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- Vertiport□□□□□□□□□□□□□□□□□□
- Vertiport□□□□□□□□□□□□□

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Vertiport??????????????????

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[illegible] eVTOL [illegible] Vertiport [illegible] heliport [illegible] vertiport [illegible] OLS [illegible] OFV [illegible]

[illegible] “[illegible]”[illegible]

1. [illegible] ICAO Annex 14 Volume II [illegible] ICAO Doc 9261 [illegible] FATO[illegible] TLOF[illegible] Safety Area[illegible] OLS [illegible]
2. [illegible] MH5013-2023[illegible] FAA AC150/5390-2D [illegible] heliport [illegible]
3. [illegible] EASA PTS-VPT-DSN[illegible] CASA AC139.V-01[illegible] T/CCAATB 0062-2024 [illegible] FAA EB105A [illegible] vertiport [illegible]
4. [illegible] FAA [illegible] ICAO/EASA/CASA/[illegible]
5. [illegible]

?????Heliport??????????

???FATO?TLOF?Safety Area?????????

ICAO Annex 14 Volume II [illegible] FATO [illegible] TLOF [illegible] FATO [illegible] TLOF [illegible] Safety Area [illegible] FATO[illegible] FATO [illegible]

Elevated heliport. A heliport located on a raised structure on land.

Ellipsoid height (Geodetic height). The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Final approach and take-off area (FATO). A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by helicopters operated in performance class 1, the defined area includes the rejected take-off area available.

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid. The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation. The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

a) are located on an area intended for the surface movement of aircraft; or

b) extend above a defined surface intended to protect aircraft in flight; or

□□□□□□□□□□

1. FATO □□ “□□□□□□□□□□□□ ”□□□□□
2. TLOF □□ “□□□□ /□□ ”□□□□□□
3. Safety Area □□□□□□□□□□□□□□□
4. □□□□□□□□ TLOF □□□□□□□□ FATO □ Safety Area □□□

□□□□□□□□□□□□□□□□□ FATO□□□□ Safety Area□□□□□□□□ /
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???Doc 9261???1D?0.83D?sub-1D?????

ICAO Doc 9261 Heliport Manual □ Annex 14 □□□□□□□□□□□□□□□□□□□ 1D FATO □
0.83D TLOF □□□□ 1D FATO □□□□□□□□□ TLOF □□□□□□□□□ 1D
□□□□□□□□□□□□□□□□□□□□□□□□

reduced TLOF (Figure I-3-2 refers). The FATO is bound by the outer circle from which the obstacle sector surfaces derive their origin. The TLOF is bound by the inner circle (represented as a circle within the octagon shape of the helideck load-bearing area). The FATO outside the TLOF perimeter represents a non-load bearing surface for helicopters as it usually extends over the safety device (whether safety net or safety shelf) which is incapable of supporting even the static load of a helicopter. Therefore, a helideck incorporates one FATO and one TLOF; notwithstanding for a fixed or floating offshore facility, to improve operational flexibility, there may be the possibility to provide additional helideck(s) elsewhere on the facility – the advantages of this are raised in Chapter 3, 3.2.1.10.

3.3.3 It should be remembered that the basic size of a 1 D FATO with coincident TLOF is, of necessity, a compromise for offshore operations where space is invariably limited. Nonetheless, it is essential that the TLOF provides sufficient space for the landing gear configuration and sufficient surface area to promote a helpful “ground cushion” effect from rotor downwash. The area provided should also allow adequate room for passengers and crew to alight or embark the helicopter and to transit to and from the operating area safely. In addition, space consideration needs to be given to allow essential on deck operations, such as baggage handling, tying down the helicopter or helicopter refuelling, to occur safely and efficiently, and, in the event of an incident or accident occurring, for rescue and firefighting teams to always have good access to the landing area from an upwind location (see also Chapter 6).

3.3.4 The design should allow for sufficient clearance from the main rotor and tail rotor of the helicopter to essential objects permitted to be around the perimeter of the TLOF, including obstacles that may be present in the limited obstacle sector (LOS). It should be clearly understood that a FATO of 1 D is the minimum dimension sufficient for the containment of the helicopter; in this case, where a precise landing is completed (see also Chapter 5, especially the use of touchdown/positioning marking circle), the main and tail rotors will abut the edge of the 1 D circle. For this reason it is important that the yellow touchdown/positioning marking circle is accurately and clearly marked and is used by aircrew every time for positioning the helicopter during the touchdown manoeuvre.

3.3.5 Sufficient margins to allow for touchdown/positioning inaccuracies as a result of normal variations or handling difficulties, for example due to challenging meteorological conditions, aerodynamic effects and/or dynamic motions due to ocean waves, should be allowed for in the design. The helideck and environs should provide adequate visual cues and references for aircrew to use throughout the approach to touchdown manoeuvre, from initial helideck location and identification (acquisition) through final approach to hover and to landing. In addition, adequate visual references should be available for the lift-off and hover into forward flight.

3.3.6 In consequence of the considerations stated above, except where an aeronautical study/risk assessment is

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1D FATO = □□□□□□□□

0.83D TLOF = □□□/□□□□□□□□□□□□□

sub-1D TLOF ≠ sub-1D obstacle protection
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□□□□□□□□□□□□□□ “FATO□□□ TLOF□□ ”□□□□ FATO□□□□□□□□ TLOF □□□□□□□□□□□□□□□□

?????heliport?OLS????FATO/Safety Area ?????????

□□□□□□□□□□□□□□ Obstacle Limitation Surfaces, OLS□□□□□

1. □□□□ Approach Surface□
2. □□□□□□ Take-off Climb Surface□
3. □□□□ Transitional Surface□
4. □□□□□□□□□□□□□□□□□□□□□□□

MH5013-2023 □ OLS □□□□□□□□□□□□□□□□□□□□□□□□□□□ Safety Area

□□□□□□□□□□ FATO □ Safety Area □□□□□□□□□□□□□□□□□□□□□□□□□□

要求应同时考虑，具体见本标准第 8.6.2 条第 5 款。

【条文说明】本条第 4 款中，允许超出障碍物限制面的物体可能会限制直升机场的运行。

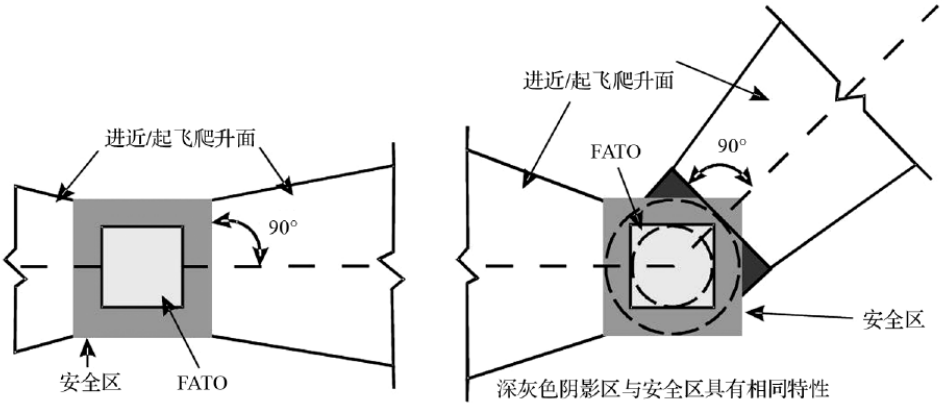


图 6.2.1-1　进近/起飞爬升面起始端形式

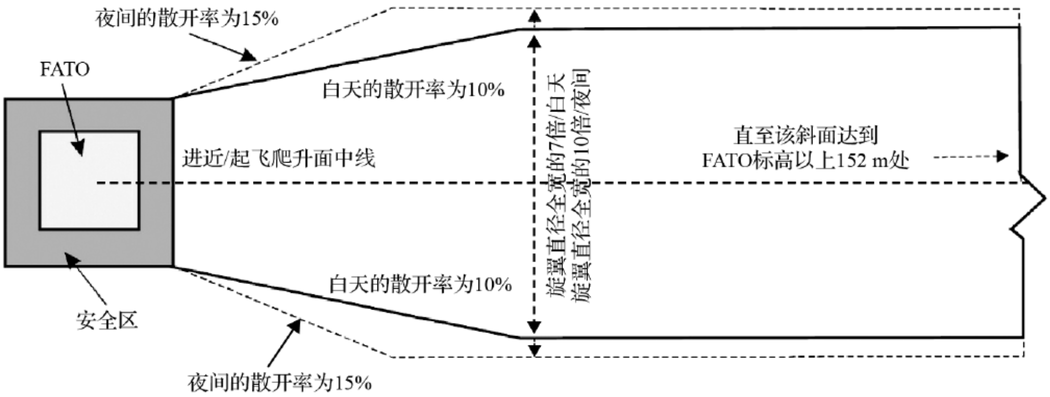
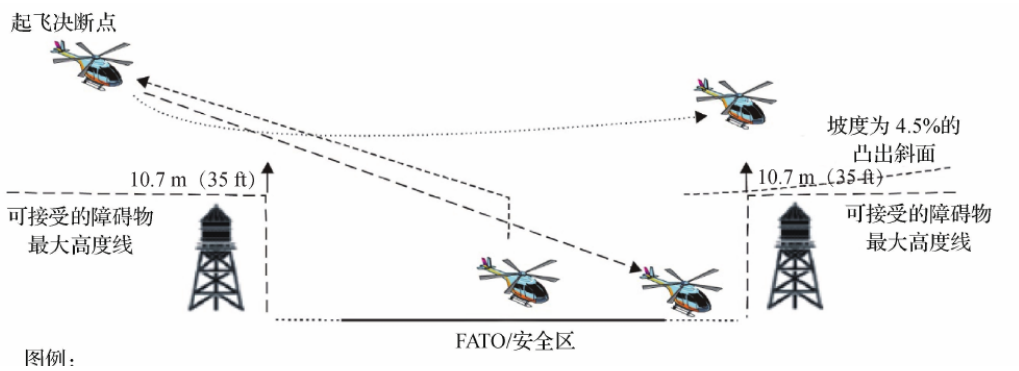


