# ADVISORY CIRCULAR

| SUBJECT: | DATE: | AC NUMBER | VERSION |
|---|---|---|---|
| **Vertiports Design Specification (VDS)** | **10-14-2024** | **AC 140-01** | **1.0** |

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# 1.0 General

## 1.1 Introduction:

A Vertiport is a defined area on land or water ( including any building, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of VTOL aircraft.

A VTOL aircraft is a heavier-than-air aircraft, other than an airplane or helicopter, capable of performing vertical take-off and landing by means of more than two lift units that are used to provide lift during the take-off and landing.

The VTOL aircraft is the primary enabler of advanced air mobility (AAM). In general, (AAM) international standards and national regulations, including those pertaining to vertiports, are continuously being developed to provide the required regulatory framework for AAM safe and sustainable operations.

Currently, in the Kingdom of Saudi Arabia, GACA handles the construction and operation of vertiport via the issuance of a GACA Vertiport Authorization based on a case-by-case evaluation as stipulated in the GACA E-BOOK VOLUME 7 Chapter 17.

## 1.3 Purpose:

The purpose of this Advisory Circular is to provide guidance and recommendations for applicants seeking to obtain GACA Authorization for the construction and operation of vertiports within the Kingdom of Saudi Arabia.

## 1.5 Additional References:

- Kingdom of Saudi Arabia Civil Aviation Law (Royal Decree No. M/44)
- GACAR Part-138
- GACA E-book V-07
- ICAO Annex 14 V-02
- EASA PTS-VPT-DSN
- Australia CASA AC 139.V-01v1.0

## 1.7 Definitions:

For the purposes of this Advisory Circular, the following definitions apply:

**Approach-Departure Path**

Means the approach or departure path for the flight track that VTOL aircraft follows when landing at or departing from a vertiport.

**Charging facility**

Means a charging station that supplies alternating current (AC) and/or direct current (DC) to an electric aircraft for recharging its batteries, including provisions for associated equipment.

**Category Enhanced**

Means a certification category for VTOL aircraft according to which the aircraft meets the requirements for continued safe flight and landing after a critical failure in performance.

**Category Basic**

Means a certification category for VTOL aircraft according to which the aircraft meets the requirements for a controlled emergency landing after a critical failure for performance (CFP).

**Clearway**

Means a defined area on the ground or water, selected and/or prepared as a suitable area over which a VTOL aircraft that is certified in the enhanced category may accelerate and achieve a specified set of flight conditions.

**Composite Aircraft**

Means composite aircraft that represents a VTOL aircraft that integrates the performance and design characteristics of VTOL aircraft which specify the performance and design characteristics for the purposes of vertiport design.

**Continued safe flight and landing (CSFL)**

Means, in relation to a VTOL aircraft, that the aircraft is capable of continued controlled flight and landing at a vertiport, possibly using emergency procedures, without requiring exceptional piloting skill or strength.

**D Value**

Means the diameter of the smallest circle enclosing the VTOL aircraft projection on a horizontal plane while the aircraft is in the take-off or landing configuration, with rotor(s) turning, if applicable. If the VTOL aircraft changes dimensions during taxiing or parking (e.g. folding wings), a corresponding D-taxiing or D-parking should also be provided.

**Design D**

Means the D of the critical or design VTOL aircraft.

**Design VTOL aircraft**

Means the VTOL aircraft type that the vertiport is intended to serve, which has the largest set of dimensions, the greatest maximum take-off mass (MTOM), and the most critical obstacle avoidance criteria. Those attributes may not reside in the same VTOL aircraft capability.

**Distance DR**

Means the horizontal distance that the VTOL aircraft has travelled from the end of the take-off distance available (TODA) to the obstacle or from the back of the final-approach and take-off area (FATO) to the obstacle.

**Dynamic load-bearing surface**

Means a surface capable of supporting the loads that are generated by a VTOL aircraft in motion.

**Elongated**

Means, when used with touchdown and lift-off area (TLOF) or final approach and take-off area (FATO) for VTOL aircraft, an area which has a length more than twice its width.

**Elevated vertiport**

Means a vertiport located on a rooftop or other elevated structure on land.

**Elevated VTOL aircraft clearway**

Means a clearway raised to a level that provides obstacle clearance.

**Landing distance available (LDAV)**

Means the length of the FATO plus any additional area that is declared available and suitable for VTOL aircraft to complete the landing maneuver from a defined height.

**Landing distance required (LDRV)**

Means the horizontal distance that is required for landing and coming to a full stop from a point that is 15 m above the landing surface.

**Landing decision point (LDP)**

Means a point along the landing flight path, which is defined as the last point from which a balked landing can be performed.

**Obstacle**

Means all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of VTOL aircraft; extend above a defined surface intended to protect VTOL aircraft in flight; or stand outside those defined surfaces but, nonetheless, are assessed as a hazard to air navigation.

**Protection area**

Means a defined area surrounding a stand, which is intended to reduce the risk of damage from VTOL aircraft accidentally diverging from the stand.

**Rejected take-off distance (RTODV)**

Means the length of the final- approach and take-off area (FATO) that is declared available and suitable for VTOL aircraft to complete a rejected take-off in accordance with the category (enhanced or basic) in which the aircraft is operated.

**Rejected take-off distance available (RTODAV)**

Means the length of the FATO that is declared available and suitable for VTOL aircraft to complete a rejected take-off in accordance with the category (enhanced or basic) in which the aircraft is certified.

**Rejected take-off distance required (RTODRV)**

Means the horizontal distance that is required from the start of the take-off to the point where the aircraft comes to a full stop, following a critical failure for performance (CFP) that is recognized at the take-off decision point (TDP).

**Safety area (SA)**

Means a defined area on a vertiport, which surrounds the final-approach and take- off area (FATO) and is free of obstacles, other than those required for air navigation purposes, and which is intended to reduce the risk of damage to VTOL aircraft accidentally diverging from the FATO.

**Static load-bearing area**

Means a surface capable of supporting the mass of VTOL aircraft that is situated upon it.

**Take-off decision point (TDP)**

Means the first point that is defined by a combination of speed and height from which continued take-off can be made meeting the certified minimum performance (CMP) following a critical failure for performance (CFP), and is the last point in the take-off path from which a rejected take-off (RTO) is ensured.

**Take-off distance available (TODAV)**

Means the length of the final- approach and take-off area (FATO) plus the length of any clearway (if provided) that is declared available and suitable for VTOL aircraft to complete the take-off.

**Take-off distance required (TODRV)**

Means the projected horizontal distance from the start of the take-off to the point at which safe obstacle clearance and a positive climb gradient are achieved following a critical failure for performance (CFP) recognized at the take-off decision point (TDP).

**Take-off flight path**

Means the vertical and horizontal path that extends from the take-off point to a point at which the aircraft is at 305 m above the take-off elevation or at such other height above the take-off elevation that allows the aircraft to clear all obstacles.

