation aircraft display system fault indications to the flight crew by use of computerized display systems. Aircraft manufacturers incorporate individual design philosophies when determining the data that is represented. The following are customized definitions (specific to each manufacturer) to help determine the level of messages affecting the aircraft's dispatch status.

L. Extended Range (ER). ER refers to extended range operations of a two-engine airplane (ETOPS) which has a type design approval for ER operations (ETOPS).

M. Excess Items. Excess items are those items that have been installed that are redundant to the requirements of the GACAR.

N. Flight Day. A flight day is a 24-hour period (from midnight to midnight) either Universal Coordinated Time (UCT) or local time, as established by the operator, during which at least one flight is initiated for the affected aircraft.

O. Flight Operations Evaluation Board (FOEB). An FOEB is a board of FAA personnel assigned for each type of aircraft. The FOEB is composed of FAA personnel who are operations, avionics, airworthiness, and aircraft certification specialists. The FOEB develops an MMEL for a particular aircraft type.

P. Flight Operations Policy Board (FOPB). The FAA FOPB develops FOEB and flight standardization board (FSB) policy recommendations, which are approved by FAA management and used in the development of MMELs.

Q. Icing Conditions. An atmospheric environment that may cause ice to form on the aircraft or in the engine(s).

R. Inoperative. A system and/or component malfunction to the extent that it does not accomplish its intended purpose and/or is not consistently functioning normally within its approved operating limit(s) or tolerance(s).

S. Inoperative Components of an Inoperative System. Inoperative items which are components of a system that is inoperative are usually considered components directly associated with and having no other function than to support that system. (Warning/caution systems associated with the inoperative system must be operative unless relief is specifically authorized per the MMEL).

> **NOTE**: Inoperative items must be placarded to inform and remind the crewmembers and maintenance personnel of the equipment condition. To the extent practical, placards should be located adjacent to the control or indicator for the item affected; however, unless otherwise specified, placard wording and location will be determined by the operator.

T. Master Minimum Equipment List (MMEL). A list of equipment that has determined *may be* inoperative under certain operational conditions and still provide an acceptable level of safety. The MMEL contains the conditions, limitations and procedures required for operating the aircraft with these items inoperative. The MMEL is used as a starting point in the development and review of an individual operator’s MEL.

U. MMEL Subsystem. The U.S. MMEL Subsystem is a computerized system which automates the process of creating, revising, approving, and distributing MMELs.

V. Minimum Equipment List (MEL). The MEL is a list derived from the MMEL for a particular make and model aircraft by an individual operator. The operator may elect to have a single MEL for multiple aircraft listed in OpSpec D85, if they are the same make and model. This is known as a Fleet MEL. The operator’s MEL takes into consideration the operator’s particular aircraft configurations, operational procedures, and conditions with certain inoperative equipment.

W. Notes (In Column 4 of the MMEL). Provide additional information for crewmember or maintenance consideration. Notes are used to identify applicable material which is intended to assist with compliance, but do not relieve the operator of the responsibility for compliance with all applicable requirements. Notes are not a part of the provisos.

X. Operative. A system and/or component will accomplish its intended purpose and is consistently functioning normally within its design operating limit(s) and tolerance(s). When an MMEL item specifies that an item of equipment must be operative, it does not mean that its operational status must be verified (unless specified in the provisions); it is to be considered operative unless reported or is known to be malfunctioning. When an MMEL item specifies that an item of equipment must be verified operative, it means that it must be checked and confirmed operative at the interval(s) specified for that MMEL item. When an MMEL item specifies that an item of equipment must be verified, but no interval is specified, verification is required only at the time of deferral. The operator's MEL may incorporate standardized terminology of their choice, to specify that an item of equipment must be operative, provided the operator's MEL definitions indicate that the selected operative terminology means that the required item of equipment will accomplish its intended function or purpose.

Y. Passenger Convenience Items. An historical and descriptive term applied to those items related to passenger convenience, comfort, or entrainment such as, but not limited to, galley equipment, movie equipment, ash trays, stereo equipment, overhead reading lamps, etc. These items are now usually referred to as non-essential equipment and furnishings. See section 7 of this chapter for further information concerning the non-essential equipment and furnishings (NEF) program.

Z. Preliminary Master Minimum Equipment List (PMMEL). A list developed by the manufacturer or operator that is submitted to the FAA FOEB as a basis for the development of a MMEL.

AA. Repair Intervals. All users of an MEL approved under GACAR Part 121, 125, 133, and 135 must effect repairs of inoperative systems or components, deferred in accordance with the MEL, at or prior to the repair times established by the following letter designators:

1) *Category A*. Items in this category shall be repaired within the time interval specified in the remarks column of the operator's approved MEL.

2) *Category B*. Items in this category shall be repaired within three (3) consecutive calendar days (72 hours), excluding the day the malfunction was recorded in the aircraft maintenance record/logbook. For example, if it were recorded at 10 a.m. on January 26, the three day interval would begin at midnight the 26th and end at midnight the 29th.

3) *Category C*. Items in this category shall be repaired within ten (10) consecutive calendar days (240 hours), excluding the day the malfunction was recorded in the aircraft maintenance record/logbook. For example, if it were recorded at 10 a.m. on January 26, the 10 day interval would begin at midnight the 26th and end at midnight February 5th.

4) *Category D*. Items in this category shall be repaired within one hundred and twenty (120) consecutive calendar days (2880 hours), excluding the day the malfunction was recorded in the aircraft maintenance log and/or record.

BB. ("-") Symbol. (Column 2) and/or (Column 3) indicates a variable number (quantity) of the item may be installed. This is common when a Fleet MEL is used since aircraft of the same make and model may have differing numbers of specific items installed.

CC. (":*") Symbol**. (Column 1) indicates an item which is not required by regulation but which may have been installed on some models of aircraft covered by this MMEL. This item may be included on the operator's MEL after the approving office has determined that the item has been installed on one or more of the operator's aircraft. The symbol, however, shall not be carried forward into the operator's MEL. It should be noted that neither this policy nor the use of this symbol provides authority to install or remove an item from an aircraft.

DD. (M) Symbol. Indicates a requirement for a specific maintenance procedure which must be accomplished prior to operation with the listed item inoperative. Normally these procedures are accomplished by maintenance personnel; however, other personnel may be qualified and authorized to perform certain functions. Procedures requiring specialized knowledge or skill, or requiring the use of tools or test equipment should be accomplished by maintenance personnel. The satisfactory accomplishment of all maintenance procedures, regardless of who performs them, is the responsibility of the operator. Appropriate procedures are required to be published as part of the operator's manual or MEL.

EE. (O) Symbol. Indicates a requirement for a specific operations procedure which must be accomplished in planning for and/or operating with the listed item inoperative. Normally these procedures are accomplished by the flight crew; however, other personnel may be qualified and authorized to perform certain functions. The satisfactory accomplishment of all procedures, regardless of who performs them, is the responsibility of the operator. Appropriate procedures are required to be published as a part of the operator's manual or MEL.

NOTE: The (*M*) and (*O*) symbols are required in the operator's MEL unless otherwise authorized by the GACA.

FF. System Definitions. System definitions are based on the Air Transport Association (ATA) Specification Number 100 and are numbered sequentially.

1) *Item (Column 1).* The equipment, system, component, or function listed in the Item column.

2) *Number Installed (Column 2).* The number (quantity) of items normally installed in the aircraft. This number represents the aircraft configuration considered in developing this MMEL. Should the number be a variable (e.g., passenger cabin items) a number is not required and the - symbol is used.

3) *Number Required for Dispatch (Column 3).* The minimum number (quantity) of items required for operation provided the conditions specified in Column 4 are met.

NOTE: Where the MMEL shows a variable number required for dispatch, the MEL must reflect the actual number required for dispatch or an alternate means of configuration control approved by the President.

4) *Remarks or Exceptions (Column 4).* This column includes a statement either prohibiting or permitting operation with a specific number of items inoperative, provisos (conditions and limitations) for such operation, and appropriate notes.

5) *Vertical bar (Change Bar).* Indicates a change, addition, or deletion in the adjacent text for the current revision of that page only. The change bar is dropped at the next revision of that page.

GG. Visible Moisture. An atmospheric environment containing water in any form that can be seen in natural or artificial light; for example, clouds, mist, rain, sleet, hail, or snow.

NOTE: More than one set of MMEL definitions exist due to years of evolving changes during which not all MMELs have been updated to the latest revision of the definitions. However, only one set of definitions may be used with a specific MMEL. The most up-to-date definitions reside in FAA Flight Standards MMEL Policy Letter 25. This policy letter can be found on the FAA's Web site: http://fsims.faa.gov/home.aspx. Inspectors should be aware that only certain portions of the latest definitions may be appropriate for a specific air carrier's MEL. Definitions found in global changes, such as administrative control and repair intervals, may be adopted by the operator.

5.4.2.11. PURPOSE OF MEL. GACAR §§ 23.1301, 27.1301, 25.1301 and 29.1301 states, in part that each item of installed equipment must function properly. Therefore, an aircraft is not airworthy if any of its installed equipment is missing or inoperative because it is not in conformity with its type design.

A. GACAR § 21.161. GACAR § 21.161 provides that an airworthiness certificate is effective so long as the maintenance, preventive maintenance, and inspections are performed in accordance with GACAR Parts 43 and 91. GACAR § 91.301(a)(1) provide that no person may operate an aircraft unless it has within it an appropriate and current airworthiness certificate. GACAR § 91.445 provides that each owner or operator of an aircraft shall have the aircraft inspected as prescribed and shall, between inspections, have defects repaired as prescribed. GACAR § 135.109(a)(2) provides that no certificate holder may operate its aircraft in a non-airworthy condition. GACAR § 135.203(c) provides, in pertinent part, that no person may operate an aircraft unless the instruments and equipment in it are approved and operable. GACAR § 121.517 states that "no person may take off with inoperable instruments or equipment installed unless certain conditions are met".

B. Experience. Experience has shown that with the various levels of redundancy designed into aircraft, operation of every system or installed components may not be necessary when the remaining operative equipment can provide an acceptable level of safety. GACAR Part 121, 125, 133, and 135 allow the continued operation of an airplane as long as a GACA approved MEL program or system exists for that operator. Based upon particular aircraft equipment configurations, operational conditions and the applicable conditions and limitations contained in an approved MEL and the OpSpecs authorizing its use, an aircraft may be operated with certain instruments and equipment in an inoperable condition (not removed, unless authorized).

C. Operations. Thus, absent a change in type design to address missing or inoperative equipment, installed items of equipment, including optional items, must be operative for all operations, to maintain the validity of the airworthiness certificate. Operations with inoperative equipment would not be in accordance with GACAR §§ 91.445, 121.517, 135.109(a)(2) and 135.203(c). Under GACAR § 91.309, the GACA approved MEL, and the GACA authorization for its use, constitute an approval to operate with inoperative equipment within the conditions and limitations of the MEL, the authorization and, where applicable, the operator's GACA approved manual, as may be applicable. A MEL is approved for a specific make and model of aircraft and the use of it are authorized by its OpSpecs.

5.4.2.13. ITEMS LISTED ON THE MEL. There are three categories of items that may be contained in the operator's MEL:

• MMEL items

• Passenger convenience items which are referred to as Non-Essential Furnishings (NEF)

• Administrative control items

A. MMEL Items. The MEL will list all of the MMEL items for which the operator seeks relief and that are appropriate for its operation. The operator, by not listing at its discretion certain items in its MEL, may be more restrictive than permitted by the MMEL.

B. Passenger Convenience Items. The passenger convenience items, now known as Non-Essential Equipment and Furnishings (NEF), as contained in the operator's approved MEL, are those related to passenger convenience, comfort, or entertainment, such as, but not limited to, galley equipment, movie equipment, in-flight phones, ashtrays, stereo equipment, and overhead reading lamps. It is incumbent on the operator and the Inspector to develop procedures to ensure that those inoperative passenger convenience items are not used. Passenger convenience items do not have fixed repair intervals. Items addressed elsewhere in the MMEL shall not be authorized relief as a passenger convenience item. *M* and *O* procedures may be required for certain inoperative passenger convenience items and those procedures should be developed by the operator, approved by the Inspector, and included in the air operator's appropriate document.

C. Administrative Control Items. An operator may use an MEL as a comprehensive document to control items for administrative purposes. In such cases, the operator's MEL may include items not listed in the MMEL; however, relief may not be granted for these items unless conditions and limitations are contained in approved documents other than the MMEL or meet the regulatory requirements of the GACARs. Examples of items considered to be administrative control items would be cockpit procedure cards, and (extra) life vests.

5.4.2.15. TIMELY REPAIR OF ITEMS THAT ARE INOPERATIVE. The MEL is intended to permit the operation of an aircraft with certain inoperative items for a limited period of time until repairs can be accomplished. The operator is responsible for establishing a controlled and effective repair program.

A. Repair Interval. Operators must make repairs within the time period specified by the MEL. Although the MEL might permit multiple days of operation with certain inoperative equipment, operators must repair the affected item as soon as possible.

B. Day of Discovery. The day of discovery is the calendar day an equipment malfunction was recorded in the aircraft maintenance log or record. This day is excluded from the calendar days or flight days specified in the MMEL for the repair of an inoperative item of equipment. This provision is applicable to all MMEL items, such as categories A, B, C, and D. The operator and the Inspector must establish a reference time in which the calendar day or flight day begins and ends 24 hours later. This reference time is established to ensure compliance with timely repair of equipment and items.

C. Continuing Authorizations. Approval to use a MEL may include authorization for an operator to use a continuing authorization to approve extensions to the maximum repair interval for category B and C items, provided the GACA is notified within 24 hours of the operator's exercise of extension authority. The operator is not authorized to extend the maximum repair time for category A and D items, as specified in the approved MEL. Misuse of the continuing authorization may result in an amendment of the OpSpecs by removing the operator's authority to use the continuing authorization or ultimately, to use an MEL.

D. Equipment Discrepancies After Blocking Out. The preamble to the Minimum Equipment List refers to the MEL as a dispatch (or flight release) document designed to be used during the preparation for flight and not intended to replace abnormal/emergency procedures when an item becomes inoperative during a flight. This provides some latitude for the air operator in establishing procedures to allow the pilot in command to consult with the maintenance and the dispatch organization. Together they will decide the best course of action in event of an equipment failure after a flight departs the blocks.

1) The phrase, *time of dispatch or release*, should be considered as the time that the aircraft begins movement for the purpose of takeoff. This is interpreted as the time that the aircraft is either pushed-back from the blocks, or the first movement of the aircraft taxiing away from the blocks, or is towed from the blocks for the purpose of takeoff. The intent is to provide protection for the required operational conditions to be considered for the dispatch of a flight in situations where delays may be encountered.

2) The operator is responsible for operating its aircraft in an airworthy condition. The operator should include a procedure for handling equipment or instrument failure after the aircraft has departed the blocks for the purpose of takeoff. The procedure should allow the pilot in command to communicate with the dispatch and maintenance organizations, if required, to review the situation and determine whether the flight should:

a) Return for repairs (the failed equipment is a no-go item), *or*

b) Return to accomplish an (M) procedure specified in the MEL before continuing the flight, *or*

c) Continue using the alternate procedure (abnormal procedure) for operating with the failed item.

3) The operator procedure may also provide for the flight to continue when the pilot in command determines that the flight can be operated safely using the alternate procedure under the conditions of the dispatch release, without communicating with the dispatch and maintenance organizations.

NOTE: If the conditions for a flight are changed to the extent that the original dispatch or flight release is no longer valid, then a new dispatch or flight release or an amended release is required.

5.4.2.17. MULTIPLE ITEMS THAT ARE INOPERATIVE. Individual MEL requirements are designed to provide coverage for single failures en route. When operating with multiple inoperative items, the operator should consider the interrelationships between those items and the effect on aircraft operation and crew workload, including consideration of a single additional failure occurring en route. The MMEL preamble provides further guidance pertaining to multiple inoperative items.

5.4.2.19. FLEET APPROVAL. An operator may have a single MEL for multiple aircraft of the same make and model as authorized in OpSpec D95. This is known as a Fleet MEL. Operators who use a single MEL for multiple aircraft may reflect equipment in its MEL that is not installed on all aircraft in its fleet. In this case, the item's title in the operator's MEL need not reference any specific airplane identification (usually the registration number) unless the operator determines that there is a need to do so.

NOTE: The MEL is not a configuration control document and any attempt to use the operator's MEL as a configuration control document penalizes the operator if his current MEL does not reflect the aircraft registration number.

A. MMEL Column 2. MMEL column 2 (the number installed) does not require that the aircraft registration marks be included in the operator's Minimum Equipment List (MEL) when there are differences in the installed number of items in an operator's fleet. The configuration of the aircraft and installed equipment is determined by the original aircraft type certification at the time of manufacture, the official parts list, any subsequent installation or removal of equipment established by STC or engineering order, or other approved maintenance procedures.

B. MEL System. In those instances where a system MEL is not easily identifiable the operator should be able to make reference to in-house supportive documentation to verify installation as discussed earlier. Many operators list registration marks with their MEL documents in the interest of quickly determining if relief is available. The source of the difficulties experienced by operators is reported to be the NOTES in the definition section of the MMEL under paragraphs (1)(b) and paragraph (5).

C. MEL Operator. Operator fleet MELs can be approved to reflect all of the equipment that can be applicable to aircraft of a specific type fleet. Aircraft identification numbers need not be listed in the MEL for fleet approvals.

5.4.2.21. OPERATOR MANUALS - INSTRUCTIONS, CONDITIONS AND LIMITATIONS.

A. Inclusion in Operational Documents. MEL procedures must be included in the operator’s operational documents. This requirement must be included in but not limited to the Operations Manual (OM), Flight Crew Manual, Flight Operations Manual (FOM) and the Cabin Crew Member Manual (CCMM).

B. Manual Instructions and Actions. Some items/systems listed in the MMEL/MEL contain standard phrases such as *provided alternate, normal and emergency procedures, and/or operating restrictions are established and used*. The intent of such phrases is to insure that air carriers develop the necessary manual instructions and appropriate actions to be followed by all concerned personnel.

C. Policy.

1) When operating in accordance with the MEL, the communications equipment (whether inoperative or functional) used between the flight deck and the cabin crew members requires specific instructions for inclusion in the appropriate operator’s manuals. In some cases it may be appropriate to include such instructions in the operators MEL “O” procedure. Instructions in these manuals concerning specific inoperative equipment situations must be consistent with instructions in the other manuals.

2) To ensure a clear understanding of the action to be taken in emergency or abnormal situations, the pilot in command (PIC) will brief the flight crew, lead cabin crew member and/or concerned cabin crew members on the procedures to be followed. Examples of methods of cockpit notification to cabin could include various cockpit combinations such as cabin chimes to indicate different events, use of a separate evacuation signaling system, PA announcements, etc. The briefing is to ensure that when cabin/flight deck communication equipment becomes inoperative, procedures to be followed for each event listed can be carried out:

a) Fire and/or smoke in the flight deck or passenger cabin.

b) Hijacking.

c) Ditching.

d) Emergency landing.

e) Evacuation of the passenger cabin/rejected takeoff evacuation.

f) Passenger problem (medical/disturbance).

NOTE: It is not the GACA's intention to impose a requirement to prevent a cabin crew member from opening the flight deck door to report an emergency situation.

5.4.2.23. CONFLICT WITH OTHER GACA OR FAA APPROVED DOCUMENTS. The MEL may not conflict with other GACA-approved or GACA-accepted documents such as the approved flight manual limitations and airworthiness directives (AD). The operator's MEL may be more restrictive than the MMEL, but under no circumstances may the operator's MEL be less restrictive.

5.4.2.25. SUPPLEMENTAL TYPE CERTIFICATE (STC) MMEL RELIEF PROCESS.

A. Inoperative Systems/Components. Relief for inoperative systems/components installed by standard type certificate (STC) must be included in the MMEL before inclusion in the operator's MEL.

B. Certification of a STC. The operator involved in the certification of an FAA STC should submit a request for MMEL relief in accordance with the MMEL Agenda Coordination Process. This submission should be made early in the certification process to allow MMEL evaluation concurrent with the certification process. Alternatively, Saudi Arabian operators intending to use GACA STCs should seek any MEL relief by applying directly to the GACA. For STCs issued by the GACA, MMEL supplements may be approved by the GACA. Consult GACA Airworthiness Engineers for further details.

5.4.2.27. OPERATIONS (*O*) AND MAINTENANCE (*M*) PROCEDURES.

A. *O* and *M* Guidelines. Guidelines for *O* and *M* procedures may be found in the preambles of the MMEL. Those guidelines indicate what the O or M procedure must cover.

1) Manufacturers normally develop such procedures for transport category aircraft. However, aircraft certificated under GACAR Part 23, i.e., normal, utility, aerobatic, and commuter category airplanes, do not generally have procedures developed by the manufacturer.

2) Operators must specifically describe each *O* and *M* procedure which appears in the MMEL.

B. Specific Steps and Actions. *O* and *M* procedures should be described in terms of specific steps and actions to be followed, and should detail each process from beginning to end. The procedures should answer the following questions;

1) How does a person accomplish the procedure?

2) What is done first and what is done second, etc.

3) What action completes the procedure?

5.4.2.29. MEL USE IN SERVICE.

A. Release. The MEL is applicable only to the release of a flight with inoperative instruments and equipment.

1) The Pilot's Operating Handbook (POH) or the AFM addresses in-flight failures; the PIC handles them accordingly.

2) When a PIC finds an inoperative item, the PIC must enter the discrepancy in the aircraft's maintenance record/logbook.

3) The discrepancy must be either repaired in accordance with the maintenance manual or deferred as per the MEL before the next flight.

B. Removal From Service.

1) A defect entered into the aircraft's maintenance record/logbook in effect removes the aircraft from service. The aircraft remains out of service until the defect is corrected or deferred and an appropriate maintenance person returns the aircraft to service.

2) Maintenance personnel can reflect this approval for return to service in the aircraft's maintenance record/logbook in one of two ways:

a) An entry showing the corrective action that was taken for the defect; appropriate maintenance personnel sign the entry and include the signer's certificate number.

b) A deferral statement with the signature of a person authorized to defer needed maintenance for the operator.

C. Deferral. The GACA grants deferrals per the MEL only after maintenance personnel have determined that the aircraft is safe to be flown and that the specific conditions, limitations, and procedures for that item have been accomplished. The satisfactory accomplishment of all procedures is primarily the responsibility of the operator. This responsibility may be delegated to qualified persons when published in the operator's manual or MEL.

D. Removal/Deactivation. Those who elect to operate without an MEL must remove (GACAR § 91.309(d)(3)(i) or deactivate (GACAR § 91.309 (d)(3)(ii)) and placard any inoperative item.

1) Removal of any item that affects an aircraft's airworthiness requires following an approved procedure. A properly certificated maintenance person must record the removal in accordance with GACAR § 43.11. A person authorized by GACAR § 43.9 must make the appropriate adjustments to the aircraft's mass and balance information and the equipment list, complete and submit Major Repair and Major Alteration Report as may be appropriate, and approve the aircraft for return to service.

2) The operator must evaluate any proposed deactivation to ensure there is no adverse effect that could render another system less than fully capable of its intended function.

a) A certificated pilot can accomplish deactivation involving routine pilot tasks, such as turning off a system. However, this deactivation must qualify under the definition of preventive maintenance in GACAR Part 43, Appendix A(c).

b) If the deactivation does not qualify as preventive maintenance, a properly certificated maintenance person must perform the deactivation. This person must record the deactivation in accordance with GACAR § 43.11.

3) Placarding can be as simple as writing the word inoperative on a piece of masking tape and attaching it to the inoperative equipment or to its cockpit control. Placarding is essential since it reminds the pilot that the equipment is inoperative. It also ensures that future flight crews and maintenance personnel are aware of the discrepancy.

5.4.2.31. REPAIR INTERVALS.

A. Source. The “Definitions” section of the MMEL establishes repair intervals. For each item of the MMEL, with the exception of passenger convenience items, a specific repair interval category is assigned. Components or subsystems of an item listed in an MMEL have the same repair interval as the item (A, B, C, D, etc.). The operator must retain these intervals in the operator’s approved MEL.

B. Excess Items. For components or systems in excess of those required for normal operations, the operator may use C intervals. For example, if the MMEL requires one altitude alerting system (B category repair interval) but two systems were installed, maintenance for the failure of one system could be deferred for 10 days as per the C repair interval. Failure of the second system requires at least one system be repaired within three days, as indicated by the B repair interval requirements.

C. Inability to Meet Repair Deadlines. There may be instances when an operator cannot meet a repair deadline because of unusual circumstances, such as a nationwide unavailability of a certain part. In these instances, the GACA may grant continuing relief as provided in the OpSpecs; however, these occurrences should be rare, and the GACA must carefully control them within their unique operating environments.

1) The operator must have a tracking system to record when an MEL item becomes inoperative and when it is repaired.

2) When an operator becomes aware that it cannot meet a repair deadline, it must document the time extension required and the reasons for the inability to meet the deadline.

3) The operator must notify its Inspector (Airworthiness) in writing within 24 hours after deciding to extend the time limit. The Inspector will review the reasons for the extension.

4) Based on the Inspectors review, the GACA will decide whether to allow the time limit extension.

a) If the Inspector approves the extension, then he must notify the principal operations inspector (POI) of each extension, who will then coordinate with other individuals as may be necessary.

b) If the operator abuses the continuing relief, the Inspector may revoke the appropriate paragraph of the operations specifications.

D. Items That Cannot Be Extended. Certain items, such as Full Authority Digital Electronic Controls (FADEC), qualify for time limited release based on the specifications in the type certificate data sheet (TCDS). The time limits specified for such items may not be extended. The notation, “and no extensions are authorized”, will appear on the MMEL for such an item.

5.4.2.33. MEL APPROVAL AND REVISION PROCEDURES. During the MEL approval process, the operator should consult with an Inspector (Operations) regarding requirements for either developing an MEL or for revising an existing MEL. The Inspector will consult with and seek the participation of an Inspector (Airworthiness) during the entire approval process.

A. Operator Familiarization. The Inspector should determine the scope of the task, based on the operator's experience with MELs. Inspectors should adapt the discussion to fit the operator's needs and experience, and should provide advice and guidance to the operator as necessary. Inspectors must clearly explain to the operator that MEL document preparation is solely the operator's responsibility.

B. Required Document Submittal. Inspectors should advise the operator that, for an MEL to be approved, they must submit the following documents:

- The proposed MEL or MEL changes
- Necessary "O" and "M" procedures, which may be based on the aircraft manufacturer's recommended procedures, STC modifier's procedures, or equivalent operator procedures
- A description of the MEL management program and its procedures as required by OpSpec D95, unless an MEL management program is already in place
- Any required guidance material developed by the operator, such as training material, guidance, and deferral procedures for both maintenance and operations personnel

NOTE: Several manufacturers have produced manuals of recommended procedures for operating with inoperative equipment. The Boeing dispatch deviation guide (DDG), are examples of these manuals. Typically, manufacturers or small aircraft normally do not publish procedures manuals. When a manufacturer's recommended procedures exist, operators may use them, or they may develop alternate procedures. When contract services are used to develop the operator's MEL along with acceptable "O" and "M" procedures, the responsible Inspectors should review the "O" and "M" procedures in light of the type of operations being conducted and should ensure the acceptability of the procedures. The Inspector should ensure that the developed MEL procedures can be adequately implemented by the operator.

C. Materials Provided to the Operator. Copies of all current MMELs are accessible to all interested parties directly from the FAA web site at: http://fsims.faa.gov/home.aspx.

D. Document Form. The operator may submit MEL draft documents to the GACA on hard copy (printed on paper), on a computer disk, or in an electronic file format as mutually agreed upon between the operator and the Inspector. The operator and the Inspector should discuss the techniques that will be used for revising and editing the proposed document. It is important that the operator understand that when the process is complete, the final proposed MEL must be submitted on paper unless otherwise approved by the GACA.

E. MEL Format. The MMEL format has been standardized to facilitate the development, revision, and approval of both master and operator documents. While the master document contains eight total sections, six of these sections are considered basic for MEL development and should be included in each operator's MEL.

F. Required Document Submittal. Inspectors should advise the operator that for an MEL to be approved, the following documents must be submitted:

1) Current equipment list for each make, model, series aircraft that is to be included in the MEL or revisions.

2) The proposed MEL or MEL changes.

3) Necessary "*O*" and "*M*" procedures, which may be based on the aircraft manufacturer's recommended procedures, STC modifier's procedures, or equivalent operator procedures.

4) A document or the portions of its required manuals (Operations Manual (OM) and Maintenance Manual (MM)) for each group of personnel that includes its comprehensive program for managing the repair of items listed in the proposed or revised MEL, as appropriate.

5) Any other parts of its manual(s) that includes duties, responsibilities, authority, policies, procedures, instructions, or information for crew members, ground, maintenance, and management personnel with regard to handling of MEL items.

6) A description in its maintenance/inspection program covering MEL items that ensures that:

a) The maintenance performed by it, or by other persons, is performed in accordance with the requirements of their manual.

b) Competent personnel are provided for the proper performance of that maintenance.

c) Each aircraft released to service is airworthy and has been properly maintained for their operation.

G. Upon receipt of the required documents compare the proposed MEL to Figure 5.4.3.1 and determine if the proposed MEL:

1) Corresponds to the MMEL.

2) Addresses all items required by the GACAR.

3) Is specific to the operation

4) Lists only equipment installed on the aircraft

5) Specifies appropriate operational limitations, e.g., placards or maintenance or flight crew operating procedures.

6) Uses the ATA code numbering system.

7) Has a revision system.

8) Incorporates references from the operator's policies and procedures manual.

9) The proposed MEL should contain the (O) and (M) procedures. If the (O) and (M) procedures are already stated in another document, ensure that the applicant has referenced that document.

a) Ensure that the (O) symbol denotes a specific operations procedure that must be accomplished before or during operation with listed items of equipment inoperative.

b) Ensure that the (M) symbol denotes a specific maintenance procedure that must be accomplished before operation with listed items of equipment inoperative.

10) The title page must include the operator's name and the aircraft's make, model, and registration and serial numbers.

11) The MEL may have an aircraft discrepancy record (optional).

12) Ensure that the following are NOT listed on the MEL:

a) Any equipment required by the airworthiness rule under which the aircraft is type-certificated;

b) Instruments and equipment required by AD; or

c) Instruments and equipment required for a specific operation in GACAR § 91.309(b).

13) Ensure that the equipment indicated on the MEL is actually installed on the airplane.

a) If so, approve the MEL.

b) If not, indicate the discrepancies to the operator. Inform the operator that the MEL must reflect equipment installed on the airplane.

H. Disapproval. If there are discrepancies with the draft MEL, inform the applicant in writing, listing the items that require correction. Indicate that all items must be corrected before the applicant may re-submit the MEL document.

I. Resubmission of Draft MEL. Determine whether all discrepancies were corrected satisfactorily. Approve or disapprove the MEL.

J. Unacceptable Submittal. If the Inspector finds the proposed MEL package to be incomplete or unacceptable at this time or at any other juncture in the approval process, the Inspector should contact the operator. A sample letter is provided in Figure 5.4.5.1. If a mutually acceptable correction cannot be immediately agreed upon, the entire package must be immediately returned to the operator, or its representative, along with an explanation of the problems found within the documents.

K. Acceptable Submittal. If the Inspector finds the proposed MEL package to be complete and to contain the required information in an acceptable format, the detailed analysis begins. During this analysis, the Inspector (Operations) should coordinate with the Inspector (Airworthiness) to perform a detailed examination of the proposed MEL document and other supporting documents and procedures. If the operator does not currently have an MEL program, its MEL management program must also be reviewed for acceptability. Inspectors should examine the technical content and quality of the proposed MEL document and other supporting documents and procedures as follows.

1) *Timely Review*. Inspectors should promptly address all deficiencies and notify the operator of any discrepancies

or outstanding issues. The Inspector and the operator may informally coordinate by telephone to clarify minor discrepancies or misunderstandings.

2) *Reference Material*. Inspectors should use the MMEL as the primary reference document when reviewing and approving the MEL. In addition, Inspectors should use the following references:

• Related GACARs

• Appropriate advisory circulars (AC)

• AFM

• Operator’s OpSpecs

• Operator’s manuals

3) *Coordination with Technical Groups*. During this phase, the Inspector may wish to coordinate with the appropriate Aircraft Evaluation Group (AEG) for guidance. Inspectors must coordinate with their Director prior to contacting any FAA personnel concerning MMEL issues.

4) *Document Deficiencies*. Return the MEL to the operator for corrections.

5) *Change in Schedule.* If certain MMEL items must be addressed within a specific time frame, the POI should notify the operator of this requirement as soon as possible. If the operator is unable to meet these schedule requirements, the POI should negotiate a new schedule with the operator.

6) *MEL Evaluation*. Inspectors should compare the operator’s MEL changes against the corresponding items in the current MMEL for the specific aircraft type. In addition, Inspectors should verify that the operator’s MEL contains the following required items:

a) Cover Page (Optional). The MEL cover page contains the operator’s name and the make and model of the aircraft to which the MEL applies.

b) Table of Contents (Required). The table of contents contains a list of all of the pages in the MEL by title and the corresponding page identification (usually a page number).

c) Log of Revisions (Required). The log contains the revision identification (usually a number) and date of the revision. It may also contain a list of the revised pages, a block for the initials of the person posting the change, and additional enhancements for use by the operator.

d) Preamble and Definitions (Required). The standard MMEL preamble and definitions section must be reproduced word-for-word in each MEL except references to the FAA, Administrator and 14 CFR should be adjusted to refer to the GACA, President and the GACAR. Any modification to the generic MMEL preamble wording must be authorized by the Director, Flight Operations Division. FAA Flight Standards Policy Letters 25, 34, and 70 provide further guidance in this area.

e) Control Page (Required). The control page is used for keeping track of the status of the MEL and includes a record of the revision status or the date of each page of the operator's MEL. It may also be used as a means of conveying GACA approval of the MEL.

1. Minimum Contents. At a minimum, the control page must contain the following:

• The operator's name

• A listing of all of the pages in the MEL (including the date of each page and its number or revision number)

• The MMEL revision number on which the MEL is based

• A signature block containing space for signature of the Inspector (only if this page is used as a means of conveying GACA approval of the MEL)

2. Optional Contents. The operator may include additional information on the control page to provide flexibility and additional approval functions.

3. Highlights of Change Page (Optional). This page contains a synopsis of the changes made by the operator in each revision.

f) Additional Items. The operator may include additional information sections in excess of the six GACA sections.

7) *Individual Air Transport Association (ATA) System Page Evaluation*. These pages contain a list of individual items of equipment in the aircraft together with provisions for the operation of the aircraft when the items are inoperative. The reviewing Inspector should examine the individual ATA/IATA system pages, ensuring that the MEL is at least as restrictive as the MMEL and that operator's procedures are adequate and appropriate. The Inspector should also examine the material contained on these pages for conflict with the GACAR, with the AFM emergency procedures and limitations, and with the operator's OpSpecs. The following elements are included:

a) The ATA Numbering System. Operators should use the standard ATA numbering system, similar to the manner used in the MMEL, for numbering individual pages in this section. An example of this numbering system would be the communications page; the first page would be 23-1; the second page would be 23-2.

b) Individual Items of Equipment. The MMEL contains listed items of installed equipment that may be inoperative.

1. MMEL Items Not Listed on the Operator's MEL. If items listed on the MMEL are not listed on the MEL there is no relief.

2. MMEL Items Listed on the Operator's MEL. Each piece of equipment that is installed on the aircraft and that is contained in the MMEL, for which the operator seeks relief and that is appropriate for its operation, should be listed on the appropriate page of the operator's MEL within the associated ATA/IATA system. The operator may be more restrictive than permitted by the MMEL by not listing certain items in its MEL. Each item title on the operator's MEL will generally be entered exactly as it is shown on the MMEL. Exceptions include the following:

a. When the MMEL uses a generic term to address equipment that serves a similar function but various operators use different names for that equipment; or

b. When the MMEL lists functions rather than individual pieces of equipment within that category (Examples include "Navigation Equipment" or "Communications Equipment." In such cases, the MEL must contain a list of the individual equipment or systems within that category that are actually installed on the aircraft, such as "VHF Communications Transceivers." When items of this type consist of several components of a system, the item may be listed as a complete system, such as "VOR Navigation System," consisting of a VOR navigation receiver and its associated indicator. The Inspector should ensure that the operator has not listed inappropriate items or items that are listed individually elsewhere in the MMEL. However, the POI is authorized to approve generic MMEL relief for navigation or communication equipment that is appropriate such as instrument landing system (ILS), VHF omni-directional range station (VOR), very high frequency (VHF), high frequency (HF) and global positioning system (GPS).)

3. Items Listed on the MMEL but Not Installed on the Operator's Aircraft. The POI may follow several acceptable methods of dealing with an item of equipment being listed on the MMEL but not installed on the operator's aircraft. One method is to simply omit the item from the MEL altogether, renumbering individual items within an ATA category as necessary to provide proper continuity. (It should be noted that individual item numbers on a page are not necessarily ATA code numbers, but are simply sequential item numbers within an ATA category.) Another method is to list the item as shown on the MMEL, and to show the Number Installed as zero. In this case, the "Number Required for Dispatch" would also be zero, and the remark "Not Installed" may be noted under "Remarks and Exceptions"; repair category designators should be omitted.

4. Triple Asterisk Symbol (***). The triple asterisk symbol is used in an MMEL to indicate that an item is not installed on some models of the aircraft. Operators should not produce or use this symbol in the MEL.

5. Repair Category. Each item of equipment listed in the operator's MEL, except for Administrative Control Items and Passenger Convenience Items, must include the repair category designator for that item as shown on the MMEL. These designators, categorized as "A," "B," "C," or "D," indicate the maximum time that an item may remain inoperative before repair is made. The actual repair categories corresponding to these letters are provided in the "Notes and Definitions" section of the MMEL. The operator may choose to adopt a more restrictive repair category than the one shown on the MMEL, but may not relax the requirement. Components or subsystems of items categorized in the MMEL, such as items of communications or navigation equipment that are not listed individually in the MMEL, must retain the repair category shown on the MMEL when listed as separate items on the MEL.

NOTE: The definitions section of the MMEL defines repair categories.

6. Passenger Convenience Items (See Nonessential Equipment and Furnishings (NEF) Program, Section

5, of this chapter). Passenger convenience items relate to the convenience, comfort, and entertainment of passengers and must never affect the airworthiness of the aircraft. These items do not carry a specific repair category; however, the operator should make repairs to convenience items within a reasonable time frame. Normally, the operator lists these items individually in ATA chapters 25 and 38. Passenger convenience items may be included elsewhere in the MEL if clearly identified as passenger convenience items. POIs should review the proposed MEL to decide which passenger convenience items are components of an item appearing in the MMEL. When listing passenger convenience items on the MEL, the operator must list each item for which the operator wishes relief. The operator may make a list of passenger convenience items that, once it is acceptable to the POI, is held at the GACA office. Passenger convenience items also apply to cargo airplanes, as appropriate.

7. Administrative Control Items. “Administrative control item” means an item listed by the operator in the MEL for tracking and informational purposes. It may be added to an operator’s MEL by approval of the POI, provided no relief is granted, or provided conditions and limitations are contained in an approved document (such as Structural Repair Manual or AD). If relief other than that granted by an approved document is sought for an administrative control item, the operator must submit a request to the President. If the request results in review and approval the item becomes an MMEL item rather than an administrative control item. Examples of items that could be considered administrative control items are cockpit procedure cards, medical kits, and life vests. These items should appear in the appropriate ATA chapter and would not have a repair category. When the operator chooses this course of action, the POI must examine each proposed administrative control item on the operator’s proposed MEL to ensure that the following conditions are met:

• No item is included as an administrative control item if it is included elsewhere in the MMEL

• Administrative items are not included as a subsystem of items listed in the MMEL

• Administrative items are not granted relief in the MEL unless the release conditions or limitations are contained in another approved document

8. Number of Items Installed. The MEL will normally contain the actual number of items of particular equipment installed on the aircraft. This number may be either greater or less than the number shown on the MMEL. The MMEL shows the number of items installed as the number of those items normally installed on a particular aircraft type. Individual aircraft operated by an operator may have a different number of items. Frequently the MMEL shows a dash in the “Number Installed” column. This dash indicates that a variable quantity of these items is generally installed on the aircraft. If the operator has an MEL for a single aircraft or identical aircraft, the actual number of these items on the particular aircraft must be listed in the MEL. If the operator has an MEL for multiple aircraft, and the equipment is not installed on all aircraft or there is a variable quantity between aircraft, and the operator’s MEL will not reference specific aircraft identifications; the “Number Installed” column may contain a dash.

9. Number of Items Required for Dispatch. Normally, the number of items required for dispatch is established in the MMEL and may be modified in the MEL in only two cases:

• When the item is not installed on the aircraft, in which case a zero may be shown as the number required for dispatch

• When the item is shown in the MMEL as being a variable number required for dispatch

NOTE: In this case of the second bullet above, the reviewing Inspector should ascertain that the operator has made a determination as to the number required for dispatch. There can be several factors that establish this number. In some cases, it is determined by a reference to specific requirements listed in the “Remarks or Exceptions” column of the MMEL. An example would be cabin lights. In this case, the MMEL may show a variable number installed while the “Remarks or Exceptions” column might state that 50 percent of those items be operable. The number required for dispatch would therefore be 50 percent of the number of lights determined to be actually installed on the individual aircraft. Another case where the MMEL may show a variable number required for dispatch is when the “Remarks or Exceptions” column of the MMEL contains the statement, “As Required by FAR,” or “As Required by GACAR.” In this case, the number is the minimum quantity of these items that must be installed for operations under the least restrictive regulation under which the operator conducts operations.

10. “Remarks or Exceptions.” Certain items demand specific relief developed by the operator as authorized through OpSpecs, area of operation, and the GACAR. “As required by CFR or GACAR” is an example of this type of relief.

11. Other Items. Other items in which relief has been specifically written to reflect actions or restrictions to the operation may be changed only when the MMEL is amended. Generally they contain “O” and “M” procedures in which the operator develops its company procedures to comply with the MEL.

8) *Evaluation of Associated Documentation*. The Inspector should evaluate the supporting documentation submitted by the operator to ensure that it is complete and appropriate.

a) The Operator’s Manual. Inspectors should evaluate the operator’s manual to ensure that it contains adequate guidance for the operator’s personnel in conducting operations using the MEL. Generally, if the operator does not presently have an MEL program, the applicable portions of its manual and other guidance material should be submitted at the time the MEL is submitted for initial review. When evaluating the operator’s manual, Inspectors should use the guidance in b) below.

b) Documentation Procedures. The procedures for documenting inoperative equipment and any required maintenance release procedures should be clear. At a minimum, provisions for recording the following items should be developed:

• An identification of the item of equipment involved

• A description of the nature of the malfunction

• An identification of the person making the entry

• The MEL item number for the equipment involved

9) *Crew Notification*. The operator should establish procedures for advising the pilot in command (PIC) of inoperative items and required procedures such as affixing placards, alternate operating procedures, and

instructions for the isolation of malfunctions. The PIC and the operator are both responsible for ensuring that flights are not dispatched or released until all of the requirements of the "O" procedures and "M" procedures have been met.

10) *Flight Restrictions*. The operator should establish procedures to ensure that dispatch or other operational control personnel, as well as the flight crew, are notified of any flight restrictions required when operating with an item of equipment that is inoperative. These restrictions may involve maximum altitudes, limitations for the use of ground facilities, weight limitations, or a number of other factors.

11) *Training Program Material*. Inspectors should ensure that the operator's flight and ground personnel training programs contain adequate instruction for MEL use.

12) *MEL Management Program*. The POI should coordinate closely with both the PMI and the operator on the MEL management program. Operators must develop an MEL management program as a comprehensive means of controlling the repair of items listed in the approved MEL. Operators must include a description of the program in their maintenance manual or other documents. The MEL management plan must include the following:

- A method for tracking the date and time of deferral and repair
- The procedures for controlling extensions to maximum repair categories
- A plan for coordinating parts, maintenance personnel, and aircraft at a specific time and place for repair
- A review of items deferred due to unavailability of parts
- The specific duties and responsibilities of the managers of the MEL management program, listed by job title

13) *POI review of Category D items*. During the review process the POI should review the following:

a) POIs, when approving Category D items for the operator's MEL, are encouraged to coordinate with the assigned Principal Maintenance Inspector (PMI) in areas where their expertise is needed.

b) The POI should evaluate each Category D MMEL item against the operator's type of operation to determine its suitability. Some items because of crew training, crew dependency, or operational dependency may not be designated as a Category D for a specific operator. An example would be SELCAL for an operator with extensive international operations. Another example would be the ACARS for an operator that has developed operational procedures dependent on its use. An inoperative system deferred by maintenance for 120 days should not negatively affect the operator's operation. Category D MMEL items determined by the POI to be inappropriate for the operator should remain as a Category C repair interval in the operator's MEL.

c) The terminology "excess items" used in the MMEL for Category D items will not be used in the operator's MEL. Those items which are identified as "excess" by the operator and authorized Category D relief by the MMEL must be specifically listed in the operator's MEL.