图 6.2.1-2　目视进近/起飞爬升面宽度



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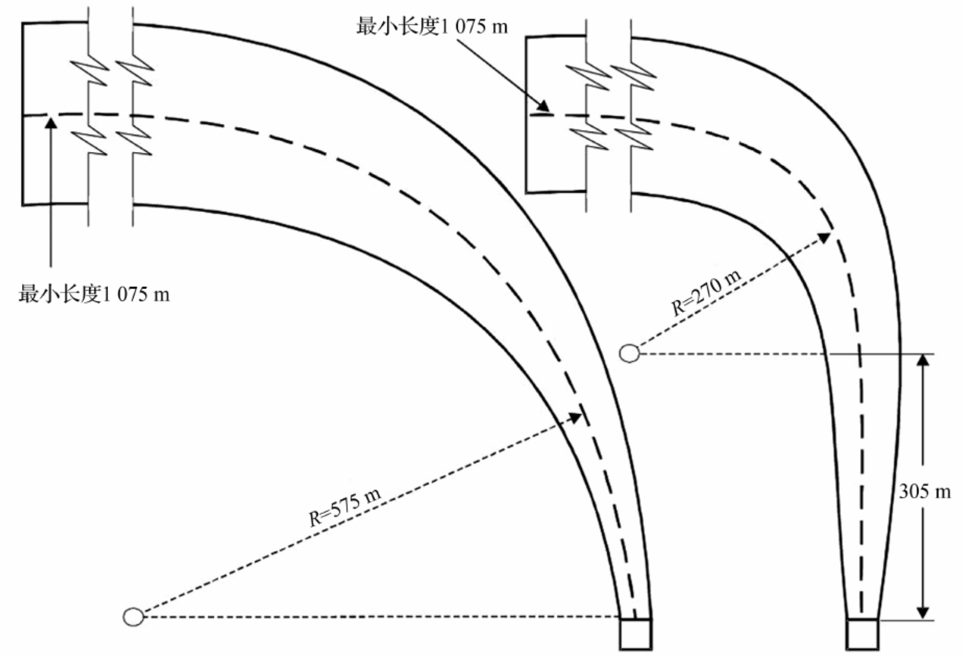
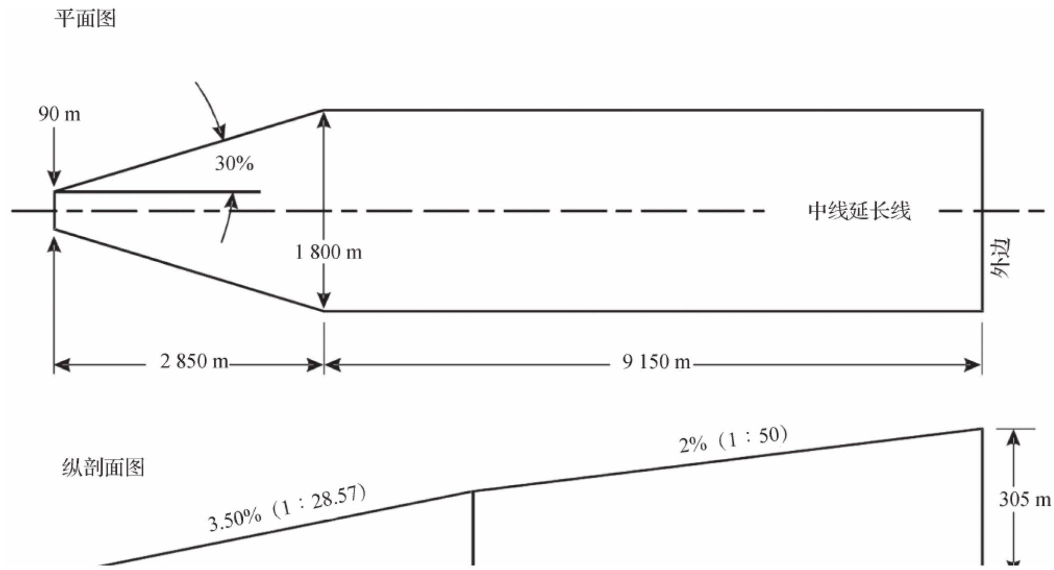


注：1　曲线和直线段的任何组合可以使用如下公式来确定：$S+R \geqslant 575$ m 和 $S=305$ m 时，$R \geqslant 270$ m 。式中 S 为直线段的长度，R 为转弯半径。任何≥575 m 的组合均可行。

2　曲线和直线段中线的最小长度为 1 075 m，但是根据所用的坡度可以更长。更长的长度，见表 6. 2. 1-1。

3　直升机的起飞性能在曲线段会降低，因此应考虑曲线段开始之前沿起飞爬升面的直线段可允许加速。

图 6. 2. 1-4　目视曲线进近/起飞爬升面



????OLS?????????

?????OLS????

[illegible] OLS [illegible]

1. [illegible]
2. [illegible]
3. [illegible]

[illegible]

?????OLS???

[illegible] OLS [illegible] vertiport [illegible]

1. [illegible]
2. [illegible]
3. eVTOL [illegible] OLS [illegible]
4. [illegible] OLS[illegible]

[illegible] vertiport [illegible] OFV [illegible]

??EASA/CASA/??????OLS???OFV

???EASA?OFV????????????

EASA PTS-VPT-DSN [illegible] Chapter D [illegible] Subpart 1 [illegible] OLS[illegible] Subpart 2 [illegible] OFV[illegible] EASA [illegible] OLS[illegible]

EASA [illegible] OFV [illegible] AFM[illegible] h1[illegible] h2[illegible] TOwidth[illegible] TOfront[illegible] TOback[illegible] FATOwidth[illegible] FATOfront[illegible] FATOback[illegible] θapp[illegible] θdep [illegible]

PTS VPT-DSN.D.455 Obstacle-free volume (OFV)

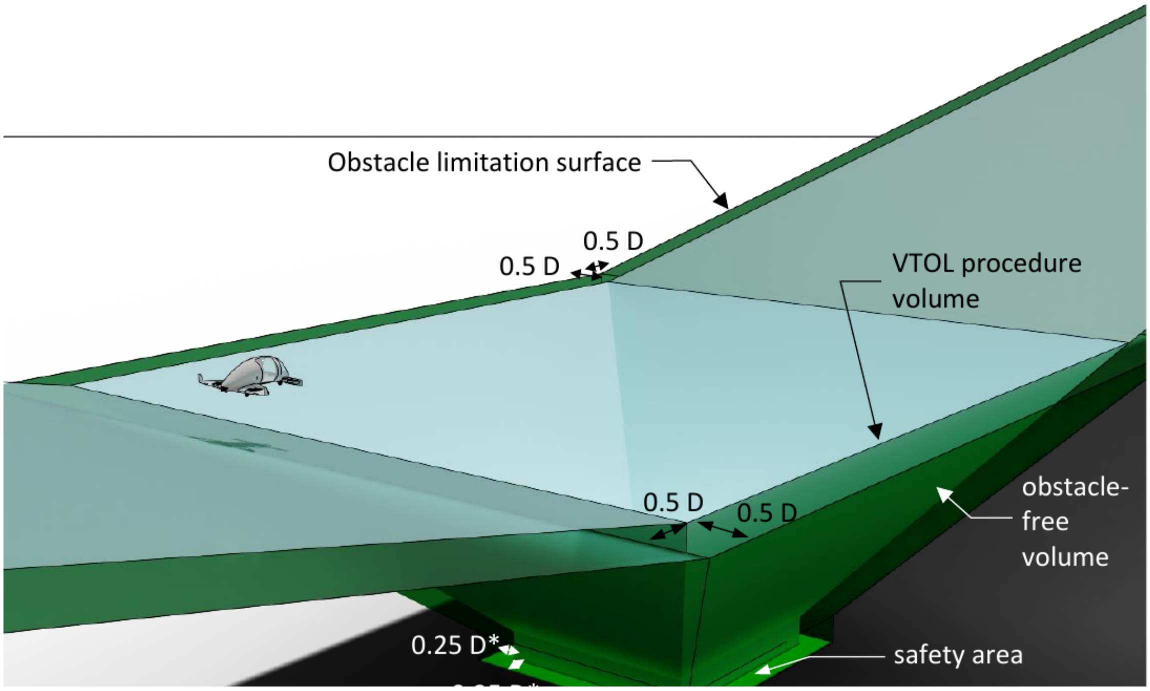
(a) The obstacle-free volume, as depicted in Figure D-15, is created by extending vertically upward the outside edges of the SA up to height h_1. The edges at height h_1 are then extended upwards linearly up to height h_2 to provide a funnel-shaped volume. At height h_2, 0.5 D are added on each side of the VTOL procedure volume so that the dimensions of the obstacle-free volume at height h_2 are:

(1) the length (TO_{back}+0.5 D) behind the aircraft and the length (TO_{front}+0.5 D) in front of the VTOL-capable aircraft, referenced to the aircraft centre of the smallest enclosing circle when positioned on the FATO; and

(2) the width (TO_{width}+1 D).