**Touchdown and lift-off area (TLOF)**

Means an area where a VTOL aircraft may touch down or lift off.

**Touchdown positioning marking (TDPM)**

Means a marking or set of markings that provide visual cues for the positioning of VTOL aircraft.

**Touchdown positioning marking (TDPM) circle**

Means the reference marking for a normal touchdown, which is so located that when the pilot's seat is over the marking, the whole of the undercarriage will be within the touchdown and lift-off area (TLOF) and all parts of the VTOL aircraft will be clear of any obstacles by a safe margin.

**Vertiport**

Means a defined area on land or water (including any building, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of VTOL aircraft.

**Vertiport elevation**

Means the highest point of the final approach and take-off area (FATO).

**Vertical procedures**

Means take-off and landing procedures that include an initial vertical climb and a final vertical descent profile.

**Vertiport operator**

Means any legal or natural person that is operating or proposing to operate one or more vertiports.

**Vertiport reference point (VRP)**

Means the designated geographical location of a vertiport.

**VTOL aircraft**

Means a heavier-than-air aircraft, other than aero-plane or helicopter, capable of performing vertical take-off and landing by means of more than two lift units that are used to provide lift during the take-off and landing.

**VTOL aircraft taxiway**

Means a defined path on a vertiport that is intended for the ground movement of VTOL aircraft and that may be combined with an air taxi route to permit both ground and air taxiing.

**VTOL aircraft stand**

Means a defined area that is intended to accommodate a VTOL aircraft for loading or unloading passengers, mail, or cargo, fueling, charging, parking, or maintenance, and for the TLOF where air taxiing operations are contemplated on the TLOF.

**VTOL aircraft taxi-route**

Means a defined path that is established for the movement of VTOL aircraft from one part of a vertiport to another:

(a) An air taxi-route: a marked taxi-route that is intended for air taxiing; and

(b) A ground taxi-route: a taxi-route that is centered on a taxiway.

## 1.9 Abbreviations/Symbols

**AAM:** Advance Air Mobility

**AFM:** Aircraft Flight Manual

**AIP:** Aeronautical Information Publication

**FATO:** Final approach and take-off area

**FOD:** Foreign object debris

**FPA:** FATO protection area

**FPAGLS:** Flight path alignment guidance lighting system(s)

**ICAO:** International Civil Aviation Organization

**MTOW:** Maximum take-off weight

**OFV:** Obstacle free volume

**OLS:** Obstacle limitation surface

**RTODRV:** Rejected take-off distance required (for VTOL aircraft)

**TDPC:** Touchdown/positioning circle

**TDPM:** Touchdown/positioning marking

**TLOF:** Touchdown and lift-off area

**UCW:** Undercarriage width

**VPS:** Vertical procedure surface

**VPT:** Vertiport

**VTOL:** Vertical take-off and landing (Undefined)

# 2.0 Technical Specifications

## 2.1 Physical Characteristics

2.1.1 Final Approach and Take-Off (FATO)

2.1.1.1 A FATO should provide:

2.1.1.1.1 An area free of obstacles, except for essential objects which because of their function are located on it, and of sufficient size and shape to ensure containment of every part of the design VTOL in the final phase of approach and commencement of take-off in accordance with the intended procedures.

2.1.1.1.2 When solid, a surface which is resistant to the effects of rotor downwash; and when collocated with a TLOF, is contiguous and flush with the TLOF; has bearing strength capable of withstanding the intended loads; and ensures effective drainage; or when not collocated with a TLOF, is free of hazards should a forced landing be required; and

2.1.1.2 Be associated with a safety area.

2.1.1.2.1 A Vertiport should be provided with at least one FATO, which need not be solid.

2.1.1.2.2 The minimum dimensions of a FATO may be: Where intended to be used by VTOL operated in performance class 1: The length of the Rejected Take-Off Distance (RTOD) for the required Take-Off procedure prescribed in the VTOL flight manual (HFM) of the VTOL for which the FATO is intended, or 1.5 Design D, whichever is greater; and The width for the required procedure prescribed in the HFM of the VTOL for which the FATO is intended, or 1.5 Design D, whichever is greater. Runway type FATO may be considered wherever applicable depending on the requirements of the VTOL aircraft and vertiport operations.

2.1.1.3 Where intended to be used by VTOL operated in performance classes 2 or 3, the lesser of:

2.1.1.3.1 An area within which can be drawn a circle of diameter of 1.5 Design D; or

2.1.1.3.2 When there is a limitation on the direction of approach and touchdown, an area of sufficient width to meet the requirement of (a) (1) but not less than 1.5 times the overall width of the design vertiport.

2.1.1.4 Essential objects located in a FATO should not penetrate a horizontal plane at the FATO elevation by more than 5cm.

2.1.1.5 When the FATO is solid, the slope should not:

2.1.1.5.1 Except as provided in (2) or (3) below; exceed 2 per cent in any direction.

2.1.1.5.2 When the FATO is elongated and intended to be used by VTOL operated in performance class 1, exceed 3 per cent overall, or have a local slope exceeding 5 percent; and

2.1.1.5.3 When the FATO is elongated and intended to be used solely by VTOL operated in performance class 2 or 3, exceed 3 percent overall, or have a local slope exceeding 7 percent.

2.1.1.5.4 The FATO should be located so as to minimize the influence of the surrounding environment, including turbulence, which could have an adverse impact on VTOL operations.

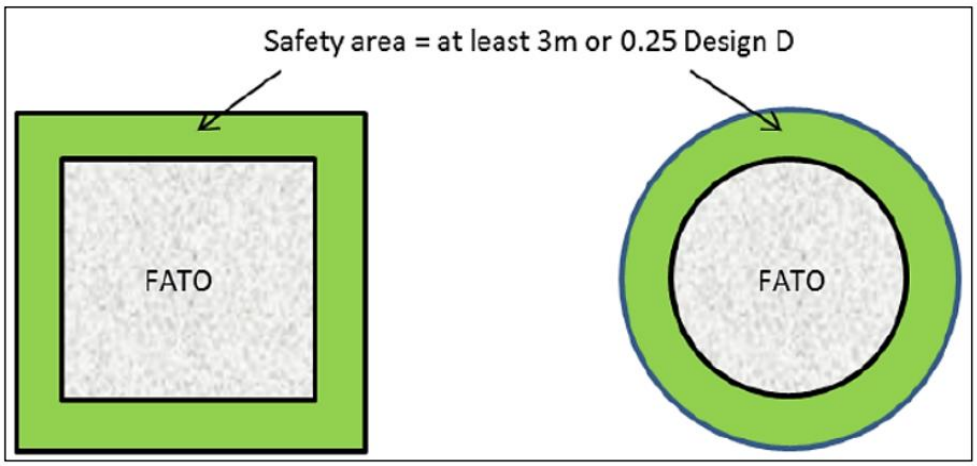



**Fig V (01). A FATO should be surrounded by a safety area which need not be solid**

2.1.2 Touch Down and Lift-Off (TLOF)

2.1.2.1 Should Provide:

2.1.2.1.1 An area free of obstacles and of sufficient size and shape to ensure containment of the undercarriage of the most demanding VTOL the TLOF is intended to serve in accordance with the intended orientation;