5.4.2.35. TERMS AND CONDITIONS OF RELIEF. This paragraph contains the terms and conditions of relief granted to an operator for operating the aircraft with items of installed equipment that are inoperative. The operator must state the terms and conditions under which operations may be conducted with inoperative items for the operator's particular organization and aircraft. The reviewing Inspector must address the following elements of this section:

A. Standard Phraseology. When reviewing the MEL, Inspectors should ensure that the operator generally uses the phraseology used in the MMEL to ensure clarity and standardization. In some cases modified phraseology is appropriate for the operator's specific installation.

B. "As Required by FAR." The general term, "As Required by FAR," must be interpreted to mean "As Required by the GACAR" and applies to ATA chapters 23 (Communications), 31 (Instruments), 33 (Lights), and 34 (Navigation Equipment). When this term appears in the "Remarks or Exceptions" section of an MMEL, the operator's MEL must contain the specific conditions that apply. The operator usually must research the applicable regulations in detail to develop the appropriate provisions that apply to that operator's particular operations. An example of a typical distance measuring equipment (DME) remark could read, "Not required for flights below FL 240."

NOTE: The operator's MEL must clearly establish the actual requirement for its operation when the MMEL stipulates "As Required by FAR." It is not acceptable for the MEL to simply refer to the GACARs.

C. "*O*" and "*M*" Procedures.

1) "*O*" and "*M*" procedures must contain descriptions of the individual steps necessary to accomplish each process. For example, if the MMEL contains an "M" symbol with a provision that a valve must be closed, the operator must include the appropriate procedures to close the valve as part of the operator's manual or MEL. The reviewing Inspector must ensure that the procedure addresses the following:

- How the procedure is accomplished
- The order of accomplishing the elements of the procedure
- The actions necessary to complete the procedure

2) Inspectors should consult the Guidelines for "*O*" and "*M*" Procedures of the MMEL when evaluating these procedures. The section about the Guidelines for "*O*" and "*M*" Procedures does not have to be contained within the operator's MEL. If the "*O*" and "*M*" procedures are not contained within the MEL, the MEL should include a reference to the location of the procedures.

NOTE: While Inspectors should ensure that the procedures are detailed and explicit, it is not necessary that the operator repeat obvious requirements of the MEL item, of the GACAR, or of other established standards.

3) *"O" Procedures*. The "(*O*)" symbol indicates a requirement for a specific operations procedure that must be accomplished in planning for and/or operating with the listed item inoperative. Normally, these procedures are accomplished by the flight crew; however, other personnel may be qualified and authorized to perform certain functions. The satisfactory accomplishment of all procedures, regardless of who performs them, is the responsibility of the operator. Appropriate procedures are required to be published as a part of the operator's manual or MEL.

4) *"M" Procedures*. The "(*M*)" symbol indicates a requirement for a specific maintenance procedure which must be accomplished prior to operation with the listed item inoperative. Normally these procedures are accomplished by

maintenance personnel; however, other personnel may be qualified and authorized to perform certain functions. Procedures requiring specialized knowledge or skill, or requiring the use of tools or test equipment should be accomplished by maintenance personnel. The satisfactory accomplishment of all maintenance procedures, regardless of who performs them, is the responsibility of the operator. Appropriate procedures are required to be published as part of the operator's manual or MEL.

5) *Provisos*. The "Remarks and Exceptions" section of the MMEL generally contains provisos that include specific conditions under which an item of equipment may be inoperative. These provisos must be carried over either verbatim into the operator's MEL or by using equivalent terminology. Provisos are distinct from "O" and "M" procedures. A procedure is an action that must be performed. A proviso is a condition that must exist. For a proviso that operations must be conducted under VFR, an operation under an IFR flight plan is not permitted, regardless of the weather conditions. When reference is made to visual meteorological conditions (VMC), operations may be conducted under an IFR flight plan, but only in VMC.

6) *POI Review of "M" and "O" Procedures* POIs should review the MEL provisions with their assigned certificate holders. At the discretion of the operator, the operator may include additional (*M*) and (*O*) symbols for a specific item in the MEL based on their needs. These additional (*M*) and (*O*) symbols are based on a determination made by the operator for dealing with an inoperative item and are in addition to those required by the MMEL. Any additional (M) and (O) symbols added to the operator's MEL will not alter in any way the definitions of the (*M*) and (*O*) symbols as shown in paragraphs 15 and 16 of the "Definitions" section of the current MMEL.

5.4.2.37. MEL REVISION PROCEDURES.

A. Revisions to an MEL. Revisions to an operator's MEL may be initiated by either the operator or the GACA. Operator-initiated revisions may be equal to or more restrictive than the Master Minimum Equipment List (MMEL). It is not necessary for an operator to submit an entire MEL when requesting the approval of a revision. The minimum submission would consist of only the affected pages; the approval by the POI may only consist of specific items. These items are approved within a controlled process, and the operator will produce the final MEL document. If the revision results in individual pages either being added or deleted, a revised table of contents page is also required. The issuance of an airworthiness directive (AD) will not be the basis for change to an operator's MEL. Instead, when ADs are issued appropriate changes will be made to the MMEL.

NOTE: When operations ("*O*") or maintenance ("*M*") procedures are required per the MMEL, it is the operator's responsibility to develop appropriate procedures or to use manufacturer-developed procedures in order to meet the requirements for inclusion of the item on the MEL. The POI is not authorized to grant MEL relief unless acceptable "*O*" and "*M*" procedures are provided by the operator.

B. Standard Revision. A standard revision to the MMEL is applicable to all operators using an approved MEL for that aircraft. A standard revision is identified by number only. Each subsequent standard revision will carry the next successive number. For example, the next standard revision following Revision 5 will be Revision 6.

C. Interim Revision. An interim revision to the MMEL allows the operator the option of revising its MEL for that aircraft. If the relief granted by the interim MMEL revision is applicable to its operation and aircraft configuration, then it would be advantageous for the operator to gain MEL approval through revision. If, however, the MMEL interim revision is not applicable, the operator may disregard that interim revision and continue to use its current approved

MEL.

1) An interim MMEL revision will be identified by the current standard revision number plus a lowercase letter. For example, an interim revision following Revision 5 will be identified as Revision 5a. There may be subsequent interim revisions to the same standard revision. These carry the next lower case letter (i.e., 5b, 5c, 5d).

2) When next standard revision is released, it will incorporate all the previous interim revisions. For example, the next standard revision following Revisions 5a, 5b, 5c, etc., will be Revision 6.

D. MEL Revision Initiated by an Operator. An operator-initiated MEL revision will normally fit into one of the following three categories:

1) *Items not requiring an MMEL Change.* Operators may propose changes to an MEL that are equal to, or more restrictive than, the MMEL. These revisions are approved by the POI using the same procedures as those required for an original MEL approval.

2) *Items Requiring an MMEL Change.* Operators may request changes to an MEL that are less restrictive than the MMEL. However, the MEL cannot be revised until the MMEL has been revised to permit the proposed MEL change. The most common instance of a revision request of this type occurs when an operator installs additional equipment on an aircraft and provisions for that equipment are not included on the current MMEL.

3) *Major Aircraft Modifications*. Major aircraft modifications, such as a supplemental type certificate (STC) or a type certificate (TC) amendment may invalidate the MEL for that aircraft. Operators should review the MEL to assess the impact of any planned modification and should immediately notify the POI of these modifications and the impact on the MEL. The POI should obtain guidance from the Director, Flight Operations Division or Director, Airworthiness Division to determine if a revision to the MMEL is required and it may be necessary to coordinate with GACA Airworthiness Engineers if a MMEL supplement/amendment is required.

E. Operator MEL Revisions Initiated by the GACA. When the FAA revises an MMEL, operators, manufacturers, and regulatory offices generally receive notification generated by the automated Master Minimum Equipment List Subsystem (MMEL Subsystem).

1) *Non-mandatory revision (interim).* MMEL revisions that only provide additional relief are reflected by a lower case letter suffix following the MMEL numeric revision number; for example, MMEL Revision No. 8 would become Non-mandatory Revision No. 8a. Any MMEL changes that are less restrictive than the operator's MEL may be ignored by the operator. An example of a non-mandatory revision is when the MMEL has been revised to provide for optional equipment normally not installed on all aircraft of a particular type, such as logo lights. Operators that operate aircraft with logo lights may choose to revise the MELs, while operators operating without logo lights would not.

2) *Global change (GC) (Issued as a Policy Letter).* A global change is defined as a newly developed, or a change to existing, MMEL relief for an inoperative item that is usually relieving in nature, and is applicable to all MMELs. A global change is another type of non-mandatory revision. A global change generally applies to items of equipment that are required to be installed by a new regulatory requirement, such as a cockpit voice recorder (CVR), or a traffic alert and collision avoidance system (TCAS). Items affected by FAA policy decisions are also global changes. The global change does not replace the normal MMEL revision process. When a standard revision

to an MMEL is issued, it will include all global changes issued to date. However, since the process for revising the MMEL can be lengthy, and the operator's MEL must be based on the MMEL, a global change will allow an operator to revise its MEL prior to the change in the MMEL. The POI has the authority to approve the operator's MEL revision on the basis that the global change is an approved addendum to the existing MMEL. A list of global changes may be obtained through the FAA MMEL Subsystem. The FAA has established a GC process, applicable to inoperative installed equipment that will permit the application of relief granted by selected policy letters to operator MEL upon its receipt. A GC will be released with consecutive assigned control numbers and will reference the approved FAA MMEL Policy Letter. All FAA GC are accepted for use by GACA in the MELs of Saudi Arabian operators.

3) *Mandatory revisions*. Mandatory changes, which are more restrictive and may remove relief from the current MMEL, are reflected by the next successive change to the basic MMEL revision number itself. For example, the next mandatory revision following the non-mandatory revisions 6a, 6b, or 6c would be revision 7. Any MMEL changes that are more restrictive than the operator's MEL will be implemented by the operator as soon as possible. In some cases when relief is removed from the MMEL, there will be a specific date for compliance, or guidance for an acceptable date to be negotiated between the POI and the operator.

4) *Principal Inspector-Initiated Revision*. A POI may initiate an MEL revision that is not based on a revision to the MMEL. The POI should make such a request to the operator in writing, stating specific reasons why the revision is necessary. A POI initiated revision may be made upon the discovery that an operator has modified an aircraft or that faulty maintenance or operations procedures exist. The POI should work closely with the operator and make every effort to resolve the matter in a mutually agreeable manner. The operator should be given a reasonable time period to make the required changes depending on whether safety of flight is affected. In the event that the operator declines to make the required change, the PI may consult with the other PIs to initiate an amendment of the operator's OpSpecs to rescind the authority for the MEL. In such a case, the procedures contained in Volume 15, Chapter 11, Section 1, Amendment, Surrender or Suspension of OpSpecs, in this handbook should be followed.

5) *Modifications Within a Fleet.*

a) If an operator has been granted approval to use the MEL for a fleet, and the operator installs a new piece of equipment in one or more aircraft, the operator may continue to operate that aircraft under the provisions of the currently approved MEL. The operator may not defer repair of the new item until an appropriate revision to the MEL has been approved.

5.4.2.39. TRACKING OF REVISION STATUS. POIs shall maintain a copy of the current MEL for each assigned operator's aircraft type.

5.4.2.41. AVAILABILITY OF MEL FOR FLIGHT CREW MEMBERS. GACAR Part 121 and 135 require that flight crew members have direct access to the MEL at all times prior to flight. Although not required, the easiest method of compliance with this requirement is for the operator to carry the MEL aboard each aircraft. The operator may choose to use some system of access to the MEL other than the MEL document. For example, the flight crew may obtain access to the MEL through the ARINC Communications Addressing and Reporting System (ACARS). The critical element in approving an alternate form of access is whether or not the flight crew has a direct means of access to the appropriate information in the MEL, specifically "O" and "M" procedures. Direct access should not be construed to mean access through telephone or radio conversations with maintenance or other personnel. If the operator chooses to provide the flight crew with access to the MEL by other than printed means, the method must be approved in the operator's MEL program.

5.4.2.43. METHOD OF AUTHORIZING FLIGHT CREW MEMBER ACCESS TO MEL. POIs may approve a method other than printed means for providing the flight crew with access to the MEL as provided in GACAR § 121.517(a)(2). Before authorizing such a method, the POI must be confident that the operator has an adequate means in place to provide flight crews with the complete equivalent of the actual text of the MEL. This method must be described in detail in the operator's OM.

5.4.2.45. DISCREPANCIES DISCOVERED DURING FLIGHT. Use of the MEL is not applicable to discrepancies or malfunctions that occur or are discovered during flight. Once an aircraft moves under its own power, the flight crew must handle any equipment failure in accordance with the approved flight manual. A flight is considered to have departed when the aircraft moves under its own power for the purpose of flight. Discrepancies occasionally occur between the time the flight departs and the time it takes off. If the flight manual contains procedures for handling that discrepancy, or if the pilot-in-command (PIC) deems that the discrepancy does not affect the safety of flight, the flight may continue. The discrepancy must be addressed prior to the next departure. For those operators who are required to use a dispatch or flight release, the PIC must handle a discrepancy that occurs after the issuance of the release, but before the flight departs, in accordance with the MEL. The PIC must obtain a new or amended dispatch or flight release, as well as any required airworthiness release. This new or amended release must contain any applicable flight restrictions necessary for operation with any item of equipment that is inoperative.

5.4.2.47. DOCUMENTATION OF DISCREPANCIES. Provisions of the MMEL preamble require that an airworthiness release be issued or an entry be made in the aircraft maintenance record or logbook prior to conducting any operations with items of equipment that are inoperative. GACAR Part 121 operators and those GACAR Part 135 operators who use a Continuous Airworthiness Maintenance Program (CAMP) generally require the use of a formal airworthiness release issued by an authorized maintenance person. Other operators must have adequate methods for recording the authorization to operate the aircraft with items of equipment that are inoperative. This does not imply that the involvement of a GACA-certificated mechanic or other person authorized under GACAR Part 43 to approve an aircraft for return to service is required in all cases. Unless maintenance actions are performed on the aircraft, flight crews may make appropriate documentation in the aircraft maintenance log.

5.4.2.49. CONFLICT WITH AIRWORTHINESS DIRECTIVES. Occasionally an AD may apply to an item of equipment that may be authorized to be inoperative under the MEL. The item may not simply be deferred under the MEL in order to avoid or delay compliance with the AD or a GACA approved alternate means of compliance with the AD. In all cases, when an AD has been issued, the operator must comply fully with the terms of the AD or a GACA approved alternate means of compliance with the AD. GACAR Part 39 provides additional information concerning GACA approved alternate means of compliance with an AD In other cases, the provisions of an AD may allow operation of the aircraft on the condition that certain items of installed equipment be used or be operable. In those cases, the affected items must be operable even though the MEL may provide for deferral of repair.

5.4.2.51. INTERRELATIONSHIPS OF INOPERATIVE COMPONENTS. When the MEL authorizes a component of a system to be inoperative, only that component may be affected. When a system is authorized to be inoperative, individual components of that system may also be inoperative. Any warning or caution systems associated with that system must be operative unless specific relief is authorized in the MEL. The operator must consider the interrelationship of inoperative components. This consideration must include the following:

• The interrelationship of one piece of equipment on another

• The crew workload

• The operation of the aircraft

• The flight restrictions

5.4.3.53. TASK OUTCOMES. Completion of this task results in:

A. Issuance. Issuance or denial of Operations Specification authorizing use of the MEL.

B. Approval or Denial. Approval or denial of a MEL document.

5.4.2.55. FUTURE ACTIVITIES.

A. Discussion. Discussing MMEL revisions with applicants.

B. Issuance. Issuance of a new Operations Specifications after revision of an MEL.

C. Approval. Approval of revisions to a MEL.

D. Surveillance. Surveillance of holders of MEL authorizations.

E. Non-Compliance. Possible non-compliance investigation if operators do not operate in accordance with the MEL authorization.

F. Cancellation. Cancellation of an MEL because of change of ownership, because of the operator's failure to comply with MEL requirements, or at the operator's request.

Figure 5.4.2.1. MEL Approval Job Aid

Name of Operator ____________________________ Certificate Number: _______________

Address ____

	YES	NO	N/A
1. The MEL is current with the MEL date and revision number.			
2. Contains the ATA Table of Contents.			
3. Contains the Preamble verbatim (with applicable KSA adjustments).			
4. Contains the Notes and Definitions Section same as the MMEL.			
5. All items addressed in the MMEL covered in the MEL. If no, include an explanation:			
6. Items have been deleted. If yes, include explanation:			
7. Items have been added. If so, include description:			
8. Revision page is appropriate.			
9. Each page of the MEL can be matched to MMEL to confirm revision number and date of revision.			
10. Describe the operations procedure for placarding:			
11. Describe the procedure for recording discrepancies:			
12. Describe the procedure for clearing discrepancies:			
13. Describe the procedure for carrying over items per the MEL:			
14. Describe how the time to fix the open MEL items is controlled (A, B, C, or D)			
15. There is a procedure for each O and M procedure found in the MMEL.			
a. Procedure describes who			
b. Procedure describes what			
c. Procedure describes when			
d. Procedure describes why			
e. Procedure describes how			

Figure 5.4.2.2. Example of Letter to Operator Denying Approval of MEL

GACA Letterhead

[date]

[address]

Dear Sir:

This letter is to inform you that the Minimum Equipment List (MEL) submitted for approval on June 6 is being returned to your office. A comparison of your submitted MEL against the current Master Minimum Equipment List (MMEL) shows that in the following places your submitted MEL is less restrictive than the MMEL.

Specifically, these System and Sequence Numbers do not comply with acceptable procedures:

1. Page 24-1, item 3. DC Loadmeter

2. Page 28-1, item 1. Boost Pumps

3. Page 30-3, item 13. Pitot Heater

Additionally, your submitted MEL does not include the required Control Page.

If you have further questions on the MEL approval process, please feel free to contact me.

Sincerely,

(Signature)
Principal Operations Inspector

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 4. MINIMUM EQUIPMENT LIST (MEL) AND CONFIGURATION DEVIATION LIST (CDL)

Section 3. Master Minimum Equipment List (MMEL) Development and Approval Process

5.4.3.1. GENERAL. This section contains background information for aviation safety inspectors (Inspectors) concerning the development, approval, and revision process for Master Minimum Equipment Lists (MMEL). It also contains a discussion of the Federal Aviation Administration's (FAA's) MMEL Subsystem which is used to automate the process of creating, revising, approving and distributing MMELs to users. The MMEL Subsystem primarily provides information to all MMEL users including regulatory personnel on the status of approved MMELs. This section contains information, direction, and guidance for Inspectors on the use of the MMEL Subsystem. See Figure 5.4.3.1, Master Minimum Equipment List Development Process, for further guidance.

> **NOTE**: The General Authority of Civil Aviation (GACA) has chosen to accept U.S. certificated Type Designs as approved by the FAA's Aircraft Certification Office (ACO). Inherent in those acceptances is the acceptance of the U.S. FAA MMEL approval process for those aircraft and continuing airworthiness activity to include acceptance of FAA Airworthiness Directives (ADs). It should be noted that in accordance with General Authority of Civil Aviation Regulation (GACAR) Part 21, where the GACA participates in the conduct of a type certificate validation, that the GACA could accept a non U.S. MMEL as a result of that process. The guidance in this section, while not utilized directly in the approval of that MMEL, will still provide appropriate information to aid in the approval and utility of that document.

> **NOTE**: While it is noted that GACA has chosen to accept U.S. certificated type designs and U.S. FAA MMELs, should a situation occur where a U.S. FAA MMEL is not available, GACA may choose to utilize an MMEL from another competent certification authority as their MMEL for that aircraft.

5.4.3.3. PRELIMINARY MASTER MINIMUM EQUIPMENT LIST (PMMEL). The first requirement for producing an initial MMEL is the development of a PMMEL that reflects the manufacturer's concepts of which items can be inoperative. The FAA encourages the aircraft manufacturer to develop a PMMEL during the aircraft certification process. The aircraft manufacturer coordinates with the Aircraft Evaluation Group (AEG) and the aircraft operators throughout the PMMEL development process. Manufacturers and operators seeking consideration for relief for operating with certain items of equipment inoperative must provide supporting documentation that sufficiently substantiates their requests. In addition to including an evaluation of the potential outcome of operating with items that are inoperative, this documentation should consider the subsequent failure of the next critical component, the interrelationships between items that are inoperative, the impact on Aircraft Flight Manual (AFM) procedures, and the increase in crew workload. The PMMEL must not conflict with the AFM limitations, Configuration Maintenance Procedures (CMP), or Airworthiness Directives (AD). The PMMEL should specify suitable limitations in the form of placards, maintenance procedures, crew operating procedures, and other restrictions as necessary to ensure an acceptable level of safety. To substantiate these considerations, the manufacturer must provide demonstrations that include evaluation flights as necessary. The manufacturer will assist in scheduling AEG participation or observation in validation flights, if needed, in conjunction with the certification test program or the Flight Standardization Board's (FSB) operational evaluation, whenever possible. The manufacturer develops the PMMEL in a format acceptable to the FAA Administrator and submits it to the AEG for review.

> **NOTE**: Regarding the roles of the Aircraft Manufacturer in contributing to the development of the MMEL, as

mentioned above; Aircraft Manufacturers can also be very helpful, on occasion, in forwarding requests for MMEL relief to the FOEB. These requests may be related to a particular fleet, or they may be requests that would be beneficial for an operator or for a regulatory interest. These communications efforts improve the utility of the document and improve standardization of the document.

5.4.3.5. INITIAL MMEL APPROVAL PROCESS. To initiate the MMEL approval process, the AEG schedules Flight Operations Evaluation Board (FOEB) meetings to review and evaluate the PMMEL for technical accuracy and acceptability. The AEG invites interested parties, such as the manufacturer, operators, and interested aviation community representatives, to participate in these meetings. The FOEB discusses each PMMEL item with the interested participants and recommends approval, modification, or disapproval for each item. If they cannot reach a consensus, they may hold an item open for further consideration or until they gather more information. The manufacturer or operator must resubmit, with additional justification, items not acceptable to or perhaps held open by the FOEB. The PMMEL is the initial, manufacturer's draft MMEL and the operators use this AEG working document to develop and further refine the draft MMEL, and further, they establish the working relationship between the initial operators and the FOEB chairman. The FOEB chairman arranges to have the draft MMEL posted on the FAA's FSIMS website at: http://fsims.faa.gov/home.aspx. The draft MMELs are posted for operator and industry review, and the Chairman receives comments related to the draft document within the indicated time period. The FOEB will review and discuss the recommendations and comments and revise the draft MMEL as necessary. After the FOEB properly completes the coordination of the draft MMEL they will post the approved MMEL on the MMEL Web site for access by industry for preparing individual operator MELs.

5.4.3.7. MMEL REVISION PROCEDURES. While the GACA approves all MELs and MEL revisions, the appropriate FAA AEG reviews and approves all MMEL revisions. An individual operator, the FAA, or industry may request changes to an MMEL. The AEG will consider those items requested by users based on operational considerations that indicate needed relief. This section contains a description of the types of MMEL revisions. Revisions to the MMELs receive approval in the same manner as initial MMELs.

5.4.3.9. LEAD AIRLINE CONCEPT.

A. Designated. For certain airplanes, industry will designate an operator representative as Lead Airline representative to coordinate with the aircraft manufacturer, other operators, and the FOEB chairman. The purpose of the Lead Airline representative is to expedite the FOEB process and MMEL revision for the affected airplane. The Lead Airline representative will conduct coordination meetings, as required, and will develop the FOEB agenda in a manner acceptable to the FOEB chairman. The Lead Airline representative will also coordinate industry participation at the FOEB meeting and will assist the manufacturer and the FOEB chairman in finalizing the MMEL revision after the meeting.

B. Required Revision or Optional Revision. When issued a required or optional revision to the MMEL, operators should consider the following:

1) The MMEL revision tracking policy applies only to MMEL changes that are more restrictive than presently published in the operator's MEL. That is, if the MMEL change provides greater relief than the operator's MEL, there is no need for the operator to make any change to his MEL.

2) Submit MMEL changes that are more restrictive than the operator's currently approved MEL to the responsible Inspector within 90 days of the MMEL revision date unless the operator and the Inspector agree that extenuating

circumstances preclude adoption of the specific MMEL item. The Inspector may authorize additional time, but you must complete the MEL approval in 180 days, or as specified by the GACA.

3) One reason that an operator might delay adopting a revised MMEL item is the time lag between an MMEL revision and publication of the airframe manufacturers recommended MEL procedures. In such cases, the operator incorporates the MMEL changes that are more restrictive than in his, except for any that require manufacturer recommended procedures.

4) In the case of a required revision, if the revision is not applicable to the operator, he should advise the Inspector of this fact and reissue the MEL Control Page to indicate that the MEL is in compliance with the required MMEL revision. An optional revision does not require an operator action.

Figure 5.4.3.1. Master Minimum Equipment List Development Process

1) Proposed Master Minimum Equipment List (PMMEL) is developed for new aircraft by the aircraft manufacturer. The PMMEL is not a Federal Aviation Administration (FAA) product and may not be used in Air Transportation operations.

2) Master Minimum Equipment Lists (MMELs) are developed for new aircraft and existing aircraft for which an MMEL has never been developed. The documents are produced by an external process involving the Flight Operations Evaluation Board (FOEB) and the Aircraft Evaluation Group (AEG) for the specific aircraft.

3) The document is then sent to the responsible policy division within Flight Standards Service (AFS) for review and comment.

4) The draft MMEL is posted in the FSIMS MMEL Web site where comments from interested parties both inside and outside the FAA may be collected.

5) Comments received are collected and sent back to the responsible AEG.

6) The AEG reviews the comments, makes changes as necessary and creates a proposed MMEL.

7) If the MMEL is acceptable it is approved; or, if not, it is sent back to the AEG with comments for further review and revisions.

8) Once the MMEL is approved, it is electronically processed and posted on the FSIMS MMEL Web site for download and use.

9) The process is then complete.

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 4. MINIMUM EQUIPMENT LIST (MEL) AND CONFIGURATION DEVIATION LIST (CDL)

Section 4. Configuration Deviation List (CDL) Development and Approval

5.4.4.1. GENERAL. This section contains information for aviation safety inspectors (Inspectors) concerning the development and approval processes of configuration deviation lists (CDLs). Aircraft type certificated under General Authority of Civil Aviation Regulation (GACAR) Part 25 may be approved for operations with missing secondary airframe and engine parts. The significant difference between a CDL item and a MEL item is a CDL item includes items that can be removed from the aircraft indefinitely.

5.4.4.3. DEVELOPMENT AND APPROVAL OF A CDL. An aircraft manufacturer develops a proposed CDL for a specific aircraft type and submits it to the responsible aircraft certification office for approval. For United States (US) type certificated airplanes, the CDL, once approved, is incorporated into the limitations section of the airplane flight manual (AFM) as an appendix. For manufacturers outside the US, the CDL may be a stand-alone document and part of the Structure Repair Manual, or another manufacturer's document. Some operators may choose to attach a copy of the CDL to their MEL for easy and ready reference by flight crews.

5.4.4.5. OPERATOR PROCEDURES. Operators should establish a standard procedure for advising their flight crew members and concerned maintenance personnel of an airplane's status when a flight is scheduled to depart with a missing part on the CDL and/or inoperative equipment on the MEL along with the conditions and limitations that apply. Service experience has demonstrated that the operator's MEL procedures are capable of addressing aircraft operations with MEL status and limitations. These same MEL procedures may also be used for addressing an aircraft's CDL status and limitations on the dispatch release. This includes operator procedures to provide the flight crew with further elaboration of the item by application in the airplane flight log and dispatch papers. Regardless of the operator's procedures, this policy does not alleviate the operator from informing all applicable personnel of the associated limitations contained in the CDL appendix to the AFM.

5.4.4.7. USE OF THE CDL. Operators must follow the CDL limitations when operating with a configuration deviation. Operators are required to observe the following:

- The limitations in the CDL when operating with certain equipment missing (except as noted in the appendix to the approved flight manual)

- The flight operations, restrictions, or limitations that are associated with each missing airframe and engine part

- Any placard(s) required by the CDL describing associated limitations, which must be affixed in the cockpit in clear view of the pilot-in-command (PIC) and other appropriate crewmembers

5.4.4.9. OPERATIONAL CONTROL. The principal operations inspector (POI) must ensure that the operator has developed appropriate procedures for the pilot in command (PIC) and, if appropriate, procedures for notifying dispatch of the CDL missing parts by an appropriate notation in the aircraft logbook or other acceptable means.

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 4. MINIMUM EQUIPMENT LIST (MEL) AND CONFIGURATION DEVIATION LIST (CDL)

Section 5. Nonessential Equipment and Furnishings (NEF) Program

5.4.5.1. GENERAL. This section contains specific direction, guidance, and procedures to be used by aviation safety inspectors (Inspectors) when evaluating and approving a Minimum Equipment List (MEL) Nonessential Equipment and Furnishings (NEF) Program for operations conducted under General Authority of Civil Aviation Regulation (GACAR) Part 91, 121, 125, 133 and 135.

5.4.5.3. DISCUSSION. In the early days of the Master Minimum Equipment List (MMEL) concept, the MMEL only provided limited relief for Passenger Convenience Items (PCI) in the cabin, galley, and lavatory areas. Many operators deferred inoperative, damaged, or missing equipment or instruments not located in these areas via means other than the MEL or Configuration Deviation List (CDL) (i.e., operator internal deferral programs authorized by their maintenance program).

A. Approved Provisions. Other than under the provisions of an approved MEL or CDL, the regulations do not provide for the deferral of inoperative, damaged, or missing equipment or instruments. Because Passenger Convenience Items (PCIs) are limited to the areas described above, the Federal Aviation Administration (FAA) has replaced the current PCI title in ATA Chapter 25 of all Master Minimum Equipment Lists (MMELs) with the new term, Nonessential Equipment and Furnishings (NEF).

B. Deferral Authority. Operators may use the deferral authority granted in the MMEL as a basis for developing an operator-specific program, approved through the MEL, that provides relief for inoperative, damaged, or missing nonessential equipment and furnishings located throughout the aircraft. Although the NEF program is listed under Chapter 25, it may address items that would fall under other ATA chapters.

5.4.5.5. NONESSENTIAL EQUIPMENT AND FURNISHINGS (NEF). NEF are those items installed on the aircraft as part of the original type certification, supplemental type certificate, or other form of alteration that have no effect on the safe operation of flight and would not be required by the applicable certification rules or operational rules. They are those items that, if inoperative, damaged, or missing, have no effect on the aircraft's ability to be operated safely under all operational conditions. These nonessential items may be installed in areas including, but not limited to, the passenger compartment, flight deck area, service areas, cargo areas, crew rest areas, lavatories, and galley areas. NEF items are not items already identified in the MEL or CDL of the applicable aircraft. They do not include items that are functionally required to meet the certification rule or for compliance with any operational rule. The operator's NEF process shall not provide for deferral of items within serviceable limits identified in the manufacturer's maintenance manual or operator's approved maintenance program such as wear limits, fuel/hydraulic leak rates, oil consumption, etc. Cosmetic items that are fully serviceable but are worn or soiled may be deferred under an operator's NEF process.

A. Definition. By definition, NEF items do not affect the safe operation of an aircraft. Due to the wide variance of these items from aircraft to aircraft, a complete list of NEF items is not required to be maintained in the operator's MEL, however they should be cataloged in another list or managed using another equivalent method of tracking.

B. Items. NEF program items are not approved through the normal MMEL development process. Operators, through their approved NEF program, identify program items. Operators are responsible for designing, implementing, maintaining and revising the NEF program.

1) The fundamental elements for an operator obtaining approval of an NEF Program are the operator's:

• development of procedures and processes for identifying items that may be deferred

• development of appropriate procedures

• documentation of inoperative, damaged, or missing items

• reporting of deferrals to the GACA, and

• procedures for follow-up maintenance

2) *The General Authority of Civil Aviation (GACA) requires that NEF items be listed in the MEL.* An NEF list (or equivalent) must be included in the MEL in order to provide flight crews, maintenance, and operations personnel, if applicable, with any applicable maintenance and operations (M & O) procedures necessary for the safe operation of the aircraft. The operator's NEF program must prescribe repair intervals for NEF items. Operators may use the current MEL deferral categories at their discretion.

C. NEF Program. The NEF program should be designed so that it can be managed to provide expedited handling of NEF items. Except as specified below, operators must submit their NEF program to the GACA for approval via the normal MEL approval process. Any portions of an NEF program submitted to the GACA for approval that references maintenance must comply with standard practices defined in GACAR § 43.19 or applicable approved data. Part 91 operators need not submit their NEF deferral program (and NEF list if applicable) to the GACA for approval, but they will make it available for GACA review upon request.

D. Approved by the GACA. Once the program has been approved by the GACA, a reference to the program must be incorporated into MEL ATA Chapter 25.

5.4.5.7. NEF PROGRAM. This paragraph provides general guidance for development and approval of an operator's NEF program. A NEF program encompasses a NEF list (or equivalent), a process for evaluating an item in accordance with NEF, reporting procedures to the GACA, and repair and/or replacement policy and procedures. Failure to comply with the GACA approved NEF program may result in the removal of the authorization to participate in the NEF portion of the MEL.

A. NEF List. In order to identify items that may be included in the NEF program, the operator's program should closely follow the recommendations prescribed below. As NEF items are identified, they should be added to a list (or other means acceptable to the GACA). It may be expeditious to develop a list of known or agreed to NEF items for inclusion in the initial program. As more items are identified through the NEF process, these items should be added to the list to preclude having to reexamine the same items through the decision making process. The NEF list and process may reside together, or separately, in a location and in a manner selected by the applicant and one that is acceptable to the GACA. Whether in paper or electronic format, the applicable portions of the list and process must be available to the flight crew, maintenance, and flight operations personnel when items are being deferred in accordance with ATA-25, Nonessential Equipment and Furnishings (NEF). The NEF list in most cases should be comprehensive but may be listed in general terms with the concurrence of the GACA. As an example, cosmetic trim-strips may be listed in general terms rather than identifying each strip individually on the NEF list.

B. NEF Reporting. Operators will work together with the GACA to determine a mutually acceptable timeframe in which the newly identified and deferred NEF items will be reported to the GACA for review.

5.4.5.9. FLOWCHART OF NEF PROCESS. Figure 5.4.5.1, and Figure 5.4.5.2 provide a flowchart that represents a sample process that should be considered when approving an NEF program. The flowchart is provided as a guide for developing an NEF deferral process. The process may be modified to facilitate inclusion in an operator's overall MEL deferral program; however, the intent of the elements outlined in the flowchart below must be addressed.

Figure 5.4.5.1. Flowchart MMEL Equipment and Furnishings: Nonessential Equipment and Furnishings (NEF)

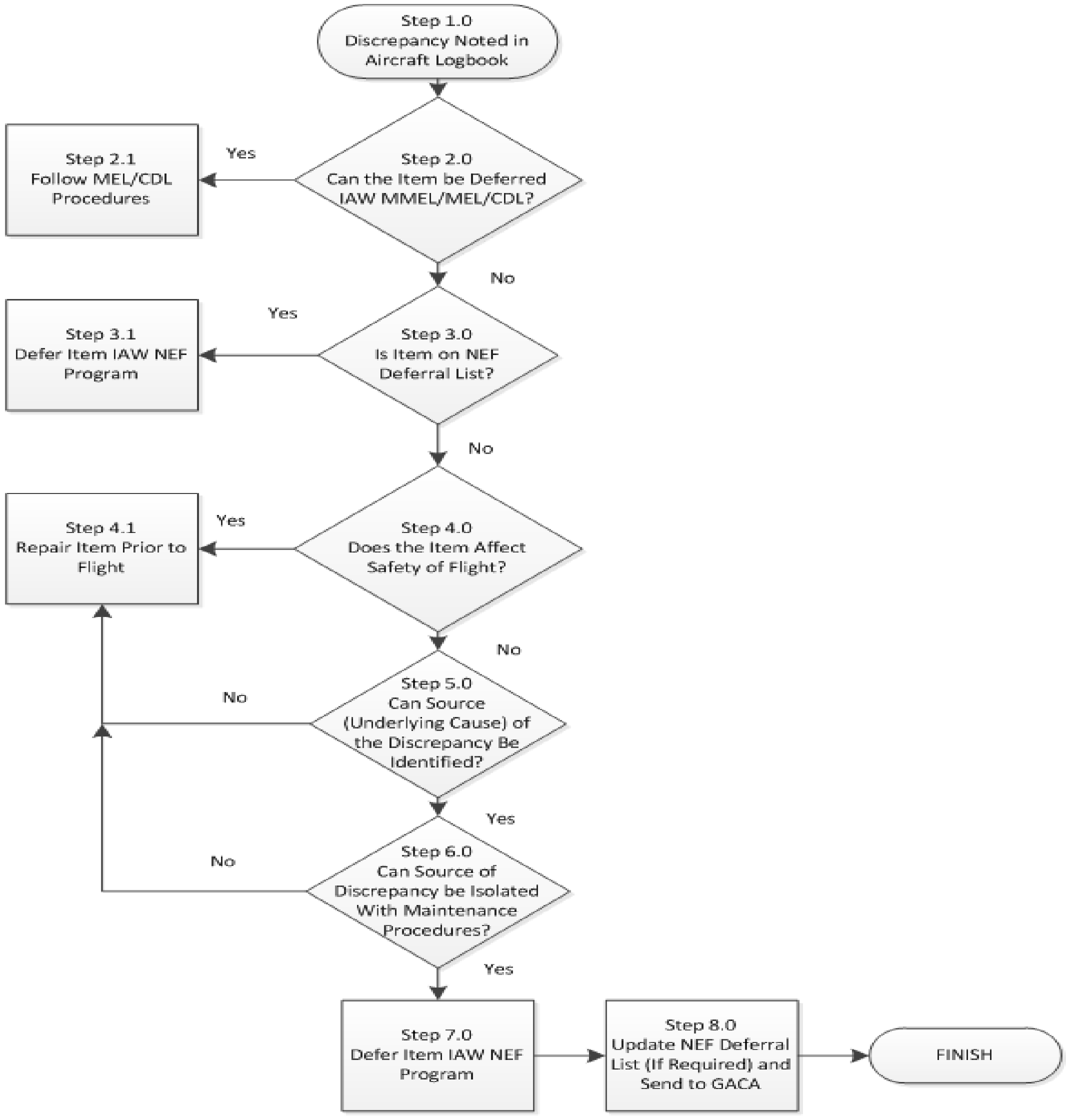


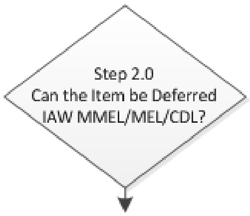
Figure 5.4.5.2. Flowchart Steps (Elements)

NOTE: These are identified in Figure 5.4.5.1

Step 1.0 Discrepancy noted in aircraft logbook. The inoperative, damaged or missing item must be identified and documented in the aircraft logbook (or other approved location) per the operator's discrepancy reporting system by:

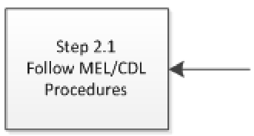
- Flight crew
- Company maintenance personnel
- Personnel authorized and approved to perform such functions as outlined in the operators maintenance program

Step 2.0 Can the item be deferred in accordance with (IAW) the MMEL, CDL, or operators MEL?



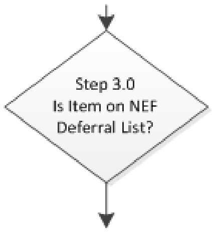
- If the inoperative, damaged, or missing item is listed in the MMEL, CDL, or operators MEL, then the deferral procedures for that item must be followed. If the item is a subcomponent of a primary system identified in the MMEL/MEL/CDL, where no previous relief was authorized, the subcomponent may not be deferred in accordance with the NEF procedures outlined in Chapter 25 of the MMEL or MEL.

Step 2.1 Follow MEL/CDL procedures.



- If the item is identified in another part of the MEL/CDL, then the procedures approved for the deferral of such item must be followed.

Step 3.0 Is item on the NEF deferral list?



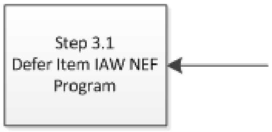
- Is the item on the NEF list? If yes, then follow the NEF deferral procedures in step 3.1. (Items that are not previously on the operators NEF list should proceed to step 4.0)

NOTES:

a. On initial approval of the NEF program, each operator must develop a list of items that it wants to include in the NEF list. This list should be coordinated internally with all appropriate lines of business for that specific operator. The GACA will review the initial list (prior to acceptance of the operator's program.

b. This list does not have to be part of the standard MEL and may be kept in a form and manner as agreed upon by the operator and the GACA. The NEF list, or the appropriate portions thereof, should be available to the flight crew, flight operations, and maintenance personnel.

Step 3.1 Defer item IAW the NEF deferral program.



- If the item is identified in the NEF deferral list, then the procedures approved for the deferral of such item shall be followed.

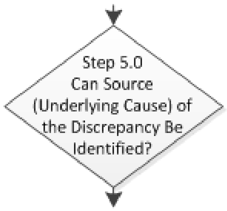
Step 4.0 Does the item affect the safety of flight?

- Is it obvious from a maintenance or operational perspective that the item, in and of itself, could have an adverse effect on the safe conduct of flight? If there is an obvious safety-of-flight issue, then the inoperative, damaged, or missing item may not be deferred and step 4.1 shall be followed.

Step 4.1 Repair item prior to flight.

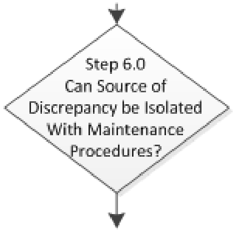
- The item may not be deferred and must be repaired prior to flight.

Step 5.0 Can source (underlying cause) of the discrepancy be identified? (If applicable)



- Can the source of the discrepancy be identified? This step may or may not apply to the item under consideration. If the source can be identified, then proceed to step 6.0, otherwise proceed to step 4.1.

Step 6.0 Can source (underlying cause) of discrepancy be isolated from the system with applicable maintenance procedures?



- If applicable, the source (underlying cause) of the discrepancy must be isolated from all other systems so as to alleviate the safety-of-flight concern.
- If the item cannot be safely isolated then the item must be repaired prior to flight (step 4.1).
- If isolated, the isolation of the source must pass the entire test previously identified in the evaluative process (steps 4.0-6.0) for the item.
- If source can be isolated then proceed to step 7.0.

Step 7.0 Defer Item IAW the approved NEF program.

- Defer the item if, after completing the previous 6 steps, the item can be deferred IAW the NEF program.

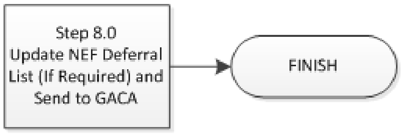
NOTE: Before an operator can defer a NEF item, the operator must follow their approved program for determining if an item can be considered a NEF. Although NEF items are not safety-of-flight items, they have not been evaluated through the normal MMEL approval process and therefore may require the concurrence of the flight crew, maintenance, and operational personnel, if applicable. NEF items are not deferred under the authority of an mechanic's certificate but rather the company/operator is deferring the item under their approved NEF program.

- The evaluation process should determine items such as:

  - Is the item required for the operational rules in which the aircraft is operated?
  - Does it create the potential for fire/smoke or other hazardous conditions?
  - Could it have an adverse effect on other required systems or components?
  - Does its condition potentially affect the safety of passengers, crew, or service personnel?
  - Could it have a negative impact on emergency or abnormal procedures?
  - Does it create additional workload for the crew at critical times of flight or flight preparation?
  - Crewmembers may need to evaluate the deferred NEF on a flight-by-flight basis.

NOTE: The above evaluation process must be accomplished for the inoperative, damaged, or missing items at its face value, and also for the underlying cause of the discrepancy.

Step 8.0 Update NEF deferral list as required.