(b) The obstacle-free volume should not be penetrated by obstacles.

Note: A larger SA may be warranted for specific local conditions, e.g. severe aerology.



[illegible]

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[illegible] Safety Area [illegible] h1
[illegible] h1 [illegible] h2 [illegible]
[illegible] h2 [illegible]
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EASA [illegible] OFV [illegible] AFM [illegible]

[illegible] AFM
[illegible]

???CASA?FPA/VPS/OFV?????????

CASA AC139.V-01 [illegible] EASA [illegible]

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FPA = FATO Protection Area
VPS = Vertical Procedure Surface
OFV = FPA [illegible] VPS [illegible]
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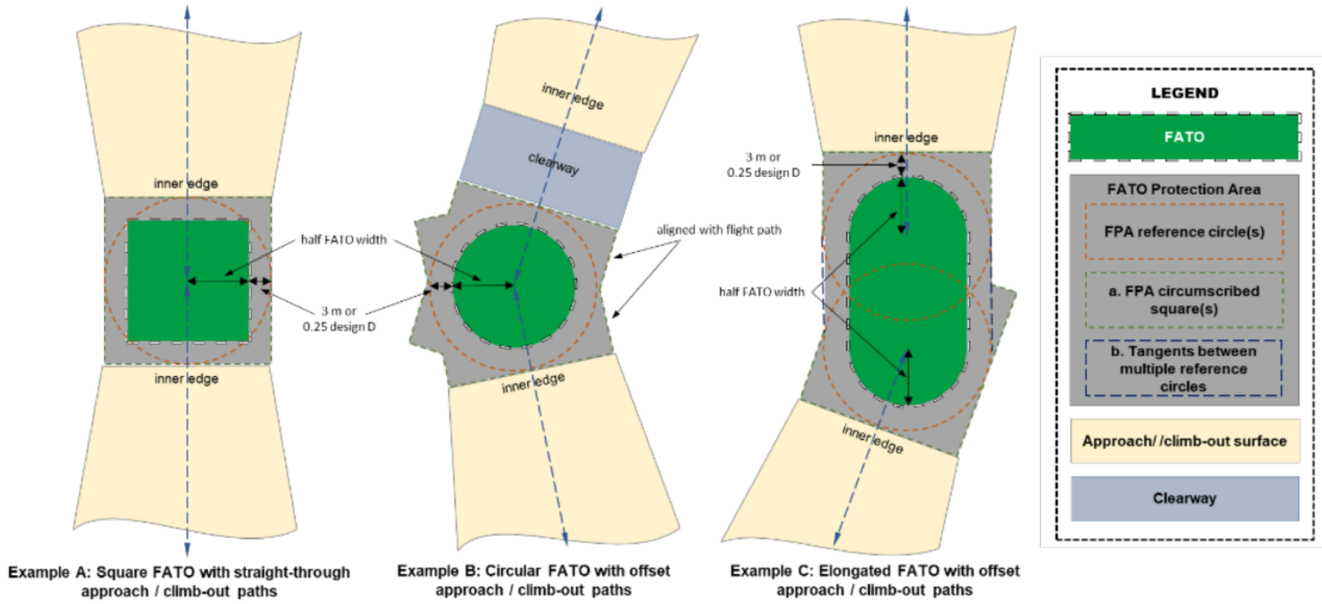


Figure 7 - Protection surfaces for vertiports without vertical procedures

4.2.3 Vertical Procedure Surface

4.2.3.1 A vertical procedure surface (VPS) should be established for where vertical procedures are used for landing or take-off from the vertiport.

4.2.3.2 The VPS is a surface that encompasses the area bordered by a circumscribed square(s) aligned with the intended aircraft flight path(s) centred on the VPS reference circle, as shown in Figures 8, 9 and 11.

4.2.3.3 A VPS should be free of obstacles.

4.2.3.4 A VPS reference circle should be established above and centred on the FATO.

4.2.3.5 The diameter of a VPS reference circle should be the diameter of the associated FPA reference circle, plus 1 Design D per 100 ft increase in height above the FATO.

4.2.3.6 The vertiport operator should determine the elevation of the VPS subject to the performance characteristics of the most demanding VCA intended to use the vertiport or the VCA operator's intended operational requirements.

4.2.4 Obstacle Free Volume (OFV)

4.2.4.1 An OFV should be established between a VPS and the associated FPA.

4.2.4.2 An OFV should be free of obstacles.

4.2.4.3 The OFV is a truncated cone extending between the edge of the FPA reference circle to the edge of the VPS reference circle, as shown in Figure 8, 9 and 11.

CASA FPA / VPS OFV

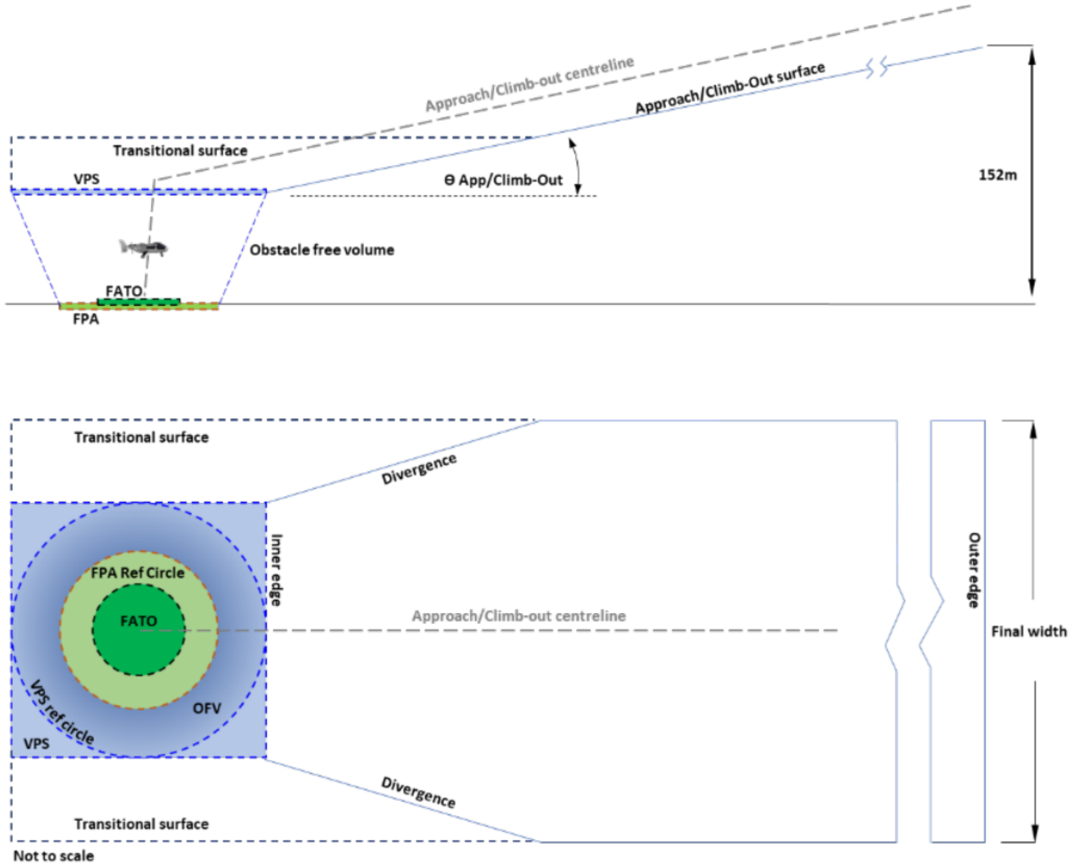
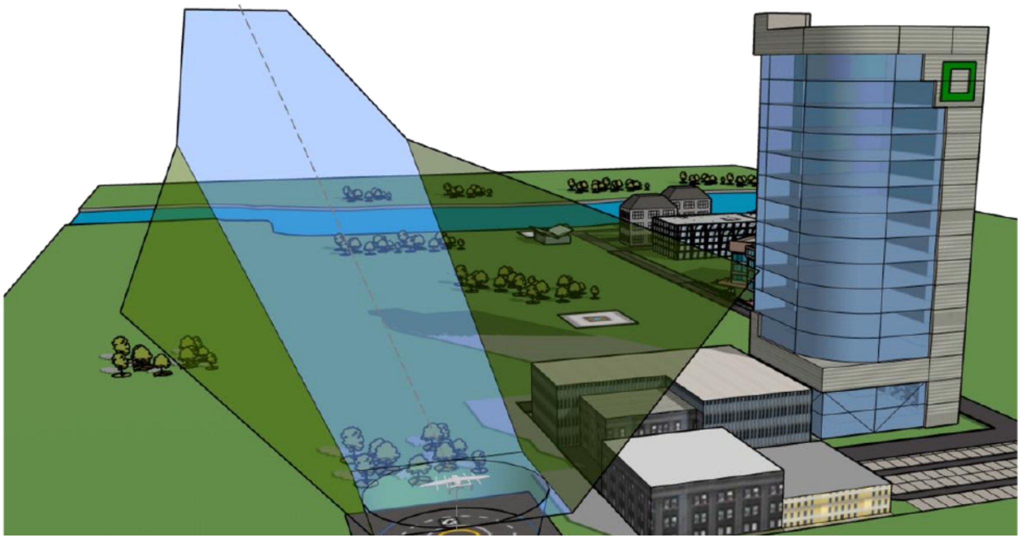


Figure 8 - An example OLS design for a vertiport accommodating vertical procedures



□□□□□ CASA □□□□ GIS□□□□□□□□□□□ "□□□□□ "
□□□□□□□□□□□□□□□□□□□□□

???????????OFV?????????