2.1.2.1.2 A surface which:

2.1.2.1.2.1 has sufficient bearing strength to accommodate the dynamic loads associated with the anticipated type of arrival of the VTOL at the designated TLOF;

2.1.2.1.2.2 is free of irregularities that would adversely affect the touchdown or lift-off of VTOL;

2.1.2.1.2.3 has sufficient friction to avoid skidding of VTOL or slipping of persons;

2.1.2.1.2.4 is resistant to the effects of rotor downwash; and

2.1.2.1.2.5 ensures effective drainage while having no adverse effect on the control or stability of a VTOL during touchdown and lift-off or when stationary; and

2.1.2.1.3 Be associated with a FATO or a stand.

2.1.2.1.4 A Vertiport should be provided with at least one TLOF.

2.1.2.1.5 A TLOF should be provided whenever it is intended that the undercarriage of the VTOL will touch down within a FATO or stand, or lift off from a FATO or stand.

2.1.2.1.6 The minimum dimensions of a TLOF should be:

2.1.2.1.6.1 When in a FATO intended to be used by VTOL operated in performance class 1, the dimensions for the required procedure prescribed in the VTOL flight manuals (HFMs) of the VTOL for which the TLOF is intended; and

2.1.2.1.6.2 When in a FATO intended to be used by VTOL operated in performance classes 2 or 3, or in a stand: When there is no limitation on the direction of touchdown, of sufficient size to contain a circle of diameter of at least 0.83 D of: in a FATO, the design VTOL; or in a stand, the largest VTOL the stand is intended to serve; When there is a limitation on the direction of touchdown, of sufficient width to meet the requirement of above but not less than twice the undercarriage width (UCW) of: (A)in a FATO, the design VTOL; or (B) in a stand, the most demanding VTOL the stand is intended to serve.

2.1.2.1.7 For an elevated vertiport, the minimum dimensions of a TLOF, when in a FATO, should be of sufficient size to contain a circle of diameter of at least 1 Design-D.

2.1.2.1.8 Slopes on a TLOF should not: (1) Except as provided in (2) or (3) below; exceed 2 percent in any direction; (2) When the TLOF is elongated and intended to be used by VTOL operated in performance class 1; exceed 3 percent overall, or have a local slope exceeding 5 percent; and (3) When the TLOF is elongated and intended to be used solely by VTOL operated in performance class 2 or 3, exceed 3 percent overall, or have a local slope exceeding 7 percent.

2.1.2.1.9 When a TLOF is within a FATO it should be: (1) Centered on the FATO; or (2) For an elongated FATO, centered on the longitudinal axis of the FATO.

2.1.2.1.10 When a TLOF is within a VTOL stand, it should be centered on the stand.

2.1.2.1.11 A TLOF should be provided with markings which clearly indicate the touchdown position and, by their form, any limitations on maneuvering.

2.1.2.1.12 Where an elongated Performance Class 1 FATO/TLOF contains more than one TDPM, measures should be in place to ensure that only one can be used at a time.

2.1.2.1.13 Where alternative TDPMs are provided they should be placed to ensure containment of the undercarriage within the TLOF and the VTOL within the FATO.

2.1.2.1.14 Safety devices such as safety nets or safety shelves should be located around the edge of an elevated Vertiport but should not exceed the height of the TLOF.

2.1.3 Safety Area A safety area should provide:

2.1.3.1.1 An area free of obstacles, except for essential objects which because of their function are located on it, to compensate for maneuvering errors; and

2.1.3.1.2 When solid, a surface which: is contiguous and flush with the FATO; is resistant to the effects of rotor downwash (the downwash and outwash of the VTOL aircraft is undetermined); and ensures effective drainage.

2.1.3.1.2.1 The safety area surrounding a FATO should extend outwards from the periphery of the FATO for a distance of at least 3m or 0.25 Design D, whichever is greater.

2.1.3.1.2.2 No mobile object should be permitted in a safety area during VTOL operations.

2.1.3.1.2.3 Essential objects located in the safety area should not penetrate a surface originating at the edge of the FATO at a height of 25cm above the plane of the FATO sloping upwards and outwards at a gradient of 5 percent.

2.1.3.1.2.4 When solid, the slope of the safety area should not exceed an upward slope of 4 percent outwards from the edge of the FATO.

2.1.4 Protected Area

2.1.4.1 A vertiport should be provided with at least one protected side slope, rising at 45 degrees outward from the edge of the safety area and extending to a distance of 10 m.

2.1.4.2 The surface of a protected side slope should not be penetrated by obstacles.

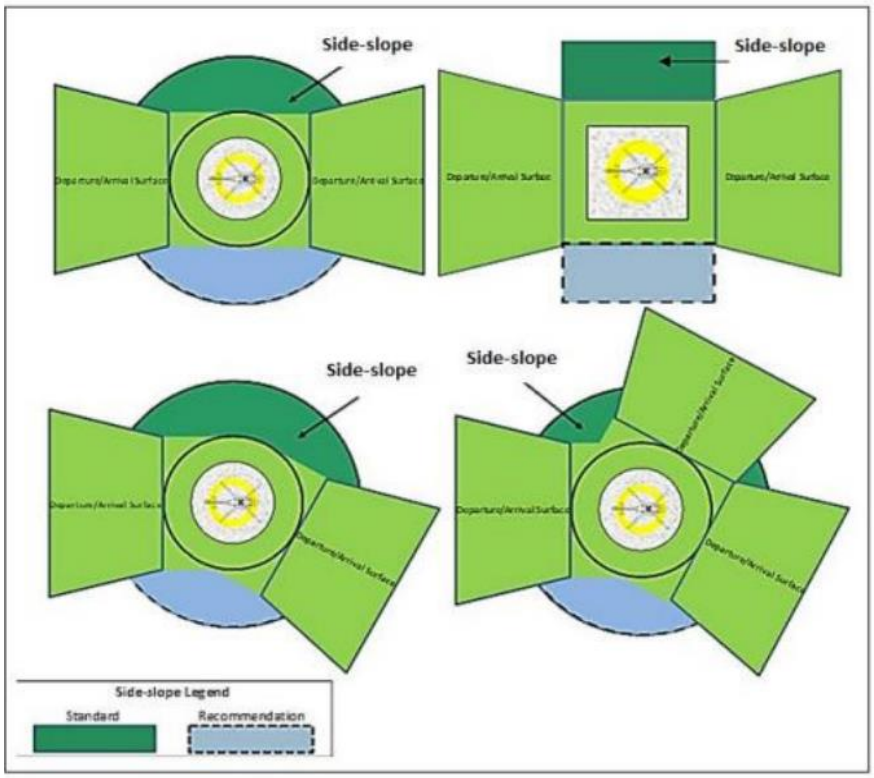



**Fig V (02).** FATO simple/complex safety area and side slope protection

**2.3 Visual Aids**

2.3.1 Vertiport Marking

2.3.1.1 Winching area marking

2.3.1.1.1 Winching area marking should be provided at a designated winching area.

2.3.1.1.2 Winching area location markings should be located so that their center(s) coincides with the center of the clear zone of the winching area.