- Operators will continually add items to their NEF list as they see fit. If applicable, the operator must control the NEF list and revise it accordingly.

VOLUME 5. AIRCRAFT EQUIPMENT AND OPERATIONAL AUTHORIZATIONS

CHAPTER 5. AIRPLANE AUTHORIZATIONS AND LIMITATIONS

Section 1. Authorization of Extended Range Operations for Part 121

5.5.1.1. GACA ACTIVITY REPORT (GAR).

A. 1358 (OP)

B. 3368 (AW)

5.5.1.3. OBJECTIVE. This section provides operations and airworthiness guidance for aviation safety inspectors (Inspectors) to perform an evaluation of a General Authority of Civil Aviation Authority Regulation (GACAR) Part 121 operator's request for authorization to conduct Extended Range Operations (ETOPS).

NOTE: Refer to Federal Aviation Administration (FAA) Advisory Circular (AC) 120 42B, (as amended), Extended Operations (ETOPS and Polar Operations), for additional detailed information on the Extended Operations (ETOPS) authorization process.

NOTE: Volume 12, Chapter 6, Section 4 contains operations and airworthiness surveillance requirements for existing ETOPS operations.

NOTE: The ETOPS supplemental maintenance programs described in this chapter are not applicable to three or more engine aircraft.

5.5.1.5. GENERAL.

A. Definition.

1) Except as provided below, for GACAR Part 121 turbine-powered airplanes with two engines, ETOPS are operations conducted over a route containing a point further than 60 minutes flying time at an approved one-engine-inoperative cruise speed under standard conditions (in still air) from an adequate aerodrome.

2) For GACAR Part 121 turbine-powered airplanes with more than two engines and multiengine turbine-powered airplanes used in "special unscheduled" service (i.e. unscheduled operations with 30 or fewer passenger seats and a maximum takeoff mass of 45,500 kg or less), ETOPS are passenger-carrying operations conducted over a route containing a point further than 180 minutes at an approved one-engine-inoperative cruise speed under standard conditions (in still air) from an adequate aerodrome.

B. Types of Authorization. The General Authority of Civil Aviation (GACA) approves ETOPS in accordance with the requirements and limitations contained in GACAR Part 121, Appendix E and GACAR §§ 121.81 and 121.209.

1) The GACA may authorize ETOPS with two-engine airplanes over a route that contains a point farther than 60 minutes flying time from an adequate aerodrome at an approved one-engine-inoperative cruise speed under standard conditions in still air.

2) For passenger-carrying aircraft with more than two engines conducting scheduled or unscheduled operations and for airplanes in “special unscheduled” operations, GACAR § 121.81 may grant authorization to conduct ETOPS operations over a route that contains a point greater than 180 minutes flying time from an adequate aerodrome at an approved one-engine-inoperative cruise speed under standard conditions in still air.

C. ETOPS Authorization. To be granted ETOPS authorization, the operator must demonstrate compliance with the requirements of the applicable GACARS.

D. Points of Contact (POC). For questions regarding an ETOPS authorization, contact:

- The Director of Flight Operations Division
- The Director, Airworthiness Division

5.5.1.7. APPLICATION PROCESS.

A. Initial Contact. The application process usually begins with a visit, phone call, or e-mail from the prospective operator to the principal operation sinspector (POI) or for new entrants, to the GACA Team Leader. At that time, ask the following questions and annotate the responses for future reference:

1) Are you familiar with ETOPS requirements?

NOTE: Inform the operator of the applicable regulations and guidance materials they should review.

2) When do you want to start the operation?

3) What kind of operation do you want to conduct: Cargo, Passenger, or Both?

4) What routes do you want to fly?

5) How many minutes of ETOPS authority are you seeking?

6) What aircraft/engine combination are you going to use?

7) What are your current capabilities?

8) Do you have an operating certificate?

9) If it is a new entrant, do you want to gain non-ETOPS authorization first or do you want to do both together?

10) What is a good day and time for you to meet with us?

NOTE: You should schedule an initial meeting with the operator.

NOTE: The term “operator” will be used for both an existing GACAR Part 121 operator and for an applicant seeking an Air Operator Certificate (AOC) under GACAR Part 121.

B. Preparation for the Initial Meeting.

1) In preparation for the meeting, complete the following tasks:

- Inform the Director, Flight Operations Division and the Director, Airworthiness Division that an operator is interested in applying for ETOPS

- If applicable, discuss the operator's existing programs for any deficiencies that could affect ETOPS authorization with GACA management

2) The Division Directors will assign an Inspector to lead the ETOPS authorization activity. This Team Leader will coordinate with team members for the meeting. The required members may include:

- Principal Operations Inspector (POI) (Operations)

- Principal Maintenance Inspector (PMI) (Airworthiness)

3) Other resources *may* include the:

- Any other applicable Inspectors and Airworthiness Engineers

- Cabin safety Inspector (CSI)

- Any Inspector in charge of aircraft dispatch (Operations)

- Any Inspector or person in charged with monitoring navigation capabilities, polar operations, minimum navigation performance specification (MNPS) authority, and areas of magnetic unreliability (AMU).

C. Conduct the Initial Meeting.

1) *Initial Meeting*. At the initial meeting, the operator should officially request ETOPS authorization and present the GACA with the official letter of intent (LOI) and the application package outlined in subparagraph 5.5.1.7, D, below.

2) *Notes*. Review any notes from the operator's initial contact (phone call, face-to-face, or e-mail).

3) *Discussion*. During the initial meeting, discuss the following items with the operator:

a) POCs. Identify all of the Points of Contact (POCs) for the operator and the GACA. The operator should also appoint a team leader as a POC.

b) Program Deficiencies. If applicable, identify any existing program deficiencies the operator may have. If the operator has existing ETOPS authority, present any existing ETOPS program deficiencies to the operator. The operator must address these deficiencies prior to applying for additional ETOPS authorization. For example, if the operator has a marginal Continuing Analysis and Surveillance System (CASS), the operator must correct it before the GACA grants additional ETOPS authority.

c) Identify Appropriate Regulations and Guidance Materials. Identify all of the regulations and guidance materials including GACARs, ACs, and the GACA handbook, as may be appropriate. Manufacturer's guidance material may also be available.

d) Methods. There are two methods that may be used to gain ETOPS authorization: accelerated and in-service. Inform the operator of the 6-month minimum notification requirement prior to the anticipated start date for the accelerated method, and the 60-day minimum notification requirement for the in-service method. The applicant must understand that these times are not negotiable.

1. The operator may choose to use either method. Depending on the circumstances, discuss the applicable method(s) and be prepared to discuss the pros and cons of each method. Although either method is available, applicants rarely use the in-service method.

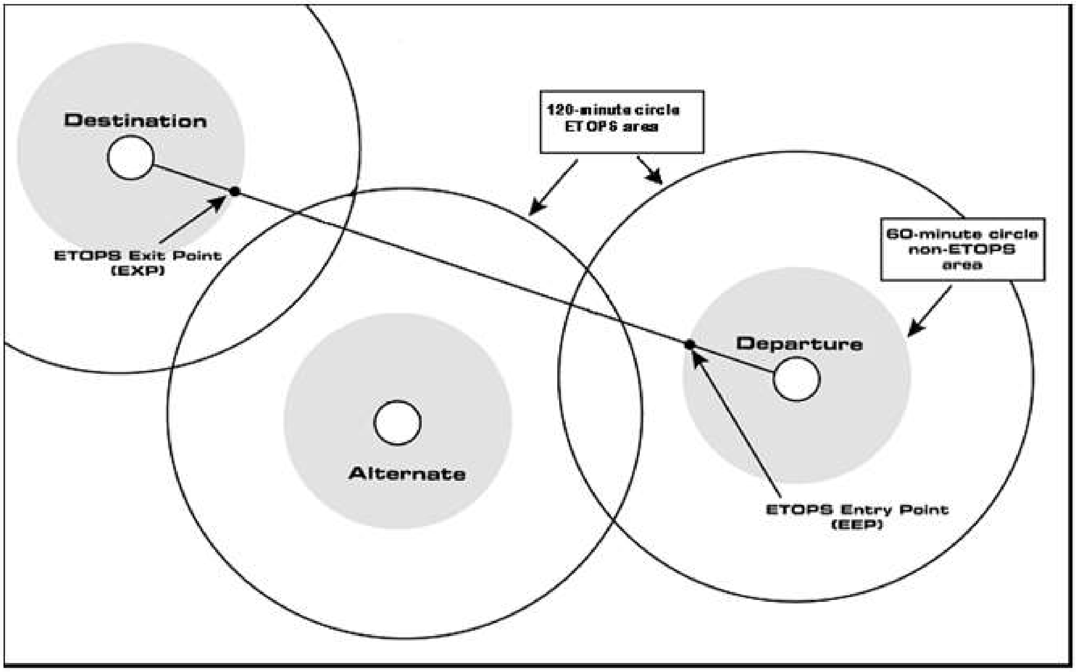
NOTE: When the in-service method is used, the applicant must understand that all training, processes, and procedures required for ETOPS must already be in place prior to submitting their application.

e) ETOPS Flight Operations Requirements. Brief the applicant on the following:

1. *Operational Requirements*. Operators applying for ETOPS authority must present to the GACA team adequate documentation to show that they have policies, procedures, and training programs for pilots, dispatchers, and flight followers (as applicable) to conduct ETOPS. The operator must provide manuals and a training program curriculum to the GACA for approval. Refer to FAA AC 120-42, as amended, for specific requirements. The application must also include the policies and processes that the operator will use to collect, monitor, evaluate, and maintain records for their ETOPS operations.

2. *Engine-Out Range.* The engine-out speed that applicants will submit for approval will be the basis for ETOPS calculations. In addition, the applicant should provide a graphical display in the form of range circles for the proposed area of operation (see Figure 5.5.1.1, Range Circles and subparagraph 5.5.1.9, A2).

[Figure 5.5.1.1. Range Circles]



f) ETOPS Maintenance Requirements. Ask the operator various questions concerning the ETOPS maintenance requirements to gather additional information. These may include:

1. What airplane/engine combination are they going to use?

2. If they are an operator, do they currently have an approved maintenance program?

3. Do they understand the supplemental maintenance programs required for two-engine ETOPS operations per GACAR § 121.671 and FAA AC 120-42 (as amended), paragraph 301.

NOTE: Although the initial contact conversation may have conveyed this information, re affirm it during this meeting.

g) Formal LOI. Inform the applicant that ETOPS authorization requires a formal Letter of Intent (LOI). The applicant may submit this separately, or it may be part of the application package (discussed later). The formal LOI should include the following information at a minimum:

- Proposed ETOPS operating start date
- Airplane/engine combination
- Intended areas of operation
- Type of ETOPS authorization requested

• Existing operating certificate information, if applicable

1. Inform the applicant that after GACA reviews the formal LOI; the Team Leader assigned by GACA management will provide a written response. This response should acknowledge receipt of the letter and should specify acceptance of the LOI, or it should specify what required information is missing.

2. After the initial meeting with the operator when they have officially requested ETOPS authorization, the Team Leader will ensure that the appropriate GAR entries are made for the evaluation of an ETOPS program (1358 or 3368, as appropriate).

3. The 6-month notification period for the accelerated method and the 60-day notification period for the in-service method begin upon GACA acceptance of the formal LOI. When the applicant uses the in-service method, the applicant must understand that all training, processes, and procedures required for ETOPS must already be in place prior to GACA acceptance of their formal LOI.

D. Application Package. The applicant must submit an application. The applicant may submit the package at the same time as the LOI; however, the applicant may also submit it later. The application package is the heart of the ETOPS authorization process. It must contain detailed information on the following:

1) As stated earlier, the application package may contain the formal LOI.

2) Defined processes, procedures, and related resources being allocated to initiate and sustain ETOPS operations. These processes, procedures, and related resources are typically referred to as the operator's ETOPS program. The certificate holder must demonstrate a commitment by management and all personnel involved in ETOPS flight operations and Maintenance. The operator must describe in detail how they will address the applicable flight operations requirements, as defined in the applicable GACARs and ACs. The applicant must describe in detail how they will address each of the maintenance elements as defined in the applicable GACARs and ACs.

3) ETOPS authorization requested (e.g., 120 or 180 minutes).

4) Proposed routes.

5) Dispatch policies and procedures.

6) Requested method of approval (in-service or accelerated).

NOTE: The method the applicant chooses requires the identification of a formal timeline.

7) Documented plan for compliance with requirements of accelerated ETOPS (if applicable).

8) An approved airplane/engine combination, including engine-out speed, upon which those ETOPS calculations will be based.

9) Detailed review gates or equivalent. You can find further information about review gates later in this section.

10) Validation process. The validation process requires the applicant to identify a formal timeline.

E. GACA Review Process. The GACA review team validates whether the applicant included all of the required elements in their application package. A review gate process, normally captured in the form of a matrix, may identify all of these elements and can facilitate tracking them throughout the validation process. If the applicant included all of the elements in the application package, then the review team will continue with the evaluation process and proceed to evaluate the application package including all of the elements. If there are missing or incomplete elements, the team leader will send written notification to the operator describing the shortfalls.

NOTE: As an aid to effectively validate the applicant's proposed ETOPS operations and maintenance program, refer to Volume 12, Chapter 6, Section 4, Extended Operations (ETOPS) Inspection (Maintenance) for Part 121.

F. Review Gates.

NOTE: The review gate process, as defined in FAA AC 120-42, as amended, is not detailed or required for the in-service method; however, it is a proven process that is useful in both application methods.

1) The review gate process will help ensure that the applicant's processes comply with the provisions of the GACARs and FAA AC 120-42, as amended, and that the applicant is capable of continued ETOPS operations. Normally, the review gate process will start 6 months, at a minimum, before the proposed start of ETOPS and should continue until at least 6 months after the start of ETOPS.

2) Review gates, or an equivalent method, are helpful to track every aspect of an ETOPS approval and to be able to see the status of the project at a glance. Review gates or milestones should be in a matrix form. The method used should:

a) Include dates of pertinent meetings, data submittals, and GACA reviews and/or approvals.

b) Identify each applicable maintenance and flight operations milestone.

c) Include a "process validation plan."

G. Process Validation Plan. The process validation plan must include how the applicant intends to validate each of the process elements required to attain ETOPS authorization. This plan will spell out in sufficient detail how the applicant intends to ensure that each required process works. Note that this is a living document and it can change many times.

1) The process validation plan must ensure that each ETOPS process is:

a) Defined.

b) Demonstrated.

c) Analyzed.

d) Amended (if required).

e) Revalidated.

f) Proven (prior to ETOPS authorization).

2) The process validation plan may include validation through simulation; however, the regulations require final validations be conducted in the aircraft/engine combination that the prospective operator proposes be used in their ETOPS operation.

3) After the team leader accepts the completed application package and the defined ETOPS processes it contains, inform the operator to begin the execution of their process validation plan. The operator will complete the process validation plan under GACA observation.

4) The final step in the process validation plan is the validation flights. The applicant cannot institute the validation flight portion of the validation until the review team develops scenarios and coordinates them as may be necessary. Upon concurrence with all involved GACA parties, the team leader will issue a memo that authorizes the operator to conduct validation flights.

NOTE: For a new entrant GACAR Part 121 operator, it will typically require six non-revenue legs to complete the ETOPS validation process. Proving runs, ditching, and evacuation exercises may be conducted concurrently with ETOPS flights provided these exercises do not interfere with the ETOPS validation.

5) Prior to the initiation of ETOPS validation flights, the operator (applicant) must have all aspects of their ETOPS program successfully validated with one exception, that is the physical inspection of all the operator’s proposed ETOPS stations/facilities. For new ETOPS operators, Inspectors (Airworthiness) may conduct ETOPS station/facility inspections in conjunction with the ETOPS validation flights. It is understood that it may not be possible for those Inspectors to visit all of the operator’s ETOPS station/facilities during the validation flight process. Ideally, an Inspector should accomplish an ETOPS station/facility inspection prior to an operator conducting revenue ETOPS operations at all of its stations. In the event that this course of action is not practical, principal maintenance inspectors (PMIs) must ensure that all of the operator’s ETOPS stations/facilities are evaluated within 90 days after the commencement of revenue ETOPS service. The PMI must ensure the accomplishment of these evaluations to make certain that every ETOPS station/facility contains all of the elements required to sustain successful ETOPS operations. In addition, Inspectors must reevaluate existing ETOPS stations/facilities at a minimum of every 3 years to ensure the operator continues to maintain all of the elements required to sustain successful ETOPS operations.

6) If the validation flight process is successful, then the operator may be granted ETOPS authority.

5.5.1.9. ETOPS VALIDATION FLIGHTS. The review team, after receiving the operator’s application, will validate the submitted processes and procedures. The validation process will conclude with validation flights. This ensures that the operator’s policies, procedures, and training will enable the operator to safely conduct ETOPS operations. For initial ETOPS approval, an operator may be required to fly six non-revenue flight legs. A operator conducting “special unscheduled” operations may only be required to fly two non-revenue flight legs If the operator has existing ETOPS approval and is adding a new aircraft/engine combination, a change to their existing authorization (120 minutes to 180 minutes), or a new geographic area of operation to its ETOPS

approval, the operator may be required to fly two flight legs (revenue service may be appropriate). Prior to the initiation of validation flights, the team leader or POI will issue appropriate operations specifications (OpSpecs) that are restricted to validation flights only (see paragraph 5.5.1.13)..

A. Validation Flight Emphasis Areas. The following areas should be given special focus by the principal inspectors (PI) during the approval process. It is recommended that an Inspector responsible for dispatch oversight, participate in the ETOPS approval process.

1) *Airplane and Flight Planning Data*. The review team should ensure that the operator is utilizing the appropriate airplane manufacturer's performance for the calculation of the ETOPS performance data. This information must be available for use by flightcrew members and dispatchers and it must include the following:

a) One-engine-inoperative level off (gross) fuel planning.

b) One-engine-inoperative level off fuel planning at 10,000 feet.

c) All-engine operating fuel planning to comply with oxygen requirements of GACAR § 91.223 and 91.303.

d) The operator must show they can obtain the appropriate winds aloft data for the area of operation in which they are planning to conduct operations. The wind forecasts model utilized in the flight planning system must be World Area Forecast System (WAFS) Gridded In Binary (GRIB) data wind forecasts. The GRIB forecast must have a minimum of 140 kilometers (km) horizontal resolution (1.25 degrees). This data must then be biased (increased) by 5 percent of the wind speed to correct for possible variations in the actual winds aloft could result in an increase in headwind or a decrease in tailwind.

NOTE: The 5-percent increase cannot be added to the tail wind component to improve the fuel burn calculation. If the operator's flight planning system does not utilize 140 km horizontal resolution GRIB data, the team leader should consult with the Director, Flight Operations Division for further guidance.

e) The flight planning system utilized by the operator must base all ETOPS fuel calculations required by GACAR § 121.1417 on aircraft-specific performance data in accordance with their approved program for each aircraft type. If the operator does not have an approved program to monitor the in-flight performance of each aircraft it operates and adjust fuel calculations accordingly, then each ETOPS fuel calculation utilized by the operator must include a 5 percent fuel penalty to account for engine degradation and airframe drag.

f) The in-flight aircraft performance data and ETOPS fuel calculations must consider the additional fuel burn required to account for the use of engine and wing anti-ice for the entire time icing is forecast or ice accretion plus wing and engine anti-ice for 10 percent of the time icing is forecast, whichever is greater.

g) The ETOPS fuel calculations must also include fuel for auxiliary power unit (APU) use, if the APU is a required power source during the flight, and fuel to account for holding, approach, and landing.

2) *ETOPS Area of Operation*. The operator must show before validation testing that the altitudes and airspeeds used in establishing the ETOPS area of operations for each airplane/engine combination comply with the terrain and obstruction clearance, as well as the critical fuel scenario associated with the applicable ETOPS equal-time point (GACAR § 121.1417) and the time-limited system requirements of GACAR § 121.1409 are not exceeded.

3) *En-Route Aerodrome Information*. Operators must assemble a list of aerodromes for the proposed ETOPS area of operation. This list should be reviewed by the review team to determine that the operator is able to access and

maintain current information on the operational capabilities of the aerodromes. The operator's program should provide flight crew members, dispatchers, flight followers, and flight locators with current and forecasted weather, field conditions, Notices to Airmen (NOTAM), rescue and firefighting services (RFFS), and any other information that may affect the safe operation of the aircraft into the aerodrome with one engine inoperative.

a) Adequate Aerodromes. An adequate aerodrome must meet the requirements of GACAR Part 139 (or equivalent) or be an active and operational military aerodrome. In order to be considered adequate for a specific ETOPS operation (flight), the aerodrome must be open and the operator should be able to show that they can land at the aerodrome in accordance with the performance requirements of GACAR § 121.279. Unless operating in North Atlantic oceanic airspace in accordance with OpSpec B41, the weather at an adequate aerodrome does not have to meet the landing minimums specified in the operator's OpSpecs.

b) ETOPS Alternate Aerodromes. Operators are required to list ETOPS alternate aerodromes in their OpSpecs. The operator may list these aerodromes as being strictly for use as ETOPS alternate aerodromes or they may also use any regular, provisional, or refueling aerodrome that is listed in their OpSpec C70 for use as an ETOPS alternate.

c) Alternate Requirements. ETOPS alternate aerodromes must meet the alternate requirements contained in the operator's OpSpec C55 prior to takeoff. Once the flight is en-route, the weather minimums at an ETOPS alternate aerodrome may fall below the minimums contained in OpSpec C55 but they must remain at or above the landing minimums prescribed in the operator's Part C OpSpecs.

NOTE: Any time the weather at the designated ETOPS alternate drops below alternate minimums, the POI must ensure that the operator has procedures in place that indicate they shall make every effort to change the alternate to another approved aerodrome within the maximum diversion time of the aircraft.

d) Operations Beyond 180 Minutes or in the North or South Polar Area. For operations conducted in the North or South Polar Area, the operator must provide a specific passenger recovery plan for the designated ETOPS alternate aerodromes (diversion aerodromes).

4) *One-Engine-Inoperative Speed Selection.* The one-engine-inoperative cruise speed is a speed that is within the certified operating limits of the airplane that the operator specifies and the GACA approves. The speed selected is used to determine the still air (no wind), 60-minute range (distance) centered on the adequate aerodromes identified in subparagraph 5.5.1.9, A3, "En-Route Aerodrome Information". If the route of flight takes the aircraft out of this area, the operation must be conducted in accordance with the approved ETOPS program (see Figure 5.5.1.1). The operator makes the calculation for the ETOPS maximum diversion times (e.g., 120 or 180 minutes); utilizing the GACA approved one-engine-inoperative speed. The ETOPS operation must remain within the maximum no-wind distance (based on the maximum diversion time) of the selected ETOPS alternate aerodromes. Normally, the operator will produce a planning chart (paper or electronic) that shows the normal one-engine-inoperative cruise range in the form of circles (Figure 5.5.1.1).

NOTE: ETOPS fuel calculations must take into account and comply with terrain clearance, GACAR § 121.267, and oxygen requirements contained in GACAR §§ 91.303 and 91.305. If the rule required for ETOPS in accordance with GACAR § 121.1417 exceeds the fuel required by GACAR § 121.1381, then the flight is considered to be "ETOPS Fuel Critical." The operator must carry the greater of the fuel required by GACAR §§

121.1381 and 121.1417.

5) *Recalculation of Flight Plan While En Route.*

a) The operator should have the capability to recalculate the flight plan after departure (in-flight reanalysis). Depending on the route of flight, the ETOPS Entry Point (EEP) can be many hours after departure. GACAR § 121.1413 requires a reanalysis of the weather at each ETOPS alternate aerodrome prior to entry into the ETOPS airspace. An analysis of the current status of the aircraft systems should also be conducted to ensure all ETOPS significant systems are functioning normally. If the weather at any ETOPS alternate aerodrome falls below landing minimums or any ETOPS significant system becomes inoperative prior to reaching the EEP, the operator must evaluate the impact and take appropriate actions, which may require an in-flight reanalysis of the route of flight, fuel calculations, or any other elements of the flight plan.

b) In addition, the operator should have the capability to re-calculate the flight plan in the event of an en-route deviation or reroute to ensure that the aircraft remains within the maximum diversion time of the ETOPS alternate aerodromes, or an appropriate adequate aerodrome, if the new route of flight takes the aircraft out of the maximum diversion range of the listed ETOPS alternate aerodromes.

6) *Computer Flight Plan (CFP) System.* The operator should substantiate that the CFP and dispatch/flight release system is capable of providing the following information to the pilot and dispatcher:

a) Flight planning based on latitude/longitude as well as air traffic system (ATS) routings in the event of an in-flight diversion.

b) Dynamic graphic display of ETOPS circles, based on speed selected during preplanning.

c) Depending on the aircraft type, the aircraft must be able to carry additional fuel for stronger-than-planned winds and additional fuel for icing.

d) A database with a list of suitable en route (ETOPS) alternates where the dispatcher would select from the list based on type of operation and aircraft; e.g., 120 or 180 minutes with a two- or four-engine aircraft.

e) Accuracy of internal computer calculations for the all critical fuel scenario calculations.

f) Ability to apply minimum equipment list (MEL)/Configuration Deviation List (CDL) restrictions and penalties unique to ETOPS operations.

g) Automated equal time point (ETP) calculations. (The operator should maintain the ability to calculate and plot the ETP manually.)

h) Ability to plan a random route flight plan and depending on the operation, select the best route of flight based on a GRIB wind forecast.

i) Calculation of flight information region (FIR) entry and exit points.

j) EEP and ETOPS Exit Point (EXP) calculations and display on the computer flight plan.

k) Ability to display to the dispatcher and list on the CFP the forecast valid time of integrated GRIB wind data.

l) ARINC 424 navigation data to show consistency between the CFP and the Navigation Database (NDB) utilized in the airplane.

m) International duty/rest time calculations.

NOTE: The certificate holder should substantiate all values in the CFP system against aircraft manufacturer data prior to validation flights. The CFP values will be validated during the ETOPS validation flights.

7) *Weather Information System.* The certificate holder should substantiate that the weather information system that it uses can be relied on to forecast terminal and en route weather, including icing forecasts, with a reasonable degree of accuracy and reliability in the proposed areas of operation. Factors such as staffing, dispatcher, training, sources of weather reports and forecasts and, when possible, a record of forecast reliability should be evaluated.

8) *Alternate Weather Minimums.* Alternate weather minimums will be those listed in the certificate holder's OpSpec paragraph C055. These minimums must reflect the current requirements of § 121.625, as applicable. Although no consideration is given for the use of Global Positioning System (GPS)/Area Navigation (RNAV) approaches, certificate holders may obtain authorization to use these approaches from the GACA, who will authorize the approaches in the certificate holder's OpSpecs.

9) *Communications.* The certificate holder must have a communications system in place that complies with § 121.99, and 121.123, as applicable. The communication system is usually two way very high frequency (VHF) radio, but alternate means such as VHF data link, high frequency (HF) voice or data link, or the certificate holder might substitute a satellite communication (SATCOM) if approved by the GACA.

NOTE: Currently the regulations do not permit SATCOM for North Atlantic operations.

10) *Navigation.* The certificate holder must show the availability of navigation facilities adequate for the operation, taking into account the navigation equipment installed on the airplane, the navigation accuracy required for the planned route and altitude of flight, and the routes and altitudes to the aerodromes designated as ETOPS alternates.

11) *Dispatch or Flight Release* (For all ETOPS operations, the dispatch or flight release must list all ETOPS alternates and the planned ETOPS diversion time under which the flight is dispatched or released. (Sections 121.687 and 121.689.)

a) The GACA grants approval to conduct ETOPS greater than 180 minutes. In selecting ETOPS alternate aerodromes, the certificate holder must make every effort to plan ETOPS with maximum diversion distances of 180 minutes or less, if possible. If conditions necessitate using an ETOPS alternate aerodrome beyond 180 minutes, the route may be flown only if the requirements for the specific operating areas contained in part 121 appendix P, Section 1, paragraph (h) or (i) are met.

b) Two hundred and seven minute ETOPS in the North Pacific (NOPAC) area of operation and 240 minute ETOPS in the North Polar Area of the NOPAC, north of the equator, may be granted by the GACA as an exception that may be used on a flight by flight basis. This exception may only be used when an ETOPS alternate aerodrome is not available within 180 minutes.

NOTE: In accordance with § 121.633(b), any operation that is authorized beyond 180 minutes must be approved in accordance with the aircraft time limiting systems, corrected for wind and temperature. In addition, the airplane must remain within the ETOPS authorized diversion time from an adequate aerodrome that is RFFS equivalent to International Civil Aviation Organization (ICAO) Category 7 or higher.

c) The certificate holder must inform the flightcrew each time an airplane is proposed for dispatch for greater than 180 minutes and tell them why the route was selected. The reason for the route selection must be included in, or attached to, the dispatch or flight release.

NOTE: AC 120 42B, paragraph 303, section c, 8 should be reviewed for the specific criteria required for ETOPS operations greater than 180 minutes.

12) *Public Protection.*

a) Protection from the Elements. If the certificate holder is applying for ETOPS operations beyond 180 minutes and for operations in the North Polar Area and South Polar Area, dispatch/flight release policies and procedures must be included for facilities at each aerodrome, or in the immediate area, sufficient to protect the passengers and cargo from the elements.

b) Passenger Recovery Plan. The certificate holder must provide training to flightcrew members and dispatchers relative to their perspective roles in the certificate holder's passenger recovery plan.

13) *Potential Diversion Aerodromes After Departure.* The certificate holder must demonstrate that the pilot, dispatcher (domestic and flag operations), or the person authorized to exercise operational control (supplemental operations), typically known as a flight follower, is able to monitor the aerodromes within the ETOPS area of operation.

a) The certificate holder must make information regarding weather, aerodrome field conditions, and aerodrome facilities readily available and should communicate this information to the pilot in command (PIC) in the event changes in these conditions would render an aerodrome unsuitable for landing. For certificate holders conducting scheduled operations, this information will be communicated to the flightcrew by a dispatcher. For certificate holders conducting unscheduled operations, this information will typically be communicated by a person authorized to exercise operational control by the certificate holder.

b) Prior to reaching the EEP, the PIC and the dispatcher or flight follower must ensure the capability and availability of all en route alternates to support any en route contingencies. Weather from the earliest to latest time of arrival (TOA) at an ETOPS alternate as well as the landing distances, aerodrome services, and facilities must be evaluated. If changes to any of these conditions since the time of departure would preclude a safe approach and landing, the dispatcher or flight follower will notify the PIC and will select a new ETOPS alternate where a safe approach and landing can be made.

14) *Emergency Conditions*. Inspectors will ensure the following emergency conditions are simulated during the ETOPS validation flights:

a) Total loss of thrust of one engine (throttle at idle),

b) Total loss of engine generated (or normal) electrical power,

c) Any other condition considered more critical in terms of airworthiness, crewmember workload, or performance risk.

NOTE: The critical scenario will result in an actual diversion to an alternate aerodrome. Planned diversions must be coordinated with the applicable air traffic services (ATS) facility.

d) For a part 121 certificate holder conducting scheduled operations, if a scenario requires the changing of en route alternates, a dispatcher must issue a new dispatch release. If the flight is en route, a dispatcher must communicate this revised release by voice or data link to the PIC for concurrence. If the flight is on the ground, the dispatcher may use any approved method to transmit flight documentation to deliver the amended release. The revised release should have current weather and any appropriate information for the new ETOPS alternate to it.

15) *Diversion and Failure Scenarios*. The team leader should make sure that there was an assessment of scenarios for system failure and partial system failure. The team leader should also include other diversion scenarios such as medical emergencies, onboard fire and loss of pressurization, or security threats.

16) *Air Operator Certificate (AOC).* Whenever the certificate holder conducts a flight to a destination outside the Kingdom of Saudi Arabia (KSA), Principal Inspectors should ensure that the aircraft has an original, certified copy of the AOC on board the aircraft as required by ICAO, Annex 6.

B. After Flight Reviews (Part 121). After the conclusion of each validation flight, the team leader and the certificate holder should conduct an in depth review of the flight. All active participants in the validation flight should participate in the review. If there are any areas of concern regarding the conduct or operation of the flight, the certificate holder must offer remedies prior to initiation of the next validation flight or final approval process.

5.4.1.11. AUTHORIZATION TO CONDUCT ETOPS OPERATIONS.

A. Team Leader Recommendation. As stated earlier in this chapter, the team leader determines the final decision on whether the certificate holder has demonstrated the appropriate qualifications to receive ETOPS authorization. The team leader will discuss any contentious issues with the rest of the review team prior to making that recommendation and prior to issuing the applicable OpSpecs.

B. Heightened Surveillance. After the above affirmative recommendations and any required coordination, the principal inspector(s) (PIs) will issue appropriate OpSpecs. Although the certificate holder now has the authority to begin ETOPS revenue flights, heightened surveillance by the GACA will continue for 6 months.

5.4.1.13. ISSUE OPSPEC PARAGRAPH B342 AND B344, ETOPS UNDER PART 121 (AS APPLICABLE).

A. ETOPS Authority. The GACA may grant a certificate holder the authority to conduct ETOPS in accordance with part 121 appendix P and § 121.161. Authority to conduct ETOPS is granted through the issuance of OpSpecs. OpSpec paragraph B342 is issued to certificate holders who have been granted approval to conduct ETOPS with two engine airplanes, and OpSpec paragraph B344 is issued to certificate holders who have been granted approval to conduct ETOPS with passenger carrying airplanes with more than two engines.

NOTE: For further information regarding the actual issuance of OpSpecs B342 and B344, refer to Volume 15, Chapter 4, Section 1, Part B Operations Specifications – Enroute Authorizations and Limitations.

B. Additional OpSpecs. In addition to the ETOPS OpSpecs, the type of operation conducted may require additional OpSpecs, such as:

- OpSpec B29, Driftdown or Fuel Dumping for Terrain Clearance
- OpSpec B37, Operations in the Pacific Track Systems
- OpSpec B39, MNPS
- OpSpec B40, Areas of Magnetic Unreliability
- OpSpec B44, Planned Re-Dispatch En-Route
- OpSpec B46, RVSM
- OpSpec B55, Polar Operations

5.5.1.15. ISSUE PARAGRAPH D86 (MAINTENANCE). OpSpec D86 contains information on the aircraft, authorized diversion time in minutes, their maintenance programs, and the Configuration Maintenance Procedures (CMP) documents (as applicable) for the airplanes the operator will use in GACAR Part 121 ETOPS.

5.5.1.17. OPERATORS WITH EXISTING ETOPS AUTHORITY.

A. Recognize that once an operator has authorization to conduct ETOPS, procedures and systems should be in place to support any additional ETOPS authority. Therefore, the application package for an operator who is experienced in ETOPS and who is requesting a new aircraft/engine combination, a change to their existing authorization (120 minutes to 180 minutes), or a new geographic area of operation may not need to be as complex as an application package from an operator who has never held ETOPS authority. The team leader will determine the necessary level of complexity with the concurrence of the operator’s PIs.

B. For operators with existing ETOPS authority wishing to add a new ETOPS destination, an inspection of the new ETOPS station/facility must be conducted by an Inspector (Airworthiness) no later than 90 days after initial start up. Additionally, for existing ETOPS stations that have never had a facility inspection or have not had an inspection within the last 24 months, a station/facility inspection by an Inspector (Airworthiness) and, if appropriate, an Inspector (Operations) should be conducted within 120 days of issuance of this guidance. For GACAR Part 121 operators, the responsible Inspector should complete the GAR Activity Report (GAR) as soon as practical. The Inspector (Airworthiness) should make every effort to schedule complementary inspections during the same station/facility visit. For example, also conduct contract maintenance, fuel facility, CAMP requirements inspections, etc., as applicable.

NOTE: Considering appropriate risk assessment guidelines, there may be a possible reduction to the 3 year requirement based on those assessments, if approved by the Director, Flight Operations Division.

VOLUME 5. AIRCRAFT EQUIPMENT AND OPERATIONAL AUTHORIZATIONS

CHAPTER 5. AIRPLANE AUTHORIZATIONS AND LIMITATIONS

Section 2. Evaluate Reduced Vertical Separation Minimums (RVSM)

5.5.2.1. GACA ACTIVITY REPORT (GAR).

A. 1411 (OP)

B. 3411 (AW)

5.5.2.3. OBJECTIVE. This section provides guidance to General Authority of Civil Aviation (GACA) aviation safety inspectors (Inspectors) evaluating applications for an operator to conduct flight in airspace where Reduced Vertical Separation Minimums (RVSM) are applied, for evaluating and approving RVSM maintenance programs associated with an application and for the approval for RVSM operations by issuance of operations specifications (OpSpecs) or a Certificate of Authorization, as appropriate.

5.5.2.5. GENERAL.

A. Requirements. General Authority of Civil Aviation Regulation (GACAR) Part 91, Appendix D, Section V states the requirements an operator and the operator's aircraft must comply to operate a civil aircraft of Kingdom of Saudi Arabia (KSA) registry in RVSM airspace.

B. Authorization Criteria. Aircraft and operators must be authorized by the President to conduct operations in RVSM airspace. The criteria needing to be evaluated to issue this authorization consist of three basic elements:

1) An aircraft must be determined to comply with the requirements of GACAR Part 91, Appendix D, Section V.

2) The operator's maintenance program must be found to comply with the requirements of GACAR Part 91, Appendix D, Section V.

3) The operator must be found to have adopted RVSM operating policies and procedures for pilots and, if applicable, dispatchers, that are acceptable to the GACA, as well as subscribing to RVSM Height Monitoring requirements.

C. Responsibilities.

1) The applicant will obtain and submit all documents that establish the eligibility of its aircraft for RVSM operation. The applicant will submit evidence to the GACA that it is capable of operating and maintaining each aircraft or aircraft group for which it applies, and an RVSM maintenance program for approval. The applicant will establish that each pilot has an adequate knowledge of RVSM requirements and procedures. The applicant may also be required to submit its RVSM policy and procedures and its initial and recurring pilot training requirements for acceptance.

2) The principal maintenance inspector (PMI) will make the determination of an aircraft's RVSM capabilities and

suitability and will evaluate the operator's maintenance program for compliance with RVSM requirements. The principal operations inspector (POI) will evaluate and accept the required RVSM program's operational elements. Upon aircraft acceptance by the PMI, the applicable principal inspector (PI) will then issue an OpSpecs or COA, as appropriate, to authorize an operator to conduct flight in RVSM airspace.

5.5.2.7. AIRCRAFT ELIGIBILITY AND DETERMINATION.

A. An aircraft may be authorized to conduct RVSM operations if the GACA finds that it complies with the requirements of GACAR Part 91, Appendix D, Section V. Aircraft may be manufactured as RVSM-compliant or brought into compliance through the application of Service Bulletins (SB), Service Letters (SL), or Supplemental Type Certificates (STC), which apply to the specific aircraft type or group and, if applicable, the specific aircraft serial number.

B. The PMI makes the determination of aircraft RVSM eligibility after reviewing substantiating documents developed to meet the following applicable requirements.

1) For an aircraft *not* produced under type certificate to meet requirements as stated in GACAR Part 91, Appendix D, Section V, the PMI ensures that the inspections and/or modifications required to meet the specified performance have been performed and documented.

2) For an aircraft produced under type certificate to meet requirements as stated in GACAR Part 91, Appendix D, Section V, the PMI ensures that RVSM eligibility is denoted in the Aircraft Flight Manual (AFM) or aircraft type certificate data sheet (TCDS) and that the initial finding of conformity with type design has been performed by the appropriate authority.

NOTE: The determination that an aircraft is RVSM-compliant may be accomplished entirely through the examination of documents and/or data. Physical inspection of an airframe may not be required if the submitted documentation is sufficient.

5.5.2.9. MAINTENANCE PROGRAM.

A. Application for Authorization. The application for authorization to operate within RVSM airspace must include an approved RVSM maintenance program. This program must outline procedures to maintain aircraft in accordance with the requirements of GACAR Part 91, Appendix D, Section V.

B. Develop and Obtain Approval. Operators without an approved aircraft maintenance program are required to develop and obtain approval of an RVSM maintenance program. The approved RVSM maintenance program is not required to include elements not related to RVSM maintenance. Inspection programs such as an Approved Aircraft Inspection Program (AAIP) or manufacturer's recommended inspection program do not satisfy the RVSM requirements because they do not contain specific procedures to maintain RVSM aircraft. Operators who maintain their aircraft under a continuous airworthiness maintenance program (CAMP) may choose to incorporate the RVSM maintenance requirements into the program.

C. Approval. The PMI will indicate approval of the RVSM maintenance program. The approved RVSM maintenance program elements are specific to the operator and aircraft for which they are approved and are not transferable.

D. RVSM Maintenance Components. Each RVSM maintenance program must include the following:

1) Identification of components considered to be RVSM critical, and identification of structural areas noted as RVSM critical areas.

2) The name or title of the responsible person who will ensure that the aircraft is maintained in accordance with GACAR Part 43 under the approved program.

3) The method the operator will use to ensure that all personnel performing maintenance on the RVSM system are properly trained, qualified, and knowledgeable of that specific system.

4) The method the operator will use to notify the crew if the aircraft has been restricted from RVSM but is airworthy for an intended flight.

5) The method the operator will use to ensure conformance to the RVSM maintenance standards, including the use of calibrated and appropriate test equipment and a quality assurance program for ensuring continuing accuracy and reliability of test equipment, especially when outsourced.

6) The method the operator will use to verify that components and parts are eligible for installation in the RVSM system, as well as to prevent ineligible components or parts from being installed.

7) The method the operator will use to return an aircraft to service after maintenance has been performed on an RVSM component/system or after the aircraft was determined to be non-compliant.

8) Periodic inspections, functional flight tests, and maintenance and inspection procedures with acceptable maintenance practices for ensuring continued compliance with the RVSM aircraft requirements.

a) These elements may be listed in detail or described by reference to an acceptable program that is identified and controlled by revision or issue number.

b) The need for functional flight tests may be limited to being only required after repairs or modifications that are deemed to warrant such testing and may be accomplished through monitoring height-keeping performance.

9) The maintenance requirements listed in Instructions for Continued Airworthiness (ICA) associated with any RVSM associated component or modification.

10) Any other maintenance requirement that needs to be incorporated to ensure continued compliance with RVSM requirements.

E. RVSM Requirements. Operators using the services of GACAR Part 145 repair stations must include provisions to ensure that the requirements of their RVSM programs are being met.

5.5.2.11. OPERATOR EVALUATION. To obtain authorization from the President to conduct operations in RVSM airspace, an applicant who operates under GACAR part 121, 125 or 135 must submit for approval the initial and recurrent pilot training requirements and RVSM policies and procedures that will enable it to conduct RVSM operations safely.

A. Program Review. The POI will conduct sufficient reviews to ensure that the operator has adopted RVSM operating policies and procedures for pilots and, if applicable, dispatchers, and ensure each pilot has adequate knowledge of RVSM requirements, policies, and procedures. In addition, the operator must establish and maintain a height monitoring program.

B. Height Monitoring Program. Each operator must establish and maintain a height monitoring program. The height monitoring program must ensure that a minimum of two aircraft of each aircraft type grouping of the operator have their height keeping performance monitored at least once every two years or within intervals of 1000 flight hours per aircraft, whichever period is longer. If an operator aircraft type grouping consists of a single aircraft, monitoring of that aircraft shall be accomplished within the specified intervals noted above. Height monitoring may be achieved by flying over designated height monitoring units (HMU) or by conducting flights with GPS-based monitoring units (GMU).

C. Coordination. The POI should coordinate with the PMI to evaluate their findings and determine whether the applicant operator should receive approval for RVSM operations.

D. Approval. After positive review of aircraft compliance, approval of the RVSM maintenance program, and acceptance of operator policies and procedures, a determination that the applicant operator should receive approval for RVSM operations will be made. The POI/PMI will then issue the appropriate paragraphs to the operator's OpSpecs or issue a Certificate of Authorization, as appropriate.

5.5.2.13. COORDINATION REQUIREMENTS. This task requires coordination between Airworthiness and Operations Inspectors.

5.5.2.15. REFERENCES, FORMS, AND JOB AIDS.

A. References.

- GACAR Parts 43, 91, 145, 121, 125 and 135

B. Forms. None.

5.5.2.17. PROCEDURES. The operator and the subject aircraft must meet specific requirements and possess special capabilities in order to be eligible for approval to operate in RVSM airspace.

A. Review and Determination of Aircraft and Maintenance Program Compliance. The PMI should perform the following reviews in order to determine the RVSM suitability of the applicant aircraft and operator's maintenance programs:

1) Determine if the aircraft meets the requirements of GACAR Part 91, Appendix D, Section V, and is RVSM-compliant.