[illegible] T/CCAATB 0062-2024 [illegible]

[illegible] MH5013[illegible] eVTOL [illegible] D [illegible]

[illegible] h0 [illegible] OFV[illegible] OFV [illegible]

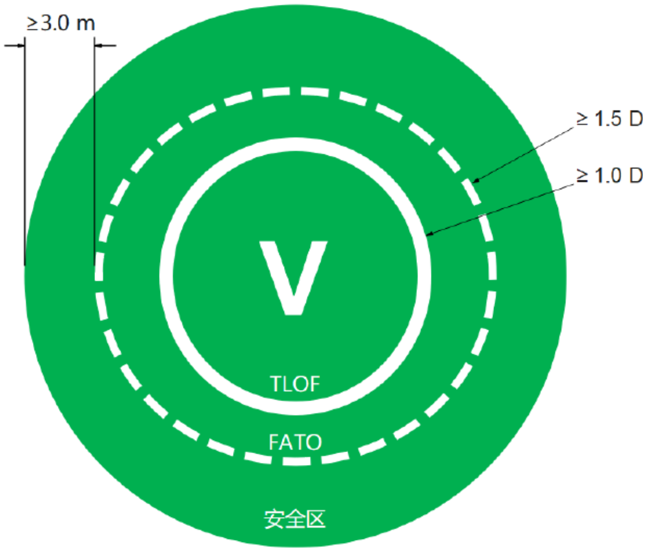


图 5.4-1 FATO、TLOF 和安全区场地物理特性示意图

5.5 机位

5.5.1 机位的尺寸和形状应满足 eVTOL 起降场设计机型在停放时，eVTOL 的垂直投影均包含在机位中。
5.5.2 机位形状为圆形，其尺寸应至少能够内切一个设计机型 1.2*D* 的圆，机位与机位之间的间距应至少为 2.0 m。
5.5.3 机位上宜设置满足 eVTOL 停放所需的系留设施。

5.6 地面滑行道

5.6.1 在机位与机位之间、机位与机库之间应设置地面滑行道。
5.6.2 地面滑行道应能承受 eVTOL 移动时的运行荷载。
5.6.3 地面滑行通道的宽度应不小于 eVTOL 起落架宽度或 eVTOL 转运装置最大轮外侧间距的 2 倍。

6 障碍物限制

6.1 净空条件良好时

6.1.1 在空域环境良好时，eVTOL 起降场障碍物限制面宜参照 MH 5013《民用直升机场飞行场地技术标准》中的规定，并以 eVTOL 最大全尺寸 *D* 代替直升机最大旋翼直径。进近和起飞爬升面内边宽度为 FATO 加安全区的宽度，内边位置为安全区边界。
6.1.2 eVTOL 起降场宜至少设置两个进近/起飞爬升面，中线夹角宜不小于 135°。

6.2 净空条件复杂时

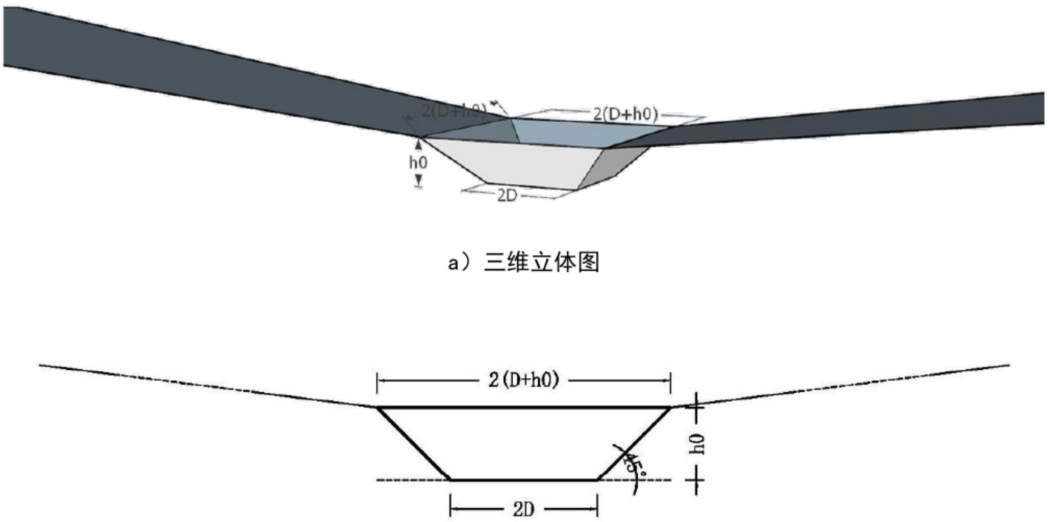
6.2.1 当场址周边净空条件复杂，或参照 MH 5013《民用直升机场飞行场地技术标准》设置障碍物限制面无法满足净空要求时，宜考虑设置悬停高度（以 h_0 表示）及相应的无障碍空间（OFV）。进近和起飞爬升面、过渡面起始端位于无障碍空间顶面，其他参数宜参照 MH 5013《民用直升机场飞行场地技术标准》设置。
6.2.2 悬停高度的设置应根据周边航路上的障碍物及 eVTOL 的飞行性能确定。

示例：以正方形 FATO 为例，悬停高度 h0≤D 时的障碍限制面示意图见图 6.2-1，悬停高度 h0＞D 时的障碍限制面示意图见图 6.2-2。

□□□ OFV □□□□□□□

1. h0≤D □□ OFV □□□□□□□□□□□□□ 2×(D+h0)□
2. h0>D □□ D □□□□□ 45° □□□ D □□□□□□□□□□□□□□□□ 4D□

T/CCAATB 0062—2024



a）三维立体图

b）纵剖面图

□□□□□□□□□□□□□□□□□□□□□□□□□ EASA□□□□□□□ AFM □□□□□□ D □ h0□

□□□□□□□ h0 □□□□□□□ eVTOL □□□□□□□□□□□□ /□□□□□□□□□ OFV □ Safety Area□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ D+h0 □□□□□□□

??FAA?????OFV????Part 77???+DCA

???FAA EB105A??heliport imaginary surfaces

FAA EB105A □ EASA/CASA □□□□□□□□□□□ OFV □□□□□□□□□□□□□□□□ 14 CFR Part 77 □□□□ heliport □ imaginary surfaces □□ vertiport□

FAA □□□ VFR □□□□

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Primary Surface = FATO
Approach / Departure Surface = 8:1□□ 4000 ft□□□□ 500 ft
Transitional Surface = 2:1□□□ 250 ft
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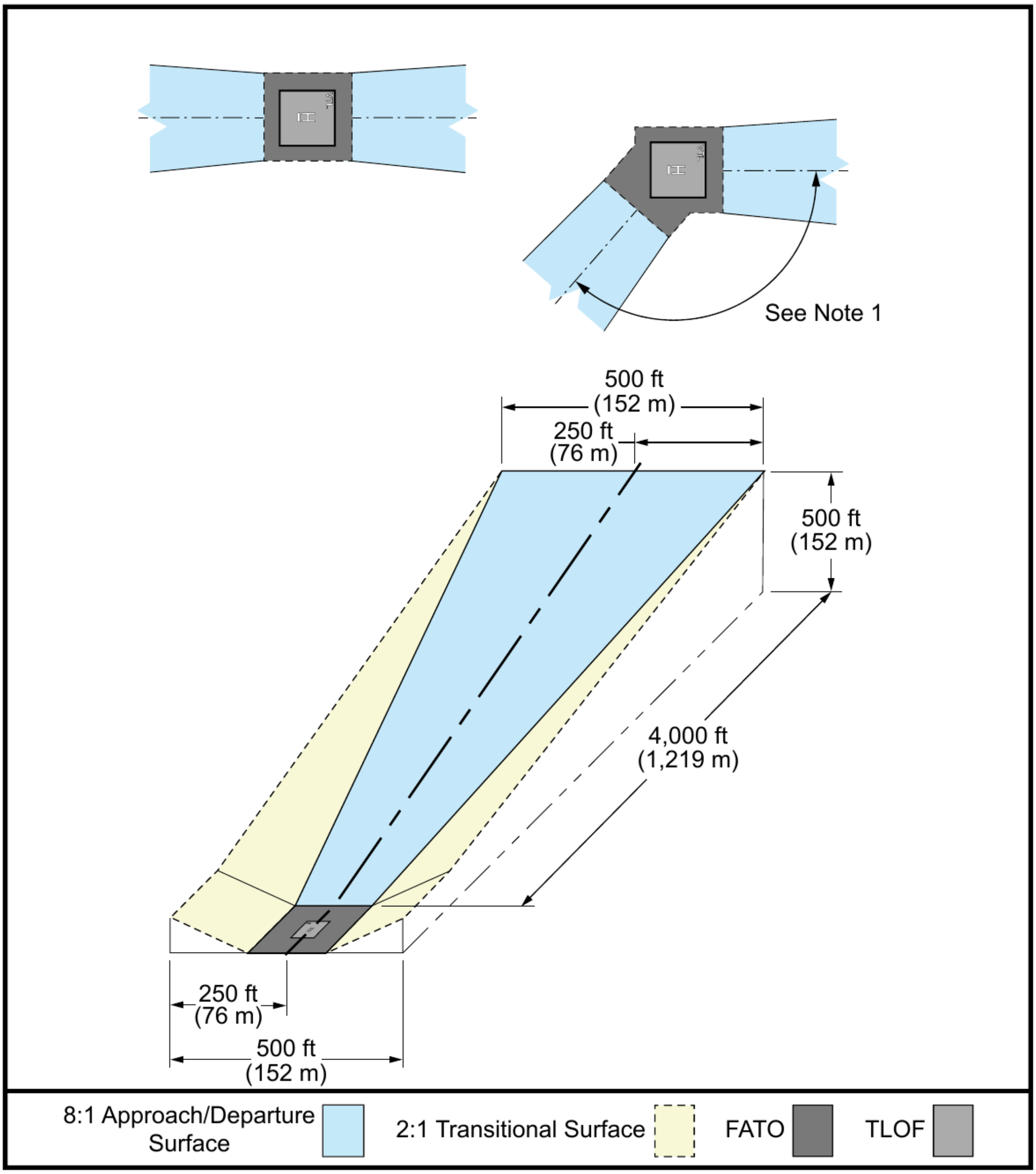
Figure 2-5: VFR Vertiport Approach/Departure Surfaces



Note 1: The preferred approach/departure surface is based on the predominant wind direction. Where a reciprocal approach/departure surface is not possible in the opposite direction, use a minimum 135-degree angle between the two surfaces.