2.3.1.1.3 Winching area characteristics markings should comprise a winching g area clear zone marking and a winching area maneuvering zone marking.

2.3.1.1.4 A winching area clear zone marking should consist of a solid circle of diameter not less than 5m and of a conspicuous color.

2.3.1.1.5 A winching area maneuvering zone marking should consist of a broken circle line of 30cm in width and of a diameter not less than 2 D and be marked in a conspicuous color. Within it "WINCH ONLY" should be marked to be easily visible to the pilot.

2.3.1.2 Vertiport marking illustrations

2.3.1.2.1 Vertiport Identification and FATO Markings

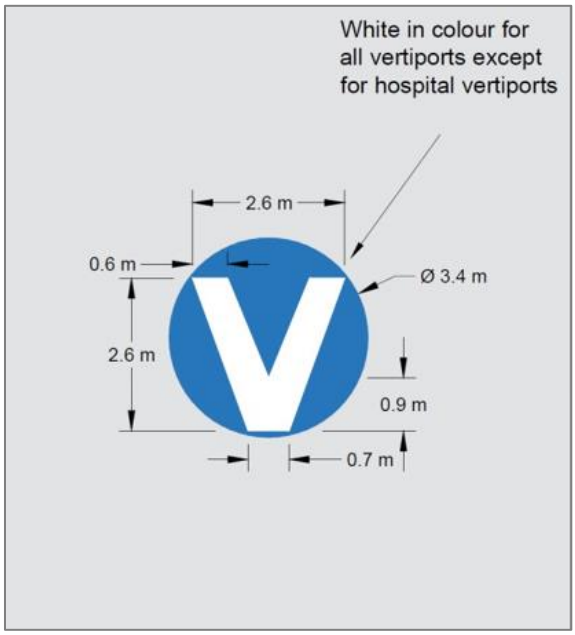



**Fig V-2A. Vertiport identification markings**

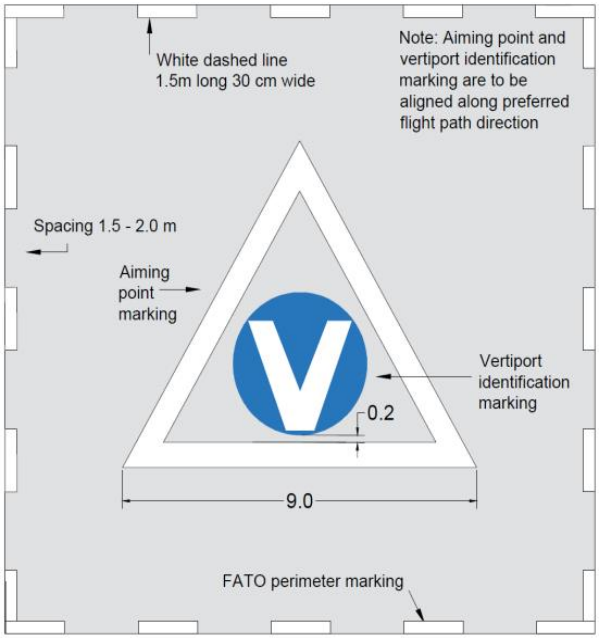



**Fig V-2B. Combined vertiport identification, aiming point and FATO perimeter marking**

2.3.1.2.2 Vertiport Number and Maximum allowable mass marking

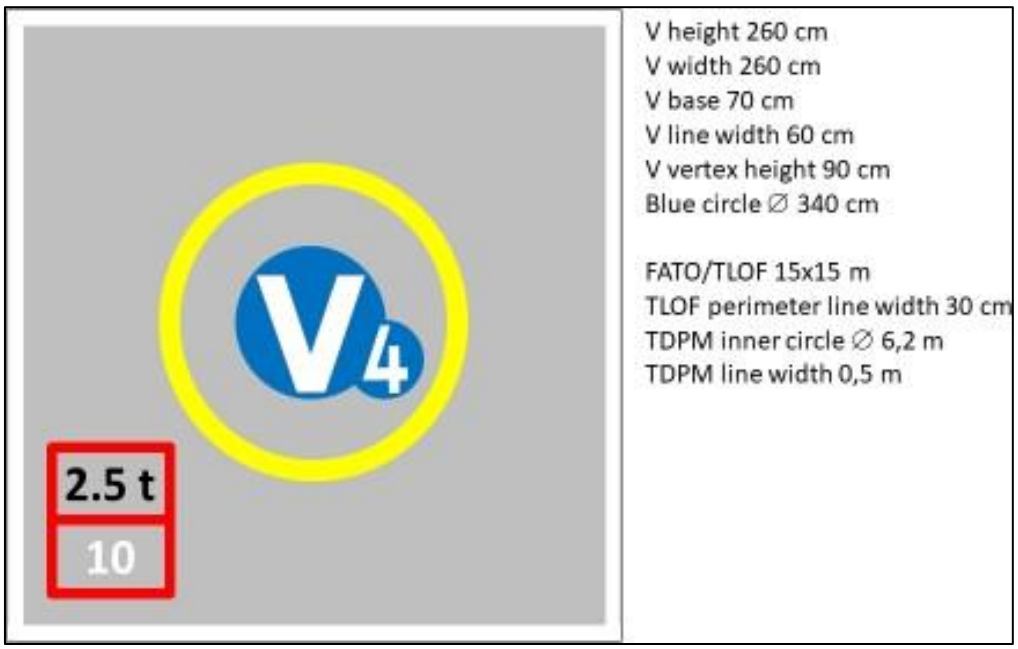



**Fig V-2C. Vertiport Number and Maximum Mass markings**

2.3.1.2.3 TLOF and Flight path alignment guidance markings