2) Review the substantiating documentation for the aircraft and its associated systems to identify references to RVSM capability. For aircraft not produced under type certificate to meet requirements as stated in GACAR Part 91, Appendix D, Section V, ensure that all required elements of the approved data through which RVSM airworthiness approval is sought have been applied. Data may consist of GACA or foreignapproved SBs, SLs, or STCs. For aircraft produced under type certificate to meet requirements as stated in GACAR Part 91, Appendix D,

Section V, either the aircraft TCDS or flight manual will state RVSM compliance.

3) If sufficient documentation is available, a determination of compliance may be made entirely through the examination of documents and/or data. Physical inspection of an airframe may not be required.

4) Review the RVSM maintenance program to ensure that it contains a minimum of the items listed in section 5.5.2.9.D above. Also, any other maintenance requirement that needs to be incorporated to ensure continued compliance with RVSM requirements should be included.

B. Review and Determination of Operator's RVSM Operational Programs. The POI should perform a review of the following applicant operator's operational programs to determine RVSM suitability:

1) RVSM operating policies and procedures for pilots.

2) RVSM operating policies and procedures for dispatchers (if applicable).

3) Training programs to ensure that each pilot has adequate knowledge of RVSM requirements, policies, and procedures.

4) Establish and maintain a height monitoring and reporting program.

5) Results of RVSM validation flights.

6) Any additional operator programs, procedures, or materials related to RVSM operations.

C. RVSM Authorization.

1) Authorization for GACAR art 121, 125 and 135 operators to operate in RVSM airspace should be granted through the issuance of OpSpec B46 and OpSpec D85. Each aircraft type group for which the operator is granted authority should be listed in their OpSpecs.

2) GACAR Part 91 operators should be issued a Certificate of Authorization (COA) when the initial authorization process has been completed.

5.5.2.19. TASK OUTCOMES.

A. Determine Aircraft RVSM Compliance.

1) If it is determined that the applicant operator's aircraft is RVSM compliant, the PMI will complete the GAR record with date of modification or RVSM compliance date in comment field, notify the POI, and notify the applicant in writing.

2) If it is determined that the applicant operator's aircraft is not RVSM compliant, the PMI will advise the operator/applicant by letter of the determination with an explanation.

B. Approve or Reject Aircraft Maintenance Program/Revision.

1) Upon approval or rejection of the applicant's RVSM program, the PMI will make an entry in the GAR and notify the applicant.

2) If it is determined that the RVSM maintenance program or revision meets all of the regulatory requirements, the approval process is as follows:

a) Approved maintenance programs shall include a list of effective pages and a revision log as future revisions are incorporated.

b) Indicate approval of RVSM maintenance program elements that will be incorporated into an existing accepted or approved program for each element or group of elements by the PMI's signature, date of approval, office name, number, and location.

c) Indicate approval of RVSM maintenance programs submitted as stand-alone on the cover page of the program together with the date of approval, Inspector's signature, office name, number and location. Stamp each succeeding page with the official office stamp, and date and initial it.

d) Other approval controls may be used.

3) If it is determined that the aircraft maintenance program/revision is not acceptable for RVSM, notify the POI, and advise the operator by letter that the program is rejected. Return it to the operator with the reasons for the rejection.

C. Approve or Reject Operator RVSM Application.

1) If it is determined that the applicant operator's aircraft (as determined by the PMI) and operational programs and procedures are RVSM compliant, the POI will grant RVSM approval by issuing OpSpecs or COA as appropriate, by completing the GAR record and then notifying the applicant in writing.

2) If it is determined that the applicant operator's operational programs and procedures are not acceptable for RVSM, notify the PMI, make a GAR entry documenting the non-acceptance, and advise the operator by letter that the program is rejected. Return it to the operator with the reasons for the rejection.

5.5.2.21. FUTURE ACTIVITIES. Surveillance

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 6. ROTORCRAFT AUTHORIZATIONS AND LIMITATIONS

Section 1. Rotorcraft En-Route Descent Area (REDA)

5.6.1.1. GENERAL. This section contains direction and guidance to be used by Inspectors for approving a Rotorcraft En Route Descent Area (REDA) for General Authority of Civil Aviation Part 121, 125 or 135 operators. A REDA is an instrument procedure that provides an en-route descent and transition from IFR to VFR conditions within a specified area of operation. A REDA is not an instrument approach procedure, and it is not authorized as an alternate destination on an IFR flight plan.

5.6.1.3. REQUEST FOR APPROVAL OF REDA. Any operator that desires to establish a REDA shall submit a written request to the GACA. The letter of request from the operator should include the following items:

- A pictorial and/or written description of the proposed REDA
- The means by which positive course guidance is to be established
- Equipment requirements for use in the REDA
- Operations and training manual revisions to incorporate REDAs, if it is an initial application
- The date of first intended use and the proposed length of service for which authorization is sought

5.6.1.5. GACA APPROVAL PROCEDURES. The application for a REDA involves coordination with/or a review by Inspectors and the appropriate air traffic service (ATS) unit servicing the proposed area. The GACA should ensure timely processing of the request to ensure sufficient coordination among all concerned parties is completed before the GACA issues operations specifications (OpSpecs) R104.

A. Navigational Equipment. Inspectors must ensure that the navigational equipment required, including radar altimeter and mapping radar, is appropriately installed and approved for the proposed type of operation. If routes of flight are predicated on the use of an area navigation system (RNAV), the Inspector must assure that the area navigation system used is approved.

B. Route Review. Inspectors must determine that the proposed REDA is clear of obstructions and that positive course guidance is available for the entire route, including descent to the lowest authorized altitude (LAA).

C. Rotorcraft Overwater or IFR Operations Equipment. The Inspector must determine that all navigation equipment to be used in these operations complies with the requirements of General Authority of Civil Aviation Regulation (GACAR) Part 91, §§ 121.513, 125.221 or 135.207. If positive course guidance for any portion of the route is obtained through the use of long-range navigation equipment (VLF/OMEGA, GNSS, etc.), two independent receivers for navigation must be installed and be operative before the Inspector can issue authorization to the operator to use that REDA. If positive course guidance for any portion of the route is obtained through the use of performance-based navigation (PBN), operations and procedures must meet the requirements of GACAR § 91.405, and be issued OpSpec B34.

D. Issuance of OpSpecs.

1) When Inspectors are satisfied that all requirements are met and that appropriate coordination with airworthiness, ATS, and other affected organizations has been accomplished, OpSpec R104 will be issued to the operator.

2) *Authorization Limit*. OpSpecs authorizing the use of REDAs are valid for one year from the date of issuance. Any operator wishing to obtain a revalidation of its REDA authorization must submit written confirmation to the GACA ensuring that the REDA remains clear of obstructions and that positive course guidance continues to be available. The operator must provide the means for any on-site inspection by an Inspector.

5.6.1.7. REDA PICTORIAL AND PLAN VIEW CRITERIA.

A. En-Route Criteria. Figures 5.6.1.1 and 5.6.1.2 portray the en route dimensions to be used to develop the primary and secondary areas for REDA use.

B. REDA Dimensions. REDAs have the profile of Figure 5.6.1.3 and the dimensions of the plan view in Figure 5.6.1.4. The descent area begins at the descent fix and ends at the descent altitude fix. This area must be free of obstacles and must be located over water.

C. Equipment Requirements. All required flight and navigation equipment must be installed and operative to utilize the 400-foot (120 m) minimums.

D. Inoperative Equipment.

1) The LAA will be increased to 700 feet (215 m) as shown in Figure 5.6.1.5 with the radar altimeter inoperative.

2) The LAA will be increased to 700 feet (215 m) as shown in Figure 5.6.1.6 with the mapping radar inoperative.

NOTE: When the radar altimeter is inoperative, altitude will be adjusted upward 5 feet (1.5 m) for each mile over 5 miles (8 km) from the altimeter setting source to the descent altitude fix.

Figure 5.6.1.1. En-Route Criteria (Profile View)

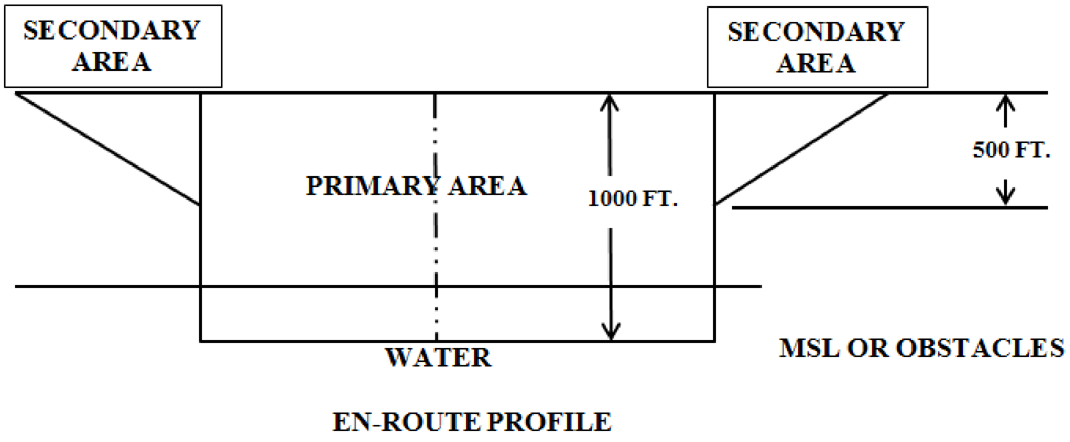


Figure 5.6.1.2. En-Route Criteria (Plan View)

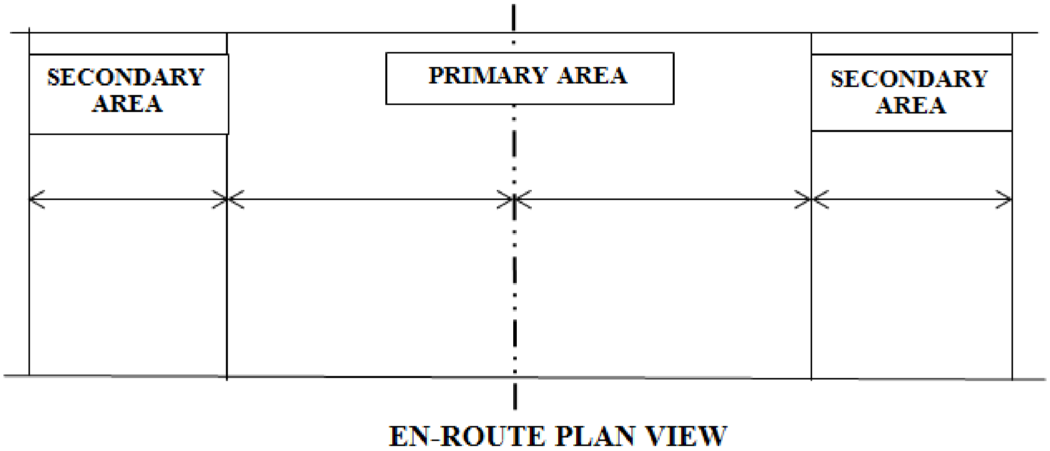


Figure 5.6.1.3. REDA Dimensions (Profile View)

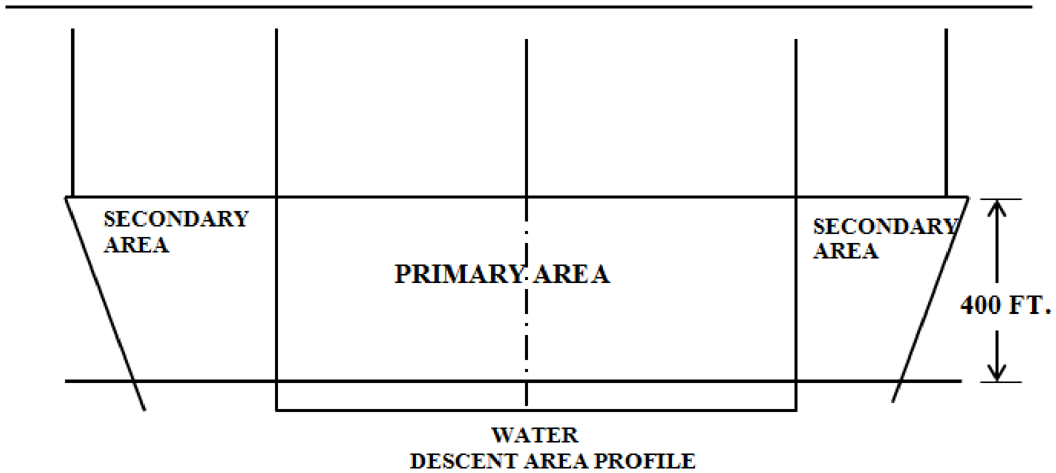


Figure 5.6.1.4. REDA Dimensions (Plan View)

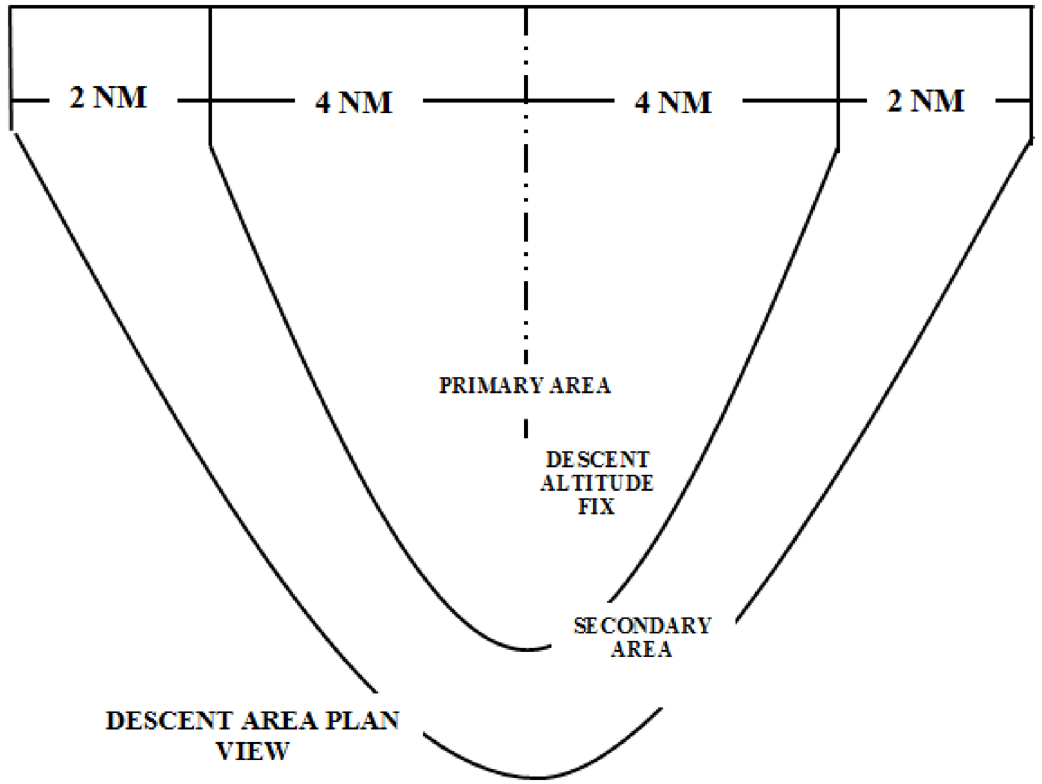


Figure 5.6.1.5. Inoperative Equipment (Radar Altimeter Inop)

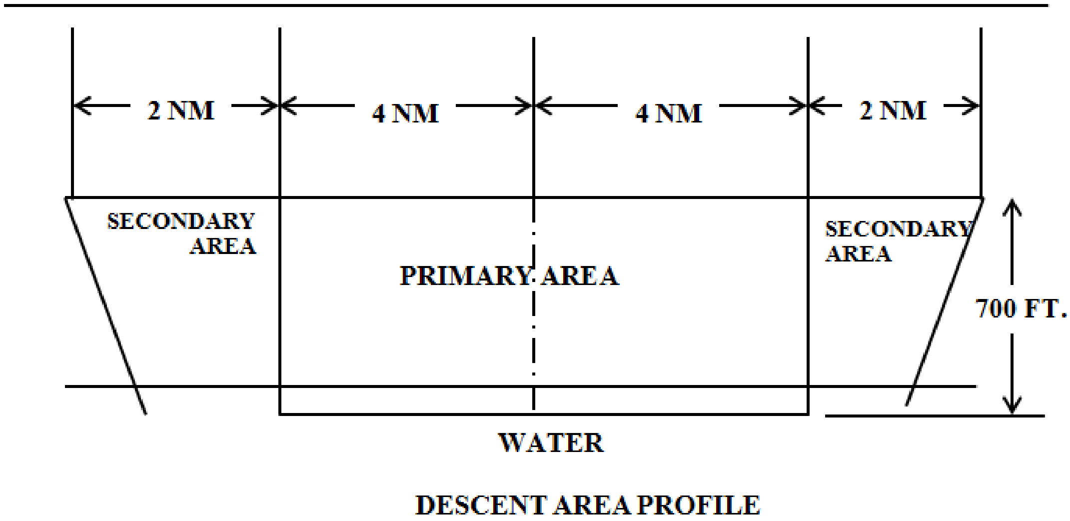
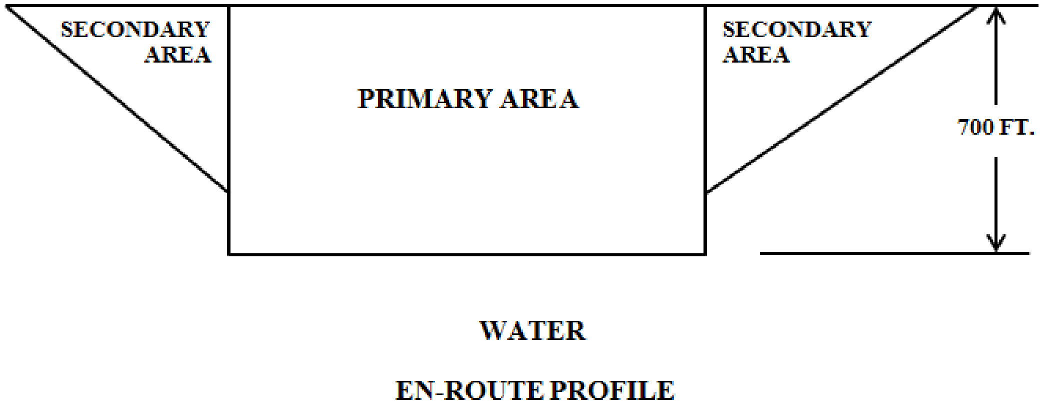


Figure 5.6.1.6. Inoperative Equipment (Mapping Radar Inop)



VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 6. ROTORCRAFT AUTHORIZATIONS AND LIMITATIONS

Section 2. Night Vision Imaging Systems (NVIS)

5.6.2.1. GENERAL. The guidance in this section should be used by General Authority of Civil Aviation (GACA) aviation safety inspectors (Inspectors) when evaluating a rotorcraft operator's request for the use of Night Vision Imaging Systems (NVIS) under General Authority of Civil Aviation Regulation (GACAR) § 91.415. This guidance covers the evaluation of the operator's formal application, revision to the Operations Manual (OM), the addition of an NVIS training program, and minimum equipment list (MEL).

5.6.2.3. OVERVIEW.

A. Night Vision Imaging Systems. The limitations, requirements, and provisions for conducting rotorcraft operations with a night vision imaging system are described in GACAR § 91.415 and the associated Appendix D, Section VIII to GACAR Part 91. Authorization for use of NVIS in rotorcraft operations is through issuance of operation specification (OpSpec) R123. Inspectors are reminded that NVIS authorizations are only permitted for those operators who hold a commercial air operator certificate (AOC) issued in accordance with GACAR Part 119 or an AWOC issued in accordance with GACAR Part 133. The complete description and performance standards of the NVIS including the Night Vision Goggle (NVG) and cockpit lighting modifications appropriate to civil aviation are contained in the Technical Standard Order TSO-C164 and the associated Minimum Operational Performance Standards (MOPS) for Integrated Night Vision Imaging System Equipment (RTCA/DO-275).

1) Currently, an NVIS system consists of the following:

- NVGs
- Interior and exterior aircraft lighting modifications
- Cockpit windows (windshield, windows, chin bubbles, etc.)
- Crew station design and components
- Radar altimeter

B. Civil Use of NVGs. The civil use of NVGs should be approved only for the purpose of enhancing operational safety. NVGs are used as an aid to night flight during visual meteorological conditions (VMC), and operators are not to use NVGs during inadvertent instrument meteorological conditions (IMC). This means that operators must comply with visual flight rules (VFR) weather minimums during a flight. For Part 121 and 135 operators these weather minimums are prescribed in the operator's OpSpecs. The use of NVIS will not change or modify any of the existing regulations.

C. NVIS Approval. The Technical Standard Order TSO-C164 prescribes the NVIS equipment performance requirements for NVIS. The approval for NVIS installation can only be accomplished through the type certificate (TC), amended TC, or Supplemental Type Certification (STC) process. The GACA must determine that an article can perform its intended function after installation and that its operation does not adversely affect the operation of the aircraft and its installed equipment. Flight deck lighting changes to support NVG use, or any approvals related to NVGs must comply with appropriate certification standards.

D. Additional Documents. In addition to TSO-C164 and the associated RTCA/DO-275, the RTCA completed two other documents, RTCA/DO-268, Concept of Operations, Night Vision Imaging System for Civil Operators, and RTCA/DO-295, Civil Operators' Training Guidelines for Integrated Night Vision Imaging System Equipment. These documents may provide operators with additional insight into the implementation of NVGs.

5.6.2.5. COORDINATION AND RESPONSIBILITIES. Inspectors assigned to evaluate NVIS applications may need to coordinate with the Airworthiness Engineering Section in the Airworthiness Division to ensure that the NVIS has been properly approved under GACAR Part 21.

A. The GACA Airworthiness Division is Responsible For:

- Approving the STC for installation of NVIS and the NVG compatible equipment modifications
- Flight testing for NVIS compatibility
- Approving the Aircraft Flight Manual (AFM) supplement

B. The Principal Inspector (PI) is Responsible For:

- Evaluating the NVIS training program and Operations Manual (OM)
- Designating operator or contract authorized instructors
- Operational approval of the NVIS through the issuance of OpSpec R123
- Monitoring training
- Ensuring competency flights are conducted

C. An NVG-Qualified Pilot (Acceptable to GACA) May Assist the PI in the Following Areas:

- Monitoring training
- Conducting competency flights
- Advising Inspectors on recommended changes to the training program and OM

5.6.2.7. CERTIFICATION PROCESS. The standard five-phase certification process described in Volume 3, Chapter 1, Section 1, should be followed for NVIS approval.

A. Pre-Application Phase. During this phase, there are several important issues that the PI must present to the operator. These issues include:

1) OpSpec R123 authorizes approval for rotorcraft Night Vision Imaging System (NVIS) operations, outlines

additional NVG requirements, restrictions, and limitations and approves the Night Vision Imaging System (NVIS) maintenance program.

2) Applicants should review the appropriate NVIS aircraft flight manual (AFM) supplement to ensure that the types of approved operations, crew requirements and other operational requirements and limitations are compatible with their intended NVIS operations.

3) Applicants should note that NVGs with image intensifier tube(s) which are marked “Not for Aviation Use” or with other similar marking(s), or whose serial number(s) is listed as not suitable for aviation use by the manufacturer, or whose tube data sheet(s) indicates that the tube(s) is not suitable for aviation use, may not be used in NVIS operations under OpSpec R123.

4) It is recommended that operators select NVIS flight instructors from the most experienced pilots, preferably those with experience as flight instructors and/or NVIS pilots. Pilots with prior NVIS qualifications with another certificated operator, or who have military NVG training, would typically be good candidates for authorized company NVIS flight instructors.

5) While NVISs provide great benefits for night operations, they have specific performance limitations that affect the visual cues and references available to the pilot. Detailed technical descriptions of NVGs and NVG operations may be found in RTCA/DO-268 and DO-275. Some of the general limitations of NVGs referenced in these documents include:

a) Visual Acuity. The user’s visual acuity with NVGs is less than normal daytime visual acuity.

b) Field of View (FOV). Both the reduced FOV of the image and the resultant decrease in peripheral vision can increase the operator’s susceptibility to misperceptions and illusions.

c) Field of Regard (FOR). The NVG has a limited FOV but, because it is head-mounted, that FOV can be scanned when viewing the outside scene. The total area that the FOV can be scanned is the FOR. The FOR may vary depending on both human limitations and aircraft design.

d) Monochromatic Image. The NVG image appears in shades of green. The image is said to be “monochromatic” because there is only one color. The lack of color variation in the NVG image may degrade object recognition, depth perception and distance estimation capabilities to varying degrees.

e) Monochromatic Adaptation. After using NVGs for a period of time, transition to normal vision, either by looking under or around the NVGs or by discontinuing their use, initially may cause color distortion, often with white lights taking on a pinkish color.

f) Dark Adaptation Time. Depending on the level of ambient light, transition from aided (NVG) to unaided (no NVG) operations may require different time periods to obtain dark adaptation and the best visual acuity. In brightly lit areas (urban areas, well-lit aerodromes/heliports) transition to maximum unaided acuity may be instantaneous. In dark areas, typically in remote areas with little cultural lighting, especially when lunar illumination is absent, dark adaptation may take up to five minutes.

g) Crew Member Performance. Night operations impose different stresses on pilots than day operations, and these factors may become worse in NVIS operations with a resulting negative effect on crew member performance. Included in these factors are: fatigue, stresses, eyestrain, working outside the crew member's normal circadian rhythm envelope, increased helmet weight, and the aggressive scanning techniques required to deal with reduced FOV. These limitations may be mitigated through proper training and recognition, experience, adaptation, rest, risk management, and proper crew rest/duty cycles.

h) Depth Perception & Distance Estimation. When flying, it is important for pilots to be able to accurately employ depth perception and distance estimation techniques. When viewing an NVG image, monocular vision is used, even though the NVG used when flying is a binocular system. This has to do with the way the eyes function and the design of the NVG. Typically, monocular vision is the type of vision used to support depth perception beyond 30 m (100 feet), not while flying a rotorcraft near the ground (takeoff, landing, hovering, etc.). Depth perception and distance estimation when viewing the surface or objects within 30 m (100 feet) using NVGs is degraded to varying degrees, depending on the quality of the NVG image.

6) Accordingly, NVIS training programs and the associated qualification segment (pilot flight check) must include maneuvers and procedures that are accomplished using external visual references (VFR maneuvers). Emphasis must be placed on maneuvers and procedures, which rely on visual cues and references, such as, but not limited to, high and low reconnaissance, approaches, landings, hovering maneuvers, slope operations, pinnacle operations, and confined area operations. Training and checking must include hovering, autorotations in single engine rotorcraft, and one-engine inoperative operations (including landings) in multiengine rotorcraft.

B. Formal Application and Document Compliance Phase. During these phases, the operator submits, and the PI reviews, appropriate company manuals and training programs.

1) *Operations Manual (OM).* The standard guidance for an OM is outlined in Volume 4, Chapter 12, Manuals, Procedures, and Checklists. A revision to an operator's OM will be required for NVIS authorization. NVIS operational control issues and responsibilities must be listed in the OM. Specific procedures for crew members (including flight nurses, emergency medical technicians (EMT), etc.) will be listed in the OM for NVIS. If there are changes in these procedures and responsibilities between existing unaided operations and proposed NVIS operations, the applicant should indicate that the procedures and responsibilities are the same. Where changes are appropriate, the operator should annotate the basic procedures and responsibilities with the NVIS operations differences.

2) *NVIS Revisions to the OM.* Procedures and responsibilities should include:

- Pilot NVG currency requirements (category and class, type if a type rating is required)
- Proficiency check requirements
- Pilot training requirements
- Check pilot and company flight instructor requirements
- Flight crew member training and currency requirements for use of NVGs
- Recordkeeping requirements

• Minimum safe altitudes for NVIS operations

• NVIS weather minimums

• Aircraft equipment requirements for NVIS and MEL deferrals

• Use of aircraft external lighting

• NVIS authorized area of operations, NVIS maintenance and inspections,

• NVIS preflight inspection procedures

• Reporting of NVIS irregularities and discrepancies

• Crew flight time and rest requirements

• Crew Resource Management (CRM)

• Preflight planning, including aircraft performance requirements

• Detailed crew briefings

• Light discipline, internal and external

• Scene landings (unimproved landing sites)

• Abort/Go Around Criteria

• Inadvertent IMC procedures

• Any additional information as needed by the operator

NOTE: The above items are intended as a guide for initial development of the NVIS portion of an OM.

3) *MEL*. MEL guidance is contained in Volume 5, Chapter 4, Minimum Equipment Lists (MEL) and Configuration Deviation Lists (CDL). NVIS includes all of the elements (including the NVG, windshield, lighting system, etc.) required to successfully and safely operate an aircraft with the aid of NVGs. Operators requesting an MEL revision may refer to the guidance outlined in Volume 5, Chapter 4.

NOTE: The installation of search lights, landing lights, and the aircraft's internal lighting system should be approved during the STC process. The GACA will not certify a rotorcraft for NVIS operations without a radar altimeter.

4) *Training Program*. NVIS training may be conducted within the initial new hire, initial equipment, transition, upgrade or recurrent training programs, or in a special qualification program for pilots already serving in the type of aircraft for which NVIS qualification is desired.

a) The ground training for initial NVIS qualification must include at least five hours of ground school. These hours must be added to existing initial new-hire and initial equipment ground training curricula. In the case of transition, upgrade, or recurrent training, one hour of ground is required.

b) Refer to Table 5.6.2.1 below, to determine the norm for flight training hours for training programs that include NVIS operations:

Table 5.6.2.1. NVIS Flight Training Hours (Norms)

	Kind of Operation	**CATEGORY OF FLIGHT TRAINING**				
		Initial New Hire	**Initial Equipment***	**Transition***	**Upgrade***	**Recurrent***
ROTORCRAFT	IFR and VFR/NVIS	PIC – 14 SIC – 14	PIC – 12 SIC – 12	PIC – 4 SIC – 4	SIC to PIC-5	PIC – 5 SIC – 5
	VFR/NVIS	PIC – 8 SIC – 8	PIC – 7 SIC – 7	PIC – 4 SIC – 4	SIC to PIC 3	PIC – 3 SIC – 3
	Minimum NVIS Flight Training Hours	5	2	1	1	1

*These categories assume that the pilot is already NVIS qualified.

1. Volume 4, Chapter 21, Section 6, Flight Training Curriculum Segments, applies in cases where the pilot has demonstrated proficiency before accumulating the program flight hours.

2. If a pilot is currently qualified as a pilot crew member but is not NVIS qualified, initial equipment, transition, upgrade and recurrent training hours are governed by the norms identified in Table 4.21.6.11, found in Volume 4, Chapter 21, Section 6, as appropriate. If NVIS qualification is desired, these training programs must be augmented by no less than five hours of ground and five hours of flight training on NVIS operations.

NOTE: These five hours of flight training may be integrated with aircraft-specific training, but in no case must programs contain less than five hours of NVG flight time.

3. If NVIS training is conducted under a special qualification program, the minimum number of flight training hours is five. For subsequent transition, upgrade or recurrent training programs, refer to Table 5.6.2.1.

4. For air transportation flight instructor and check pilot training, see Volume 4, Chapter 20, Section 4, Check Pilot and Air Transportation Flight Instructor Training.

c) Guidelines for the development of NVIS training programs are contained in Volume 4, Chapter 21, Training

Programs and Airman Qualifications for GACAR Parts 121 and 135. During the formal application phase, the PI should review the training program for appropriate content. If the program requires additional information, the PI should inform the operator in writing. After the satisfactory review of the training program, the PI may approve the NVIS training program. Initial and final approval processes are the same as for other training program approvals. This section also contains elements that inspectors should consider when performing evaluations, as appropriate, of the operator's operations (see Volume 4, Chapter 21 for the types of training categories that operators must use in training curricula in general).

d) All categories of training have both ground training and flight training curricula. Portions of ground training can be divided into airman-specific and operator-specific segments, normally included in basic indoctrination.

1. Modules within the airman-specific segment include, appropriate to the crew member position (pilot, medical crew member, etc.):

- Introduction to NVIS and NVGs
- Limitations/Emergency Procedures
- NVG Aeromedical Consideration/Aviation Physiology, including visual illusions
- NVIS/Night Flight planning (including terrain interpretation)
- Risk management tool for each phase of flight (see FAA Handbook 8083-21, Rotorcraft Flying Handbook, Chapter 14, Aeronautical Decision Making.

2. Modules within the operator-specific segment include:

- Authorized Operations
- Forms and Records
- Responsibilities of the Duty Position
- Applicable regulations and OpSpecs
- Operations Manual

3. Modules within the aircraft ground-training segment include:

- Lighting systems
- Caution/warning systems
- Cockpit familiarization and NVG compatibility

e) Detailed descriptions of the normal, abnormal, and emergency maneuvers must be a part of the NVIS training program. These descriptions may be the same as those used for unaided VFR operations. If differences exist, however, those differences should be noted in the basic description package.

f) In addition to pilot crew members, additional crew members who perform duties in flight are required to have an approved training curriculum. This training includes five hours ground training that must include one hour of NVG demonstration and use, which must be accomplished at night and may be accomplished in flight or on the ground. These crew members will receive the same ground training segments as the pilot crew members, including the aircraft-specific and operator-specific segments. Crew Resource Management (CRM) will be emphasized during crew member training.

g) If only one NVG crew member is required for takeoff from unimproved sites, the operator must develop and use appropriate operational procedures and training for dual NVG high and low reconnaissance, which must include the evaluation of egress route(s). The single pilot using NVISs, provided no substantial change in conditions (wind, obstructions, and weather conditions) has occurred between the time of the reconnaissance and the departure, may use egress routes selected during high and low reconnaissance.

h) It is highly recommended that personnel who support NVIS operations also receive training regarding NVIS operations. For example, local law enforcement officers and other ground support personnel should receive training to ensure appropriate light discipline is used when rotorcraft are landing in remote areas. While encouraged to do so, records of such training are not required to be maintained by the operator, as these personnel are not employees or agents of the operator. It is suggested that this training be conducted during municipality, governorate, or province first responder meetings or training seminars to cover the greatest possible audience.

C. Demonstration and Inspection Phase. During this phase, the PI determines that an operator’s proposed procedures and programs are effective. This is a total evaluation of the operator’s system to include crew members and maintenance personnel. Draft OpSpecs should be provided to the operator for use in its ground and flight training curriculums.

1) NVIS is an advancing field of civil rotorcraft operations. Some certificated operators may not have the expertise to effectively conduct an NVIS ground curriculum without using a contract-training provider. A training vendor, with special qualifications in NVIS operations, may contract with an operator to conduct the ground training for that operator in accordance with Volume 4, Chapter 20, Section 1 and with GACAR §§ 121.839, 133.121, and 135.377.

2) Company flight instructors and check pilots must meet the requirements of GACAR §§ 121.801, 121.863 through 121.875, 133.123, or 135.393 through 135.399. A training vendor cannot conduct any flight training unless the vendor meets the requirements of GACAR §§ 121.847, 133.121, or 135.379. This section of the regulations states “Other than the certificate holder, only another certificate holder certificated under this part or a training center certificated under GACAR Part 142, or a foreign training center approved by an ICAO Contracting States and deemed acceptable by the President, is eligible under this subpart to conduct training, testing, and checking under contract or other arrangement to those persons subject to the requirements of this subpart.” Any training vendor who does not hold an operating certificate and OpSpecs for the same type of operation for which training is provided, or does not hold a GACAR Part 142 training center certificate, with approved courses applicable to the training provided, must be qualified as a pilot and flight instructor for operations by the operator. Policy pertaining to NVIS contract flight instructors and contract NVIS check pilots is covered in

Volume 4, Chapter 9, Section 5. This section also applies to vendors (other GACAR Part 121, 135 or 142 operators) who provide outsourced contract training and checking.

3) The PI should observe all ground and flight training curricula with the operator's initial cadre crew members. This procedure allows the responsible inspectors to evaluate and make recommendations for improvements in training in a very timely manner.

4) The final portion of this phase is completion of the qualification segment. A GACA operations Inspector should conduct or observe the conduct of the initial cadre pilot qualification checks, including any check pilot evaluations for the initial cadre of check pilots.

D. Certification Phase. In this phase, OpSpec R123 is issued to the operator authorizing NVIS operations. OpSpec R123 is NVG-specific. Once the operator has revised the applicable sections of its OM, maintenance manual (MM), training program, and the aircraft has completed the NVIS STC certification requirements, the PI's may approve the NVIS operation with the issuance of OpSpec R123. GACA Activity Report (GAR) records should be completed and the surveillance plan established.

E. OpSpec Currency Requirements.

1) In order for a pilot to act as a pilot in command (PIC) using NVGs while carrying passengers, the pilot must have performed and documented within the preceding 90 days three NVIS operations as the sole manipulator of the controls during the period that begins one hour after sunset and ends one hour before sunrise. These NVIS operations must be performed in the same category, class, and, if a type rating is required, type of aircraft in which NVIS operations will be performed. Each NVIS operation must include, at a minimum, the tasks listed by the OpSpec R123. If a pilot has not performed and documented these tasks, the pilot may be allowed an additional 90 days to perform and document them; but will not be allowed to carry passengers using NVGs during that time. If the pilot has still not performed and documented these tasks during those additional follow-on 90 days, then the pilot will be required to pass an NVIS proficiency check in order to act as a PIC using NVGs.

2) During the Demonstration and Inspection Phase, oversight of the operator's recordkeeping is essential. The tracking of NVG currency should be a continuous 90-day review, similar to the pilot flight and rest requirements of Part 121 or 135.

3) The reliability of the NVIS and safety of flight operations is dependent on the operators adhering to the Instructions for Continued Airworthiness (ICA). These ICAs are developed by the NVIS manufacturer and the STC holder.

4) A common misconception in pilot NVG qualification requirements is that qualified NVG pilots must always be trained and checked in each aircraft approved for NVIS use on an annual basis. GACAR §§ 121.801, 121.923, 133.121, and 135.349, which address pilot training and testing requirements, require pilots to have completed an annual written or oral test, and a competency check in each aircraft type. Furthermore, they require each pilot to be tested on the installed major appliances and contents of the Aircraft Flight Manual (AFM) or equivalent. Additionally, these regulations refer to rotorcraft type as basic make and model when completing pilot testing. This language has led operators to believe that training and checking of NVG qualified pilots in each NVG approved make and model aircraft were always required on an annual basis. However, there are limitations to the number of recurring checks that are necessary to meet the NVG qualification and currency requirements.

5) In addition to the checking requirements outlined in GACAR §§ 121.801, 133.121, and 135.349, OpSpec R123 provides supplemental information for NVIS currency requirements. These documents require NVG qualified pilots to maintain a 90-day currency requirement when conducting NVG operations, and such currency is limited to aircraft “category and class” (i.e., rotorcraft) and type, if applicable.

6) The NVIS requirements are determined to be similar within most rotorcraft, (i.e., there are no make/model specific NVIS currency requirements). However, there are 90-day NVIS currency requirements pertaining to category/class, and type, if applicable.

7) Regarding initial and recurrent pilot testing requirements, such testing shall be conducted in accordance with GACAR §§ 121.801, 133.121, and 135.349, in make/model, for rotorcraft. Similarly, NVG checks can be alternated between aircraft during each successive recurrent check (after the initial NVG competency check in that make/model), thereby eliminating redundant NVG checks thereafter, provided all aircraft in which the pilot is qualified are equipped with the same manufactured model of NVGs. However, during each recurring check, the pilot, if qualified in NVG operations, should be tested on those NVG operations specific to that make/model aircraft.

8) If an NVG qualified pilot receives NVG-only differences or transition training in the same duty position on an additional make/model aircraft, in which he is already qualified for VFR-day/night operations, then he is required to have an initial NVG competency check in that aircraft. However, once the initial competency check is completed, the pilot may alternate between other make/model aircraft (with the same manufactured model of NVGs) during each successive recurring check.

9) At a minimum, operators should ensure that pilots receiving transition training or differences training on other make/model aircraft receive NVG ground and flight training in the following special emphasis areas: specific lighting considerations, switchology, aircraft configuration (e.g., wheel or skid gear; single or multiengine), and aircraft ergonomics that are applicable and relevant to the safety and efficiency of NVG operations in that aircraft. Once the pilot completes the initial NVG check for that make/model aircraft, the pilot may alternate NVG checks between aircraft in subsequent checks to meet the annual NVG checking requirements, unless the operator chooses to conduct all required recurrent checking events during NVIS operations to satisfy both the recurrent aircraft-specific requirements (to include line checks) and NVIS requirements simultaneously. Combining the aircraft-specific and NVIS events may be desired, to eliminate unnecessary additional checking, while still providing an equivalent level of safety and standardization.

10) Guidelines for NVIS check pilot and instructor approvals should follow the same principles cited above. However, the NVIS check pilot and instructor must still meet the regulatory requirement to remain a qualified crew member in the same types of operations for which he holds check pilot or instructor authority. Evaluations of check pilots conducting NVIS checks in multiple aircraft should be alternated between aircraft when possible.

F. Considerations for Use of NVIS in REMS Operations. Specific NVIS procedures for flight nurses, emergency medical technicians (EMT), and other medical crew members involved in Rotorcraft Emergency Medical Service (REMS) operations will be listed in the OM. Inspectors should ensure the REMS elements outlined in Volume 4, Chapter 28, Air Ambulance Operations, are included in an operator’s training program for flight crew and medical personnel in REMS operations. Additional crew members, such as flight nurses and EMTs, who perform duties in flight, are required to have an approved NVIS training curriculum. This training includes five hours ground training that must include one hour of NVG demonstration and use, which must be accomplished at night and may be accomplished in flight or on the ground. These crew members will receive the same ground training segments as the pilot crew members, including the aircraft-specific and operator-specific segments. CRM will be emphasized during crew member training. It is highly recommended that ground ambulance operators and other ground medical personnel who support NVIS operations also receive training regarding NVIS operations. For example, training to ensure appropriate light discipline is used when a rotorcraft is landing in remote areas should be given. Since these personnel may not be employees or agents of the operator, a record of their training is not required to be maintained; however, operators are encouraged to do so.

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CHAPTER 6. ROTORCRAFT AUTHORIZATIONS AND LIMITATIONS

Section 3. Rotorcraft Hoist Operations (RHO)

NOTE: This guidance to be developed at a later date.

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CHAPTER 6. ROTORCRAFT AUTHORIZATIONS AND LIMITATIONS

Section 4. Authorization of Helicopter Performance Class-2 with Exposure (PC2WE)

5.6.4.1. GACA ACTIVITY REPORT (GAR).

1- Flight Operations (to be developed)
2- Airworthiness (to be developed)

5.6.4.2 GENERAL.

1- The purpose of this Section is to stipulate the policies, processes, and procedures employed by GACA for the issuance of authorization of helicopter performance Class-2 with exposure operations.
2- The policies, processes and procedures contained in this Section are to be followed by the GACA Flight Operations Inspectors, Airworthiness Inspectors, and the applicant for this authorization.
3- GACA Authorization for helicopter performance Class-2 with exposure operation is done via the issuance of OpSpec R-140 Helicopter Performance Class-2 with Exposure (PC2WE).

5.6.4.3 INSPECTOR REQUIREMENTS. Both Flight Operations and Airworthiness Inspectors must be thoroughly knowledgeable and fully familiar with the contents and requirements of this Section.

5.6.4.5 REQUIREMENTS BY THE APPLICANT: An applicant for the Helicopter Performance Class-2 (PC2WE) Authorization must:

1- Be thoroughly familiar with the contents and requirements of this Section.
2- Comply with the stipulated requirements in this Section that include but not limited to preparing:

a- A PC2WE Manual.
b- A compliance checklist against all the stipulated requirements.

5.6.4.7. REGULATORY REFERENCES:

1- § 121.353 Operations in Performance Class 2.
2- APPENDIX F TO GACAR PART 121 – ROTORCRAFT PERFORMANCE REQUIREMENTS, Section-II-Helicopter Performance Class-2 with Exposure.
3- GACA eBook Volume-15, Chapter-3, Section-5 (Rotorcraft).

5.6.4.9. ADDITIONAL RELATED REFERENCES.

1- ICAO Annex-6 Part-III, Section-II, Chapter-3, (3.1.2).
2-ICAO Document-10110 Helicopter Code of Performance Development Manual (HCPDM).