[illegible] FAA [illegible]

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S + R ≥ 1886 ft / 575 m
R ≥ 886 ft / 270 m
[illegible] ≥ 4000 ft / 1219 m
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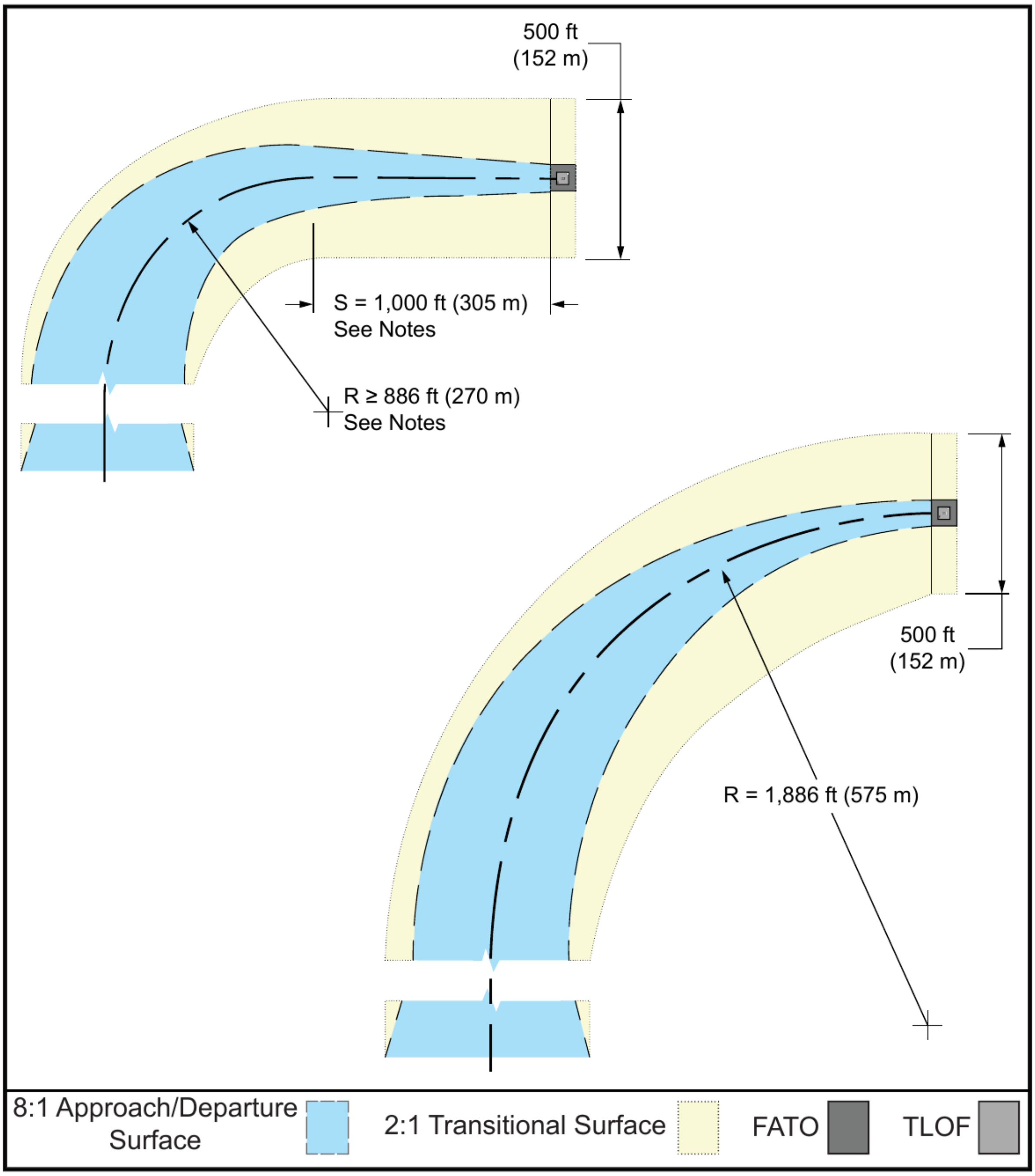
Figure 2-6: VFR Vertiport Curved Approach/Departure and Transitional Surfaces



Note 1: Use any combination of straight portions of one curved portion using the following formula: S + R ≥ 1,886 ft (575 m) and R ≥ 886 ft (270 m), where S is the length of the straight portion(s) and R is the radius of the turn. Note that any combination ≥ 1,886 ft (575 m) will work.

Note 2: The minimum total length of the centerline of the straight and curved portion is 4,000 ft (1,219 m).

Note 3: VTOL takeoff performance may be reduced in a curve. Consider a straight portion along the takeoff climb surface prior to the start of the curve to allow for acceleration.

???FAA?eVTOL?????????DCA

FAA □□□□□ eVTOL □□□□□□□□□□ EB105A □ eVTOL □□□□□□□□□□□□□□□□□□ OFV□□□□□□□□□□ Downwash/Outwash Caution Area□ DCA□□□

FAA □□ /□□ 34.5 mph（55.5 kph）□□ DCA □□ FAA 2024 □□ /□□ eVTOL □□ Safety Area□

□□ FAA □□

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□□ Part 77 □
□□ DCA
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□□ EASA/CASA □□ EASA/CASA □□ OFV □□ FAA □□ eVTOL □□

??FAA?ICAO/EASA/CASA??????

???????????????????????????

ICAO heliport □□ FAA EB105A □□ OLS□□ FATO □ Safety Area □□

EASA/CASA/□□

□□ OFV□

□□

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FAA□FATO → 8:1/2:1 surfaces
EASA/CASA□□FATO/SA → OFV → OLS
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???????FAA?eVTOL??????D/RD?DCA???? OFV

FAA EB105A □□ eVTOL □□

1. □□ FATO/TLOF □ D □□ RD□ Safety Area □□ D□
2. □□ DCA□□ downwash/outwash□

EASA/CASA □□

1. OFV□□
2. AFM□□ OFV□
3. downwash protection□□

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[illegible] FAA [illegible] Part 77 [illegible] EASA [illegible] AFM [illegible] OFV [illegible]

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[illegible]MH5013 OLS
[illegible]h0 + [illegible] OFV
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[illegible] eVTOL [illegible]

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[illegible] OLS [illegible]

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1. [illegible]
2. [illegible] vertiport[illegible]
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OFV [illegible]

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1. [illegible]
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3. [illegible] vertistop[illegible]
4. [illegible]

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1. [illegible] AFM [illegible]
2. [illegible]
3. [illegible] /[illegible] DCA [illegible] Safety Area [illegible] OFV [illegible]
4. [illegible]
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[illegible] FAA[illegible] FAA [illegible] FAA [illegible]

1. [illegible] RD [illegible]
2. DCA [illegible] /[illegible]
3. VFR [illegible] 8:1 [illegible] 2:1 [illegible]
4. [illegible] Part 77 [illegible]

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[illegible]A[illegible] OLS [illegible]
[illegible] MH5013/ICAO/FAA [illegible]


[illegible]B[illegible]OFV + OLS [illegible]
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[illegible] h0[illegible] h0 [illegible]

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2. [illegible]
3. eVTOL [illegible]
4. [illegible]

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5. FAA 8:1 / 2:1 □□□□□□□□
6. DCA □ Safety Area□ OFV □□□□□□
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□□□ EASA □ OFV □□□□□□□ AFM □□□□□ CASA □ OFV □□□□□□□□□□□□□ OFV □□□□□□□□□□□□□ FAA EB105A □□□□□ OFV□□□□□ Part 77 imaginary surfaces□□□ DCA □□ eVTOL □□ /□□□□□

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□□□□□□□ eVTOL □□□□□□□□□□□□ “MH5013 OLS + □□ OFV + FAA RD/DCA□□□□ ” □□□□□□□□□□□□□□□□□□□□□□□□□□□ eVTOL □□□□□□□

Vertiport??????????????????