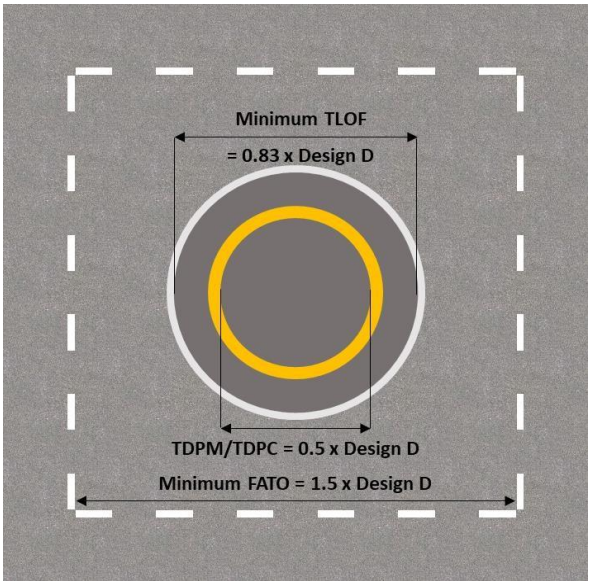



**Fig V-2D. TLOF & TDPM markings**

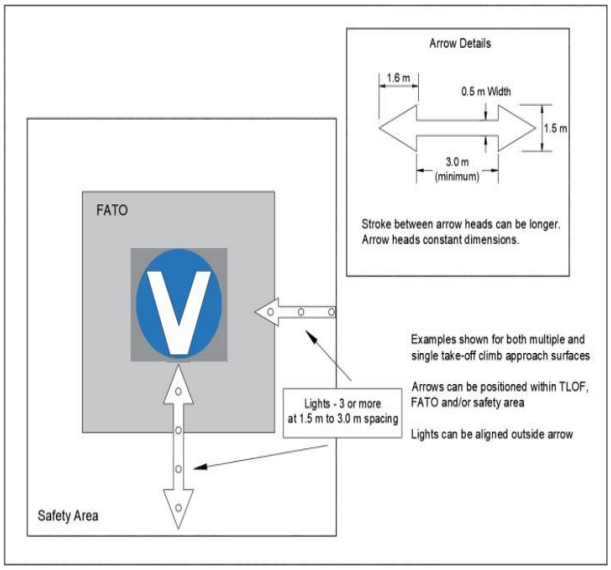



**Fig V-2E. Flight path alignment guidance markings**

2.3.1.2.4 VTOL Stand Markings

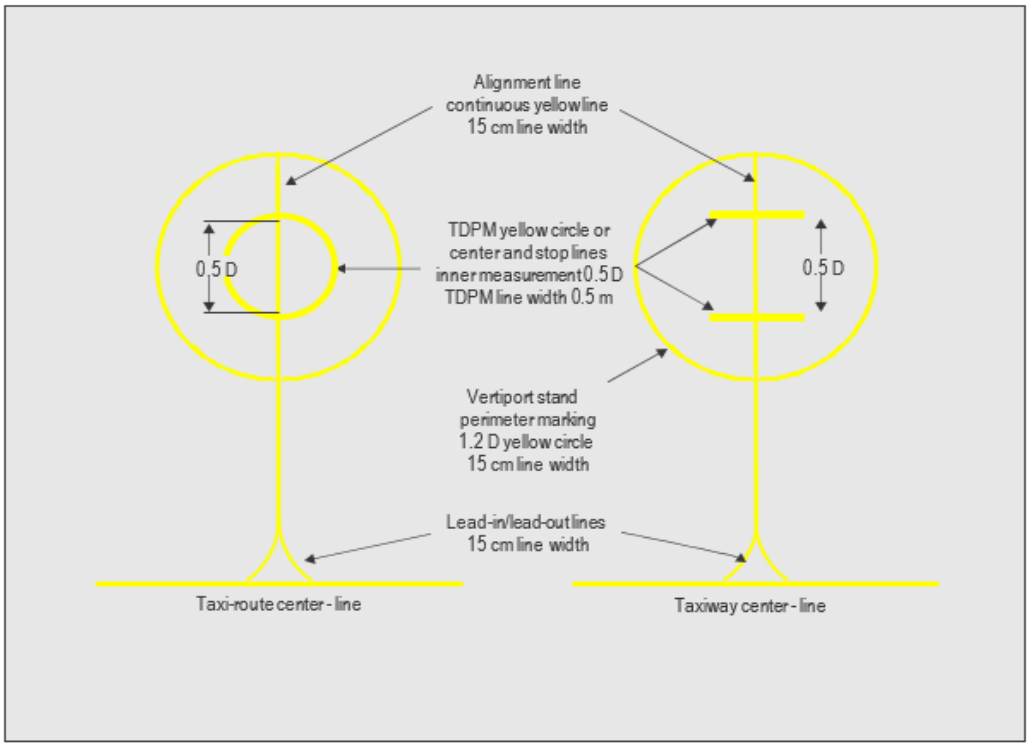



**Fig V-2F. VTOL Stand Markings**

2.3.1.2.5 Taxi Edge and Taxi Route Markers

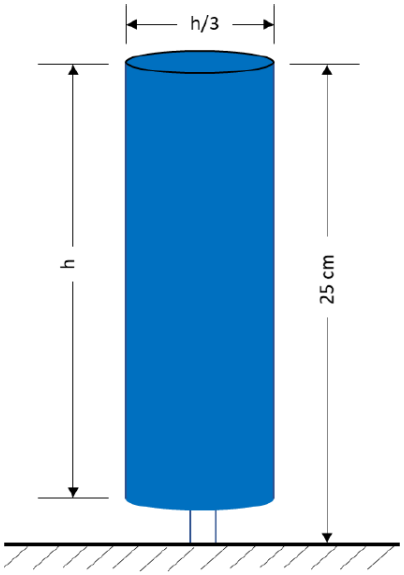



**Fig V-2G Vertiport Closed Marking**

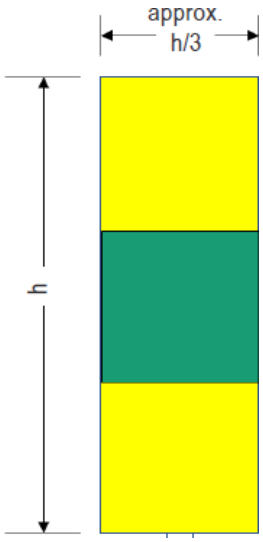



**Fig V-2H Taxi Route Marker**

2.3.1.2.6 Vertiport Closed Marking

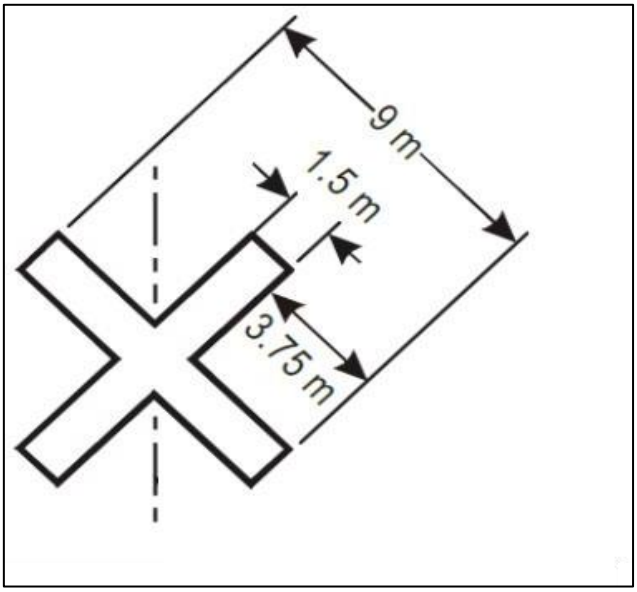



**Fig V-2I Vertiport Closed Marking**

2.3.2 Wind Direction Indicator

2.3.2.1 A Vertiport should be equipped with at least one wind direction indicator.

2.3.2.2 Location a wind direction indicator should be located so as to indicate the wind conditions over the FATO and TLOF and in such a way as to be free from the effects of airflow disturbances caused by nearby objects or rotor downwash. It should be visible from a VTOL in flight, in a hover or on the movement area.