5.6.4.11 GACA PROCESS FOR HANDLING PC2WE APPLICATIONS: The process of handling the PC2WE will be according with the following main steps:

1- The applicant submits the request for PC2WE authorization to the assigned operator's POI.
2- The applicant will be informed of all the required regulatory requirements and all the requirements stipulated in this Section.
3- The applicant will prepare the required PC2WE Manual in accordance with the requirements of this Section in addition to the required Compliance Checklist.
4- GACA assigned Flight Operations and Airworthiness Inspectors will review the submitted documents.
5- Upon satisfactory review and approval of the PC2WE Manual and Compliance Checklist, GACA Flight Operations and Airworthiness Inspectors will conduct the physical evaluation phase of the process to ensure the ability of the applicant to comply with the PC2WE authorization requirements.
6- Upon satisfactory findings of the above, GACA will issue the PC2WE OpSpec (R-140) to the applicant operator.

5.6.4.13. FUTURE ACTIVITIES: Upon the issuance of the PC2WE OpSpec, the continuous compliance of the applicant with the requirements in this Section will be covered under the GACA Surveillance Program in accordance with GACA eBook Volume-12.

5.6.4.15. PC2WE MANUAL REQUIREMENTS: An applicant for PC2WE authorization must prepare and submit a PC2WE Manual to GACA for evaluation and approval. The PC2WE Manual may be a separate manual or a part of the operator's Operations Manual. The PC2WE must contain, but not limited to the following items:

− Identification of the aircraft (by model, type, and registration) to be authorized for PC2WE authorization.
− Identification of the exact location(s) within KSA where PC2WE is to be conducted per each aircraft type and model.
− A defined exposure time (in seconds) for the PC2WE authorization for each aircraft type and model.
− Procedures covering the "Limitations of Exposure" as prescribed in **(5.6.4.17.2.8)**.
− Procedures covering the "Limitations Over Congested Areas" as prescribed in **(5.6.4.17. 2.9)**.
− Procedures for maintaining the Target Level of Safety (TLS) as prescribed in **(5.6.4.17. 3.2.1)**.
− Procedures for accessing manufacturer's power loss data to accurately establish the engine failure rates (the Power-loss Exposure Risk Report (PERR)) as prescribes in **(5.6.4.17. 3.3.1)**.
− Procedures for establishing continuing reliability assurance as prescribed in **(5.6.4.17. 3.4)**.
− Airworthiness mitigating procedures as stipulated in **(5.6.4.17. 3.5)**.
− Operations mitigating procedures as stipulated in **(5.6.4.17. 3.6)**.
− Procedures covering the requirement for engine reliability statistics as stipulated in **(5.6.4.17.4)**.
− Procedures covering the requirements for ongoing engine airworthiness requirements as stipulated in **(5.6.4.17.5)**.
− Procedures covering the requirements for operational mitigation as stipulated in **(5.6.4.17.6)**.
− Procedures covering the requirements for PC2WE operations to/from non-confined area ground level helipads as stipulated in **(5.6.4.17.7)** and as applicable to the applicant's authorization.
− Procedures covering the requirements for PC2WE operations to/from non-confined area ground level helipads as stipulated in **(5.6.4.17.8)** and as applicable to the applicant's authorization.
− Procedures covering the requirements for Operations from elevated heliports, helipads or helidecks as stipulated in **(5.6.4.17.9)** and as applicable to the applicant's authorization.

5.6.4.15.1. Documents retention.

The following documents must be retained for a period of no less than 2 years:

− PC2WE Risk assessments,
− PC2WE Performance calculations,
− Pilots PC2WE training records, and the flight
− Completed load manifest.
− Dispatch release.
− Fuel and oil records.
− Flight release.
− Airworthiness release.
− En-route certificate holder radio contact with pilots.
− Flight logbook records.

5.6.4.17. DETAILED INFORMATION ON PC2WE.

5.6.4.17.1. The following portion of this Section provides all required details pertaining to the PC2WE authorization.

5.6.4.17.2. Introduction to Performance Class 2 with exposure

5.6.4.17.2.1. Introduction

5.6.4.17.2.1.1. ICAO Annex 6, Part III, Section II, Chapter 3, section 3.1.2 states *"in conditions where the safe continuation of flight is not ensured in the event of a critical engine failure, helicopter operations shall be conducted in conditions of weather and light, and over such routes and diversions, that permit a safe forced landing to be executed"*.

5.6.4.17.2.1.2. Despite section 3.1.2, section 3.1.3 provides the State (in our case KSA) with the capacity to include operations without a safe forced landing (exposure) in their Code of Performance.

5.6.4.17.2.1.3. The process used to establish such operations must, however, indicate how the safety risk of operating with exposure in the take-off, landing, or en-route phase of a flight will be managed (refer to ICAO Doc 10110 Helicopter Code of Performance Development Manual (HCPDM)).

5.6.4.17.2.2. What is exposure.

5.6.4.17.2.2.1. The term 'exposure' is used within a Code of Performance to describe any part of a flight during which the failure of an engine or system could result in a forced landing with an outcome of 'hazardous' or 'catastrophic' (refer to ICAO Doc 10110 HCPDM).

5.6.4.17.2.3. Operations with exposure

5.6.4.17.2.3.1. Following on from above, within performance class operations, a flight where failure of an engine or system does not permit continued safe flight and does not ensure a forced landing into a suitable forced landing area, and subsequent survival of the occupants of the helicopter or any potentially impacted third parties, is considered as being conducted with exposure.

5.6.4.17.2.3.2. The consequence of this event will likely result in a safety risk severity category of either 'Hazardous' or 'Catastrophic':

− HAZARDOUS -failure that would result in serious or fatal injury to an occupant.
− CATASTROPHIC -failure that would result in multiple fatalities, or loss of rotorcraft.

5.6.4.17.2.3.3. Despite the above, it is also recognized that a failure leading to a forced landing in an unsuitable forced landing area (for example, one that does not support the survival of the occupants of the rotorcraft), if handled with exceptional skill or with sufficient luck, could result in an outcome better than hazardous or catastrophic, and occupants have been known to survive and be rescued from the most extreme conditions. However, such an outcome is not assured and, as such, this concept cannot be reasonably utilized within a Code of Performance Risk Assessment due to the inherent unpredictability of safety risk severity category outcome.

5.6.4.17.2.3.4. With this in mind, within Performance Class operations, the use of the defined place known as a 'suitable forced landing area' is intended to facilitate management of safety and not to create unrealistic expectations or constrain normal operations. However, when continued safe flight is not possible, or alternatively suitable forced landing areas are not available, the operation is assumed to be conducted with exposure.

5.6.4.17.2.4. Performance Class 2 (PC2)

5.6.4.17.2.4.1. ICAO Annex 6; Part III, PC2 definition: *“A helicopter with performance such that, in the case of critical power-unit failure, it is able to safely continue the flight, except when the failure occurs prior to a defined point after take-off (DPATO) or after a defined point before landing (DPBL), in which case a forced landing may be required”.*

5.6.4.17.2.4.2. During the take-off and landing phases of flight, operations within PC2 need not provide an absolute assurance of safety, provided a forced landing into suitable forced landing area can be achieved, or a safe climb-out conducted. The use of a suitable forced landing area is on the assumption that normal aircraft limits may be exceeded, but there remains a ‘reasonable expectation that there would be no injuries to persons in the rotorcraft or on the ground’.

5.6.4.17.2.5. Flight in performance class 2 with exposure (PC2WE)

5.6.4.17.2.5.1. PC2WE permits operations without the safety assurance of a suitable forced landing area provided that the Safety Target is achieved. However, suitable forced landing areas are just one means of protecting persons and property against engine failure risk. PC2WE offers operators alternative mitigation strategies based on:

− a defined exposure time limit in operation manual,
− demonstrated engine reliability,
− engine continued airworthiness,
− pilot procedures and training, and
− operator risk assessments.

5.6.4.17.2.5.2. Due to complexities around the risk mitigation strategies for PC2WE, GACA can only permit this by the issue of specific operational approval via the issuance of Operations Specification (OpSpec) R-140 titled “Helicopter Performance Class-2 with Exposure”. The approval to operate in PC2WE is specific to the operator with specific identification of authorized aircraft by type, model, and registration mark in addition to specific locations where this type of operation is authorized. Despite this, operators must not assume that PC2WE will be acceptable for every departure or landing site due to significant variations in the consequence of engine failures across different sites, particularly for third parties exposed to the operation. For example, PC2WE may not be operationally acceptable to the operator to/from a heliport within a densely populated urban area, but it may meet the operator’s risk criteria to/from a rural heliport with few people routinely in the vicinity. Thus, most operators will use a combination of the available performance classes across their operations dependent on location and circumstance, with each situation supported by the results of a risk assessment using their SMS processes.

5.6.4.17.2.6. Examples of 'exposure' to engine failure risk

5.6.4.17.2.6.1. If what would normally be a PC2 take-off is flown outside of the avoid area of the Helicopter Height-Velocity HV envelope, or within the weights and profile of a Category A procedure, but the forced landing area does not allow for a reasonable expectancy of no injuries to persons in the aircraft or on the surface, (i.e. there is no suitable forced landing area available) this is PC2WE (e.g. over bush, swamp, rocky ground, houses, public roads etc.).

5.6.4.17.2.6.2. If the take-off is flown over a suitable forced landing area, but the take-off is flown inside the avoid area of the Helicopter Height-Velocity HV envelope, this is PC2WE (e.g. vertical Out of Ground Effect (OGE) take-off from a football field).

5.6.4.17.2.6.3. If the take-off is flown over a suitable forced landing area via a published Category A flight path, but the aircraft mass is beyond the Category A mass limits, this is PC2WE (e.g. using a back-up Category A technique to a large hospital helipad when above Category A mass limits).

5.6.4.17.2.6.4. Where the landing area can provide for a suitable forced landing, but the approach path is not flown via the published Category A approach profile and within the Category A mass limits for that procedure, or if flown inside the avoid are of the Helicopter Height-Velocity HV envelope, this is PC2WE.

5.6.4.17.2.7. Helicopters permitted to fly in PC2WE.

5.6.4.17.2.7.1. The performance classes exist to provide a measure of safety assurance following an engine failure. A key component of this assurance is the knowledge that the rotorcraft being used is meeting a specified certification standard that represents redundancy of systems, quality of manufacture, and availability of performance data for pilots. For these reasons, only helicopters which fall within the definition of a Category A Helicopter and are equipped with all the required systems as stipulated in APPENDIX D TO GACAR PART 91 – SPECIAL FLIGHT OPERATIONS AUTHORIZATIONS, VI. REMS Operations (b) (3), dual radio altimeters, and a low-height warning system capable of visual and aural warnings.

5.6.4.17.2.8. Limitations of exposure

5.6.4.17.2.8.1. GACAR §121.323(g) details the types of operations where PC2WE, or a higher performance class, is required.

5.6.4.17.2.8.2. All obstacles encountered while All Engines Operating (AEO) during the exposure time must be avoided by an adequate vertical margin as defined by the operator in accordance with §121.329.

5.6.4.17.2.8.3. Exposure operations are only permitted before Defined Point After Take-Off (DPATO) or after Defined Point Before Landing (DPBL). This equates to a maximum height of 300 ft above the Helicopter Landing Site (HLS). While above this height, rotorcraft must be flown in accordance with the standard PC2 or PC1 requirements as explained in §121.323.

5.6.4.17.2.8.4. Take-off and landing mass limits are as for PC2, either the more limiting of a mass which will permit One Engine Inoperative (OEI), a 150-fpm rate of climb at 1,000 ft above the HLS, or the mass determined by the One Engine

Inoperative (OEI) power required for the procedure. It is recommended for added safety that these mass limits must be reduced for operations over congested areas as detailed in the next section below.

5.6.4.17.2.9. Limitations over Congested areas.

5.6.4.17.2.9.1 Operations over congested areas do not change the likelihood of the engine failure risk being realized, but they increase the consequences compared with being outside congested areas. These increased consequences may be realized due to the presence of third parties on the ground or critical public infrastructure (hospitals). For this reason, any operator approved for PC2WE when operating over congested area must consider further limitations aimed at maximizing a pilot's ability to avoid third parties or property. Operators who have been granted approval for PC2WE must ensure that there is no risk to the lives or property of third parties during exposure time.

5.6.4.17.2.9.2. For PC2WE operations over congested areas, it is recommended that the helicopter mass, with the critical power unit inoperative and the remaining power unit at the maximum for the One Engine Inoperative (OEI) procedure, avoid exceeding the maximum mass specified in the RFM to assure a climb gradient of 8.0% in still air.

Note: 8.0% climb gradient at a Takeoff safety speed for Category A rotorcraft (V_{TOSS}) of 40 kts equates to 324 fpm rate of climb and will ensure pilots have sufficient power margins to allow increased flexibility in their actions during the exposure time.

5.6.4.17.2.9.3. Degraded vision at night reduces a pilot's ability to avoid obstacles (while exposed) and select options to minimize the risk to third parties or property. Because of this, PC2WE will not be approved for night REMS operations over congested hostile environment.

5.6.4.17.3. The Safety of risk assessment to PC2

5.6.4.17.3.1. The Safety of risk assessment

5.6.4.17.3.1.1. GACA acceptance of the risk of failure of the critical engine without having a suitable forced landing area is based on the principles of risk management as described in GACAR §5.3 Risk Management – Principles and guidelines and VOLUME 2. SAFETY MANAGEMENT SYSTEMS – GENERAL CHAPTER 6. MISCELLANEOUS Section 1. Safety Risk Management (SRM) Processes and Tools.

5.6.4.17.3.1.2. Under circumstances where such engine failure risk would be present, operations must be conducted under a specific approval, for example:

- operations to an elevated Final Approach and Take-off Area (FATO),
- exposure to deck edge strike,
- when permitted, operations from a site where a suitable forced landing area is not available because the surface is inadequate,
- operations where there is penetration into the avoid area of the Helicopter Height-Velocity HV envelope for a short period during take-off or landing.

5.6.4.17.3.1.3. The authorization for the above operations may be granted for operators certificated under GACAR Part-121 who are authorized to use aerodromes.certificated under GACAR Part-138.

5.6.4.17.3.1.4. The authorization is based on a risk assessment that includes the mandatory application of the five key risk control measures for operations with exposure, all of which are discussed in detail in the following paragraphs:

1) A stated target level of safety that represents the likelihood of the engine failure risk being realized during a stage of flight where suitable forced landing areas are not available, or a safe fly-away is not possible.
2) A rotorcraft reliability assessment that is used to derive maximum approved exposure times from the safety target.
3) Continuing reliability assurance processes to ensure the rotorcraft reliability assessment remains valid.
4) Mitigating airworthiness procedures used as an additional control measure aimed at further reducing the likelihood below the safety target.
5) Mitigating operational procedures aimed at further reducing the likelihood below the safety target, and for reducing the consequences of any realized risk.

5.6.4.17.3.2. The Target Level of Safety (TLS)

5.6.4.17.3.2.1. To establish the probability of an engine failure occurring within the period of time where a safe continuation of flight, or a safe forced landing to a suitable forced landing area is not possible, is known as the exposure time (§ 121.323(g)). In keeping with a number of international Aviation Authorities, GACA considers a TLS of 5×10^{-8} (1:20 million) as an acceptable residual risk of engine failure within the defined stages of flight which allow PC2WE, for a well-maintained turbine powered rotorcraft operated in accordance with this Appendix.

5.6.4.17.3.2.2. Most modern helicopters, with well-maintained turbine engines, are assumed to be able to achieve an engine failure rate of less than 1:100,000 flight hours with an engine reliability figure of 1×10^{-5} (PR of 1). On this assumption, a calculation can be made to determine that a 0.18 second exposure time for a multi-engine helicopter results in a 1:20 million probability RA of 1×10^{-9} for a “Catastrophic” event with “Multiple Fatalities”, results in the following TMAX.

RA set to 1×10^{-9} and PR set to 1, produces the following TMAX for a twin-engine helicopter:

$TMAX = (10^5 \,.\, 3.6 \,.\, 10^3 .\, RA) / (n \,.\, PR)$
TMAX = (105. 3.6. 103. 10-9) / (2. 1)
Where:
TMAX = The maximum permitted exposure time (in seconds)
PR = Power unit failure rate per 100 000 engine hours
RA = Probability of power unit failure during the exposure time
n = Number of engines

$TMAX = (3.6 \,.\, 10^{-1}) / (2) = 0.18$ Seconds
With the RA set to 5×10^{-8} and a PR set to 1 with a twin-engine helicopter, the following TMAX results:
$TMAX = (10^5 \,.\, 3.6 \,.\, 10^3 \,.\, 5.\, 10^{-8}) / (2 \,.\, 1)$
TMAX = (3.6 . 5) / (2) = 9 Seconds

5.6.4.17.3.2.2. Protecting occupants from post-crash fire.

5.6.4.17.3.2.2.1. Helicopters have the unique ability to slow their forward and vertical speed to near zero during a forced landing, minimizing, to some extent, the dynamic load on occupants. A helicopter built with crash protection standards provides an opportunity for occupants to survive a crash. Yet many survive the crash only to perish in post-crash fires.

5.6.4.17.3.2.2.2. As with crashworthy seats, harnesses, and helicopter design, crash resistant fuel systems have been required in newly certified helicopter-types since the early 1990's. Also, like crash protection requirements, rules for derivative types have permitted the manufacture of new helicopters lacking these safety features.

5.6.4.17.3.2.2.3. Several manufacturers have made compliant systems a standard on all or a large number of their models. In addition, unlike passenger protection, which often cannot be easily improved in legacy aircraft due to basic design issues, fuel tanks and systems are normally upgradable – even if not achieving full compliance with the certification standard.

5.6.4.17.3.2.2.4. This is an area where GACA can mitigate some of the risk inherent in operations with exposure over a hostile environment. Protecting occupants from post-crash fires has been the subject of intense research, on both rotary and fixed wing aircraft, for many decades. The technology is mature, and affordable.

5.6.4.17.3.2.4. Post-Crash Survival and Rescue

Helicopters are often used to access remote locations far removed from rescue resources. When approving the operations with exposure in such environments, GACA must consider the issues of:

- flight following and tracking,
- expeditious warning of forced landing;
- location of downed helicopter and occupants; and,
- survival requirements.

The term hostile environment pertains not only to the unavailability of a safe forced landing area, but also to the conditions that influence post-landing survival. GACA will allow PC2WE operation only if all above mitigations are met.

5.6.4.17.3.3. Reliability assessment

5.6.4.17.3.3.1. The Critical Safety Related Parameter (CSRP), which is a parameter that affects the ability of helicopters to perform a safe forced landing such as engine power, rotor speed, airspeed, altitude, or flight angle, can only be validated by assessing the reliability of specific models of helicopters and their engines. For this reason, operators wishing to conduct PC2WE operations are required to access manufacturer's power loss data to accurately establish the engine failure rates as being not greater than 1:100,000. This data, which is known as a Power-loss Exposure Risk Report (PERR) is available on request from the rotorcraft Original Equipment Manufacturer (OEM).

5.6.4.17.3.4. Continuing reliability assurance

5.6.4.17.3.4.1. It is not sufficient to rely on a snapshot of helicopter reliability in terms of power loss and a rolling five-year average reliability assessment must be obtained each year. This will identify upwards or downwards trends in reliability and allow operators to adequately adjust their procedures where necessary.

5.6.4.17.3.4.2. For new types and new engine airframe combinations that are yet to be established and five-year reliability history, GACA will assess these on a case-by-case basis in conjunction with the certifying National Aviation Authority of an ICAO Contracting State that is accepted by GACA under conditions set by the President.

5.6.4.17.3.5. Mitigating procedures (airworthiness)

5.6.4.17.3.5.1. Mitigating airworthiness procedures are required and consist of the following elements:

− the fulfillment of all manufacturer's applicable modifications.
− a comprehensive reporting system for failures and usage data where reports must be submitted to the Principal Airworthiness Inspector in addition to other regulatory requirements, and
− the implementation of an engine usage monitoring system (UMS).

5.6.4.17.3.5.2. Each of these elements is to ensure that engines, once shown to be sufficiently reliable to meet the safety target, will sustain such reliability (or improve on it). The monitoring system is felt to be particularly important, as it has already been demonstrated that, when such systems are in place, it encourages a more considered approach to operations.

5.6.4.17.3.6. Mitigating procedures (operations)

5.6.4.17.3.6.1. Operational and training procedures to mitigate the risk, or minimize the consequences, are required of the operator. Such procedures are intended to minimize risk by ensuring that:

− the rotorcraft is operated within the exposed region for the minimum time, and
− simple but effective procedures are followed to minimize the consequence must an engine failure occur.

5.6.4.17.4. Engine reliability statistics

5.6.4.17.4.1. Operator requirements

5.6.4.17.4.1.1. As part of the risk assessment when applying for an approval for PC2WE, the operator must provide GACA with appropriate engine reliability statistics for the rotorcraft type and the engine type. This data is available from the rotorcraft OEM.

5.6.4.17.4.1.2. In situations where the operator cannot gain access to the actual failure rate per 100,000 flight hours, GACA may be able to access this information directly from the OEM.

5.6.4.17.4.1.3. Except in the case of new engines, the PERR data must show sudden power loss from the set of in-flight shutdowns (IFSD) events not exceeding one per 100,000 engine hours in a five-year moving window. However, a rate slightly in excess of this value may be accepted by GACA after an assessment showing an improving trend. GACA will consider the potential for heightened exposure of third-party persons and facilities; in such assessment GACA will impose safety conditions to manage the level of exposure of the operation.

5.6.4.17.4.1.4. New engines must be assessed on a case-by-case basis, refer to (5.6.4.17.3.4.2) of this section.

5.6.4.17.4.1.5. After the initial assessment, updated statistics must be periodically reassessed by the operator. Any adverse sustained trend will require an immediate evaluation to be accomplished by the operator in consultation with GACA and the manufacturers concerned. The evaluation may result in corrective action or operational restrictions being applied. Moreover, operators operating PC2WE must report to GACA any data that affects the engine reliability.

5.6.4.17.4.2. Requirements on rotorcraft Type Certificate Holder (TCH)

5.6.4.17.4.2.1. The purpose of this section is to provide guidance for TCH on how the in-service power plant sudden power loss rate is determined. In this determination, there must be shared roles between the rotorcraft and engine type certificate holders. This information may also be of interest to operators using PC2WE.

5.6.4.17.4.2.2. Documents must be provided to GACA establishing the in-service sudden power loss rate for the rotorcraft/engine installation. Such documents must be provided by the engine TC or the rotorcraft TCH, depending on the way they share the corresponding analysis work. For reasons of maintaining commercial confidentiality, these documents are not required to be presented to rotorcraft operators, unless OEMs allow such data sharing. PC2WE will not be approved for a rotorcraft unless the TCH provides the data described in this section.

5.6.4.17.4.2.3. The engine TCH must provide the rotorcraft TCH with a document including:

- the list of in-service power loss events
- the applicability factor for each event (if used), and
- the assumptions made on the efficiency of any corrective actions implemented (if used).

5.6.4.17.4.2.4. The engine or rotorcraft TCH must provide GACA with a document that details the calculation results considering:

- events caused by the engine and the events caused by the engine installation
- applicability factor for each event (if used), the assumptions made on the efficiency of any corrective actions implemented on the engine and on the rotorcraft (if used), and
- calculation of the power plant power loss rate.

5.6.4.17.4.2.5. The following documentation must be updated every year:

- the document with detailed methodology and calculation as distributed to the authority of the State of design.
- a summary document with results of computation, and
- a service letter establishing the eligibility for PC2WE and defining the corresponding required configuration as provided to the operators.

5.6.4.17.4.2.6. Sudden in-service power loss is an engine power loss:

- larger than 30 % of the take-off power.
- occurring during operation, and
- without the occurrence of an early intelligible warning to inform and give sufficient time for the pilot to take any appropriate action.

5.6.4.17.4.2.7. Each power loss event must be documented, by the engine and/or rotorcraft TC, as follows:

- incident report number
- engine type
- engine serial number
- rotorcraft serial number
- date
- event type
- presumed cause

− applicability factor when used, and
− reference and assumed efficiency of the corrective actions that will have to be applied (if any).

5.6.4.17.4.2.8. Various methodologies for counting engine power loss rates have been accepted by authorities. The following is an example of one of these methodologies:

• The events resulting from:

- unknown causes (wreckage not found or totally destroyed, undocumented or unproven statements), or
- where the engine or the elements of the engine installation have not been investigated (e.g. when the engine has not been returned by the customer), or
- an unsuitable or non-representative use (operation or maintenance) of the rotorcraft or the engine are not counted as engine in-service sudden power loss and the applicability factor is 0%.

• The events caused by:

- the engine or the engine installation, or
- The engine or rotorcraft maintenance, when the applied maintenance was compliant with the maintenance manuals, are counted as engine in-service sudden power loss and the applicability factor is 100%.
- For the events where the engine or an element of the engine installation has been submitted for investigation, but where this investigation subsequently failed to define a presumed cause, the applicability factor is 50%.

5.6.4.17.4.2.9. The corrective actions made by the engine and helicopter manufacturers on the definition or maintenance of the engine, or its installation, may be defined as mandatory for specific operations. In this case, the associated reliability improvement may be considered a mitigating factor for the event. A factor defining the efficiency of the corrective action may be applied to the applicability factor of the concerned event.

5.6.4.17.4.2.10. The detailed method of calculation of the power plant power loss rate must be documented by engine or helicopter TC and accepted by GACA.

5.6.4.17.5. Ongoing engine airworthiness requirements

5.6.4.17.5.1. Airworthiness conditions of approval for PC2WE

5.6.4.17.5.1.1. The rotorcraft operator must attain and then maintain the helicopter/engine modification standard defined by the manufacturer, including where that standard has been specifically designated to enhance reliability during the take-off and landing phases.

5.6.4.17.5.2. Preventative maintenance

5.6.4.17.5.2.1. Operators must conduct the preventive maintenance actions recommended by the helicopter or engine manufacturer as follows:

− engine oil spectrometric and debris analysis, where the OEM specifies a system or process for collection, analysis and interpretation of such data.

− engine trend monitoring, based on available power assurance checks.
− engine vibration analysis (plus any other vibration monitoring systems where fitted), and
− oil consumption monitoring.

5.6.4.17.5.3. Usage monitoring system (UMS)

5.6.4.17.5.3.1. The UMS must fulfil at least the requirements of this subsection.

5.6.4.17.5.3.2. The following data must be recorded:

− date and time of recording, or a reliable means of establishing these parameters
− amount of flight hours recorded during the day plus total flight time
− N1 (gas producer RPM) cycle count − N2 (power turbine RPM) cycle count (if the engine features a free turbine)
− turbine temperature exceedance: value, duration
− power-shaft torque exceedance: value, duration (if a torque sensor is fitted)
− engine shafts speed exceedance: value, duration.

5.6.4.17.5.3.3. Data storage of the above parameters, if applicable, must cover the maximum flight time in a day, and not less than five flight hours, with an appropriate sampling interval for each parameter.

5.6.4.17.5.3.4. The system must include a comprehensive self-test function with a malfunction indicator and a detection of power-off or sensor input disconnection.

5.6.4.17.5.3.5. A means must be available for the download and analysis of the recorded parameters. Download frequency must be sufficient to ensure data are not lost through overwriting.

5.6.4.17.5.3.6. The analysis of parameters gathered by the UMS, the analysis methodology and the frequency of such analysis must be described in the operator's manual UMS management procedures, and any subsequent maintenance actions generated by that analysis must be described in the aircraft's maintenance documentation.

5.6.4.17.5.3.7. The data must be stored in an acceptable form and accessible to GACA for at least 24 months.

5.6.4.17.5.3.8. Where a Full Authority Digital Engine Control (FADEC) system is already being used to record some of the parameters described in this subsection, it is not intended that recording of those parameters are duplicated with an alternative device.

5.6.4.17.5.3.9. For rotorcraft which do not have installed UMS, off the shelf products such as an airborne image recording system (AIRS) with the capability to record and store images, and which permit the download and analysis of the parameters outlined above (as applicable to the rotorcraft) may be suitable for this task.

5.6.4.17.5.3.10. Where an image recording system (AIRS) is used to meet the UMS requirements; operators need to be aware of the limitations relating to such devices. In order to be able to use an AIRS to satisfy the UMS requirements, the images recorded of the flight deck would need to be limited to images of the instrument panel only. Any images of persons on the flight deck would need to be limited to transient images only, for example a hand adjusting the QNH on an altimeter. If the AIRS has the function, any recording of ambient flight deck sounds would need to be disabled so that the information recorded does not constitute *CVR information*.

5.6.4.17.5.3.11. Any UMS to be utilized in PC2WE operations must remain a reliable, accurate, comprehensive, and continuously operating system. The applicant is required to substantiate such assurances it its application.

5.6.4.17.5.4. Power loss reporting

5.6.4.17.5.4.1. Operators must report to the manufacturer and GACA on any loss of power control, engine shutdown (precautionary or otherwise), or engine failure for any cause. The reports must be sent to the assigned Flight Operations and Airworthiness Inspectors in addition to the other regulatory requirements. The content of each report must provide:

- operator (and maintenance organizations where relevant).
- type of rotorcraft and description of operations.
- registration and serial number of the airframe.
- engine type and serial number.
- power unit modification standard where relevant to failure.
- engine position.
- symptoms leading up to the event.
- circumstances of engine failure including phase of flight or ground operation.
- consequences of the event.
- weather/environmental conditions.
- reason for engine failure (if known).
- in case of an in-flight shutdown (IFSD), nature of the IFSD (demanded/un-demanded).
- procedure applied and any comment regarding engine restart potential.
- engine hours and cycles (from new and last overhaul).
- airframe flight hours.
- actions applied including, if any, component changes with part number and serial number of the removed equipment, and
- any other relevant information.

5.6.4.17.6. Requirements for operational mitigation

5.6.4.17.6.1. Development of operational procedures in operation manual.

5.6.4.17.6.1.1. Rotorcrafts may only have a nine-second exposure time available to work within. In these cases, flight profiles must be selected to ensure either a suitable forced landing area can be utilized, or a safe One Engine Inoperative (OEI) climb is achievable, before the nine seconds have expired. This may only be feasible with a normal angle In Ground Effect (IGE-type) take-off where rapid acceleration to V_{TOSS} or V_Y is possible. Vertical take-offs from confined areas often take much more than nine seconds before Takeoff safety speed for Category A rotorcraft (V_{TOSS}) / Speed for best rate of climb (V_Y) is achieved, so may not be a viable option.

5.6.4.17.6.1.2. Rotorcrafts may only have a nine-second exposure time available to work within. In these cases, flight profiles must be selected to ensure either a suitable forced landing area can be utilized, or a safe One Engine Inoperative (OEI) climb is achievable, before the nine seconds have expired. This may only be feasible with a normal angle In Ground Effect (IGE-type) take-off where rapid acceleration to VTOSS or VY is possible. Vertical take-offs from confined areas often take much more than nine seconds before Takeoff safety speed for Category A rotorcraft (VTOSS) / Speed for best rate of climb (VY) is achieved, so may not be a viable option.

5.6.4.17.6.1.3. Some rotorcraft manufacturers of modern rotorcraft will provide specific procedures designed to meet a nine-second exposure requirement. These must be used wherever practical. These procedures may be called ‘PC2 Defined Limit of Exposure (DLE)’.

5.6.4.17.6.1.4. During an approach to land, if RFM Category A weights and procedures are being met (this may not mean PC1), it is always possible to reach the FATO no matter where the engine fails on approach. In these cases, there is zero exposure time, provided the landing distance available is sufficient. For some hot/high/heavy non-Category A approaches, there may be periods where there is insufficient height or speed energy to allow a safe baulked landing or allow the rotorcraft to reach the FATO. Profiles must be adopted that aid in minimizing this time.

5.6.4.17.6.1.5. There are two key questions for exposure following an engine failure during landing where there are no suitable forced landing areas surrounding the FATO:

− Does the rotorcraft have the speed and/or height energy available to allow a safe One Engine Inoperative (OEI) fly-away? and
− Can the pilot achieve a One Engine Inoperative (OEI) landing without the rate of descent exceeding 720 fpm (ultimate load limit)?

Exposure will be present if the answer to both questions is NO.

5.6.4.17.6.1.6. Guidance for the speed and/or height energy requirements can come from RFM landing procedures and with knowledge of One Engine Inoperative (OEI) climb performance. For example, provided the speed is not below V_{TOSS}/V_Y, and 35 ft obstacle clearance is maintained, there is no exposure. Maintaining V_{TOSS} or V_Y until as late as possible will delay the commencement of exposure but may introduce other hazards associated with losing sight of the helicopter Landing Site (HLS) and potential obstacle strikes.

5.6.4.17.6.1.7. Reaching the Helicopter Landing Zone (HLZ) following an engine failure is more difficult in the hot, high and heavy environment. Shallow, faster approaches provide a measure of assurance due to lower power demands but require a largely obstacle free surrounding area. Steeper approaches may more easily reach the helipad, but there remains a risk of excessive rate of descent with a resulting hard landing. Procedures must be chosen that best suit the All-Engine Operative (AEO) and One Engine Inoperative (OEI) performance of the relevant rotorcraft for the operating environment. As a guide, if an approach technique is flown where the total All Engine Operative (AEO) power required is no more than the One Engine Inoperative (OEI) power available, until over the helipad, then the helipad can at least be reached albeit with a possible hard landing.

5.6.4.17.6.2. Flight crew member requirements

(1) **Selection.** The operator must establish criteria for the selection of flight crew members for the PC2WE task, taking previous experience into account. No certificate holder may use, nor may any person serve as, a PIC of a PC2WE operation

unless that person holds a helicopter instrument rating or an airline transport pilot certificate with a category and class rating for that aircraft.

(2) **Experience.** The minimum experience level for the PIC/SIC conducting PC2WE flights must not be less than—

(i) Either—

(A) 1000 hours as PIC of aircraft of which 500 hours are as PIC on type; or
(B) 100 hours as an SIC on type.

(ii) 300 hours operating experience in rotorcraft, gained in an operational environment in the Kingdom of Saudi Arabia similar to the intended operation; and

(3) **Operational training.** Successful completion of operational training in accordance with the PC2WE procedures contained in the operations manual and accepted by the President.

(4) **Recency.** All pilots conducting PC2WE operations must have completed a minimum of 30 minutes of flight by sole reference to instruments in a rotorcraft or in an FSTD within the last 6 months.

5.6.4.17.6.3. Training in operational procedures

The flight crew training and competency check observed by GACA inspector based on the approved OMD.

5.6.4.17.6.3.1 Development of operational procedures for PC2WE will be driven by:

− the rotorcraft type,
− the operating environment, and
− the requirements of the task.

The above items require specific pilot training processes to be put in place.

5.6.4.17.6.3.2. Operators must detail within their manual, pilot induction training, Proficiency check (Recurrent), Semiannual check to cover at least the following elements of PC2WE:

− differences between PC2 and PC2WE
− understanding of when a rotorcraft is exposed to the risk of engine failure
− knowledge of the limitations for approval of PC2WE
− take-off and landing techniques to be applied for the range of expected heliports
− understanding of the PC2 climb performance requirements prior to exposure commencing on approach, or after exposure finishes on take-off, and
− detailed discussion around PC2WE from different types of heliports.

5.6.4.17.6.4. Requirement for risk assessments

5.6.4.17.6.4.1. Any operator conducting PC2WE operations will require a formalized risk assessment process within their manual for the application of PC2WE to their particular operational situations. This risk assessment may form part of the operator's overall risk management processes contained within their SMS but must include identification of the hazards particular to their operations with exposure plus outline control measures put in place to mitigate the risk.

5.6.4.17.6.4.2. Operators wishing to conduct PC2WE operations must consider the following points when developing their risk assessment:

- the consequence of the engine failure risk being realized over critical public infrastructure.
- identifying possible heliports where PC2WE will not be used due to excessive risk.
- development and publication of One Engine Inoperative (OEI) escape maneuver flight paths for specific heliports.
- the potential benefits of the use of full-motion Level-D flight simulator modelling of critical heliports and regular pilot training in low speed One Engine Inoperative (OEI) handling and escape maneuvers in these devices.
- methods of minimizing or removing exposure by operating within Category A helipad weight limits and procedures, and
- regular pilot competency checks to confirm adherence to company procedures to/from critical heliports.
- follow VOLUME 2. SAFETY MANAGEMENT SYSTEMS – GENERAL, CHAPTER 6. MISCELLANEOUS, Section 1. Safety Risk Management (SRM) Processes and Tools.

5.6.4.17.7. PC2WE operations to/from non-confined area ground level helipads

5.6.4.17.7.1. Open areas unsuitable for forced landings.

5.6.4.17.7.1.1. PC2WE may be relevant for non-confined area ground level helipads over areas of flat ground or water where the potential reject area does not constitute a suitable forced landing area. This may be due to excessive vegetation, rocky/uneven conditions, rough seas, or water areas where flotation systems are not available. However, the low height of obstacles might allow Clear Area Category A flight paths, or normal In Ground Effect (IGE) take-offs or landings to be performed (these may also be known as oblique or Cat B take-offs and landings).

5.6.4.17.7.2. Operations within Clear Area Category A weight limits

5.6.4.17.7.2.1. Where the rotorcraft is able to operate within the RFM Clear Area Category A weights, and follow the published Category A flight paths, the exposure time will commence once there is insufficient Final Approach and Takeoff Area (FATO) or clearway remaining to allow for a rejected take-off. This could be as early as the rotating point (Figure 1 below), or after some greater distance (Figure 2 below), depending on the particular heliport.

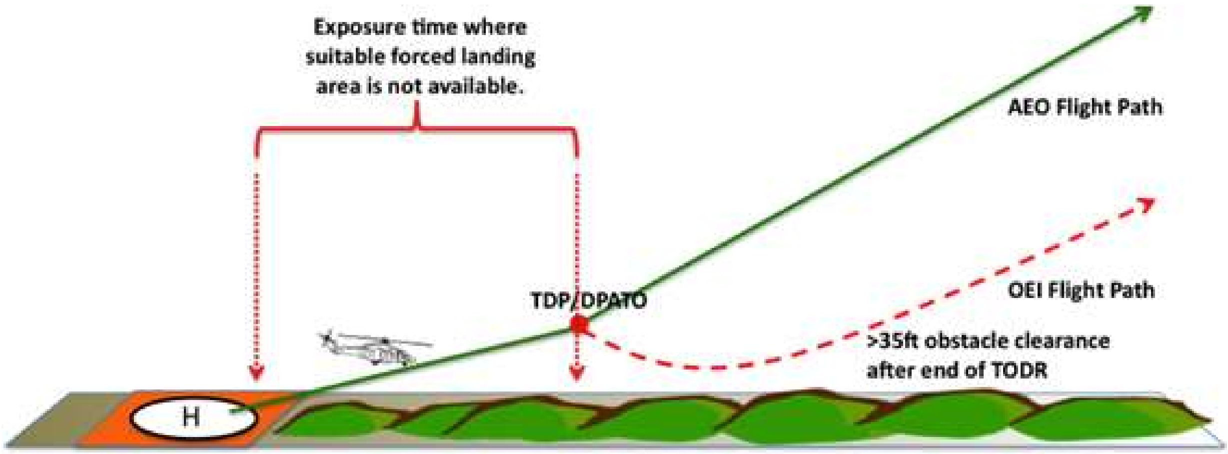

Figure 1: Exposure within Category A weight limits

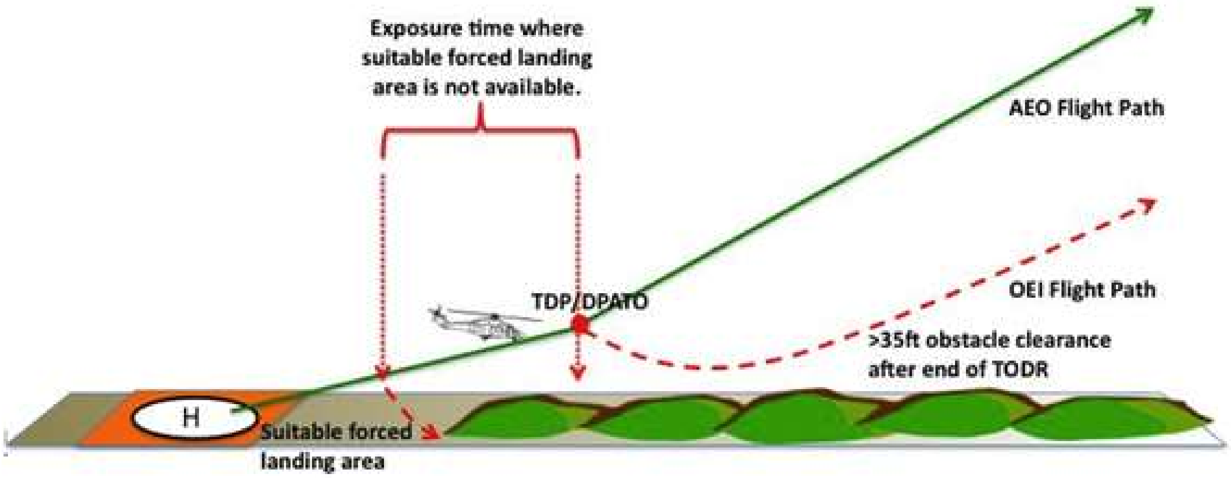

Figure 2: Partial exposure on take-off

5.6.4.17.7.2.2. The exposure time can finish once the rotorcraft is at Take-off Decision Point (TDP) for the procedure, from which point a safe One Engine Inoperative (OEI) climb will be achievable, and supportable with RFM Category A data. In some cases, obstacles in the take-off path may require more height to be gained, beyond the TDP, before the exposure time can be finished and a safe OEI climb conducted (Figure 3 below). In this case, the Defined Point After Takeoff (DPATO) is the point where VTOSS is achieved and 35 ft clearance from obstacles can be continuously maintained.

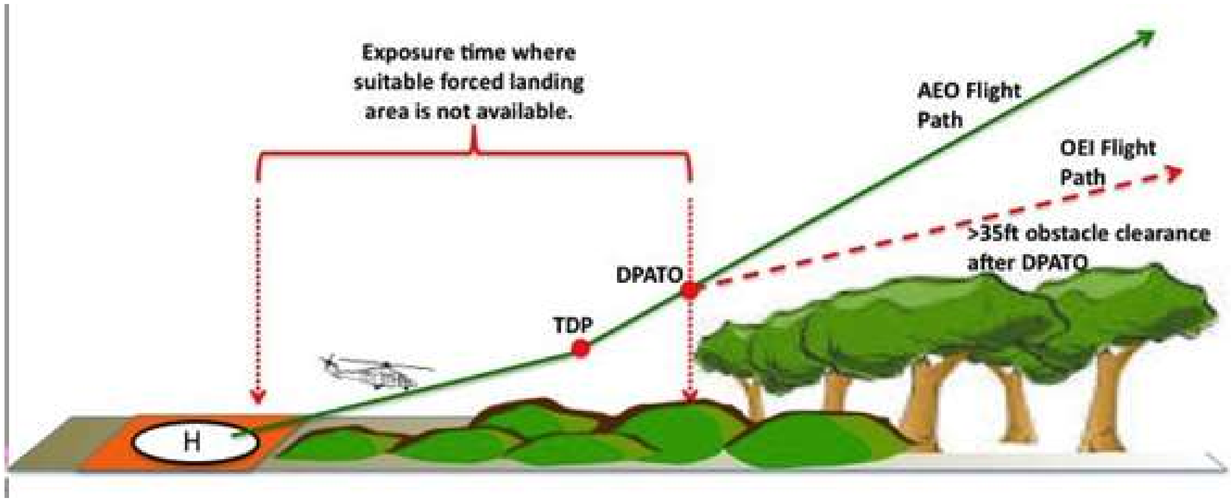

Figure 3: Increased exposure time due to obstacles

5.6.4.17.7.2.3. The point from which the rotorcraft can comply with all the obstacle clearance requirements of a PC2 climb usually marks the end of the exposure time, and it is also the DPATO. However, in some cases, where suitable forced landing areas become available after clearing unsuitable areas (e.g. across rough terrain or rivers), the exposure time could finish before DPATO (Figure 4 below).