Vertiport —— ICAO Heliport Manual ICAO FAA
2026 5 29
Vertiport

FATO TLOF Safety Area OLS eVTOL
OFV Vertiport
heliport ICAO Annex 14 Volume II
ICAO Doc 9261 MH5013
Heliport Manual
MH5013 OLS EASA OFV OFV eVTOL OLS
FAA EB105A 14 CFR Part 77 imaginary surfaces D/RD DCA
eVTOL EASA OFV
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OFV OLS h0
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OLS OFV eVTOL /FATO
h0 h0 OLS OFV

heliport Heliport Manual MH5013 45°
D

vertiport ICAO
FAA vertiport heliport heliport
ICAO Annex 14 Volume II Doc 9261 FATO TLOF Safety Area
OLS EASA CAAC/MH5013/ ICAO EASA vertiport
OFV ICAO/MH5013 OFV FAA
heliport AC 150/5390-2D 14 CFR Part 77
EB105A Part 77 imaginary surfaces D/RD DCA vertiport FAA ICAO
heliport “ ”

ICAO EASA PTS-VPT-DSN OFV EASA FAA
ICAO/CAAC heliport EASA EASA
ICAO Annex 14 Volume II ICAO Document 9261 Heliport Manual
VTOL EASA Chapter D Subpart 1 OLS Annex 14 Volume II
Doc 9261 Subpart 2 vertiport OFV OFV
eVTOL OLS
eVTOL

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[illegible] ICAO [illegible] EASA [illegible] OFV
[illegible] OFV [illegible] ICAO/Heliport Manual/MH5013 [illegible] OLS
[illegible] EASA [illegible] CAAC [illegible] heliport [illegible] FATO [illegible] TLOF [illegible]
Safety Area [illegible] OLS [illegible] OFV [illegible] ICAO
[illegible] h0 [illegible] OFV [illegible] eVTOL
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[illegible] 1 Vertiport [illegible] ICAO [illegible] FATO [illegible] TLOF
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[illegible] TLOF [illegible] Safety Area
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[illegible] Safety Area [illegible] OLS [illegible] FAA Part 77 [illegible] primary surface=FATO [illegible] FATO
[illegible] ICAO [illegible]

[illegible] 2 ICAO Annex 14 Volume II [illegible] FATO [illegible]

[illegible] 3 ICAO Annex 14 Volume II [illegible] TLOF [illegible] FATO
[illegible] TLOF
[illegible] Safety Area [illegible] ICAO/MH5013 [illegible] OLS [illegible] TLOF
[illegible] FATO [illegible] Safety Area [illegible] FATO
[illegible] Safety Area [illegible] OLS [illegible] Doc 9261 [illegible] 1D
[illegible] 0.83D [illegible] sub-1D [illegible] ICAO Doc 9261 Heliport Manual [illegible] Annex 14 [illegible]
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ICAO/Heliport Manual/MH5013 [illegible] EASA [illegible] ICAO [illegible] vertiport
[illegible] FATO [illegible] TLOF [illegible] Safety Area [illegible] FATO
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[illegible] Safety Area
[illegible] FAA [illegible] “primary surface = FATO”“approach/departure surface [illegible] FATO [illegible] ” [illegible] FAA Part 77 [illegible] EB105A [illegible] FAA
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[illegible] 5 [illegible] OLS [illegible] OLS [illegible] Safety Area
[illegible] FATO [illegible] / [illegible] Safety Area
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MH5013 [illegible] OLS [illegible]

[illegible] 6 MH5013 [illegible] / [illegible]

[illegible] 7 MH5013 [illegible] / [illegible] ICAO/MH5013
[illegible] FAA [illegible] Part 77 [illegible] OLS [illegible] ICAO Annex 14 Volume II [illegible] Safety Area
[illegible] / [illegible] FATO
[illegible] ICAO [illegible] FATO
[illegible] FATO [illegible] FATO [illegible] MH5013-2023
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[illegible] OLS [illegible]
eVTOL [illegible] Safety Area [illegible] OFV
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[illegible] “ [illegible] OFV [illegible] ” [illegible] MH5013
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primary surface [illegible] approach/departure surface [illegible] transitional surfaces [illegible] VFR vertiport
[illegible] 2:1 [illegible] primary surface [illegible] approach surface
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eVTOL h0 OFV /

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ICAO/MH5013/EASA

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OLS OLS

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OFV OFV OFV Obstacle-Free Volume /FATO

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OFV OLS ICAO/MH5013 OLS Safety Area OFV

8 OFV OFV OLS ICAO/MH5013 OLS OLS Safety Area OFV

OLS OFV OFV

EASA OFV EASA PTS-VPT-DSN Chapter D OLS OFV EASA ICAO OLS

OFV EASA PTS EASA ADR/CS-HPT-DSN ICAO Annex 14 Volume II ICAO Document 9261 Heliport Manual Chapter D Subpart 1 Annex 14 Doc 9261 OLS Subpart 2 vertiport OFV OFV

AFM h1 h2 TOwidth TOfront TOback FATOwidth FATOfront FATOback θapp θdep

9 EASA PTS-VPT-DSN Figure D-15 OFV EASA OLS

“visual FATOs” PTS-VPT-DSN VFR vertiports Chapter D Table D-1 “Dimensions and slopes of OLSs for all visual FATOs” EASA

OLS vertiport ICAO/Doc 9261 OLS VFR vertiport

10 EASA Table D-1 all visual FATOs OLS EASA PTS

VFR vertiports VTOL

EASA D.405

/ EASA D.410 ICAO

FATO Safety Area Safety Area

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[illegible] 11 EASA D.410[illegible] Safety Area/[illegible] [illegible] EASA [illegible] OLS[illegible] D.415[illegible] vertical procedures include lateral transit[illegible] where appropriate[illegible] VFR vertiports [illegible] lateral transit[illegible] Table D-1[illegible] VTOL[illegible] transitional surface may be provided[illegible] EASA[illegible] OLS[illegible] “VFR[illegible] + [illegible] /[illegible] + [illegible] ”[illegible]

[illegible] 12 EASA D.415[illegible] lateral transit [illegible] EASA[illegible] OFV [illegible] OLS[illegible] vertiport [illegible] eVTOL [illegible] vertiport[illegible] heliport [illegible] OFV[illegible] EASA[illegible] OFV [illegible] eVTOL [illegible] eVTOL[illegible] eVTOL [illegible] eVTOL [illegible] “[illegible] AFM/[illegible] ” [illegible] OFV [illegible] “ [illegible] ”[illegible] h0[illegible] h0 [illegible] OLS [illegible] OFV[illegible] h0[illegible] CASA[illegible] FPA/VPS/OFV[illegible] CASA AC139.V-01[illegible] EASA[illegible] FPA[illegible] VPS[illegible] OFV[illegible] FPA[illegible] FATO Protection Area[illegible] VPS[illegible] Vertical Procedure Surface[illegible] OFV [illegible] GIS[illegible]

[illegible] 13 CASA AC139.V-01[illegible] FPA[illegible] VPS[illegible] OFV[illegible]

[illegible] 14 CASA AC139.V-01[illegible] OFV[illegible] CASA[illegible] “[illegible] ” [illegible] heliport OLS[illegible] h0+OFV[illegible] eVTOL[illegible] T/CCAATB 0062-2024[illegible] “[illegible] ”[illegible] “[illegible] ”[illegible] heliport OLS[illegible] MH5013[illegible] eVTOL[illegible] D [illegible] OLS[illegible] h0[illegible] OFV [illegible] OFV[illegible] OFV [illegible] OLS[illegible] OLS[illegible]

[illegible] 15 [illegible] h0≤D[illegible] h0>D[illegible] OFV[illegible] [illegible] h0≤D[illegible] OFV[illegible] FATO[illegible] 2D[illegible] h0[illegible] 2×(D+h0)[illegible] h0>D[illegible] 4D[illegible] D[illegible] 45° [illegible] D[illegible] h0[illegible] “[illegible] ”

OLS OFV

45°

ICAO Annex 14 Volume II

FATO 45° 10m protected side slope

MH5013-2023 4.4.1 FATO 45°

10m heliport 45°

eVTOL h0≤D h0 h0 2D

2(D+h0) h0>D 45° D 4D D 45°

4D OFV h0 EASA

4D D

16 FATO OFV “ OFV” eVTOL

h0 eVTOL

h0 OLS

h0 D

OFV

/

FAA Part 77 D/RD DCA FAA EB105A

EASA OFV FAA EB105A EASA/CASA/ OFV

FAA 14 CFR Part 77 heliport imaginary surfaces vertiport

primary surface approach surface transitional surfaces

14 FAA EB105A Figure 2-5 VFR Vertiport / FAA VFR

FAA EB105A/Part 77 primary surface FATO approach/departure surface FATO

4000 ft 1219 m 500 ft 152 m 8:1 transitional surface primary

surface approach surface 2:1 250 ft 76 m FAA

ICAO/MH5013

15 FAA EB105A Figure 2-6 / FAA S+R≥1886 ft 575 m

R≥886 ft 270 m 4000 ft 1219 m ICAO/MH5013

“ ” FAA eVTOL

D/RD DCA FAA eVTOL D/RD

DCA / EB105A D RD /

TLOF 1RD FATO 2RD Safety Area 2.5D

16 FAA EB105A D RD DCA Downwash/Outwash Caution Area

eVTOL / 34.5 mph 55.5 kph

DCA FAA Part 77 eVTOL DCA

FAA ICAO/EASA/CASA/

17 FAA ICAO/EASA/CASA FAA ICAO/EASA/CASA/

“ ” “ ” FAA EASA/CASA/

OLS

OLS

vertiport

OFV OFV

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Safety Area eVTOL h0

OLS eVTOL

OLS

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MH5013/Heliport Manual OLS

eVTOL

OFV OLS h0

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OLS OFV h0 D

Safety Area OLS eVTOL

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h0 h0 OFV

OFV heliport 45° 45° 4D 4D

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eVTOL
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“ ” eVTOL
MH5013/ICAO OLS
MH5013/ICAO OLS h0+OFV OLS OFV
heliport manual eVTOL h0
h0 “ OLS
eVTOL ”
OLS OLS
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FAA RD DCA FAA EB105A
RD D DCA /
Safety Area OFV
FATO/TLOF/Safety Area OLS OFV
h0≤D h0>D FAA 8:1/2:1 DCA Safety Area/OFV
Vertiport ICAO
FATO TLOF Safety Area OLS FATO TLOF /
Safety Area OLS
OFV
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EASA OFV
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eVTOL CASA
FPA/VPS/OFV h0+OFV “
OFV OLS”
FAA EB105A EASA/CASA/
FAA OFV Part 77 imaginary surfaces
D/RD DCA eVTOL / ICAO/Heliport
Manual/MH5013 OLS h0 OFV
FAA D/RD Part 77 DCA /
FAA ICAO
FAA eVTOL OFV
D h0

ICAO Annex 14 Volume II — Heliports ICAO Doc 9261 Heliport Manual, Fifth Edition, 2021 FAA Engineering Brief No.105A, Vertiport Design, 2024 FAA AC 150/5390-2D, Heliport Design EASA PTS-VPT-DSN, Prototype Technical Specifications for Vertiport Design

CASA AC139.V-01, Guidance on Vertiport Design, 2023[illegible] T/CCAATB 0062-2024
[illegible] MH5013-2023[illegible]

Vertiport??????????????