2.3.2.3 Where a TLOF and/or FATO may be subject to a disturbed airflow, then additional wind direction indicators located close to the area should be provided to indicate the surface wind on the area.

2.3.2.4 Characteristics wind direction indicator should be constructed so that it gives a clear indication of the direction of the wind and a general indication of the wind speed.

2.3.2.5 An indicator should be a truncated cone made of lightweight fabric and should have the following minimum dimensions:

2.3.2.6 The color of the wind direction indicator should be so selected as to make it clearly visible and understandable from a height of at least 200 m (650 ft.) above the Vertiport, having regard to background. Where practicable, a single color, preferably white or orange, should be used. Where a combination of two colors is required to give adequate conspicuity against changing backgrounds, they should be orange and white, red and white, or black and white, and should be arranged in five alternate bands the first and last band being the darker color.

2.3.2.7 A wind direction indicator at a Vertiport intended for use at night should be illuminated.

2.3.3 Vertiport Beacon

2.3.3.1 Vertiport beacon should be provided, when necessary, long-range visual guidance and when not provided by other visual means, or when identifying the vertiport is difficult due to surrounding lights.

2.3.3.2 The vertiport beacon should be located on or adjacent to the vertiport preferably at an elevated position and so that it does not dazzle a pilot at short-range

2.3.4 Vertiport Lighting

2.3.4.1 Vertiport lighting should be consider and provided, when necessary and vertiport is intended to use for night operation. The requirement of various lighting systems should be assessed as per operation needs to ensure the safety of VTOL operation at night

2.3.4.2 The requirements and characteristics of the lights should be as prescribed in ICAO annex 14 vol 1 and 2.

## 2.5 Obstacle Limitation Surfaces

2.5.1 Approach Surface

2.5.1.1 Description–An inclined plane or a combination of planes or, when a turn is involved, a complex surface sloping upwards from the end of the safety area and centered on a line passing through the center of the FATO.

2.5.1.1.1 Characteristics- The limits of an approach surface should comprise:

2.5.1.1.1.1 An inner edge horizontal and equal in length to the minimum specified width/diameter of the FATO plus the safety area, perpendicular to the centerline of the approach surface and located at the outer edge of the safety area;

2.5.1.1.2 Two side edges originating at the ends of the inner edge diverging uniformly at a specified rate from the vertical plane containing the center line of the FATO; and

2.5.1.1.3 An outer edge horizontal and perpendicular to the center line of the approach surface and at a specified height of 152 m (500 ft.) above the elevation of the FATO. The elevation of the inner edge should be the elevation of the FATO at the point on the inner edge that is intersected by the center line of the approach surface. For VTOL intended to be used by VTOL operated in performance class 1 and when approved, the origin of the inclined plane may be raised directly above the FATO.

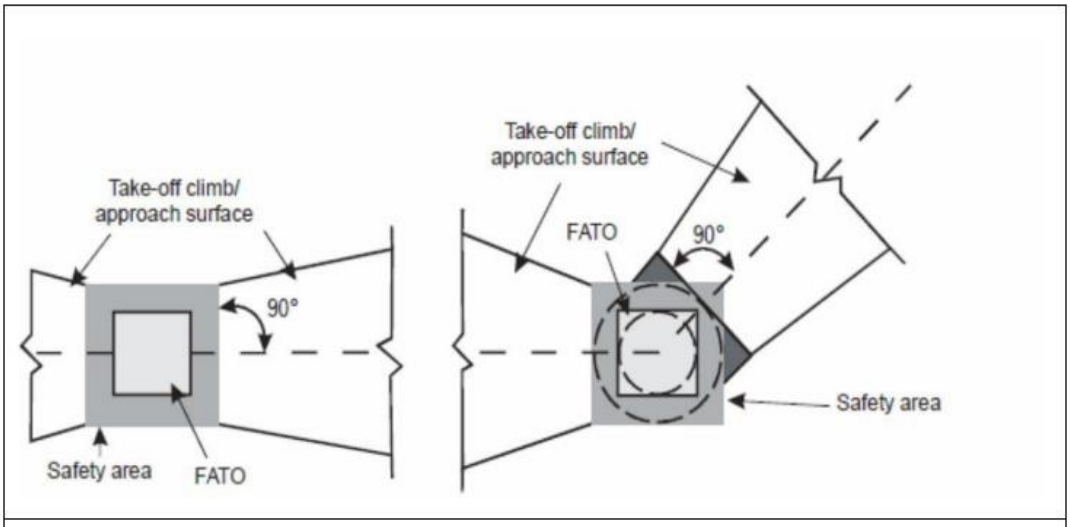
2.5.1.2 The slope(s) of the approach surface should be measured in the vertical plane containing the center line of the surface.

2.5.1.3 In the case of an approach surface involving a turn, the surface should be a complex surface containing the horizontal normal to its center line and the slope of the center line should be the same as that for a straight approach surface.

2.5.1.4 In the case of an approach surface involving a turn, the surface should not contain more than one curved portion.

2.5.1.5 Where a curved portion of an approach surface is provided, the sum of the radius of the arc defining the center line of the approach surface and the length of the straight portion originating at the inner edge should not be less than 575 m.

2.5.1.6 Any variation in the direction of the center line of an approach surface should be designed so as not to necessitate a turn radius of less than 270m.




Note 1. Dark grey shaded area requires the same characteristics as the safety area.
Note 2. Angle between take-off climb/approaches surface from centerline to centerline depicted for illustration purpose only.
Note 3. Offset take-off climb/approach surface rotated around center point of FATO.