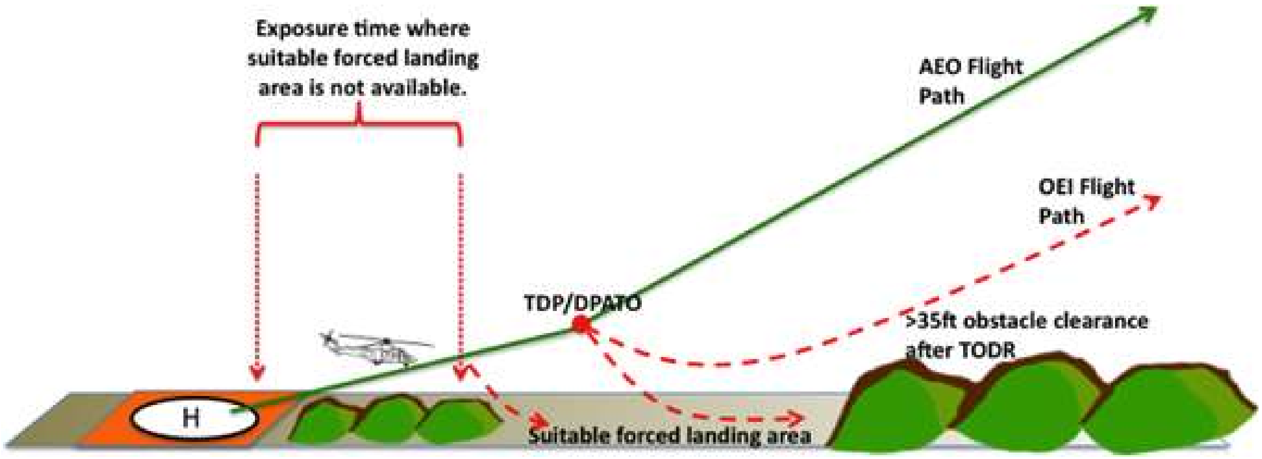

Figure 4: Exposure Finishing before DPATO

5.6.4.17.7.2.4. Unless the end point of the exposure time coincides with the TDP, the position of the DPATO must be based on achievement of a valid V_{TOSS} /V_Y and a positive climb 35 ft clear of obstacles. However, it must be no higher than 300 ft above the heliport. In all cases, the pilot must consider the rotorcraft performance and topography to keep the exposure time less than the approved maximum.

5.6.4.17.7.2.5. When conducting an approach and landing from within Category A weights and following clear area Category A flight paths, but with insufficient landing distance available (per RFM data), the rotorcraft must be able to reach the FATO if it is OEI. However, if the lack of sufficient landing distance results in the area not being a suitable forced landing area, this in turn results in exposure to a hard-low speed landing. Exposure in these cases will be from the

LDP/DPBL until touchdown (Figure 5 below).

Note: If the FATO can be considered a suitable forced landing area for an OEI landing, the operation will not be exposed, but will have reverted to PC2.

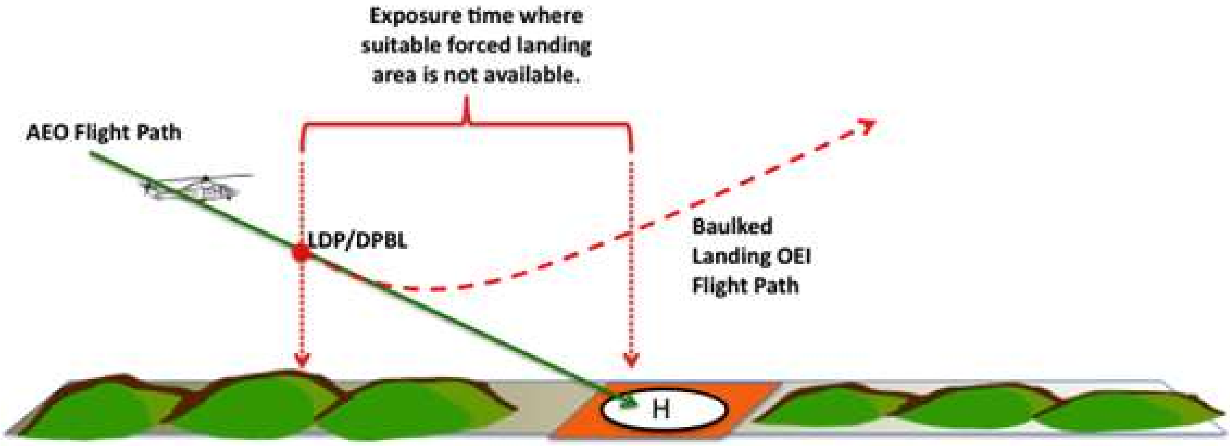

Figure 5: Insufficient landing distance available

5.6.4.17.7.2.6. In cases with high obstacles beyond the FATO, the DPBL might be prior to the LDP. Electing to continue an OEI landing from higher than the Category A LDP is without exposure, but only if sufficient running landing distance is available. Without sufficient landing distance available, a baulked landing and diversion to a more suitable landing area would be appropriate.

5.6.4.17.7.2.7. There is a significant advantage in operating to Clear Area Category A weights and procedures, because the RFM provides data on the height loss from LDP, which allows certainty of a baulked landing with 35 ft obstacle clearance. This aids in delaying the commencement of exposure. Without this Category A data, there is no way to determine height loss in the baulked landing, so exposure would have to commence at the point of deceleration below an appropriate safe OEI climb speed (usually V_Y).

5.6.4.17.7.3. Operations above Category A weight limits

5.6.4.17.7.3.1. Given the PC2WE requirement for hover out of ground effect (HOGE) performance, operations above Category A weight limits are unlikely. However, this subsection details the situation for these rare circumstances. Where the rotorcraft operates above Clear Area Category A weights or does not follow the published Category A flight paths, the exposure time will commence once there is insufficient FATO or clearway remaining to allow for a rejected take-off. This could be as early as the rotate point, or after some greater distance, depending on the particular heliport.

5.6.4.17.7.3.2. The exposure time will finish once the rotorcraft is at the point where a suitable forced landing area becomes available (refer to Figure 4 above), or a safe OEI climb (usually V_Y) and 35 ft clear of obstacles is achieved (Figure 6 below). A flight path remaining clear of the avoid area of the HV envelope must help to achieve V_Y in the shortest possible time. Operators and pilots must be aware that, if operating to the limits of exposure (i.e. OGE hover power and 150 fpm OEI rate of climb), the time taken to reach V_Y could be greater than the approved exposure time. For rotorcraft where this is shown to be the case, weight reductions to below Category A limits may be necessary so that a slower V_{TOSS} speed can be used as the end point of exposure.

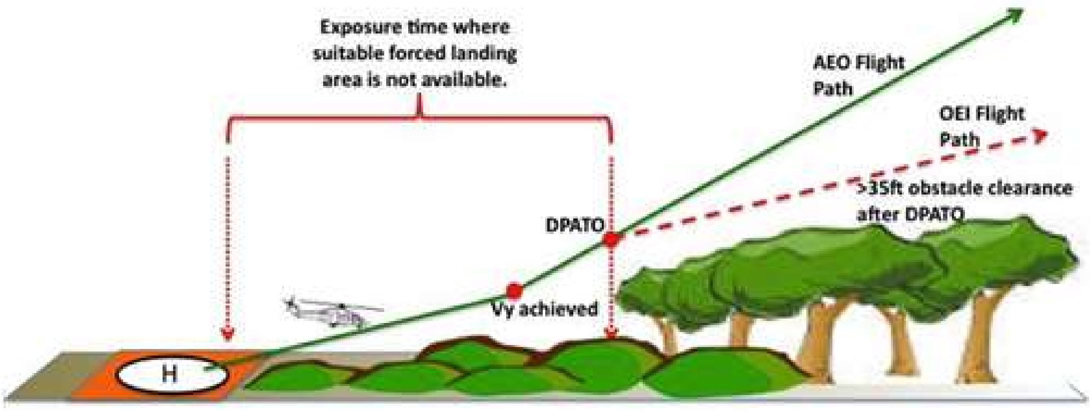

Figure 6: Take-off exposure when above Category A weights

5.6.4.17.7.3.3. When conducting an approach and landing from above Category A weights, there will be zero exposure only if the approach profile is flown outside the avoid area of the HV envelope, and sufficient landing distance (per RFM) is available (Figure 7 below). In this case, the point of deceleration through V_Y and 35 ft clear of obstacles in the baulked landing flight path will coincide with DPBL. If there is insufficient landing distance, exposure will be from the point where a deceleration through V_Y takes place until touchdown.

Note: Operating below Clear Area (Runway) Category A weight limits will allow use of the associated V_{TOSS}, which may be significantly less than V_Y and, thus, reduce the exposure period.

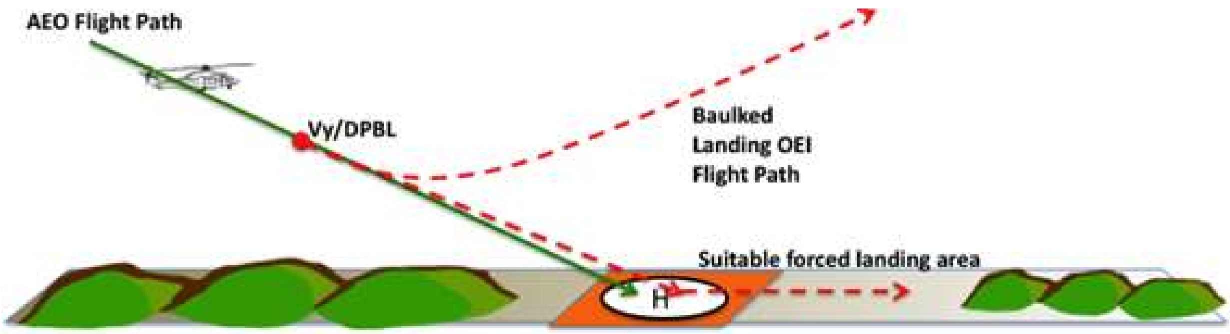

Figure 7: Zero exposure with sufficient landing distance available

5.6.4.17.8. PC2WE to/from confined area ground level helipads

5.6.4.17.8.1. Introduction

5.6.4.17.8.1.1. PC1 may not be possible from confined ground level helipads due to excessive rotorcraft weight, lack of a formal survey or the complexity of obstacles surrounding the helipad. PC2 is only possible if an operator survey or pilot assessment has been conducted, and helipad Category A weights and procedures can be complied with.

5.6.4.17.8.1.2. Therefore, PC2WE will primarily be required from confined area ground level helipads when Category A weights and procedures cannot be complied with.

5.6.4.17.8.1.3. Rotorcraft manufacturers often provide Category A data for ground level helipads. Generally, there are two different types of take-offs that could be described: vertical (short field) take-off, and the back-up take-off. Vertical take-offs usually require a lower TDP (due to less height loss), but the TDP height may be limited by the dimensions of the FATO, and the ability to maintain visual cues. The back-up take-off requires a higher TDP (due to more height loss), but because vision of the helipad is maintained, the TDP height may be raised to allow for obstacles in the take-off path. A back-up take-off will also need consideration of obstacles within the back-up zone.

5.6.4.17.8.2. Exposure during take-offs from ground level helipads within Category A weights

5.6.4.17.8.2.1. If Category A weight limits and procedures are complied with for vertical or back-up take-offs, and sufficient height loss is available from TDP for a safe OEI fly-away, this could be PC1 or PC2 (depending on obstacle survey) but is not PC2WE.

5.6.4.17.8.2.2. If obstacles ahead require the TDP to be raised to achieve 35 ft obstacle clearance, but the RFM does not allow this, exposure will commence from the TDP. A pilot may elect to continue the vertical/back-up climb (above TDP) to a height where the known RFM height loss (if available) could ensure 35 ft obstacle clearance (Figure 8 below), in which case the exposure is from TDP up to the pre-determined Rotate Point (RP). If a rejected take-off is conducted from above TDP, without the support of the RFM, the potential rate of descent build-up may result in a hard landing beyond the ultimate load limits (Figure 8 below).

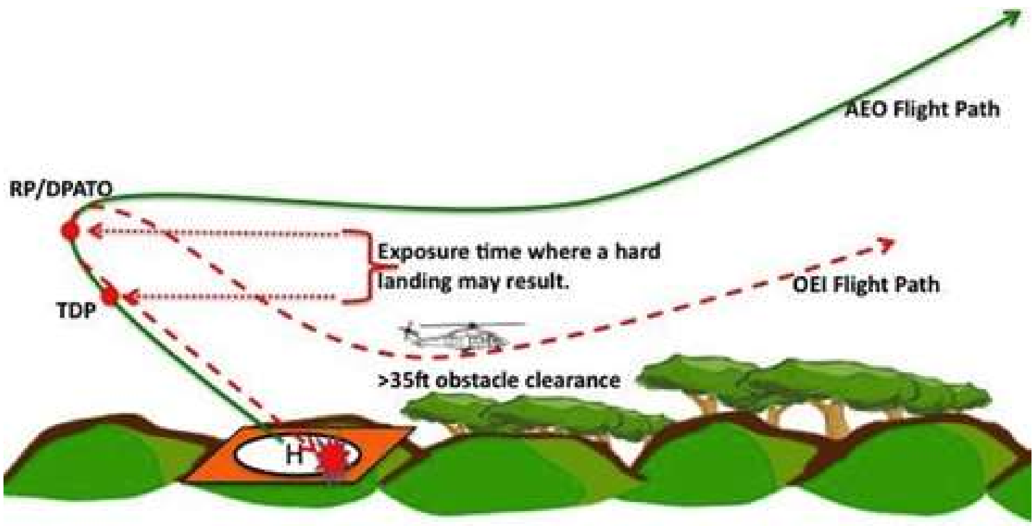

Figure 8: Exposure to hard landing above TDP

5.6.4.17.8.2.3. Alternatively, the pilot could elect to rotate from TDP and, due to insufficient drop-down height available, the exposure will be present from rotate until a V_{TOSS} climb 35 ft clear of obstacles is achieved (Figure 9 below). In these two cases, the choice of which exposure to accept may be driven by the anticipated consequences to any persons on the ground or in the rotorcraft, and by the time period required to climb above TDP compared with accelerating to V_{TOSS}.

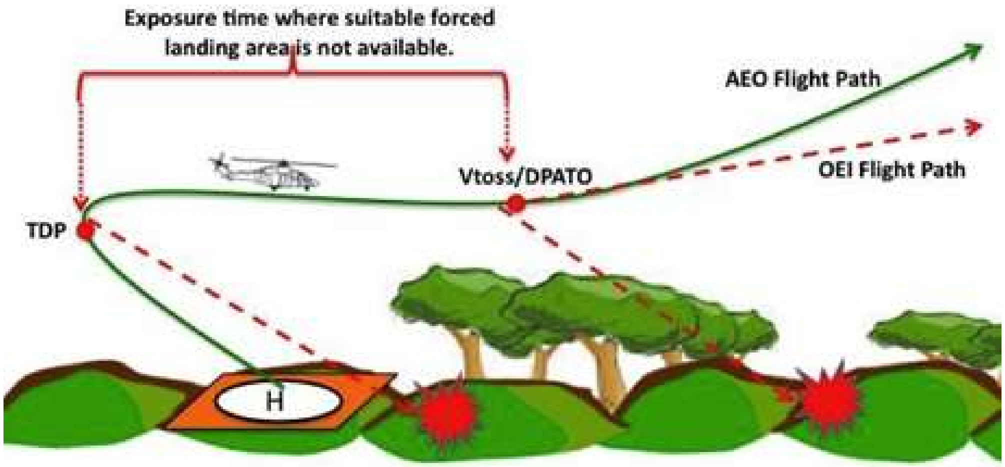

Figure 9: Exposure after the Rotate Point (RP) with insufficient drop-down

5.6.4.17.8.3. Exposure during take-offs from ground level helipads above Category A weights

5.6.4.17.8.3.1. For many rotorcraft types, operations from confined area ground level helipads are conducted above helipad Category A weight limits. If Category A helipad weight limits and procedures cannot be complied with, and suitable forced landing areas are not available, this becomes PC2WE. In these operations, the exposure is present for the possibility of:

- penetration into the avoid area of the HV envelope during take-off and landing, and/or
- a forced landing to an unsuitable forced landing area.

5.6.4.17.8.3.2. If a vertical or back-up take-off procedure is used, exposure will be from the point of entry into the avoid area of the HV envelope (often 15-20 ft) until established in a V_{TOSS} /V_Y climb 35 ft clear of obstacles (a clear area CAT A V_{TOSS} could be a valid speed to use and keeps the exposure time lower). For take-offs from confined areas with high obstacles, long exposure times may result, so determinations may be needed regarding maximum rotate heights to ensure exposure limits are not exceeded.

5.6.4.17.8.3.3. In circumstances where there is a rich variety of lateral cues, vertical, instead of backup take-offs may be preferable from ground level helipads. Vertical take-offs require fewer control inputs, allow faster accelerations, and are at less risk of obstacle strikes to the rear. To minimize exposure time, the rotate point must be at the point where all obstacles can be avoided AEO by an adequate vertical margin and a near-level acceleration can be achieved (Figure 10 below).

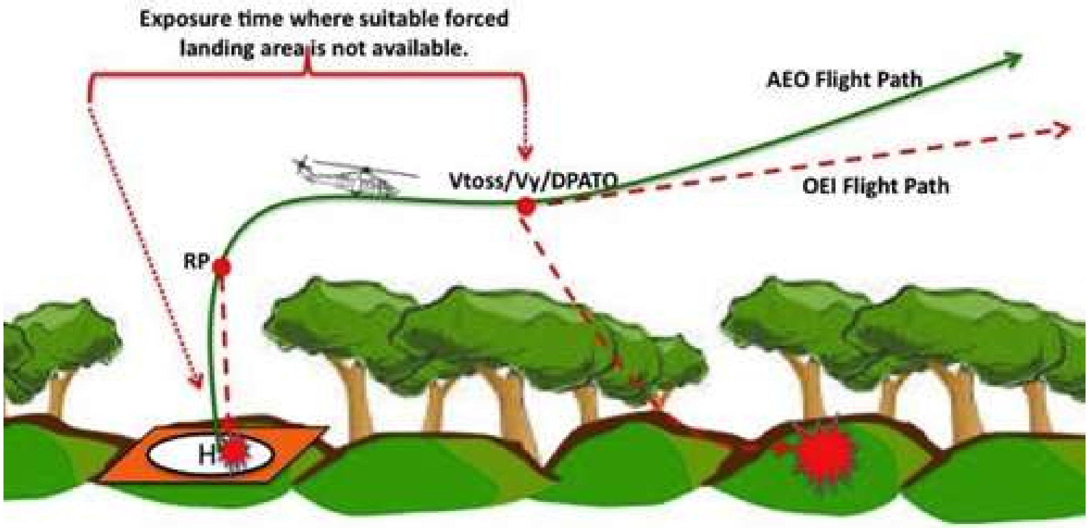

Figure 10: Non-Category A helipad vertical take-off

5.6.4.17.8.3.4. In some circumstances, a confined area ground level helipad may allow scope for an angled departure, as shown in Figure 11 below. This will reduce overall exposure time by allowing a faster acceleration to V_{TOSS}/V_Y. However, careful consideration must be given to the consequences of a rejected landing to an area off the FATO. In some circumstances, where those consequences may be fatal to rotorcraft occupants or persons on the ground, it would be prudent to accept the longer exposure time (within limits) provided by the pure vertical take-off.

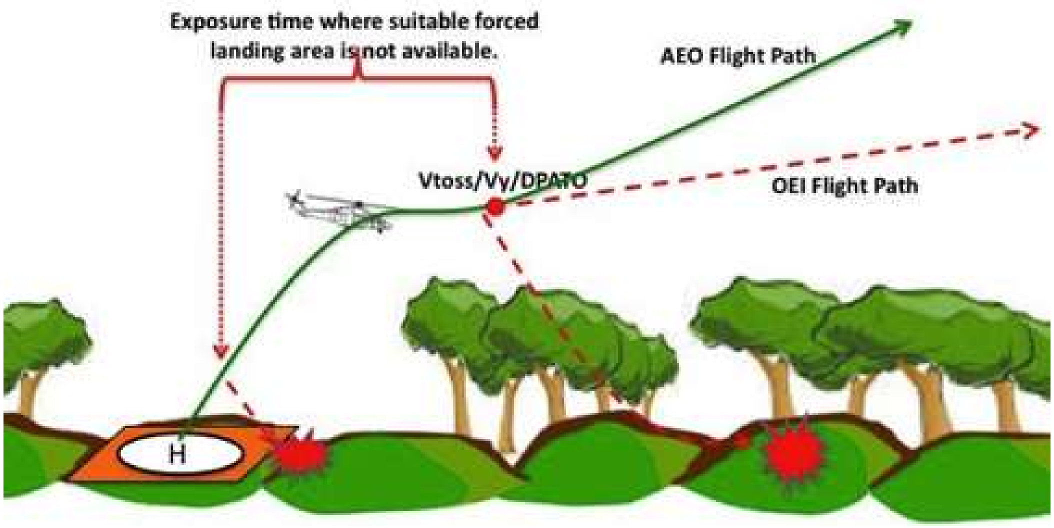

Figure 11: Non-Category A helipad angled take-off

5.6.4.17.8.3.5. Figure 12 below shows another example from a football field where the initial take-off can remain outside the avoid area of the HV envelope, and suitable forced landing areas can be used. This could allow a more rapid early acceleration before commencing a steeper climb to clear obstacles then acceleration to V_{TOSS} /V_Y. In this case, exposure commences at the last point the pilot assesses that a reject is possible. Once again, the consequences of rejection from this type of take-off must be carefully considered.

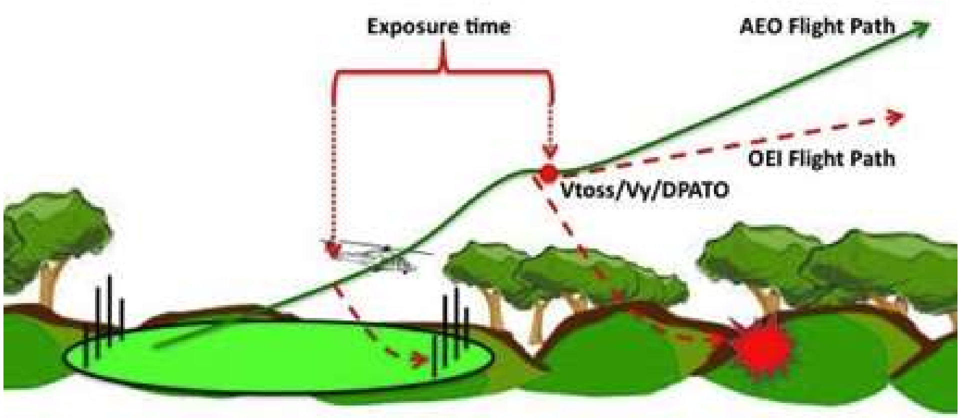

Figure 12: Delayed commencement of exposure

5.6.4.17.8.4. Exposure during approach and landing to confined area ground level helipads

5.6.4.17.8.4.1. Where RFM Category A weights and procedures can be followed, PC1 or PC2 operations without exposure may be possible depending on the formality of the surveys. Where they are not possible, there are two main scenarios of exposure:

- within helipad Category A weights but with insufficient height from LDP to achieve a baulked landing, and
- above helipad Category A weights.

5.6.4.17.8.4.2. When within Helipad Category A weights, there is no exposure provided that the correct flight path is flown (PC2). However, where there are obstacles beyond the FATO, and where the RFM procedure does not allow the LDP to be elevated, it may not be possible to conduct a safe baulked landing from LDP. In these cases, there will be a committal point at the LDP equivalent speed/height above the obstacles, after which a baulked landing is not possible. Beyond this committal point, it is accepted that any engine power loss can still be carried safely through to touchdown, provided the category A speed, height and rate of descent parameters are maintained (Figure 13 below).

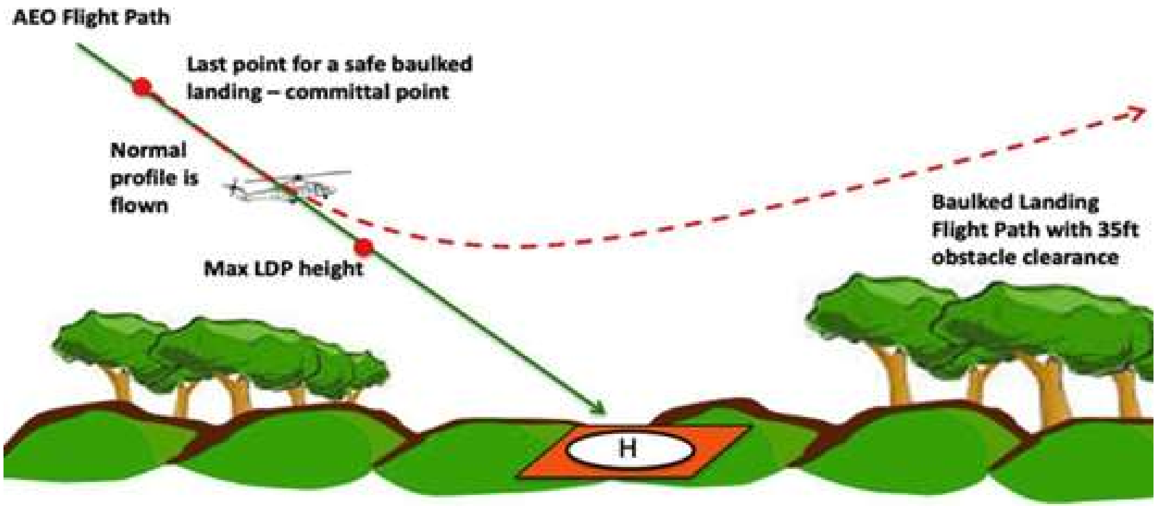

Figure 13: Nil exposure with height limited LDP

5.6.4.17.8.4.3. If the Figure 13 profile above is being flown, when above Helipad Category A weights, it can be advantageous to use Clear Area (Runway) Category A V_{TOSS} speeds for guidance on the committal point. Below this point, a baulked landing is not safe. At the expected HOGE weight limits for PC2WE, even if above helipad category A weights, it is considered acceptable to carry an engine power loss through to an OEI landing without having any exposure. Though this approach profile may penetrate the avoid area of the HV envelope, the combination of a HOGE power margin, low power and a descent profile all contribute to an expectation that the helipad could be reached with the only exposure possibly being for the touchdown.

5.6.4.17.8.4.4. If above category A weights and conducting a double-angle approach into a confined area, with the first stage quite shallow, exposure will be from the point of deceleration through V_{TOSS}, with 35 ft obstacle clearance, until touchdown (Figure 14 below). Clear Area Category A height loss data can also be derived from the Clear Area LDP, and this can aid in providing guidance for the last safe point where a baulked landing could be conducted.

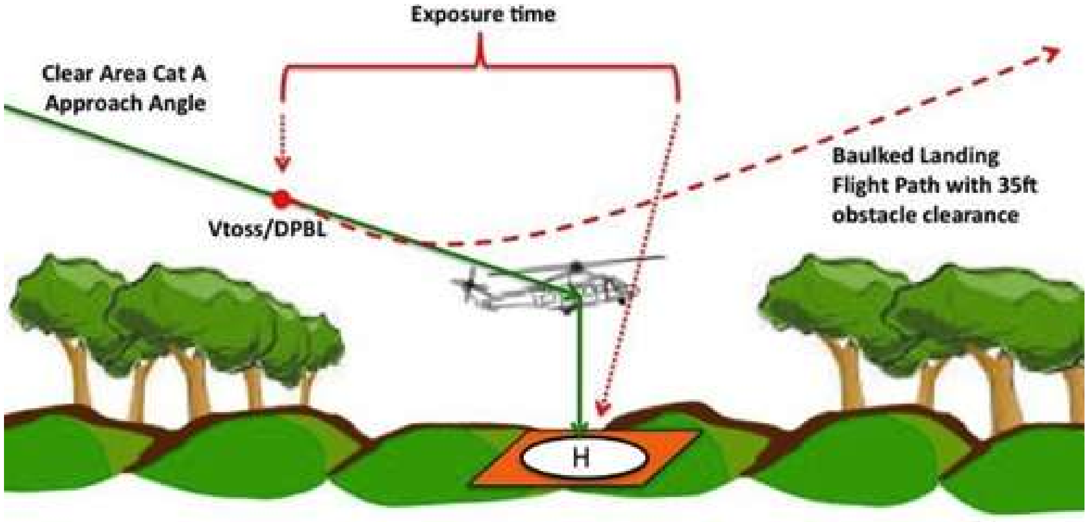

Figure 14: Exposure during helipad approach using Clear Area V_{TOSS}

5.6.4.17.8.4.5. If above Clear Area Category A weights, which would be unusual when constrained by HOGE power margin requirements, there is no data to support a baulked landing height loss profile. However, OEI climb performance at V_Y will be known so deceleration below V_Y can be defined as the point where exposure commences. Once again, exposure will only finish at touchdown (Figure 15 below). The exposure time from V_Y to touchdown could be quite significant, depending on pilot technique, and it may be beyond the approved exposure time limit for the rotorcraft type. Adoption of ‘quick stop’ or autorotation profiles (to maintain speed for as long as possible) must not be conducted due to the high potential for pilot mishandling, hard landings, overshooting the helipad and/or tail strikes.

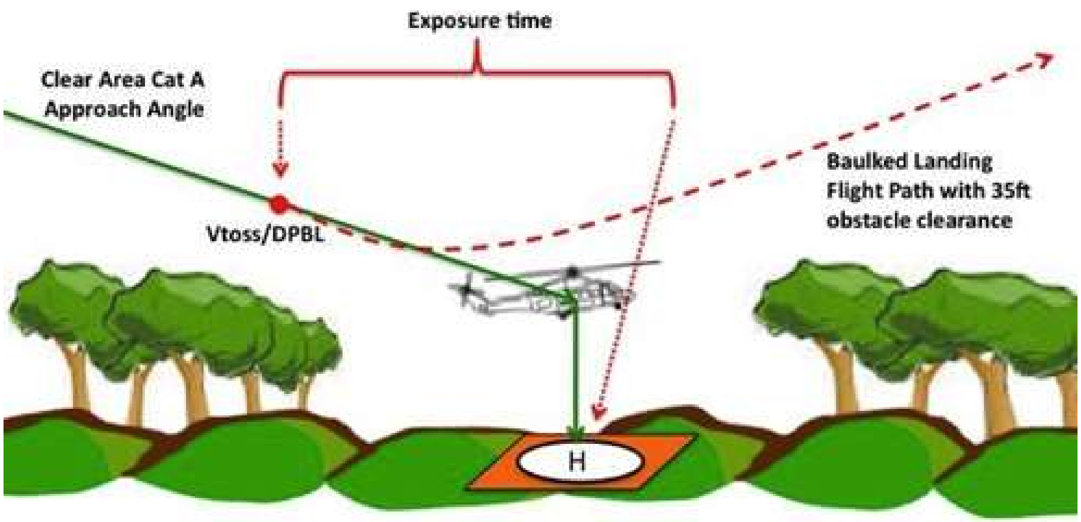

Figure 15: Exposure during helipad approach above Category A weights

5.6.4.17.8.4.6. Exposure times, when operating to any helipads without suitable forced landing areas, can be greatly reduced by operating within weight limits that allow the application of V_{TOSS} OEI climb speeds. These speeds are usually much lower than V_Y and allow exposure to finish earlier on the take-off and start later on the approach. Limiting operating weights in this way may make the difference to remaining within the exposure time limit.

5.6.4.17.9. Operations from elevated heliports, helipads or helidecks

5.6.4.17.9.1. Introduction

5.6.4.17.9.1.1. PC1 is not traditionally a standard that is applied to offshore helidecks or vessels due to the complexities around obstacles and their likely infringement on the Category A flight paths. However, some newer types with improved performance and procedures make this more feasible in the future. Many types will therefore require PC2 or PC2WE. PC2 without exposure requires an RFM Category A (or alternative) procedure that avoids backing up toward obstacles, avoids deck-edge strike, and either achieves a safe OEI fly away or has the ability to take advantage of a suitable forced landing area (water surface within ditching limits for the rotorcraft). If the RFM has no such procedures, PC2WE may be the only remaining option.

5.6.4.17.9.1.2. RFM Category A procedures must be carefully studied and applied to the elevated FATO or helideck scenarios. RFM data that allows for deck-edge strike, drop-down heights, and possible ditching needs to be carefully considered before any exposure time can be defined. Some manufacturers are now offering PC2 Defined Limit of Exposure (DLE) RFM procedures to assist operators in PC2WE operations.

5.6.4.17.9.2. Procedures to minimize exposure from helidecks.

5.6.4.17.9.2.1. Rotorcraft manufacturers often provide Category A data for elevated heliports, helipads or helidecks. Generally, there are three different types of take-offs that could be described:

- vertical-dynamic take-off
- lateral take-off, and
- back-up take-off.

The first two usually involve the use of a low TDP, with a drop-down height below the level of the helideck to allow V_{TOSS} to be gained.

5.6.4.17.9.2.2. The back-up take-off assumes a higher TDP, with no descent below the level of the helideck, but may require a larger size FATO for maintenance of adequate visual cues. The back-up take-off also requires a less complex obstacle environment surrounding elevated heliports, helipads or helidecks, but is not always available. Guidance on PC2WE during back-up take-offs is similar to that for ground level helipads and is provided in Section 8 of this document.

5.6.4.17.9.2.3. If Category A weight limits and procedures are complied with for vertical dynamic and lateral take-offs, and sufficient drop-down is available for a safe OEI fly-away, PC1 could be achieved with appropriate surveys. Alternatively, if a forced landing to a suitable forced landing area was available below the heliport or helideck, this could be PC2.

5.6.4.17.9.2.4. If Category A weight limits and procedures cannot be complied with, or there is insufficient drop-down available, this becomes a specific case of PC2WE. In these operations, the exposure is relevant for the possibility of:

- a deck-edge strike if the engine fails early in the take-off or late in the landing.
- penetration into the avoid area of the HV envelope during take-off and landing, and
- forced landing with obstacles on the surface (hostile water conditions or structures) below the elevated helipad (helideck).

5.6.4.17.9.2.5. Where the RFM elevated heliport, helipad or helideck take-off procedure cannot be applied, it is necessary to adopt a procedure that minimizes the risk of a deck-edge strike and minimizes the time to V_{TOSS}. A recommended helideck procedure (described below) has been modelled across various European rotorcraft types to achieve mean exposure times of less than nine seconds and is shown in Figure 16 below:

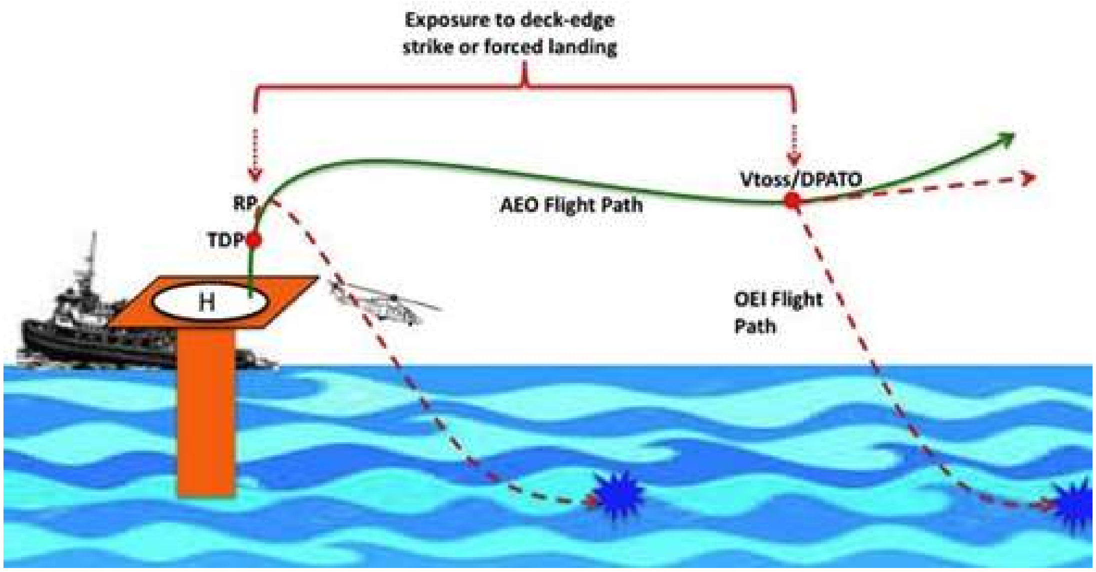

Figure 16: PC2 Vertical-dynamic take-off technique for minimizing exposure.

5.6.4.17.9.2.6. The take-off must be performed in a dynamic manner ensuring that the rotorcraft continuously moves vertically from the hover to the rotation point (RP) and then into forward flight. If the manoeuvre is too dynamic, there is an increased risk of losing spatial awareness (through loss of visual cues) in the event of a rejected take-off, particularly at night.

5.6.4.17.9.2.7. If the transition to forward flight is too slow, the rotorcraft is exposed to an increased risk of contacting the deck edge in the event of an engine failure at or just after the point of cyclic input (RP).

5.6.4.17.9.2.8. It has been found that the climb to RP is best made between 110% and 120% of the power required in the hover. This power offers a rate of climb that assists with deck-edge clearance following engine failure at RP, while minimizing ballooning following a failure before RP. Individual types will require selection of different values within this range.

5.6.4.17.9.3. Avoidance of deck-edge strikes

5.6.4.17.9.3.1. Where Category A weights and procedures are followed, a 4.5 m (15 ft) deck-edge clearance will be assured. In these cases, exposure to the deck-edge strike is removed. Where Category A weights and procedures are not possible, there remains a risk of deck-edge strike, but this risk can be reduced by use of the procedure described above and consideration of the factors in this section. Many of these considerations can also be relevant to ground level helipad operations.

5.6.4.17.9.3.2. Positioning on the helideck–It is important to position the rotorcraft as close to the deck edge (including safety nets) as possible while maintaining sufficient visual cues, particularly a lateral marker. The ideal position is normally achieved when the rotor tips are positioned at the forward deck edge. This position minimizes the risk of striking the deck edge following recognition of an engine failure at or just after RP.

5.6.4.17.9.3.3. Lateral visual cues–To obtain the maximum performance in the event of an engine failure being recognized at or just after RP, the RP must be at its optimum value, consistent with maintaining the necessary visual cues. If an engine failure is recognized just before RP, the helicopter, if operating at a low mass, may 'balloon' a significant height before the reject action has any effect. It is, therefore, important that the pilot flying selects a lateral visual marker and maintains it until the RP is achieved, particularly on decks with few visual cues. In the event of a rejected take-off, the lateral marker will be a vital visual cue in assisting the pilot to carry out a successful landing.

5.6.4.17.9.3.4. **Rotation point**–The optimum RP must be selected to ensure that the take-off path continues upwards and away from the deck with AEO, but minimizing the possibility of hitting the deck edge due to the height loss in the event of an engine failure at or just after RP. The optimum RP may vary from type to type. Lowering the RP will result in a reduced deck edge clearance in the event of an engine failure being recognized at or just after RP. Raising the RP will result in possible loss of visual cues, or a hard landing in the event of an engine failure just prior to RP.

5.6.4.17.9.3.5. Pilot reaction times–Pilot reaction time is an important factor affecting deck edge clearance in the event of an engine failure prior to or at RP. Simulation has shown that a delay of one second can result in a loss of up to 15 ft in deck edge clearance.

5.6.4.17.9.3.6. Acceleration–Elevated helipads and helidecks provide the opportunity to quickly and safely gain airspeed using a level or slightly descending acceleration to V_{TOSS} /V_Y. This technique can reduce potential exposure time compared with the climbing acceleration that would be used from ground level helipads. Only slight descents must be tolerated during the acceleration due to the possibility that OEI power available (if required) is unable to overcome the descent rate prior to obstacle impact.

5.6.4.17.9.3.7. Variation of wind speed–Relative wind is an important parameter in the achieved take-off path following an engine failure. Wherever practicable, the take-off must be made into wind. Simulation has shown that a 10 kt wind can give an extra five feet of deck edge clearance compared to a zero-wind condition.

5.6.4.17.9.4. Adequacy of drop-down height

5.6.4.17.9.4.1. Category A procedures may provide data for drop-down heights at specified weights for vertical-dynamic or lateral take-offs. If this data can be used, determinations can be made regarding the adequacy of the drop-down height available, with an assurance of 35 ft obstacle clearance. In these cases, there may be zero exposure (Figure 17 below). Operators must allow for the inaccuracies in available drop-down due to possible tidal influences, variable buoyancy of vessels, sea state, or uncertain construction activities over land.

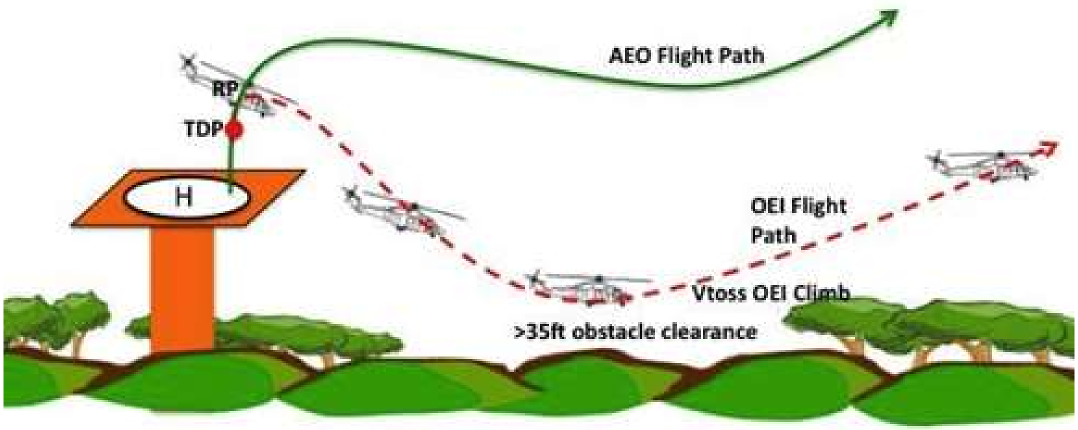

Figure 17: Vertical-Dynamic Category A take-off (zero exposure)

5.6.4.17.9.4.2. A helideck take-off outside of Category A limits places many helicopters inside the avoid area of the HV envelope, from where a safe forced landing cannot be assured. In some circumstances, the helicopter OEM may provide non-Category A procedures that allow for a forced landing to a suitable forced landing area (sea surface) below the helideck. Where these procedures are present, this operation may be classified as PC2. However, if there is no suitable forced landing area and/or the drop-down height is insufficient, exposure will be present.

5.6.4.17.9.4.3. If there is no achievable suitable forced landing area, or the drop-down height is insufficient for a safe OEI fly-away, the exposure time will be from the decision point (equivalent TDP) until the earliest point where a safe OEI climb speed is achieved, and obstacles can be cleared by 35 ft. During the exposure time prior to DPATO, an OEI flyaway may still be possible, but unless RFM data supports a procedure, exposure will still be present (Figure 18 below).

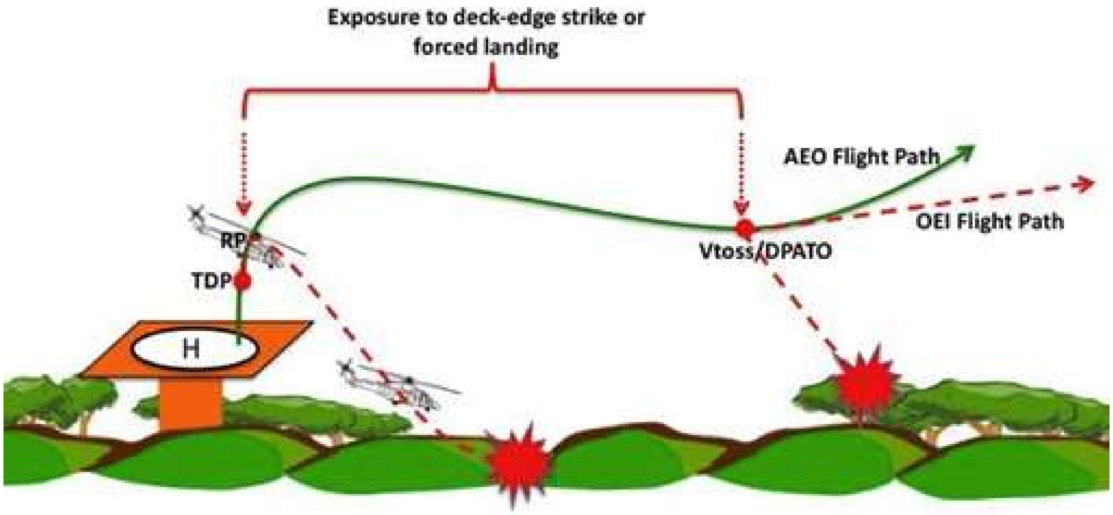

Figure 18: Vertical-dynamic take-off with insufficient drop-down

5.6.4.17.9.5. Exposure during approach and landing to elevated heliports, helipads or helidecks.

5.6.4.17.9.5.1. There are two common Category A approach techniques usually described within the RFM for elevated helipads or helidecks: offset procedure or straight-on procedure. Either of these procedures may be flown as part of a PC2WE operation. The offset procedure is based on the concept of an approach to an LDP that is laterally displaced from the helipad, and where baulked landings require a drop-down below the level of the helipad. This procedure may not be feasible depending on the nature of surrounding obstacles, wind direction, and pilot seating arrangements.