Vertiport ??????????????

——[illegible] ICAO Heliport Manual [illegible] ICAO [illegible] FAA [illegible] 2026 [illegible] 5 [illegible] 29 [illegible]

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[illegible] Vertiport [illegible] FATO[illegible] TLOF[illegible] Safety Area[illegible] OLS [illegible] eVTOL [illegible] OFV[illegible]

[illegible] Vertiport[illegible] heliport [illegible] ICAO Annex 14 Volume II[illegible] ICAO Doc 9261[illegible] MH5013 [illegible] Heliport Manual [illegible] MH5013 [illegible] OLS [illegible] EASA[illegible] OFV[illegible] OFV[illegible] eVTOL[illegible] OLS [illegible] FAA EB105A [illegible] 14 CFRPart 77 imaginary surfaces[illegible] D/RD [illegible] DCA [illegible] eVTOL [illegible]

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[illegible] OLS [illegible] OFV [illegible] OLS [illegible] OFV [illegible] eVTOL [illegible] /FATO [illegible] h0 [illegible] h0[illegible] OLS [illegible]

OFV [illegible] heliport [illegible] Heliport Manual [illegible] MH5013 [illegible] 45° [illegible] D [illegible]

[illegible] vertiport [illegible] ICAO[illegible] FAA [illegible] vertiport [illegible] heliport [illegible] heliport [illegible] ICAO [illegible] Annex 14 Volume II [illegible] Doc 9261 [illegible] FATO[illegible] TLOF[illegible] Safety Area [illegible] OLS [illegible] EASA [illegible] CAAC/MH5013/[illegible] ICAO [illegible] EASA [illegible] vertiport[illegible] OFV [illegible] ICAO/MH5013[illegible] OFV[illegible] FAA[illegible] heliport [illegible] AC 150/5390-2D[illegible] 14CFR Part 77 [illegible] EB105A [illegible] Part 77imaginary surfaces[illegible] D/RD [illegible] DCA [illegible] vertiport [illegible] FAA[illegible] ICAO [illegible] heliport [illegible] “[illegible]” [illegible]

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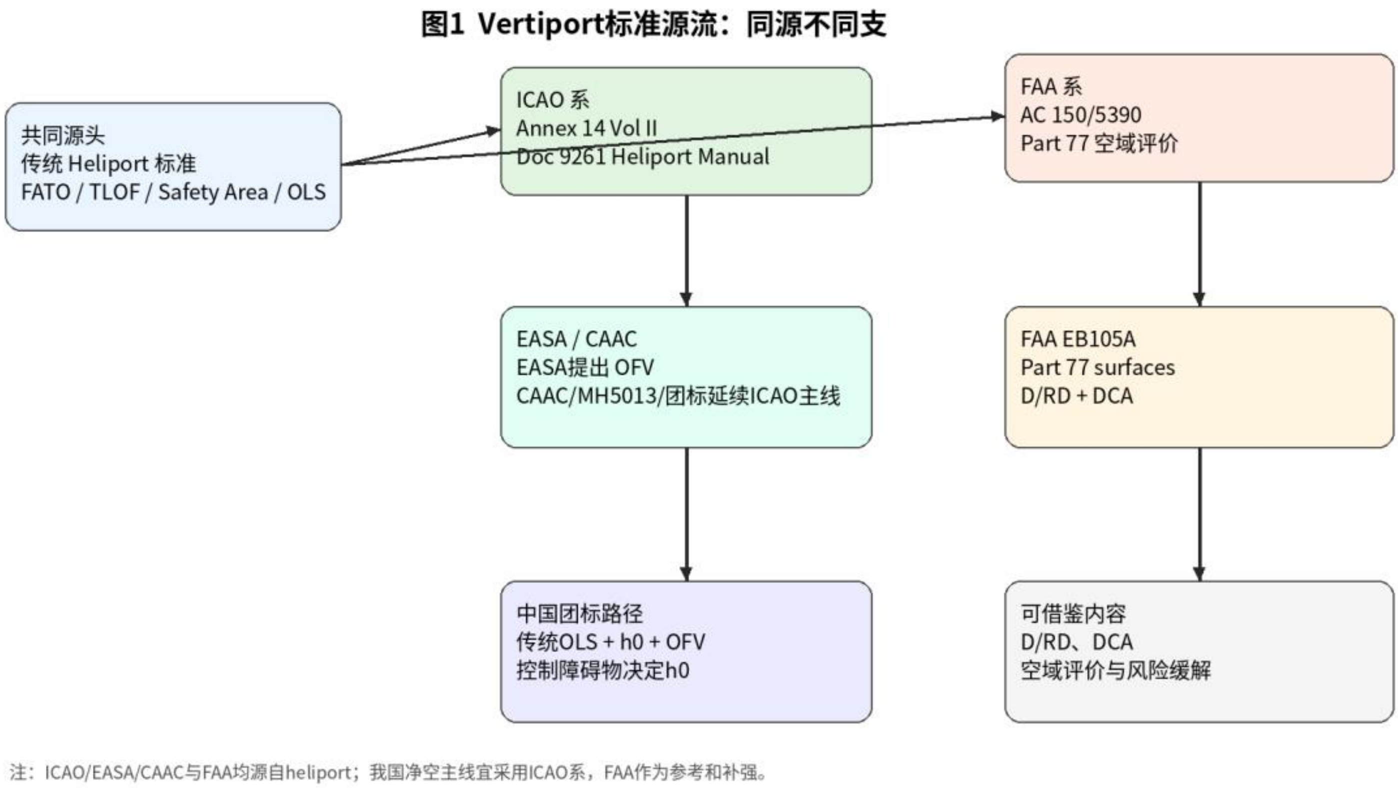

□ 1 Vertiport □□□□□□□□□□□

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???FATO?TLOF ? Safety Area ????????????

ICAO Annex 14 Volume II □□□ FATO □□□□□□□□□□□□□□□□□□□□□□□ TLOF □□□□□□□□□□□□ Safety Area □□□ FATO □□□□□□□□□□□□□ FATO □□□□□□□ ICAO/MH5013□□□□□□□□□□□□□□□□□□□□ Safety Area □□□□□□□□□□□□□□□□□□□□□□□□□ FATO□□□□□□□□□□□□□□□□ / □□□ Safety Area □□□□ OLS □□□□□□□□□ FAA Part 77 □ primary surface=FATO□□ FATO □□□□□□□□□ ICAO □□□□

Elevated heliport. A heliport located on a raised structure on land.

Ellipsoid height (Geodetic height). The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Final approach and take-off area (FATO). A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by helicopters operated in performance class 1, the defined area includes the rejected take-off area available.

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid. The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation. The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the