**Fig V-3A. Obstacle limitation surfaces – take-off climb/approach surface**

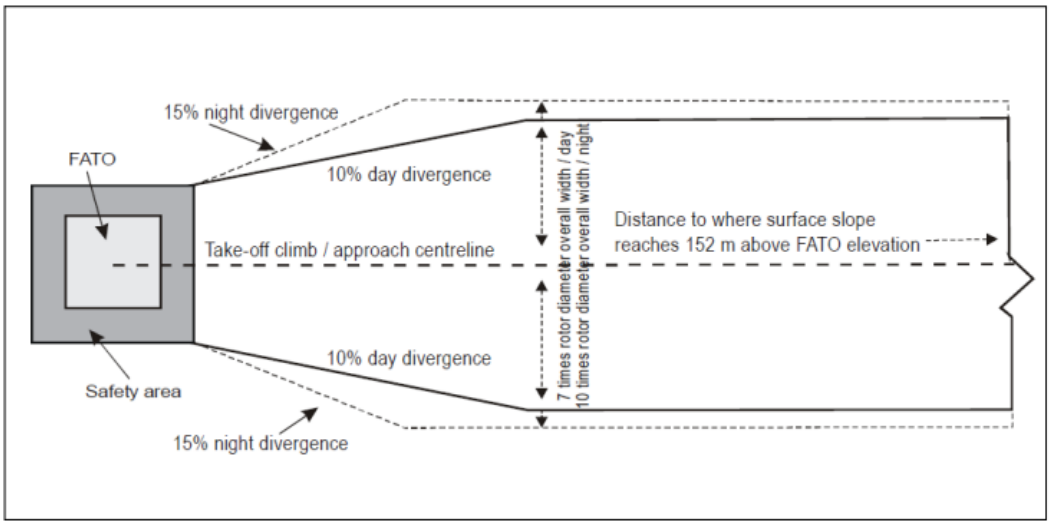
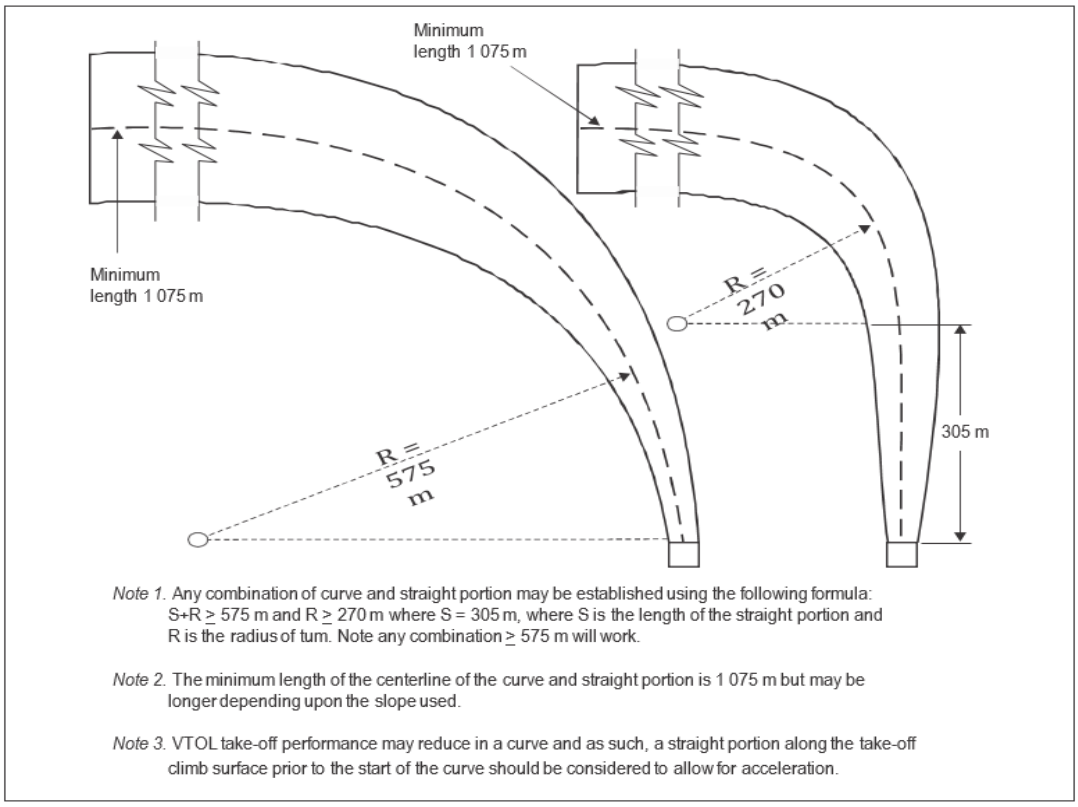



**Fig V-3B. Obstacle limitation surfaces – take-off climb/approach surface**

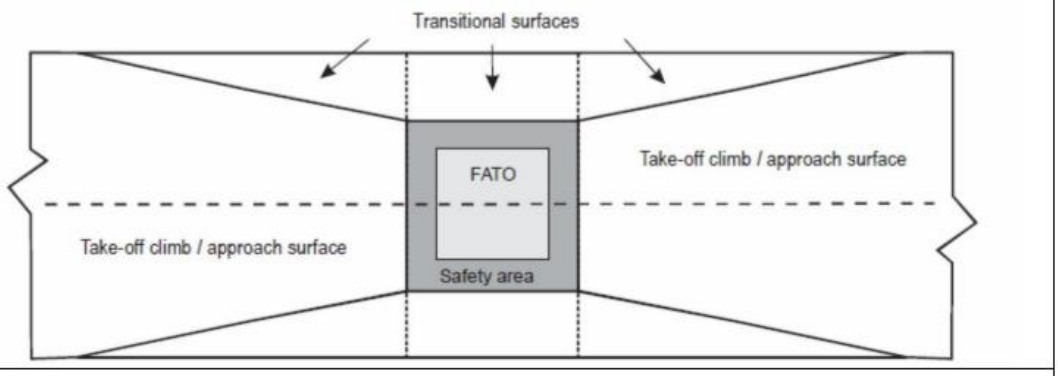



*Note 1.* Any combination of curve and straight portion may be established using the following formula: S+R ≥ 575 m and R ≥ 270 m where S = 305 m, where S is the length of the straight portion and R is the radius of turn. Note any combination ≥ 575 m will work.

*Note 2.* The minimum length of the centerline of the curve and straight portion is 1 075 m but may be longer depending upon the slope used.

*Note 3.* VTOL take-off performance may reduce in a curve and as such, a straight portion along the take-off climb surface prior to the start of the curve should be considered to allow for acceleration.

**Fig V-3C. Curved approach and take-off climb surface for all FATO**




Note 1. For single take-off climb/approach surface. Transitional surface extends to perpendicular to far side of safety area.
Note 2. This figure shows a square FATO for illustrate purposes only. For circular FATO the transitional surface lower and upper edges would also be circular.

**Fig V-3D. Transitional surface for a FATO with a Pin's approach procedure with VSS**

2.5.2 Transitional Surface

2.5.2.1 Description - A complex surface along the side of the safety area and part of the side of the approach/take-off climb surface, that slopes upwards and outwards to a predetermined height of 45 m (150ft). (See Figure V-3D-See Table V-1 for dimensions and slopes of surfaces).