5.6.4.17.9.5.2. The straight-on procedure has a higher LDP, and the baulked landing flight path overflies the FATO. This procedure requires a FATO of sufficient size, appropriate visual cues, and minimal obstacles in the approach or baulked landing flight paths. Guidance on exposure for this type of procedure is provided in Section 8 of this document.

5.6.4.17.9.5.3. The offset procedure must be considered in the context of two exposure scenarios:

- within Category A weights, but with insufficient drop-down for the procedure, and
- above Category A weights.

5.6.4.17.9.5.4. Within Category A weights, but with insufficient drop-down height available, the offset procedure can provide varying exposure times depending on the degree of drop-down available. The landing exposure time will commence at the closest point to the helideck from which the OEI baulked landing height loss retains 35 ft obstacle clearance (Figure 19 below). Exposure will finish at the standard LDP for the procedure, after which a safe landing to the helideck will be possible.

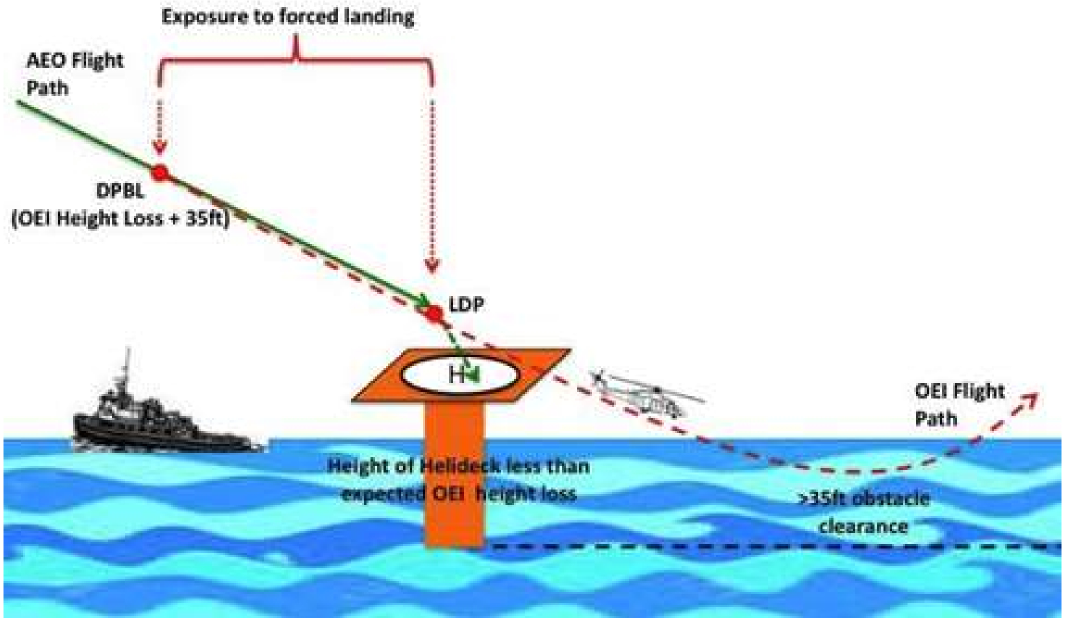

Figure 19: Landing exposure with insufficient drop-down (offset procedure)

5.6.4.17.9.5.5. RFM Category A data can provide height loss information for the pilot to apply. For example, an RFM-defined height loss of 85 ft plus 35 ft obstacle clearance will place the DPBL at 120 ft above the surface obstacles at the applicable LDP speed. However, speeds faster than the LDP speed will achieve a baulked landing with much less height loss, but this figure is not determinable from the RFM. Therefore, depending on the circumstances, the DPBL could be based on height loss data, or on the point of deceleration through V_{TOSS}, which, as discussed earlier, is a speed from which a climb will be certain.

5.6.4.17.9.5.6. For offset approaches above Category A weight limits, the principle is the same as described above, but the lack of RFM height loss data place the DPBL at the point of deceleration through V_{TOSS}/V_Y (Figure 20 below). Exposure will only finish once positively over the helideck because the use of an LDP is not supported by the RFM at these weights. Safe deceleration times from V_Y to the helideck could easily be over 18 seconds, which may be beyond the exposure time limits for the helicopter and, therefore, not a viable option.

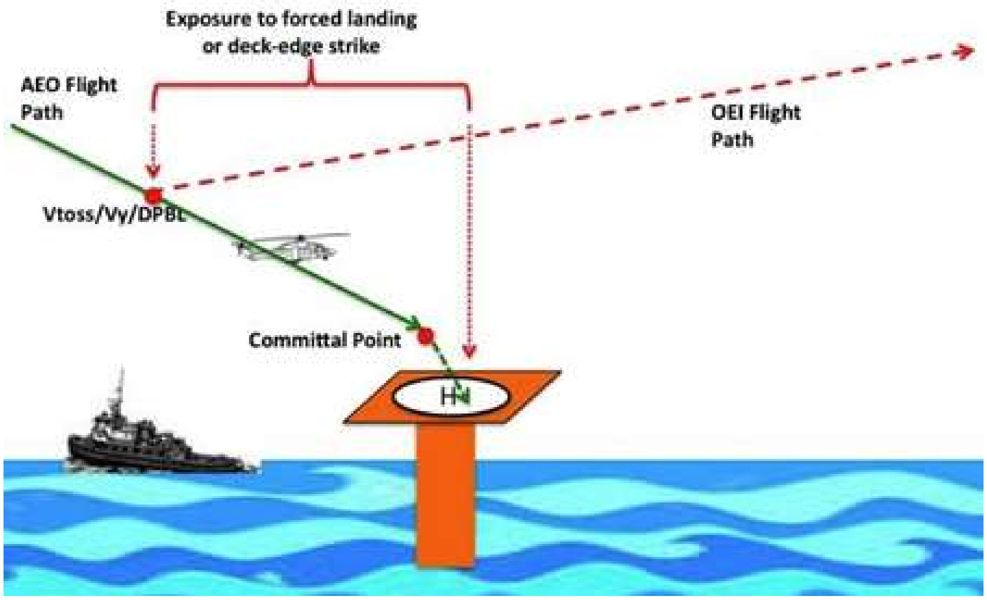

Figure 20: Landing exposure above Category A weights (offset procedure)

5.6.4.17.9.5.7. In spite of the best planning by the operator and/or pilot, there may be occasions where the circumstances of operating at a particular helideck require an extra level of care to be taken in the approach and/or take-off. Pilots must not allow their perceived need to keep exposure times within limits for the helicopter to overcome the requirement to exercise an appropriate level of caution during helideck operations. Examples of this lack of caution might include approaches that are too fast for the power available, obstacles, and wind conditions. This can be particularly relevant to moving helidecks/vessels close to surface obstacles or the sea.

5.6.4.19. TASK OUTCOME.

1- Complete GAR reports.
2- Upon satisfactory compliance with the policies, processes, and procedures stipulated in this Section, the POI will issue GACA OpSpec R-140 (Helicopter Performance Class-2 with Exposure (PC2WE)) to the applicant.
3- Upon any unsatisfactory compliance with the policies, processes, and procedures stipulated in this Section, the POI will inform the applicant to take the required corrective actions.

5.6.4.21. Future Activities. Upon issuance of GACA OpSpec A-140 to the operator, the POI will include the surveillance task of the operator’s Helicopter Performance Class-2 with Exposure (PC2WE) in the annual surveillance plan.

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 7. LOW VISIBILITY TAXI OPERATIONS

Section 1. Evaluate Low Visibility Taxi Operations

5.7.1.1. GACA ACTIVITY REPORT (GAR).

A. 1380 (OP)

5.7.1.3. GENERAL. This section contains guidance to be used by aviation safety inspectors (Inspectors) for evaluating the implementation of procedures concerning low visibility taxi operations as contained in a General Authority of Civil Aviation (GACA) approved Surface Movement Guidance and Control System (SMGCS). In addition, this section addresses the responsibilities of air operators, air traffic service (ATS) providers and aerodrome operators to implement low visibility taxi operations as developed for each applicable aerodrome.

> **NOTE**: Volume 7, Chapter (TBD) and of this handbook, along with the Federal Aviation Administration (FAA), Advisory Circular (AC) 120-57 (as amended), Surface Movement Guidance and Control System, found on the FAA web site at and ICAO Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476) and Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual (ICAO Doc 9830) found on the ICAO web site at: http://www.icao.int/anb/panels/atmrpp/Documents/Doc.9830.alltext.en.pdf, provide additional information on the development and approval process for the SMGCS.

5.7.1.5. BACKGROUND. Ground movement of equipment and aircraft during periods of visibility of less than 350 meters runway visual range (RVR) has become more common as ground navigational aids (NAVAID) and onboard aircraft systems have advanced. Ground accidents and incidents during taxi in low visibility conditions point to the need to improve taxi guidance and control systems. FAA AC 120-57 and ICAO Docs. 9476 and 9830 provide guidance for the development and implementation of a surface movement guidance and control system (SMGCS) and a SMGCS plan for each aerodrome where reduced visibility taxi is to be authorized. Each SMGCS plan contains operational procedures for taxi during periods of low visibility. These procedures are documented in the SMGCS as flight crew information and low visibility taxi route chart guidance for a specific aerodrome. The SMGCS chart and its related plan are developed and maintained by the aerodrome operator in consultation with users and the GACA.

5.7.1.7. APPLICABILITY. FAA AC 120-57 and ICAO Docs. 9476 and 9830, in conjunction with General Authority of Civil Aviation Regulation (GACAR) Part 139, apply to all aerodromes seeking approval for takeoff and landing operations below 175 meters RVR, and for all aerodromes seeking initial Category III (CAT III) landing approvals. All aerodromes conducting operations below 350 meters RVR shall develop an SMGCS in accordance with the guidance in Volume 7, Chapter (TBD) of this handbook along with FAA AC 120-57 and ICAO Docs. 9476 and 9830. Air operators that operate during periods of low visibility at aerodromes that require an SMGCS shall operate in accordance with the developed procedures.

5.7.1.9. AIR OPERATOR RESPONSIBILITIES. Air operators shall include SMGCS procedures in their operations manuals for all applicable aerodromes. Flight crew indoctrination, initial, and recurrent training programs shall include low visibility taxi procedures where applicable.

5.7.1.11. GACA RESPONSIBILITIES. FAA AC 120-57 and ICAO Docs. 9476 and 9830 suggests that a SMGCS working group be developed at each applicable aerodrome. This working group should be led by the aerodrome operator and contain members of aerodrome operations management, affected air operators, ATS providers at the aerodrome , GACA Flight Operations Division, GACA ANS Safety Division and GACA Aerodromes Standards & Safety Division Inspectors.

A. GACA-S&ER.

1) *GACA-S&ER Flight Operations Division, ANS Safety Division and Aerodromes Standards & Safety Division Offices*. The Flight Operations Division Office will ensure that air operators conducting operations during periods of low visibility at aerodromes requiring a SMGCS are addressing appropriate items in the SMGCS plan through inclusion in operations manuals and appropriate training programs. Required operations information will include flight crew information and aerodrome low visibility taxi route chart guidance. The Flight Operations Division, Aerodromes Standards & Safety Division and ANS Safety Division shall monitor adherence to SMGCS and its plan by the aerodrome and air operators and ensure that any deficiencies are corrected.

NOTE: The approval of the SMGCS involves the Flight Operations, Aerodromes Standards & Safety Division and the ANS Division. Further details on the approval process are described in Volume 7, Chapter (TBD) of this handbook.

2) *Principal Inspectors*. Principal Inspectors (PIs) are required to take the following actions:

- Bring to the attention of assigned air operators the information contained in this chapter
- Ensure that air operators are training flight crew members about the information/guidance contained in the SMGCS plan
- Ensure that each air operator has provided flight crew members with adequate procedures for compliance with low visibility taxi requirements
- Determine through an operational control inspection or other means that the air operator has acceptable procedures for the acquisition and dissemination of all required flight information to flight crew members

B. Air Traffic Service. ATS units shall adhere to those sections of the SMGCS plan that are under its control. Deficiencies observed or brought to its attention must be corrected.

C. Aerodromes. Aerodromes shall adhere to those sections of the SMGCS plan that are under its control. Deficiencies observed or brought to their attention must be corrected.

5.7.1.13. FUTURE ACTIVITIES. PIs should monitor their operators by using normal surveillance procedures.

VOLUME 5. AIR OPERATOR - OPERATIONAL APPROVALS

CHAPTER 8. SPECIAL FLIGHT PERMIT WITH CONTINUING AUTHORIZATION TO CONDUCT FERRY FLIGHTS

Section 1. Evaluating a Special Flight Permit with Continuing Authorization to Conduct a Ferry Flight Program

5.8.1.1. GACA ACTIVITY REPORT (GAR).

A. 3404 (AW)

5.8.1.3. OBJECTIVE. This section provides aviation safety inspectors (Inspectors) with policy and guidance for evaluating and approving a General Authority of Civil Aviation Regulation (GACAR) Part 121 operator's special flight permit (SFP) with continuing authorization to conduct a ferry flight program (CAFP) as provided by GACAR § 21.179(c).

NOTE: Volume 6, Chapter 2 contains guidance for the issuance of SFPs. The Inspector will follow the instruction contained in this section for issuing a SFP with a continuing authorization.

5.8.1.5. COORDINATION. Principal Maintenance Inspectors (PMIs) are responsible for evaluating and accepting or approving a CAFP. However, because of the operational aspects of ferry flight, PMIs must closely coordinate the review and evaluation of the program with the Principal Operations Inspector (POI). Additionally, Inspectors should verify that the operator includes both their maintenance and operations management personnel in the development and operation of the CAFP.

5.8.1.7. GENERAL.

A. Eligibility Requirements. GACAR § 21.179(c) establishes the eligibility requirements for obtaining a SFP with a continuing authorization to ferry aircraft.

NOTE: At the present time, only GACAR Part 121 operators are eligible for CAFP authorizations.

B. Standards. Regardless of how the operator maintains its aircraft, it is responsible for safe operation of its aircraft and the control and oversight of the CAFP.

C. Requirements. GACAR § 21.179(c) specifies the requirement for an approved CAFP for GACAR Part 121 operators. The regulation states that upon application, as prescribed in GACAR § 119.51, a SFP with a continuing authorization may be issued for aircraft that may not meet applicable airworthiness requirements, but are capable of safe flight for the purpose of flying aircraft to a base where maintenance or alterations are to be performed. GACAR § 21.179(c) by itself does not provide the authorization. The operator must apply for operations specifications (OpSpecs). Additionally, the intent of the authorization is for flying aircraft that do not meet applicable airworthiness requirements but are capable of safe flight. It is not intended for any other reason or purposes such as:

- Repositioning flights
- One-engine inoperative ferry flights

• Maintenance flights

• Delivering or exporting aircraft

• Flights in excess of maximum certificated takeoff mass

• Special flight authorization for foreign-registered aircraft

• Operating aircraft not on OpSpec D85

• Evacuating aircraft from areas of impending danger

NOTE: The GACA authorizes the SFP with a continuing authorization in the form of OpSpec D84 for GACAR Part 121 operators.

5.8.1.9. APPLICATION AND EVALUATION PROCESS.

A. Application. As stated above, GACAR § 21.179(c) alone do not automatically provide the necessary authorization for the SFP with a continuous authorization to ferry aircraft. It only provides eligibility for obtaining the authorization. The eligible operator must apply for an amendment to its OpSpecs. The operator must also submit its CAFP for approval or acceptance, as applicable, to their assigned PMI.

B. Program Review.

1) The PMI should verify that the operator document their CAFP and control it as part of their Continuous Airworthiness Maintenance Program (CAMP). Without the proper controls, there is a potential for the operator to make changes to the CAFP without receiving prior General Authority of Civil Aviation (GACA) approval.

2) The PMI should verify that the CAFP contains requirements addressing the following, as applicable:

a) All the conditions, limitations and provisions listed on OpSpec D84.

b) Requirements for conveying the authorization to ferry to the flight crew.

c) Prohibition for ferrying aircraft to which an Airworthiness Directive (AD) applies except in accordance with the AD. (Refer to GACAR § 39.15).

d) Prohibition for ferrying aircraft outside of the Kingdom of Saudi Arabia (KSA) under the CAFP unless permission is received in advance from each State to be overflown. See paragraph 5.8.1.11 below, for further details.

e) Ferry flight situations (especially aircraft damage) that might require the performance of maintenance or alterations on the aircraft to assure safe flight. Even though the operator might consider or call these actions temporary, the regulations govern the performance of all maintenance and alterations. The use of such things as metallic tape (speed tape) must meet regulatory requirements for acceptability.

f) Requirements for training and authorizing maintenance personnel involved with the CAFP, including contract personnel, and how the operator will keep them informed of any changes to the CAFP.

g) Requirements for complying with GACAR § 119.47(b) as it applies to the CAFP and OpSpec D84. The regulation requires each operator to keep each of its employees and other persons used in its operations informed of the provisions of the OpSpecs that apply to that employees or person's duties and responsibilities.

h) Requirements for documenting the basis used to determine that the aircraft is safe to fly and that the aircraft is in a safe condition for the flight with the discrepancy or condition that triggered the need for the ferry flight permit.

i) Requirements to ensure the safety of the crew and the safe operation of the aircraft with inoperative avionics, instrumentation and equipment.

j) Aircraft logbook requirements for documenting the ferry flight. The requirements should address such things as persons authorized to sign the log entry for the issuance of the permit, persons responsible for ensuring signature documentation, and what the signature signifies. If the operator uses its own form for issuing the ferry permit, the PMI should verify that the form addresses, at a minimum, all the applicable limitations and provisions listed on OpSpec D84, and control of the form as a required aircraft record.

5) The PMI should verify that the CAFP contains operational requirements such as:

- Ferry flight pilot training/authorization
- Pilot ferry flight briefings
- Aircraft configuration control
- Operational equipment necessary for safe flight
- Aircraft mass limits
- Fuel and fuel distribution limits
- Center of gravity (CG) limits
- Maneuvers to which the GACA limits the aircraft
- Limit on usage of flight equipment such as autopilot (AP), etc.
- Meteorological conditions to avoid
- Airspeed limits as required
- Weather minimums appropriate to the aircraft operating condition

C. Issuance of OpSpec D84. Upon completion of the evaluation and the acceptance or approval of the CAFP, the PMI will issue OpSpec D84, in accordance with Volume 15, Chapter 3, Section 4.

5.8.1.11. APPLICATIONS INVOLVING FOREIGN AIR TRANSPORTATION. International Civil Aviation Organization (ICAO) Annex 8, Airworthiness of Aircraft, Section II details the airworthiness requirements for all contracting states. This section basically states that all contracting states operating their aircraft over foreign (other contracting states) territory must be airworthy. Because aircraft operated under the provisions of ICAO must meet this requirement any time an aircraft will operate in an un-airworthy condition (under the provision of a SFP), the operator must have special permission from each foreign country it wishes to fly over. Because of this requirement, the SFP with continuing authorization is not valid outside the KSA. Special permission from each foreign country must accompany it in order to ensure validity.

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CHAPTER 9. RESERVED

Section 1. TBD

NOTE: This guidance to be developed at a later date.

VOLUME 5. AIR OPERATOR - OPERATIONAL APPROVALS

CHAPTER 10. ISSUE/RENEW A CERTIFICATE OF AUTHORIZATION FOR OPERATIONS IN SPECIAL AREAS OF OPERATION

Section 1. Issue/Renew a Certificate of Authorization for Operations in Special Areas

5.10.1.1. GACA ACTIVITY REPORT (GAR).

A. 1406 (North Atlantic)

B. 1408 (Other)

5.10.1.3. OBJECTIVE. The objective of this task is to issue a Certificate of Authorization (COA) to a General Authority of Civil Aviation Regulations (GACAR) Part 91 operator planning a flight(s) in special areas of operation. While this section may be used by all aviation safety inspectors (Inspectors) as a general reference; guidance for Inspectors issuing Operations Specifications (OpSpecs) to GACAR Part 121, 125 and 135 operators planning to operate in special areas of operation is contained in Volume 5, Chapter 1, Section 5, Special Navigation Areas of Operation and the applicable OpSpecs guidance found in Volume 15.

5.10.1.5. BACKGROUND. A special area of operation is international airspace where navigation performance standards are governed by international agreements, separation minimums are reduced, and the standards of navigation performance accuracy are strictly enforced. In this chapter, particular emphasis is placed on Minimum Navigation Performance Specification (MNPS) airspace in the North Atlantic (NAT) region.

5.10.1.7. GENERAL REQUIREMENTS FOR OCEANIC OPERATIONS. Inspectors should be aware of the requirements imposed on operators for flights in special areas of operation. Operator, as used in this chapter, is defined to mean one who exerts operational control as defined in GACAR Part 1.

A. Navigation Equipment and Procedures. Approved navigation equipment must be installed in accordance with a design approval granted in accordance with GACAR Part 21. The Inspector (Operations) should coordinate with an Inspector (Airworthiness) to ensure that the equipment installation is acceptable.

B. Operations Manual Requirements. Although not required by regulation, operators should be encouraged to prepare an International Operations Procedures Manual. Either a journey logbook (trip log) or a navigation log is required by International Civil Aviation Organization (ICAO) for any aircraft engaged in international navigation and is regulatory for Kingdom of Saudi Arabia (KSA) registered aircraft under GACAR § 91.475. In either case, the information should be accessible to the flight crew. The manual should include specific preflight, in-flight, and post-flight procedures. The manual should specify the crew member(s) responsible for inserting waypoints in the long-range navigation systems (LRNS) and for verification of the waypoint insertions, and should also identify the source of the waypoint information. Much of this information will depend upon the type of LRNS equipment in use. Procedures for logging equipment accuracy should be explained. If a manual is developed, the log should be depicted in the manual, and a sample log page should be submitted to the approving office. Plotting chart procedures should also be included in the manual, and a completed sample chart should be submitted. An LRNS checklist should be incorporated with the regular aircraft checklists and should include procedures in case of LRNS equipment failure.

C. Communication Equipment Required. ICAO rules state that an aircraft operated on a flight plan shall maintain continuous listening watch on the appropriate radio frequency and establish two-way communication, as necessary, with the appropriate air traffic service (ATS) facility, except as prescribed by the ATS authority in regard to an aircraft forming part of the air traffic pattern at a controlled airport. In addition, Canadian regulations require that aircraft flying in or departing from Canadian airspace for transoceanic flights have the following communications equipment installed on the aircraft. These requirements are in addition to applicable requirements of GACAR Part 91.

1) In order to maintain communication capability, high frequency (HF) communications equipment is normally used by each aircraft crossing the Atlantic. The only exception is for aircraft flying at flight level (FL) 250 or above on specific routes crossing Greenland. In the oceanic control areas (OCA) and flight information regions (FIR), very high frequency (VHF) coverage is not sufficient to ensure continuous two-way communications with ground stations. Although relay through other aircraft is possible, it is not guaranteed.

2) VHF equipment shall include 121.5 MHz capability. A listening watch should be maintained on 121.5 MHz unless communication on another frequency prevents this. Frequency 121.5 MHz is not authorized for routine use; 123.45 or 131.8 MHz should be used for air-to-air communications.

D. Crew Qualification Requirements. In the International Standards and Recommended Practices—Annex 6, Operation of Aircraft, ICAO makes the following stipulations for flights outside the jurisdiction of member states:

1) An operator shall ensure that all employees, when abroad, know that they must comply with the laws, regulations, and procedures of those states where operations are conducted, and also comply with the relevant laws, regulations, and procedures of their state of registry.

2) An operator shall ensure that all pilots are familiar with the laws, regulations, and procedures pertinent to the performance of their duties that are prescribed for the areas to be traversed, the airports to be used, and the related air navigation facilities. The operator shall ensure that other members of the flight crew are familiar with those laws, regulations, and procedures that are pertinent to the performance of their duties.

3) Operators shall ensure that all pilots in command (PIC) understand that, if a deviation in an emergency situation violates local regulations or procedures, the PIC shall notify the appropriate local authorities without delay. If required by the state where the incident occurs, the PIC shall submit a report on any such violation to the appropriate authority of that state.

4) An operator shall not use a pilot as PIC of an aircraft on a route or route segment for which that pilot is not currently qualified until that pilot has satisfied the knowledge requirements of the following:

- The route to be flown and the airports to be used
- The terrain and minimum safe altitudes
- The seasonal meteorological conditions
- The meteorological, communication and air traffic facilities, services and procedures
- Search and rescue procedures

• The navigational facilities and procedures, including any long-range navigation procedures associated with the planned route

E. Pilot Qualification. The minimum pilot qualification for any oceanic flight is a private pilot certificate. An instrument rating is required if operating at or above 6,000 feet pressure altitude in the North Atlantic Track (NAT) region. Some states (for example, Canada) require pilots to hold an instrument rating for operating at any altitude in the NAT region under their jurisdiction; therefore, it is imperative that pilots are acquainted with states' varying legislative requirements. Pilots must comply with the regulations imposed by the state of registry of the aircraft being flown and with the regulations of countries in which they land or overfly. Irrespective of the mandatory requirements, Inspectors should strongly recommend that all pilots hold a valid instrument rating. In addition to cross-country flight time, the demanding nature of the oceanic operational environment requires that the PIC meet the recency of experience requirements stipulated by the state of registry, have adequate recent flight experience in the use of long-range navigation equipment and communications equipment, and have training in dead reckoning navigation techniques.

F. Training Curriculum Content. Experience has clearly demonstrated that the presence of sophisticated navigational equipment on board an aircraft does not, by itself, ensure that a high level of performance will be achieved. It is essential that operators provide adequate training for the personnel operating or maintaining the equipment, and that operating drills and procedures are included in crew training. Inspectors should strongly recommend that the crew qualifications include, as a minimum, the subjects listed below.

• ICAO operational rules and regulations

• ICAO measurement standards

• Use of oceanic flight planning charts

• Sources and content of international flight publications

• Itinerary planning

• Preparation of ICAO flight plans and flight logs

• Route planning within the special area of operation where flights are to be conducted

• En-route and terminal procedures (if different from KSA procedures)

• Long-range, air-to-ground, communication procedures

• Structure of the special area of operation where the flights are to be conducted

• Air traffic clearances

• International meteorology, including significant weather charts, prognostic weather charts, tropopause prognostic charts, and terminal weather forecasts

• Specific en-route navigation procedures for each type of navigation equipment required for use in the special area of operation, including abnormal procedures

• Emergency procedures, including required emergency equipment, search and rescue techniques, and navigation and communications equipment failure techniques

• If operations are to be conducted in areas of magnetic unreliability, specialized training must be given

5.10.1.9. SPECIAL AREA OF OPERATION REQUIREMENTS.

A. When Authorization Is Required. There is no requirement for a general aviation operator to obtain authorization for oceanic operations outside of designated special areas of operation. However, the Inspector may be called upon to advise pilots desiring to obtain information on oceanic operations. In addition to the guidance in this chapter, FAA AC 91-70 (as amended), Oceanic and International Operations, contains detailed information on most aspects of oceanic operations.

B. ICAO Requirements. When conducting oceanic flights, pilots of Saudi Arabian-registered aircraft must adhere to GACA regulations, ICAO rules, and the regulations of the nations that they overfly or where they land. This requirement is based upon the Convention on International Civil Aviation, commonly known as the Chicago Convention. Flight regulations for oceanic operations are specifically covered in Annex 2, Rules of the Air, and Annex 6, Part II, International General Aviation Aeroplanes. Section 91.703 ensures that ICAO rules are regulatory to operators of KSA registered aircraft operating in oceanic airspace.

5.10.1.11. NORTH ATLANTIC TRACK (NAT) REGION OCEANIC OPERATIONS.

A. NAT Region. The majority of the airspace in the NAT region is controlled airspace. Instrument flight rules (IFR) apply to all flights at or above FL 60 or at 2,000 feet above ground level, whichever is higher. Within the NAT region, two types of special areas of operation have been structured. The first of these is Minimum Navigation Performance Specification (MNPS) airspace, which has been operational for many years. The second special area of operation is Reduced Vertical Separation Minimum (RVSM) airspace. RVSM airspace is any airspace or route where aircraft are separated by 1,000 feet vertically between FL 330 and FL 370.

B. MNPS Airspace. MNPS airspace is that portion of the NAT airspace between FL 275 and FL 400, between latitudes 27 1/2 N and the North Pole; bounded in the east by the eastern boundaries of control areas (CTA) Santa Maria Oceanic, Shanwick Oceanic, and Reykjavik; and bounded in the west by the western boundary of CTAs Reykjavik and Gander Oceanic, and New York Oceanic east of longitude 60° W and south of 38° 30' N. All aircraft operating in MNPS airspace are required to have a specified minimum navigation performance capability that has been approved by the state of registry or by the state of the operator, as appropriate. The approval process includes all aspects of the required navigation accuracy, navigation equipment required, installation and maintenance procedures, and crew training. The integrity of MNPS airspace is maintained by a series of procedures that include approval of navigation equipment and procedures plus continuous monitoring of the navigation accuracy of aircraft using MNPS airspace. It is implicit in the concept of MNPS airspace and essential to the application of the lateral separation minimums that all operations in MNPS airspace achieve the highest standards of navigation performance accuracy. The obligations of the operator and crew operating under GACAR Part 91 for flight in MNPS airspace can be summarized as follows:

1) The operator must have a COA from the GACA for that aircraft.

2) The approved aircraft minimum navigation installations must be operable and must have been checked for accuracy, airborne by the flight crew, before entry into MNPS airspace.

3) Approved operating procedures must be followed while in MNPS airspace and deviations from track must not be made without prior ATS clearance, except in an emergency.

4) ATS must be advised in the event of navigation equipment failure or navigation uncertainty.

5) There must be a high standard of supervision, monitoring, and cross-checking of data inserted into automatic navigation systems.

6) Coordination must be maintained with ATS to ensure that misunderstandings over the route to be flown do not occur.

7) RVSM authorization should be noted in the COA for operators wishing to operate in RVSM airspace.

a) Operators operating in RVSM airspace are required to establish and maintain a height monitoring program. The operator can currently participate in the program by overflying the fixed-location height monitoring unit (HMU) located at Strumble, England, or by carrying a portable GPS-based monitoring unit (GMU).

C. Navigation Performance Requirements. For approval of unrestricted operation in NAT MNPS airspace, an aircraft must be equipped with two fully serviceable and independent LRNSs. Acceptable LRNSs include an inertial navigation system (INS), a technical standard order (TSO) C-129 approved global positioning system (GPS) (use of and approval of GPS is detailed in paragraphs 5.10.1.13 and 5.10.1.15 of this section), and flight management computer systems (FMCS) with inputs from one or more inertial reference systems (IRS), or approved GPS sensors. Each LRNS must be capable of providing a continuous indication of the aircraft's position relative to track. When coupled with an FMCS for automatic flight guidance, INS and an inertial sensor system (ISS)/IRS have demonstrated a capability to meet MNPS requirements. Some smaller aircraft may carry two IRSs (or ISS) but only one FMCS. Such an arrangement may meet track-keeping parameters, but does not provide the required redundancy (in terms of continuous indication of position relative to track or of automatic steering guidance) should the FMCS fail. In this case, dual FMCS is required to obtain MNPS certification. The use of Doppler equipment (having a capability of displaying drift, groundspeed and crosstrack error) has been approved, on occasions, in conjunction with single INS for operations in NAT MNPS airspace. However, such approvals are considered to be at the lowest acceptable level of navigation fit suitable for the MNPS. Doppler requires that continuous attention be paid to in-flight rating of, and compensation for, systematic errors to guard against failure of the other navigational aid (NAVAID). Thus, use of Doppler and one other LRNS cannot be recommended for unrestricted MNPS operations.

D. Routes for Aircraft With Only One Long Range Navigation System (LRNS). A number of special routes have been developed for aircraft equipped with only one LRNS. These routes are within MNPS airspace and require a COA. Aircraft that are equipped with normal short-range navigation equipment (VHF omnidirectional radio range (VOR)/distance measuring equipment (DME), automatic direction finding (ADF)) and at least one fully operational LRNS should be considered capable of meeting the MNPS while operating along the routes listed below. Routes, listed below, were, historically, known as Blue Spruce routes and are now referred to as special routes. Continuous VHF coverage exists on these routes at FL 300 and above, except as noted. Inspectors issuing a COA for routes approved for aircraft with only one LRNS must note this limitation on the COA. :

1) A listing of the specific route(s) authorized.

2) A statement: Operators of all routes authorized for aircraft with only one LRNS must be familiar with the guidance material in volume 5, chapter 10, section 1 of this handbook, as may be applicable.

3) A statement: See reverse side of this LOA. (See Figure 5.10.1.1 below.) (If this statement is used, the routes must be specified on the reverse side of the LOA with a line drawn under the last route for which approval is given followed by the office manager's signature.)

E. Routes for Aircraft With Short-Range Navigational Equipment. The following routes may be flown by aircraft with short-range navigation equipment (VOR/DME, ADF), but a COA for operation within MNPS airspace is still necessary:

- Flesland-Myggenes-INGO-Keflavik (G3)
- Sumburgh-Akraberg-Myggenes (G11)

NOTE: Inspectors issuing a COA for routes approved for aircraft with short-range navigational equipment must note this limitation on the COA.

F. Special Provisions for Aircraft Not Equipped for Operation in MNPS Airspace to Climb or Descend through MNPS Airspace. Some aircraft, particularly higher performance international general aviation (IGA) aircraft, operate at flight levels above the upper limit of MNPS airspace (FL 410 and above). Depending on their point of departure, such aircraft often require a comparatively brief penetration of MNPS airspace. In order that these aircraft are not unduly penalized by being excluded from operating at their most economic cruising level, provisions are made for climb and descent through MNPS. The NAT Special Planning Group agreed to the following provisions on the understanding that these would be published in the relevant aeronautical information publications (AIP) by the states concerned, stating the VOR/DMEs to be used and indicating those parts of the MNPS airspace which may be affected by this procedure. Aircraft not equipped for operation in MNPS airspace may be cleared by the responsible ATS unit to climb or descend through MNPS airspace provided the following circumstances exist:

- The climb or descent can be completed within the usable coverage of selected VOR/DMEs and/or within the radar coverage of the ATS unit issuing such clearance
- The aircraft is able to maintain direct pilot-controller communications on VHF
- MNPS authorized aircraft operating in that part of the MNPS airspace affected by such climb or descent are not penalized by the application of this procedure

5.10.1.13. FLIGHT INFORMATION. Operators must supply or ensure that the information necessary to plan, conduct, and control operations is available to operational control and flight crew personnel. Most of this data can be obtained through subscriptions to a government service or to a commercial aeronautical information and charting service. Operators should be expected to supplement these services if necessary and, in all cases, are responsible for ensuring that the information used is accurate and complete. Operators must also supply other data, such as NOTAMs, track messages, and airport obstruction data, when applicable.

A. NOTAMs. Operators must provide NOTAMs to flight crews and operational control personnel for domestic and international operations in airspace covered by NOTAM systems. NOTAM and the related monthly checklists are issued via the Aeronautical Fixed Telecommunication Network (AFTN), while Pre-Flight Information Bulletins (PIBs) are made available at aerodrome AIS units. All other elements of the package are distributed in an agreed upon most expeditious manner.

NOTE: Refer to the Aeronautical Information Publication (AIP) for a description of the current NOTAM system.

B. Track Messages. Messages containing the coordinates of routes to be followed on flexible track systems such as the North Atlantic organized track structure are transmitted approximately every 12 hours. Western Pacific and Northern Pacific Track NOTAMs are available as international NOTAMs under the location identifiers of the respective air route traffic control center; examples are Oakland Center (KZOA) or Anchorage Center (PAZA). Flight crews operating over these routes are required to have all current valid track coordinates available in the cockpit to verify flight plan coordinates, should an in flight rerouting become necessary. Inspectors must ensure that an operator's operational control personnel have this information for flight planning and flight monitoring purposes.

5.10.1.15. PREREQUISITES AND COORDINATION REQUIREMENTS.

A. Prerequisites. This task requires knowledge of GACA policies, pertinent ICAO regulations and other applicable regulations, and qualification as a GACA Inspector.

B. Coordination Requirements. This task may require coordination between the Inspector, the Director, Flight Operations Division, and, any other individual person or office that may be designated to coordinate GACA's navigation interests, activities and approvals, to include the Airworthiness Division.

5.10.1.17. REFERENCES, FORMS, AND JOB AIDS.

A. References.

- FAA AC 91-70 (as amended), Oceanic and International Operations
- GACAR Part 61 and 91
- Annexes to the International Civil Aviation Organization (ICAO)

B. Forms. GACA Activity Report (GAR).

C. Job Aids.

- Figure 5.10.1.1, Letter Informing Operator That a Request for an COA Has Been Denied

5.10.1.19. THE APPROVAL PROCESS. The approval process for oceanic operations is used to ensure that those operations meet regulatory standards and provide for safe operating practices. The process consists of five phases that result in approving or not approving an applicant's proposal. The Inspector must:

- accurately assess the character and scope of the proposal

• determine if a demonstration is required

• determine the need for any coordination requirements

• ensure that the operator has a clear understanding of the minimum requirements that constitute an acceptable submission

• determine the date the operator intends to implement the proposal

5.10.1.21. MNPS OPERATIONAL APPROVAL. In the KSA, operational approval to fly in MNPS airspace is obtained by the issuance of OpSpecs for certificated operators (Part 121, 125 and 135) or by issuance of a COA to an operator under GACAR Part 91. Authorization for operations in NAT MNPS airspace requires GACA approval of crew qualifications as described in FAA AC 91-70 (as amended), Oceanic and International Operations, approval of equipment installation and maintenance procedures, and verification that the ICAO Annex 6 requirements for navigation equipment redundancy are satisfied. All COAs will be issued through the Aviation Operations Safety System (AOSS).

5.10.1.23. PHASE ONE. Phase One is initiated when an applicant inquires about the need for a COA.

A. Purpose of the COA. The issuance of an COA satisfies the requirements of GACAR Part 91, Subpart D. COAs must be carried on the aircraft at all times when operating in special areas of operation.

B. Applicant and GACA Communication. In Phase One, the Inspector must ensure that the operator clearly understands the requirements that must be met for the proposal to be approved by the GACA. It is essential for the operator to understand that, although the Inspector may provide advice and guidance, the proposal submitted to the GACA for approval is solely the operator's responsibility. The operator must be informed of the benefits of submitting required documents as early as possible. The operator must also be aware of the responsibility to advise the GACA, in a timely manner, of any significant changes in the proposal.

C. Authorization Criteria for Issuance of COAs. Before receiving approval for operations in oceanic airspace, the operator must meet the following requirements:

1) The required navigation and communication equipment must be inspected and approved.

2) The aircraft must be properly registered and certificated as airworthy.

3) The operator must develop a journey log in accordance with Article 29 of the Convention on International Civil Aviation. The article states, in part, there shall be maintained in respect to every aircraft engaged in international navigation a journey logbook in which shall be entered particulars of the aircraft, its crew, and of each journey.

NOTE: The term logbook in this context means a navigation log and/or plotting chart that may be kept in the form of electronic data. These logs are sometimes referred to as "trip logs". These records should be maintained for 6 calendar-months following the flight.

4) The crew(s) must have international operations qualifications as certified by a specific, named individual associated with this specific operator, who must accept responsibility for the crew's operation in international

airspace. Crews must meet the applicable requirements stated in paragraph 5.10.1.7, D. If the Inspector determines the crew's qualifications to be inadequate, a validation test will be required. Qualifications for the issuance of a COA may be satisfied by one of the following:

• Completing an operator's oceanic operations training program

• Completing an oceanic operations training program from an approved training establishment or another operator whose program has been approved by GACA

• Submitting military training records indicating prior oceanic operations experience

• Other methods indicating to the Inspector that the operator has been assured that the crew can safely conduct oceanic operations (examples could include written or oral testing)

NOTE: Specific training is not required by the regulations or by Annex 2 to the ICAO Rules of the Air. Inspectors should exercise a great deal of latitude in determining qualifications. For example, a record of previous flights in MNPS airspace without incident is sufficient to indicate that the crew is qualified.

5) For a crew to be considered as being qualified for oceanic operations, crew members must be knowledgeable in the following subject areas:

• ICAO operational rules and regulations

• ICAO measurement standards

• Use of oceanic flight planning charts

• Sources and content of international flight publications

• Itinerary planning

• ICAO flight plan, and flight log preparation;

• Route planning within the special area of operation where flights are to be conducted

• En-route and terminal procedures-different from KSA procedures

• Long-range, air-to-ground communication procedures

• Structure of the special area of operation where the flights are to be conducted

• Air traffic clearances

• International meteorology, including significant weather charts, prognostic weather charts, tropopause prognostic charts, and the terminal area forecasts

• Specific en-route navigation procedures for each type of navigation equipment required for use in the special area of operation

• Emergency procedures, including required emergency equipment, search and rescue techniques, navigation equipment failure techniques, and communication equipment failure techniques

5.10.1.29. PHASE TWO. Phase Two begins when the operator formally submits a proposal for GACA evaluation. The GACA makes initial examination of the documents for completeness with respect to requirements established in Phase One. As a result of phase two, the proposal is accepted or returned with an explanation of deficiencies.

A. Initial Action. In Phase Two, the Inspector's initial action is to review the operator's submission to ensure that the proposal is clearly defined and that the documents specified in phase one have been provided. The required information must be complete and detailed enough to permit a thorough evaluation of the operator's ability and competence to fully satisfy the applicable regulations, national policy, and safe operating practices in oceanic operations. The Inspector also queries the Aviation Operations Safety System (AOSS) to obtain the flight crew's accident, incident, and pilot violations history to determine eligibility, and to ascertain whether the aircraft registration and operator citizenship requirements are met. Authorization for operations in special areas of operation requires that a specific named individual associated with this specific operator, be identified and be one who must accept responsibility for crew performance. Phase Two does not include a detailed operational and technical evaluation or analysis of the submitted information (see Phase Three). However, in phase two the submission must be examined to assess the completeness of the required information.

B. Unsatisfactory Submission. If the operator's submission is not complete or the quality is obviously unacceptable, it must be immediately returned before any further review and evaluation is conducted.

1) Normally, an unacceptable submission is returned with a written explanation of the reasons for its return.

2) In complex cases, a meeting with the operator's key personnel may be necessary to resolve issues and agree on a mutually acceptable solution. If mutual agreements cannot be reached, the Inspector must terminate the meeting, inform the operator that the submission is unacceptable, and return the submission.

3) If all parties are able to reach agreement on measures to correct omissions or deficiencies, and the Inspectors (both operations and maintenance, if applicable) determine that the submission is acceptable, the operator is informed, and phase three begins.

C. Status Reports. It is important for the Inspector involved to keep the operator advised of the status of the proposal. If the Inspector takes no other action, or if the submission is deficient and not returned in a timely manner, the operator may assume that the GACA has tacitly accepted the submission and is continuing with the process. Timeliness of action depends on the situation and on the Inspector's judgment.

5.10.1.31. PHASE THREE. During Phase Three, the GACA evaluates the operator's formal proposal for compliance with the regulations, compliance with the direction provided in this handbook, and compliance with other safety-related documents and safe operating practices. If the results of the evaluation are unsatisfactory, the proposal is returned to the operator for correction and/or termination of the phase. Planning of Phase Four (if required) may begin during Phase Three. When the results of the evaluation are satisfactory, proceed with phase four (if a demonstration is required) and grant conditional approval or acceptance, if appropriate. Proceed to Phase Five if a demonstration is not required.

A. Detailed Analysis. Phase three is the GACA's detailed analysis, review, and evaluation of the operator's proposal. In phase three, the GACA evaluation is focused on the form, content, and technical quality of the submitted proposal.

B. Evaluation Criteria. The Inspector must ensure that the documents adequately establish the operator's ability and competence to conduct operations safely in accordance with the submitted proposal. Operators must present their aircraft at a location convenient to the operator and the Inspectors. A representative minimum flight crew must accompany the aircraft to the inspection site for evaluation of the crew's qualifications to operate navigation and communication equipment in accordance with the approved manual. Additional crews do not need to be present during this inspection, but a representative of the operator will be required to certify, by the signing of the COA, that all crews operating aircraft in special area of operation are at least as qualified as the representative crew. Communication and navigation equipment must be inspected by an Inspector (Airworthiness) to ensure that the installation was done in a manner approved by the GACA, and to verify that the aircraft has the required communication and navigation equipment for operations in MNPS airspace.

C. Equipment Manuals. Operations manuals are required for all navigation equipment. These manuals must contain the material required to define all operational limitations associated with the system's performance. For example, in the case of a station referenced system, the manual would include details of the areas where an adequate signal level may be received or, in the case of an inertial system, any limitations of the system's ground alignment and of the time period within which adequate navigational performance within specified limits can be reasonably assured.

D. Addressing Deficiencies. During Phase Three the Inspector must address any deficiencies in the submitted material in a timely manner before proceeding to subsequent phases. Discussion with the operator may be sufficient to resolve certain discrepancies or questions or to obtain additional information. It may be necessary to return certain portions of the submission to the operator for specific changes. However, when an Inspector determines that, for specific reasons, the material is unacceptable, the Inspector must return the proposal to the operator with an explanation and immediately terminate the process and close the GAR file. If the results of the evaluation are acceptable and a demonstration is necessary, the Inspector may need to grant conditional, initial, or provisional approval of the proposal, pending the results of the demonstration, before continuing with the process.

E. Phase Four Planning. An important aspect of Phase Three is for Inspectors to begin planning the conduct of Phase Four. While evaluating the operator's formal proposal, Inspectors should begin to formulate plans to observe and evaluate the operator's ability to perform, if necessary. These plans must be completed before the actual demonstrations. Inspectors should be aware that situations may arise when a crew that has been conducting oceanic operations under GACAR Part 135 requests approval to operate under GACAR Part 91, or vice versa. In either case, the Inspector may grant credit for the previous operational experience if it is determined that operations can be safely conducted under either set of regulations.

5.10.1.33. PHASE FOUR. During Phase Four, the GACA observes the validation test, and the operator demonstrates ability. As a result of phase four, the validation test is either satisfactory or unsatisfactory.

A. Observation and Evaluation of Demonstration. Phase Four is an operational evaluation of the operator's ability to function in accordance with the proposal evaluated in Phase three. This phase may be completed in Phase Three unless the Inspector determines that a validation test is required. If a validation test is required, it will be necessary to complete this phase in accordance with Volume 4, Chapter 17 of this handbook.

B. Handling Discrepancies. The Inspector must plan for the conduct and observation of the validation test, including such items as participants, evaluation criteria, and sequence of events. During these tests it is normal for minor discrepancies to occur. Discrepancies can often be resolved during the tests by obtaining commitments from responsible company officials. If any questions should arise with regards to the issuance of a COA, responsible Inspectors should request guidance from the Director, Flight Operations Division.

1) The Inspector responsible for overseeing a demonstration must evaluate each discrepancy in terms of its overall impact on the operator's ability and competence to conduct the proposed operation.

2) The Inspector must stop the demonstration in Phase Four when deficiencies or unacceptable levels of competency are observed. The Inspector must identify the phase of the general process to which the applicant must return or decide to terminate the process entirely. If the demonstration is unacceptable because crewmembers were unable to perform their assigned duties, it may be appropriate to advise the operator that the process is terminated and a new proposal should be submitted.

C. Acceptable Demonstrations. If the GACA evaluation of the operator's demonstrated ability is acceptable, the process continues. An operator will not, under any circumstances, be authorized or otherwise approved to conduct any particular operation until all airworthiness and operations requirements are met and the operator is clearly capable of conducting a safe operation in compliance with GACA regulations and safe operating practices.

5.10.1.35. PHASE FIVE. During Phase Five, the GACA approves or accepts a proposal.

A. Indicating Approval. Approval is granted by the issuance of the COA. Upon satisfactory completion of the aircraft and crew inspection, the Inspector issues the approval.

NOTE: Inspectors issuing a COA for routes approved for aircraft with short range navigational equipment must note this limitation on the COA.

E. Issuing the COA. The COA will clearly identify the specific operator with all of the appropriate information and the assigned authorization number.

5.10.1.37. RENEWAL OF A COA. Requirements for renewal of a COA are the same as those for original issuance. If no change of equipment has been made and the same individual is still in charge of crew training in international operations, a new COA may be issued without a re-inspection of the aircraft or a validation flight.

5.10.1.39. DENIAL OF A REQUEST FOR A COA. If an operator is unable to satisfy all requirements for issuance of a COA, the Inspector shall deny the request, notify the operator by letter (Figure 5.10.1.1), and return all submitted documents to the operator.

5.10.1.41. COMPLETION.

A. GAR. Upon completion of all of the above phases, Inspectors should complete the GAR.

5.10.1.43. TASK OUTCOMES. The completion of this task results in:

A. Issuance. Issuance of a COA authorizing operations in special area of operation.

B. Renewal. Renewal of a COA.

C. Denial. Denial of application for a COA.

5.10.1.45. FUTURE ACTIVITIES.

A. Renewal. The operator may apply for renewal of an existing COA.

B. Investigate. The Inspector may be asked to investigate a reported navigational error, altitude deviation, or erosion of longitudinal separation.

C. Verify. The Inspector may be asked to verify a COA.

D. Cancel. A COA may be canceled.

Figure 5.10.1.1. Letter Informing Operator That a Request for a COA Has Been Denied

FROM: General Authority of Civil Aviation
[address]

TO: [person or department requesting COA]
[company name (if applicable)]
[address]

Dear [name],

Your request for a Certificate of Authorization (COA) to operate in [name of special area of operation airspace has been denied for the following reasons:

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You may reapply for a COA upon correction of the discrepancies listed above. You may contact this office at [telephone number] if you have any questions.

Sincerely,

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[Inspector's signature who reviewed application]

[Inspector's name]

[title]

VOLUME 5. AIR OPERATOR – OPERATIONAL APPROVALS

CHAPTER 11. AUTHORIZE ELECTRONIC FLIGHT BAGS (EFB)

Section 1. Evaluation and Authorization

5.11.1.1. GENERAL. This section provides references, information, and guidance to be used to evaluate an operator's initial application for operations specification (OpSpec)/Certificate of Authorization (COA) ,or to evaluate a significant modification to an existing EFB program.

5.11.1.3. APPLICABILITY. This process for an EFB authorization is to be used in combination with Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76 (as amended), Guidelines for the Certification, Airworthiness, and Operational Approval of Electronic Flight Bag Computing Devices, and the issuance of OpSpec A61, as described in this handbook. Such approvals should be coordinated with the Flight Operations Division and the Airworthiness Division, and they should reflect any aircraft flight manual (AFM) limitations and operational limitations defined by the GACA.

5.11.1.5. BACKGROUND.

A. EFB Program. An EFB is any device, or combination of devices, running EFB software applications. Operators seeking EFB program authorization will utilize the language within the Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76 (as amended), Authorization for Use of Electronic Flight Bags, to develop an EFB program. The program specifics (i.e., operating procedures, pertinent training modules, checklists, operations manuals, training manuals, maintenance programs, minimum equipment lists (MEL), other pertinent documents, and reporting procedures) are developed and incorporated into operator policy before GACA grants authorization. GACA authorization for an EFB program is granted through the issuance of OpSpec A61.

B. EFB Program Authorization. The initial authorization for an EFB program establishes a baseline for an operator's authorized use of EFB hardware and software. The authorization recognizes the operator's ability to manage their EFB program with an appropriate level of GACA involvement. PIs are given authority to tailor the formality and process of an assessment appropriate to the scope of the modifications proposed by the operator.

5.11.1.7. RESOURCES. The following are resources to be referenced in the evaluation process

A. The Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76 (as amended). This is an AC authored by FAA Flight Standards. It addresses considerations for EFB hardware, EFB software applications, and all the required and applicable elements that should be incorporated into an EFB program. The current edition of AC 120-76 provides a means of addressing many elements that an operator may incorporate into an EFB program. Some elements are necessary of every program (e.g., EFB program catalog) and others are optional elements (e.g., electronic charts). An operator may elect to provide an alternate means; however, such action may require further GACA evaluation at the discretion of the principal operations inspector (POI).

B. FAA Flight Standardization Board (FSB) Reports and Operational Suitability Reports (OSR). FAA FSB

Reports and OSRs may contain information that can help an inspector evaluate an EFB program application. FSB Reports or OSRs containing recommendations pertaining to EFBs for a particular model aircraft are controlling. FSB Reports and OSRs are published on the FAA's Flight Standards Information Management System (FSIMS) (http://fsims.faa.gov) "Publications" tab under the "MMEL & AEG Guidance Documents," "Flight Standardization Board (FSB) Reports" section.

C. OpSpec Guidance. GACA eBook Volume-15 provides administrative guidance for the issuance of A61.

5.11.1.9 INITIAL EFB PROGRAM EVALUATION. An operator seeking to use EFBs in its flight operations must develop an EFB program and submit an application for OpSpec A61. PIs must use the five-phase process described in Volume 3, Chapter 1, Section 1 as a guideline for the evaluation and authorization of initial EFB program applications. PIs may also utilize the checklists within Volume 5, Chapter 11, Section 2 to validate an operator's initial EFB program application. The following is additional guidance for initial EFB program evaluation.

A. Review Published Guidance. GACA personnel responsible for evaluating any part of an A61 application must read the Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76 (as amended); GACA eBook Volume-15 (A61); and this guidance (Volume 5, Chapter 11, Sections 1 and 2) in their entirety to ensure an understanding of the GACA's EFB policy. Inspectors must use the Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76 (as amended as the primary reference to assess an EFB program application. Inspectors responsible for accepting and evaluating an application can use the checklist in Volume 5, Chapter 11, Section 2 as an additional aid to help identify specific requirements defined in the Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76 (as amended).

B.EFB Program Catalog. The EFB program catalog is one of the most important aspects of an EFB program and PIs should make sure the catalog and the processes associated with it are well defined and demonstrated. The catalog is a reference of the EFB hardware (make and model) and EFB software applications used by crewmembers on each aircraft make, model, and series (M/M/S). An EFB program must have a process defined to keep the catalog current. In addition, a record of all EFB program catalog revisions must be maintained by the operator. PIs must have access to the current catalog, when requested, to facilitate the performance of surveillance and oversight functions.

C. EFB Program Modifications. POIs must verify that an operator's proposed EFB program has the processes in place to identify, incorporate, and evaluate minor EFB program changes, as defined by the Federal Aviation Administration (FAA) Advisory Circular (AC) 120-76 (as amended). POIs must have a reasonable expectation with the process because EFB program authorization is intended to allow operators to manage their EFB program with a limited level of GACA involvement. Operators must demonstrate their ability to autonomously manage minor changes while identifying appropriate times for GACA involvement (i.e., significant changes). Operators must update the program catalog with all minor and significant program changes.

D. Demonstrations.

1) The POI must observe and verify the operator's ability to manage an EFB program and conduct flight operations in a planned demonstration period. The demonstration phase for an initial EFB program must:

• Include at least 6 months of flight operations.

• Allow observation and data collection of the EFB use in actual flight operations.

• Allow observation of EFB program management processes, to include the ability to evaluate program modifications, revise software applications, and manage the EFB program catalog.

• Begin with the issuance of A61 with a temporary authorization condition (see details in subparagraph 5.11.1.9.E below).

2) The demonstration concludes when the POI determines the operator has provided sufficient proof to satisfy the GACA's requirement for meeting all the plan objectives, or when the operator is unable to complete them satisfactorily.

E. Temporary Authorization. Issuance of OpSpecA61 with a temporary authorization condition is required when the POI requires demonstration in actual flight operations. When operations are being conducted with a temporary authorization, the operator must have an additional independent means of acquiring required information in flight (i.e., a backup) in the event of a failure or common mode error of the evaluated items. The backup strategy and the EFB are not used simultaneously during the demonstration period, but the backup strategy must be available. Once OpSpec A61 is issued without temporary authorization, the backup may be removed.

NOTE: All initial evaluations of an EFB program require a demonstration in actual flight operations and, therefore, require issuance of A61 with a temporary authorization condition.

5.11.1.11. EVALUATING MODIFICATIONS TO EFB PROGRAMS. Once an operator receives authorization for an EFB program, they may elect to modify the hardware, software applications, procedures, or aircraft associated with the program. PIs may also utilize the checklists within Volume 5, Chapter 11, Section 2 to validate, as applicable, an operator's EFB program modification.

A.Minor Modifications. Operators issued A61 are allowed to incorporate and evaluate minor changes into their EFB programs. An authorized EFB program must have a process for the operator to determine if a modification is minor. All minor modifications incorporated by an operator must be recorded in the EFB program catalog, and operators must keep a record of all revisions to the catalog.

B.Significant Modifications. The POI must conduct a formal assessment of any modification to an EFB program that is not considered minor. POIs are encouraged to use Volume 5, Chapter 11, Section 2 as a general outline for the evaluation and authorization of new modifications. Because an operator can seek to modify their authorized EFB program in a variety of ways, it is impracticable to define a standard assessment to fit all possible requests. The POIs must work with the operator to define/develop an assessment with the formality, timeline, and demonstration parameters appropriate to the modification requested. Past operator experience and performance should also be considered.

5.11.1.13. LIMITED EVALUATIONS. An operator may desire to conduct a limited evaluation of a program modification in actual flight operations for business/safety case purposes. POIs can authorize these evaluations by issuing a remark in A61. In general, this should only be a consideration if all other means (e.g., simulator testing) of evaluating an EFB program modification are considered inadequate. These types of evaluations should be small in scope (i.e., approximately 15 percent or less of total pilots and/or Cabin Crew Member (CCMs)), performed by experienced crewmembers, and have defined test parameters. GACA and the operator must reach a common understanding of what will be necessary to achieve the goals of the evaluation and define the limitations and conditions (if necessary).

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CHAPTER 11. AUTHORIZE ELECTRONIC FLIGHT BAGS (EFB)

Section-2 Electronic Flight Bag (EFB) Program Checklist.

A.5.11.2.1 GENERAL. This section contains questions for use by PIs to review an operator's EFB program. In general, these questions are specific to initial installations and training for a given aircraft. When an operator proposes changes to their EFB program, these questions may also be referenced, when applicable.

Figure 5.11.2.1.

Checklist 1—Electronic Flight Bag (EFB) Hardware & Software Evaluation

NOTE:Checklist 1 contains a list of questions for PIs to use during a tabletop evaluation of the EFB focusing on the EFB hardware and software applications. The checklist starts with EFB hardware questions, then presents general user interface questions, and ends with specific EFB software application questions (if applicable). The checklist is designed so any question answered as "No" requires a comment, and in some cases may be "Not Applicable."

Electronic Flight Bag (EFB) Hardware

1. Is the display brightness and contrast adjustable?	▢ No	▢ Yes
2. Is the display brightness acceptable when it adjusts automatically?	▢ No	▢ Yes
3. Are there any display artifacts, such as jagged lines, impairing functionality?	▢ No	▢ Yes
4. Are controls labeled appropriately to describe their intended function?	▢ No	▢ Yes

5. Is the display readable under all flight deck illumination conditions?	▢ No	▢ Yes
6. Are touch-sensitive areas clearly indicated on the touch screen?	▢ No	▢ Yes
7. Can EFB inputs be made quickly and accurately in any operational environment (e.g., in turbulence)?	▢ No	▢ Yes
8. Can touch screen inputs and selections be made without obscuring critical information on the display?	▢ No	▢ Yes
9. Is the touch screen resistant to scratching, hazing, or other damage that can occur through normal use and exposure?	▢ No	▢ Yes
10. Are inadvertent or multiple activation of controls minimized?	▢ No	▢ Yes
11. Does the EFB start up in a predictable state?	▢ No	▢ Yes
12. Can the EFB be rebooted when power is cut to the EFB?	▢ No	▢ Yes

13. Does the EFB function correctly when rebooted?	☐ No	☐ Yes
14. Are all the EFB failure modes easy to see and identify?	☐ No	☐ Yes
15. Is the failure annunciation/message appropriate for the EFB function which failed?	☐ No	☐ Yes
16. Are EFB recovery means easy to remember and apply when the EFB fails?	☐ No	☐ Yes
17. Has the operator provided evidence of electromagnetic compatibility (EMC) testing if utilizing portable EFB hardware?	☐ No	☐ Yes
18. Has the operator provided evidence that the device will continue operation after a rapid decompression event?	☐ No	☐ Yes

Provide the Number and a Comment for Each EFB Hardware Question Checked as "No."

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General User Interface

19. Is the revision information and currency expiration date available and presented clearly?	☐ No	☐ Yes
20. Does the device respond immediately to user inputs?	☐ No	☐ Yes
21. Is the processing speed always appropriate for normal use?	☐ No	☐ Yes
22. Are appropriate busy or progress indicators displayed when processing is delayed?	☐ No	☐ Yes
23. Is the user interface, including functions and navigation, consistent throughout the EFB?	☐ No	☐ Yes
24. Is all information needed displayed and easily accessible? Is there missing or difficult to find information?	☐ No	☐ Yes
25. Are common actions and time-critical functions easy to access?	☐ No	☐ Yes
26. Are there standard ways to perform common actions?	☐ No	☐ Yes

27. Are the displays and controls used on the EFB similar across software applications? Are a common set of controls and graphical elements used across software applications?	▢ No	▢ Yes
28. Can all colors be distinguished under the various lighting conditions?	▢ No	▢ Yes
29. Is color coding implemented with a secondary code, such as shading or highlighting, when used to display critical information?	▢ No	▢ Yes
30. Are the colors red and yellow used appropriately—only for warnings and cautions?	▢ No	▢ Yes
31. Is the text easily readable?	▢ No	▢ Yes
32. Do the characters stand out against the display background?	▢ No	▢ Yes
33. Are upper case and italic text used infrequently?	▢ No	▢ Yes
34. Is text used in low-light conditions appropriate in size and easy to read?	▢ No	▢ Yes

35. Is it easy to zoom in on text or graphics when they are too small?	☐ No	☐ Yes
36. Is it obvious when information is out of view and can it easily be brought into view?	☐ No	☐ Yes
37. Is the spacing between characters appropriate?	☐ No	☐ Yes
38. Is the vertical spacing between lines appropriate?	☐ No	☐ Yes
39. Are icons and symbols legible?	☐ No	☐ Yes
40. Are icon and symbol functions obvious?	☐ No	☐ Yes
41. Are the icons and symbols distinguishable from one another?	☐ No	☐ Yes
42. Is each icon's meaning explained by a label or other means?	☐ No	☐ Yes

43. Are the EFB icons and symbols consistent with their paper equivalents?	▢ No	▢ Yes
44. Are alerts and reminders consistent across all EFB software applications?	▢ No	▢ Yes
45. Are reminders implemented so as not to distract?	▢ No	▢ Yes
46. Is the failure message appropriate for the EFB function that failed?	▢ No	▢ Yes
47. Is it easy to reset parameters to their default when they have been customized?	▢ No	▢ Yes
48. Is EFB customization controlled through an administrative control process?	▢ No	▢ Yes

Provide the Number and a Comment for Each General User Interface Question Checked as "No."

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General EFB Software Applications

49. Can required information be found quickly and accurately within all EFB software applications?	☐ No	☐ Yes
50. Is the information within EFB software applications organized consistently?	☐ No	☐ Yes
51. Is the layout of information appropriate for all EFB software applications?	☐ No	☐ Yes
52. Is required information easy to read?	☐ No	☐ Yes
53. Is it easy to tell which EFB software application is currently open/active?	☐ No	☐ Yes
54. Is it easy to switch between EFB software applications?	☐ No	☐ Yes
55. Does each EFB software application function as intended?	☐ No	☐ Yes
56. Is access or links to related information appropriately supported?	☐ No	☐ Yes

57. Are similar types of information accessed in the same way? ☐ No ☐ Yes

58. Is it easy to return to the place where the user started from? ☐ No ☐ Yes

Provide the Number and a Comment for Each General EFB Software Applications Question Checked as "No."

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Electronic Documents (If Applicable)

59. Is it easy to find the information needed in a document? ☐ No ☐ Yes

60. Is it easy to tell which documents are open? ☐ No ☐ Yes

61. Is it easy to move between documents quickly? ☐ No ☐ Yes

62. Is it easy to tell what document is currently in view? ☐ No ☐ Yes

63. Is there a list of available documents to choose from?	☐ No	☐ Yes
64. Is the document search function appropriate?	☐ No	☐ Yes
65. Are tables readable and usable?	☐ No	☐ Yes
66. Are figures readable and usable?	☐ No	☐ Yes

Electronic Charts (If Applicable)

67. Is there a way to pre-select specific charts for easy access during a particular flight?	☐ No	☐ Yes
68. Is it easy to search for a chart?	☐ No	☐ Yes
69. Is it easy to access charts when a last-minute change is necessary?	☐ No	☐ Yes
70. If the chart application uses aircraft location to facilitate access to charts, is this function appropriate (i.e., either approved by Aircraft Certification Service (AIR) or explicitly allowed by the current edition of Advisory Circular (AC) 120-76)?	☐ No	☐ Yes

71. Is the information layout for fixed charts consistent with the paper equivalent?	☐ No	☐ Yes
72. Is it easy to switch between a decluttered and normal display if decluttering is supported?	☐ No	☐ Yes
73. Is there a clear indication when any chart elements are suppressed?	☐ No	☐ Yes
74. Can the display be easily returned to its default position after zooming, panning, or decluttering?	☐ No	☐ Yes

Provide the Number and a Comment for Each Electronic Documents and Charts Question Checked as "No."

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Electronic Checklists (ECL) (If Applicable)

75. Are normal checklists available in the appropriate order of use?	☐ No	☐ Yes
76. Can checklists be accessed individually for review or reference?	☐ No	☐ Yes

77. During abnormal conditions, are relevant checklists easy to access?	▢ No	▢ Yes
78. During abnormal conditions, does the device indicate which checklists and/or checklist items are required and which are optional?	▢ No	▢ Yes
79. Is it clear where to find all checklists, whether on the EFB or on paper?	▢ No	▢ Yes
80. Is the location of a paper document provided when it is referred to by the ECL?	▢ No	▢ Yes
81. Does each checklist have a constantly visible title distinct from other checklists?	▢ No	▢ Yes
82. Is it easy to select a checklist from a set of open checklists?	▢ No	▢ Yes
83. Is there a reminder to review incomplete items when closing an incomplete checklist?	▢ No	▢ Yes
84. Can an incomplete checklist be closed after acknowledging it is not complete?	▢ No	▢ Yes

85. Does the ECL discourage two or more checklists from being used simultaneously?	☐ No	☐ Yes
86. Is progress through the ECL clear?	☐ No	☐ Yes
87. It is easy to reset the ECL to start over again?	☐ No	☐ Yes
88. Does the checklist provide appropriate reminders for tasks requiring a delayed action?	☐ No	☐ Yes
89. Does the checklist clearly highlight decision branches?	☐ No	☐ Yes
90. Can you return to the checklist from links or related information in one step?	☐ No	☐ Yes
91. Is there an indicator of which item in the checklist you are working on?	☐ No	☐ Yes
92. Is the checklist's active item clearly indicated?	☐ No	☐ Yes

93. Can the status of an item be easily changed?	☐ No	☐ Yes
94. Does the next item automatically become active when the previous one is complete?	☐ No	☐ Yes
95. Can the current item be deferred without completing it?	☐ No	☐ Yes
96. Is it easy to view other items, even in a long checklist, without changing the active item?	☐ No	☐ Yes
97. Is it easy to move between items within a checklist?	☐ No	☐ Yes
98. Is there a clear indication all items, as well as the whole checklist, are complete when finished?	☐ No	☐ Yes

Provide the Number and a Comment for Each ECL Question Checked as "No."

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Performance Calculations (If Applicable)

99. Does the device identify entries having an incorrect format or type and does it generate an appropriate error message?	☐ No	☐ Yes
100. Does the error message clarify the type and range of data expected?	☐ No	☐ Yes
101. Are units for performance data clearly labeled?	☐ No	☐ Yes
102. Do the labels used in the EFB match the language of other operator documents?	☐ No	☐ Yes
103. Is all the information necessary for a given task presented together or easily accessible?	☐ No	☐ Yes
104. Can the crews modify performance calculations easily, especially when making last-minute changes?	☐ No	☐ Yes
105. Are outdated results of performance calculations deleted when modifications are entered?	☐ No	☐ Yes
106. Does the display and/or crew training provide information to the crew on the assumptions on which the calculations are based?	☐ No	☐ Yes

107. Are crews trained to identify and review default values and assumptions about the aircraft status or environmental conditions?	▢ No ▢ Yes
108. Are the assumptions made about any calculation as clear to pilots as similar information would be on a tabular chart?	▢ No ▢ Yes

General Electronic Flight Bag (EFB) Hardware

1. Is there a backup source in the flight deck for EFB information?	▢ No ▢ Yes
2. Is the EFB display readable under all typical flight-deck lighting conditions?	▢ No ▢ Yes
3. Are there appropriate Master Minimum Equipment List (MMEL)/minimum equipment list (MEL) items to handle EFB failures?	▢ No ▢ Yes
4. Have EFB failure items been incorporated into Federal Aviation Administration (FAA)-required/accepted checklists?	▢ No ▢ Yes
5. Are crews able to adjust and lock the EFB for optimal viewing?	▢ No ▢ Yes
6. Are the EFB hardware components usable and suitably durable for the flight deck?	▢ No ▢ Yes

Provide the Number and a Comment for Each General EFB Hardware Question Checked as "No."

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EFB Stowage

7. Is there a stowage area for the EFB?	☐ No ☐ Yes
8. Is the stowage securing mechanism simple to operate?	☐ No ☐ Yes
9. Is the stowage securing mechanism unobtrusive when not in use?	☐ No ☐ Yes
10. Does the EFB stowage allow appropriate visual and physical access to flight controls, displays, and emergency egress path?	☐ No ☐ Yes
11. Does the viewable stowage allow pilots a sufficiently clear view of critical outside references?	☐ No ☐ Yes
12. Can the EFB be moved easily to and from the stowage area without blocking access to flight displays/controls?	☐ No ☐ Yes

13. Are the device and/or the stowage area unlikely to be damaged under normal use?

▢ No ▢ Yes

Unsecured EFB (If Applicable)

14. Is there appropriate access to flight controls/displays when the unsecured EFB is in use? ▢ No ▢ Yes

15. Is there an acceptable place to put an unsecured EFB when in use? ▢ No ▢ Yes

16. Is there an acceptable place to put an unsecured EFB when *not* in use? ▢ No ▢ Yes

17. Can the kneeboard EFB be positioned so the pilot has full control authority? ▢ No ▢ Yes

18. Is the kneeboard EFB comfortable for the pilot to wear under normal conditions? ▢ No ▢ Yes

Provide the Number and a Comment for Each EFB Stowage and Unsecured EFB Question Checked as "No."

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Workload

19. Is the EFB installation appropriate for use in high workload phases of flight? ▢ No ▢ Yes

20. Does stowing the EFB require excessive head-down time or workload? ▢ No ▢ Yes

21. Is the workload acceptable when there is an EFB failure? ▢ No ▢ Yes

22. Are other than critical EFB messages inhibited during high workload phases of flight? ▢ No ▢ Yes

23. Is the workload acceptable when configuring electronic charts while flying a procedure? ▢ No ▢ Yes

24. Are there procedures to mitigate EFB workload? ▢ No ▢ Yes

25. Are there appropriate procedures for using EFB in high workload phases of flight? ▢ No ▢ Yes

Software Applications

26. Does the EFB use terms, icons, colors, and symbols consistent with other flight deck systems?	▢ No	▢ Yes
27. Does using the electronic checklist (ECL) produce the same crew actions the paper equivalent would?	▢ No	▢ Yes
28. If the EFB shows own-ship in flight, is there an operationally similar function presented on an installed display? Can the flightcrew differentiate between the information on the EFB and the information on the installed display?	▢ No	▢ Yes
29. Is there a clear indication of the revision date(s) of the software that are on the EFB?	▢ No	▢ Yes

Provide the Number and a Comment for Each Workload and Software Applications Question Checked as "No."

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EFB Cybersecurity

30. Are cybersecurity controls in place to mitigate against the risk of unauthorized modifications to an EFB's operating system architecture, its specific hosted applications, and any of the databases or datalinks used to enable its hosted applications?	▢ No	▢ Yes
31. Are cybersecurity controls in place to ensure administrative management of portable electronic devices (PED), which have been authorized for use as a portable EFB? (Note: This includes, but is not limited to, identifying the individual or aircraft to which the PED is assigned, as well as ensuring operating system architecture and associated hosted software applications are updated in a timely manner.)	▢ No	▢ Yes

EFB Procedures

32. Are there procedures for starting up and shutting down the EFB?	▢ No ▢ Yes
33. Are there appropriate procedures for all the EFB failure modes?	▢ No ▢ Yes
34. Are there EFB procedures for when other aircraft system failures could render the EFB unusable?	▢ No ▢ Yes
35. Are there procedures for using EFB backup information?	▢ No ▢ Yes
36. Are there procedures for establishing which source of information is primary?	▢ No ▢ Yes
37. Are there procedures specifying what data to use when data is redundant or different from the EFB?	▢ No ▢ Yes
38. Are there procedures for removal of a kneeboard EFB during emergency landing or egress (if applicable)?	▢ No ▢ Yes
39. Are there procedures for updating passwords and for device lockout?	▢ No ▢ Yes

Provide the Number and a Comment for Each EFB Cybersecurity and Procedures Question Checked as "No."

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Procedures for Keeping EFB Content/Data Current

40. Are there procedures to ensure data is accurate and current for each software application?	▢ No ▢ Yes
41. Are changes to content/data appropriately documented?	▢ No ▢ Yes
42. Are there procedures to notify crews of EFB updates?	▢ No ▢ Yes
43. Are there procedures to ensure the correct information is installed when EFBs use information specific to the aircraft type or tail number?	▢ No ▢ Yes
44. Are operational control procedures consistent with regulations concerning preventative maintenance?	▢ No ▢ Yes
45. Is there a procedure to avoid corruption/errors during changes to the EFB device?	▢ No ▢ Yes

46. Is there a procedure to ensure all EFBs have the appropriate content/data installed when there are multiple EFBs on the flight deck?	☐ No	☐ Yes
47. Is there a procedure to ensure EFB data in use is approved for use in flight?	☐ No	☐ Yes
48. Is there a procedure for when the database is not approved for use in flight?	☐ No	☐ Yes
49. Is there a procedure to ensure all customized values are cleared from the EFB?	☐ No	☐ Yes

Procedures for User Feedback

50. Is there a procedure for EFB users to provide feedback?	☐ No	☐ Yes
51. Is there a procedure for the operator to monitor feedback, correct EFB deficiencies, and/or notify the EFB manufacturer?	☐ No	☐ Yes
52. Are there procedures or built-in limits preventing the setting of customized color schemes conflicting with flight deck color conventions?	☐ No	☐ Yes
53. Is there a policy regarding the use of supplemental audio and/or video in flight?	☐ No	☐ Yes

54. Is the EFB audio set to minimize any interference with higher priority communications?	▢ No ▢ Yes

Procedures for Specific EFB Software Applications (If Applicable)

55. Are there specific policy/procedures for using the electronic charts application?	▢ No ▢ Yes
56. Does the policy specify what other EFB software applications can be used while a procedure using the electronic charts is actively being flown?	▢ No ▢ Yes
57. Are there procedures on how to use the electronic charts when the EFB uses aircraft status data to configure chart elements?	▢ No ▢ Yes
58. Are there procedures to ensure navigation/approach charts required for the flight are installed and available?	▢ No ▢ Yes
59. Is there a procedure to identify the controlling copy of Weight and Balance (W&B)?	▢ No ▢ Yes
60. Is there a procedure to establish responsibility for completion of W&B software applications?	▢ No ▢ Yes
61. Are there procedures to maintain required W&B records?	▢ No ▢ Yes

62. Is there a procedure to ensure EFB performance data can be stored outside the EFB? ▢ No ▢ Yes

63. Are there procedures for crosschecking EFB performance data to identify data entry errors? ▢ No ▢ Yes

Provide the Number and a Comment for Each EFB Procedure Question Checked as "No."

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EFB Training

64. Are there appropriate EFB training, checking, and currency requirements? ▢ No ▢ Yes

65. Does the EFB training program address all EFB intended functions and EFB software applications? ▢ No ▢ Yes

66. Is there training on how to use unique features of the software applications? ▢ No ▢ Yes

67. Are crews proficient on the EFB at the completion of EFB training? ▢ No ▢ Yes

68. Is EFB training customized for new users?	▢ No ▢ Yes
69. Is the manufacturer's EFB documentation sufficient?	▢ No ▢ Yes
70. Does the EFB training device provide an appropriate degree of fidelity when the actual EFB is not used?	▢ No ▢ Yes
71. Does the EFB training device simulate the key aspects of the task?	▢ No ▢ Yes
72. Does the EFB training appropriately address the meaning of icons and symbols?	▢ No ▢ Yes
73. Does EFB training address security considerations (e.g., passwords, device lockout)?	▢ No ▢ Yes

Training for Charts (If Applicable)

74. Is training on the use of electronic charts appropriate?	▢ No ▢ Yes
75. Is there training on unique features of the electronic charts?	▢ No ▢ Yes

76. Is there training on differences in map scale, orientation, and data quality between the electronic charts and other flight deck displays?	☐ No	☐ Yes
77. Is there training on the limitations of own-ship position when it is displayed?	☐ No	☐ Yes
78. Is there training on policies pertaining to use of the electronic charts?	☐ No	☐ Yes
79. Can crews use the electronic charts as well as paper charts?	☐ No	☐ Yes
80. Can crews use the electronic charts to orient themselves and track their progress as they fly required procedures?	☐ No	☐ Yes

Training for ECL Systems (If Applicable)

81. Is there appropriate training on how to use ECLs?	☐ No	☐ Yes
82. Is there training on how to use unique features of the ECLs (e.g., how the EFB indicates a checklist item has been deferred)?	☐ No	☐ Yes
83. Is there training on which checklists are supported electronically and which are not?	☐ No	☐ Yes

84. Is there training on the limitations of ECL automation when it uses aircraft status data?	▢ No	▢ Yes

Training for Flight Performance Calculations (If Applicable)

85. Is there appropriate training on how and when to use the flight performance software application?	▢ No	▢ Yes
86. Is there training on critical performance calculation assumptions (e.g., runway length, W&B)?	▢ No	▢ Yes
87. Is there training to review default values for aircraft status and environmental conditions?	▢ No	▢ Yes
88. Is there training on how to enter information required by the performance software applications?	▢ No	▢ Yes
89. Is there training on how to interpret and use results of the flight performance calculations?	▢ No	▢ Yes
90. Is there training on where to obtain values when their normal sources are not available?	▢ No	▢ Yes
91. Is there training on coordinating the roles of dispatchers and crewmember?	▢ No	▢ Yes

Provide the Number and a Comment for Each Training Question Checked as "No."

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Crew Performance: Preflight Planning

Do crews with the EFB perform as well or better than crews with paper documents when:

92. Calculating aircraft W&B, takeoff, climb, and maneuvering speeds?	☐ No ☐ Yes
93. Crews maintain critical data for immediate reference?	☐ No ☐ Yes
94. There is a runway change and a need to reference deicing fluid requirements or an MEL item?	☐ No ☐ Yes
95. There are time-critical adjustments prior to block out/taxi and takeoff?	☐ No ☐ Yes

Crew Performance: Takeoff

Do crews with the EFB perform as well or better than crews with paper documents when:

96. There is a takeoff on a runway requiring a briefing for a special operator engine-out procedure?	☐ No ☐ Yes

97. There is a complex Standard Instrument Departure (SID) with an abnormal or an emergency during the departure climb-out?

☐ No ☐ Yes

98. There is an emergency requiring a return to the departure or alternate departure airport?

☐ No ☐ Yes

99. One EFB fails, requiring one pilot to rely on the EFB of the other pilot immediately after takeoff?

☐ No ☐ Yes

Provide the Number and a Comment for Each Preflight Planning and Takeoff Question Checked as "No."

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Crew Performance: Cruise

Do crews with the EFB perform as well or better than crews with paper documents when:

100. There is an engine failure/fire with possible condition of destination below weather minimums?

☐ No ☐ Yes

101. There is electrical smoke in the cockpit requiring use of smoke mask/goggles while completing checklists or using EFB for approach briefing?

☐ No ☐ Yes

Crew Performance: Descent

Do crews with the EFB perform as well or better than crews with paper documents when:

102. There are conditions requiring reference to Surface Movement Guidance and Control System (SMGCS) taxi routing or a complex clearance?	☐ No	☐ Yes
103. Reported runway conditions require reference to operational limitations?	☐ No	☐ Yes

Crew Performance: Approach/Landing

Do crews with the EFB perform as well or better than crews with paper documents when:

104. There is a runway change or the need to recompute landing weight and V speeds during approach?	☐ No	☐ Yes
105. There are poor weather conditions or airports with complex taxi routes?	☐ No	☐ Yes
106. There is a request for a specific taxiway turn during rollout after landing?	☐ No	☐ Yes

Crew Performance: Destination Ground Operations

Do crews with the EFB perform as well or better than crews with paper documents when:

107. There is an EFB partial failure or erroneous output requiring maintenance discrepancy to be entered?	☐ No	☐ Yes

Provide the Number and a Comment for Each Crew Performance Question Checked as "No."

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Figure 5.11.2.3. Checklist 3—Electronic Flight Bag (EFB) Line Evaluation Job Aid

USED FOR DATA COLLECTION DURING VALIDATION PERIOD

This tool provides a starting point for EFB line operations evaluations. Use of this tool can be customized as appropriate for the situation. This is a final check to ensure there are no problems with the EFB design/interface, training, or procedures prior to the authorization for use.

The questions below encompass the operations and safety evaluation. In cases where a system shows weaknesses or limitations, mitigations must be developed in consultation with the applicant.

In some cases, an EFB may add to the complexity of flight operations. The key questions to be answered are:

1. Can the flight be conducted as safely with an EFB as with the methods/products it is intended to replace?
2. Does the EFB add an unacceptable level of complexity for any critical activity or phase of flight?

In order to answer these questions, it is helpful to consider more specific aspects of EFB usage, which are covered in Sections II through V below. Space is also provided in Section I to record general notes about the system and the evaluation.

I. Describe system configuration and flight conditions:

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II. Overview. The main aspects to be assessed are encompassed by the following questions:

1. a. Was training adequate to ensure the crewmember(s) could perform in a safe and efficient manner? ☐ No ☐ Yes

   b. Were individual crewmember knowledge and skills adequate to allow normal coordinated flight deck activities? ☐ No ☐ Yes

   c. Was crewmember knowledge regarding observed software applications adequate? ☐ No ☐ Yes

2. Are adequate procedures in place to ensure the EFB is integrated into the crew/operator's system (e.g., normal and abnormal/emergency operations and maintenance functions)? ☐ No ☐ Yes

3. Were the EFB hardware or software applications adequate and appropriate during the flight? If there were any problems, particularly in a critical phase of flight, describe in the notes space below. ☐ No ☐ Yes

4. Could the crewmember(s) recover from usage errors without undue distraction or discussions? If usage errors were frequent or a distraction, describe in notes space below. ☐ No ☐ Yes

5. Was the workload required for completing a task with the EFB equal to or less than the workload for completing the task with the conventional method? Consider the use of the EFB both in isolation as well as with those functions used concurrently with other aircraft systems. If no, specify phase of flight and task for any marginal or unacceptable increases in workload in notes space below. ☐ No ☐ Yes

Describe any problems checked as "No" above:

III. General.

6. Was each crewmember able to use the controls for menu and functionality without frequent errors?

☐ No ☐ Yes

7. Was the device appropriate and operational when exposed to environmental factors (e.g., turbulence, cold weather, vibration)?

☐ No ☐ Yes

8. a. Was the device free of significant limitations in regard to display (e.g., off-axis view angles or various different lighting conditions)?

☐ No ☐ Yes

b. Does the device have easy and adequate dimming functions in low-light (nighttime) conditions?

☐ No ☐ Yes

c. Is the device adequately backlit and/or viewable by flight deck lighting in low-light (nighttime) conditions?

☐ No ☐ Yes

d. Is the device clearly visible in bright sunlight conditions?

☐ No ☐ Yes

9. Was the device display clear (adequate resolution)? Confirm the display was never misinterpreted because of viewing limitations. If so, record issues in notes space below.

☐ No ☐ Yes

10. Did the crewmember(s) ensure proper EFB stowage (including viewable stowage) per standard operating procedures (SOP)? Temperature limitations acknowledged?

☐ No ☐ Yes

11. Does the display continue to be usable after prolonged use in the flight deck environment (if applicable)?

☐ No ☐ Yes

12. Are normal functions (e.g., shutdown, startup) adequate to ensure crewmembers are not required any undue attention or concern?

☐ No ☐ Yes

13. Were procedures adequate for identifying currency of EFB data?

☐ No ☐ Yes

14. Could the crewmember(s) easily find and use required items and functions?

☐ No ☐ Yes

15. Were the abbreviations and/or icons easy to understand?

☐ No ☐ Yes

16. Could the crewmember(s) easily switch between critical software applications?

☐ No ☐ Yes

17. If critical (e.g., abnormal or emergency checklists) software applications are authorized in the EFB configuration basis, is their use at least equal to or better than previously approved methods?

▢ No ▢ Yes

▢ N/A

18. Was the time to complete normal tasks appropriate?

▢ No ▢ Yes

19. Were audio features adjustable and appropriate for the flight deck or cabin environment and did they not cause crewmember distraction?

▢ No ▢ Yes

▢ N/A

Describe any problems checked as "No" above:

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IV. Electronic Charts, Documents, and Checklists.

20. Were all necessary documents (including charts, checklists, and manuals) found, identified, and easily viewed by the crewmember(s) without undue distraction?

▢ No ▢ Yes

21. Was information contained in electronic charts, documents, and checklists complete, equal in quality to previously provided products, and easily accessible and understandable?

▢ No ▢ Yes

22. Was crewmember knowledge of chart/document/checklist selection and viewing adequate?

▢ No ▢ Yes

23. Could the crewmember(s) easily rearrange content on the screen to meet needs (e.g., by zooming, panning, or otherwise customizing the view)?

▢ No ▢ Yes

24. Could the crewmember(s) use the EFB concurrently with an installed display and differentiate the information?

▢ No ▢ Yes

25. Did the crewmember(s) exhibit adequate knowledge of EFB functions to efficiently brief and fly required procedures?

▢ No ▢ Yes

26. Did the crewmember(s) exhibit adequate knowledge of the software applications revision process procedure/method ensuring appropriate database accuracy and currency?

▢ No ▢ Yes

27. a. Did the crewmember(s) exhibit adequate knowledge of contingency procedures?

▢ No ▢ Yes

b. In the event of a failure of a single device?

▢ No ▢ Yes

c. In the event both devices fail?

▢ No ▢ Yes

28. Were crewmember(s) able to monitor necessary electronic chart displays during critical phases of flight?

▢ No ▢ Yes

29. Did the EFB allow quick entry of updates for last-minute changes (e.g., flight plan/runway changes)?

▢ No ▢ Yes

30. For electronic checklists (ECL), was it easy to track completed items?

▢ No ▢ Yes

▢ N/A

Describe any problems checked as "No" above:

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V. Flight Performance Data/Calculations.

31. Could the crewmember(s) interpret and use flight performance data/calculations efficiently and accurately?

▢ No ▢ Yes

▢ N/A

32. Did the device allow quick entry of updates for last-minute changes (e.g., flight plan/runway changes)?

▢ No ▢ Yes

▢ N/A

33. Are crewmembers aware of any software application limitations and do they understand only approved calculation methods may be used as a primary means of computation?

▢ No ▢ Yes

▢ N/A

Describe any problems checked as "No" above:

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VI. General Conclusions.

34. Were any unique safety issues or events caused or exacerbated by using the EFB during this evaluation?

☐ No ☐ Yes

35. Can the flight be conducted as safely with an EFB as with the methods/products it is intended to replace?

☐ No ☐ Yes

36. Does the EFB add an unacceptable level of complexity for any critical activity or phase of flight?

☐ No ☐ Yes

Observer Name (Print): __________________ Observer Signature: ________________________