2.5.2.2 Characteristics - The limits of a transitional surface should comprise:

2.5.2.2.1 A lower edge beginning at a point on the side of the approach/take-off climb surface at a specified height above the lower edge extending down the side of the approach/take-off climb surface to the inner edge of the approach/takeoff climb surface and from there along the length of the side of the safety area parallel to the center line of the FATO; and

2.5.2.2.2 An upper edge located at a specified height above the lower edge.

2.5.2.3 The elevation of a point on the lower edge should be:

2.5.2.3.1 Along the side of the approach/take-off climb surface — equal to the elevation of the approach/take-off climb surface at that point; and

2.5.2.3.2 Along the safety area — equal to the elevation of the inner edge of the approach/take-off climb surface.

2.5.2.3.2.1 The slope of the transitional surface should be measured in a vertical plane at right angles to the center line of the FATO.

2.5.2.3.2.2 The transitional surface along the safety area will be curved if the profile of the FATO is curved or a plane if the profile is a straight line.

2.5.3 Obstacle Limitations

2.5.3.1 The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a FATO, i.e., approach maneuver to hover or to land, or take-off maneuver and type of approach, and are intended to be applied when such use is made of the FATO. In cases where operations are conducted to or from both directions of a FATO, then the function of certain surfaces may be nullified because of more stringent requirements of another lower surface.

| *Surface and dimensions* | *Slope design categories* | | |
|---|---|---|---|
| | *A* | *B* | *C* |
| **Approach and take-off climb surface:** | | | |
| Length of inner edge | Width of safety area | Width of safety area | Width of safety area |
| Location of inner edge | Safety area boundary (Clearway boundary if provided) | Safety area boundary | Safety area boundary |
| **Divergence:** (1st and 2nd section) | | | |
| Day use only | 10% | 10% | 10% |
| Night use | 15% | 15% | 15% |
| **First section:** | | | |
| Length | 3 386 m | 245 m | 1 220 m |
| Slope | 4.5% (1:22.2) | 8% (1:12.5) | 12.5% (1:8) |
| Outer width | (b) | N/A | (b) |
| **Second section:** | | | |
| Length | N/A | 830 m | N/A |
| Slope | N/A | 16% (1:6.25) | N/A |
| Outer width | N/A | (b) | N/A |
| Total length from inner edge (a) | 3 386 m | 1 075 m | 1 220 m |
| **Transitional surface** (b)**:** | | | |
| Slope | 50% (1:2) | 50% (1:2) | 50% (1:2) |
| Height | 45 m | 45 m | 45 m |

*a. The approach and take-off climb surface lengths of 3 386 m, 1 075 m and 1 220 m associated with the respective slopes brings the VTOL to 152 m (500 ft.) above FATO elevation.*

*b. Seven rotor diameters overall width for day operations or 10 rotor diameters overall width for night operations.*

Table V-1. Dimensions and slopes of obstacle limitation surfaces for all visual FATOs

# 3.0 Rescue and Fire Fighting

## 3.1 Vertiport Emergency Plan

3.1.1 The vertiport emergency plan should consider the following:

3.1.1.1 A vertiport emergency plan should be established commensurate with the VTOL operations and other activities conducted at the vertiport.

3.1.1.2 The operator of vertiport should establish a vertiport emergency planning committee (VEPC). All assigned members from both internal and external (off-vertiport) agencies will be participants in the development, review, and exercise of the vertiport emergency plan.

3.1.1.3 The plan should identify agencies that could be of assistance in responding to an emergency at the vertiport or in its vicinity. (d) The vertiport emergency plan should provide for the coordination of the actions to be taken in the event of an emergency occurring at a vertiport or in its vicinity.

3.1.1.4 Where an approach/departure path at a vertiport is located over water, the plan should identify which agency is responsible for coordinating rescue in the event of a vertiport ditching and indicate how to contact that agency.

3.1.1.5 The plan should include, as a minimum, the following information:

3.1.1.5.1 The types of emergencies planned for;

3.1.1.5.2 How to initiate the plan for each emergency specified;

3.1.1.5.3 The name of agencies on and off the vertiport to contact for each type of emergency with telephone numbers or other contact information;

3.1.1.5.4 The role of each agency for each type of emergency;

3.1.1.5.5 A list of pertinent on-vertiport services available with telephone numbers or other contact information;

3.1.1.5.6 Copies of any written agreements with other agencies for mutual aid and the provision of emergency services; an

3.1.1.5.7 A grid map of the vertiport and its immediate vicinity.

3.1.1.6 All agencies identified in the plan should be consulted about their role in the plan.

3.1.1.7 The vertiport emergency plan should include procedures for the Emergency operations center and command post.

3.1.1.8 Sufficient medical services and supplies should be available at the vertiport facility to deal with routine medical emergencies (which normally occur at the vertiport such as on-the-job injuries, heart attacks etc.) and for medical emergencies of vertiport accidents.

3.1.1.9 The plan should be reviewed and the information in it updated at least yearly or, if deemed necessary, after an actual emergency, so as to correct any deficiency found during an actual emergency.

3.1.1.10 The vertiport emergency plan should contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness and:

3.1.1.10.1 The plan should be tested by conducting a full-scale vertiport emergency exercise at intervals not exceeding three years and partial emergency exercises in the intervening year to ensure that any deficiencies found during the full-scale vertiport emergency exercise have been corrected;

3.1.1.10.2 The vertiport operator should hold a meeting of all members of emergency planning committee at least 120 days prior to the scheduled full-scale emergency exercise. At this time, the aims of the exercise should be outlined, a scenario formulated, work tasks assigned and duties of all agencies and personnel defined.

### 3.2 Rescue and Fire Fighting Services (RFFS)

3.2.1 The rescue firefighting equipment and services for VTOL aircraft are yet to be determined depending on the model, batteries, and fuselage dimensions.

3.2.2 The rescue firefighting equipment and services for VTOL aircraft will be established by the vertiport applicant to cover the required requirements of RFFS for safe VTOL intended operations.

3.2.3 The Categories of RFFS for the vertiports will be established depending on the types of VTOL aircraft while considering the most demanding VTOL aircraft and as per provisions given in the VTOL manufacturers manual.

### 3.3 Hazard Areas

3.3.1 Hazard areas, whereas some VTOL aircraft, those equipped with lithium-ion batteries, may not have the capability to extinguish an onboard fire and may thus need to land while venting the fire overboard. There may be other areas around the aircraft where a hazard to persons or

equipment may exist; for example, due to moving surfaces or engine exhaust. These hazard areas are identified and depicted in the aircraft flight manual (AFM) and should be considered. Significant mean winds or other local characteristics may also warrant an extension of certain hazard areas.

# 4.0 Contact Information

**4.1 For further information, please contact the GACA Aerodrome Safety Department at the given email address Vertiports@gaca.gov.sa.**

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