2 ICAO Annex 14 Volume II FATO

Chapter 1 ***Annex 14 — Aerodromes***

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

a) are located on an area intended for the surface movement of aircraft; or

b) extend above a defined surface intended to protect aircraft in flight; or

3 ICAO Annex 14 Volume II TLOF

FATO TLOF Safety Area ICAO/MH5013 OLS TLOF

FATO Safety Area FATO Safety Area OLS

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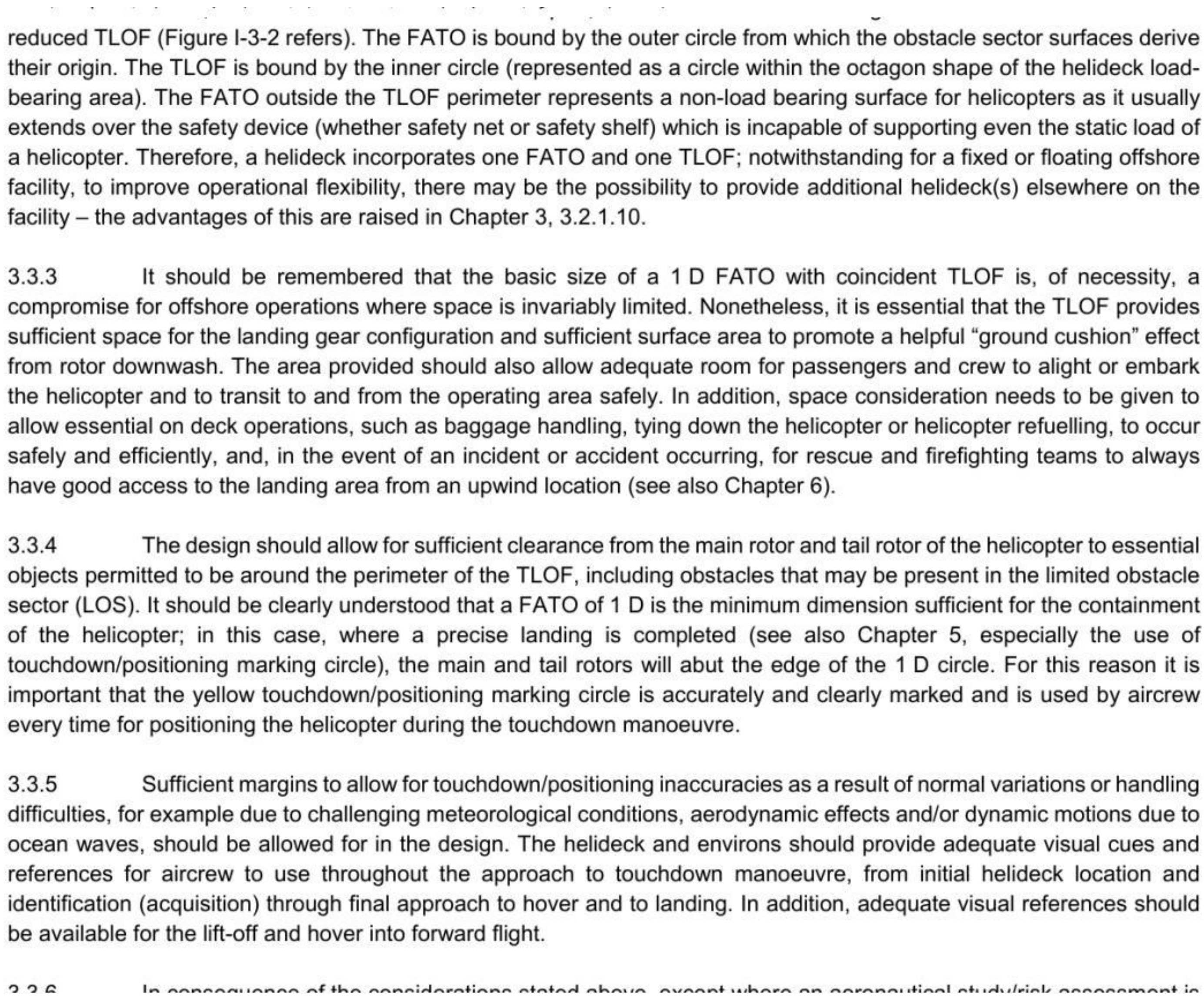

reduced TLOF (Figure I-3-2 refers). The FATO is bound by the outer circle from which the obstacle sector surfaces derive their origin. The TLOF is bound by the inner circle (represented as a circle within the octagon shape of the helideck load-bearing area). The FATO outside the TLOF perimeter represents a non-load bearing surface for helicopters as it usually extends over the safety device (whether safety net or safety shelf) which is incapable of supporting even the static load of a helicopter. Therefore, a helideck incorporates one FATO and one TLOF; notwithstanding for a fixed or floating offshore facility, to improve operational flexibility, there may be the possibility to provide additional helideck(s) elsewhere on the facility – the advantages of this are raised in Chapter 3, 3.2.1.10.

3.3.3 It should be remembered that the basic size of a 1 D FATO with coincident TLOF is, of necessity, a compromise for offshore operations where space is invariably limited. Nonetheless, it is essential that the TLOF provides sufficient space for the landing gear configuration and sufficient surface area to promote a helpful "ground cushion" effect from rotor downwash. The area provided should also allow adequate room for passengers and crew to alight or embark the helicopter and to transit to and from the operating area safely. In addition, space consideration needs to be given to allow essential on deck operations, such as baggage handling, tying down the helicopter or helicopter refuelling, to occur safely and efficiently, and, in the event of an incident or accident occurring, for rescue and firefighting teams to always have good access to the landing area from an upwind location (see also Chapter 6).

3.3.4 The design should allow for sufficient clearance from the main rotor and tail rotor of the helicopter to essential objects permitted to be around the perimeter of the TLOF, including obstacles that may be present in the limited obstacle sector (LOS). It should be clearly understood that a FATO of 1 D is the minimum dimension sufficient for the containment of the helicopter; in this case, where a precise landing is completed (see also Chapter 5, especially the use of touchdown/positioning marking circle), the main and tail rotors will abut the edge of the 1 D circle. For this reason it is important that the yellow touchdown/positioning marking circle is accurately and clearly marked and is used by aircrew every time for positioning the helicopter during the touchdown manoeuvre.

3.3.5 Sufficient margins to allow for touchdown/positioning inaccuracies as a result of normal variations or handling difficulties, for example due to challenging meteorological conditions, aerodynamic effects and/or dynamic motions due to ocean waves, should be allowed for in the design. The helideck and environs should provide adequate visual cues and references for aircrew to use throughout the approach to touchdown manoeuvre, from initial helideck location and identification (acquisition) through final approach to hover and to landing. In addition, adequate visual references should be available for the lift-off and hover into forward flight.

3.3.6 In consequence of the considerations stated above, except where an aeronautical study/risk assessment is

□ 4 ICAO Doc 9261 □□ 1D □ sub-1D FATO/TLOF □□□□□

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FAA Part 77 □ EB105A□□□□□□□□□□□ FAA□□□□□□□□□□□□□□ ICAO
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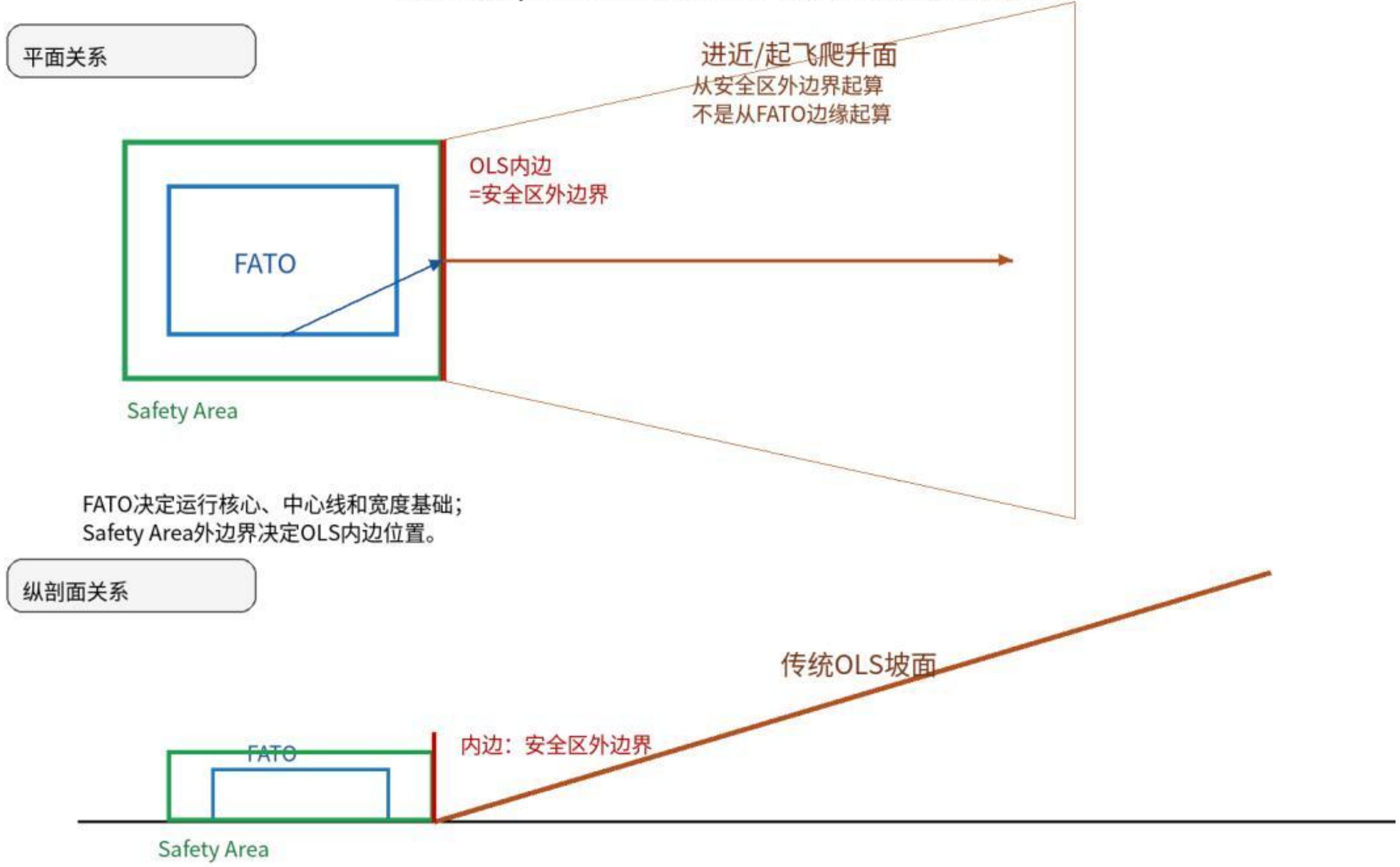
图2 ICAO/MH5013传统OLS：以安全区外边界为内边



注：本图为ICAO/MH5013主线；FAA primary surface=FATO的表达不在本图适用。

□ 5 □□ OLS□□□□□□□□□□□

OLS □□□□□□□□□□□□ Safety Area □□□□□□□□□□□□□□ FATO □□□□□□ / □□□ Safety Area □□□

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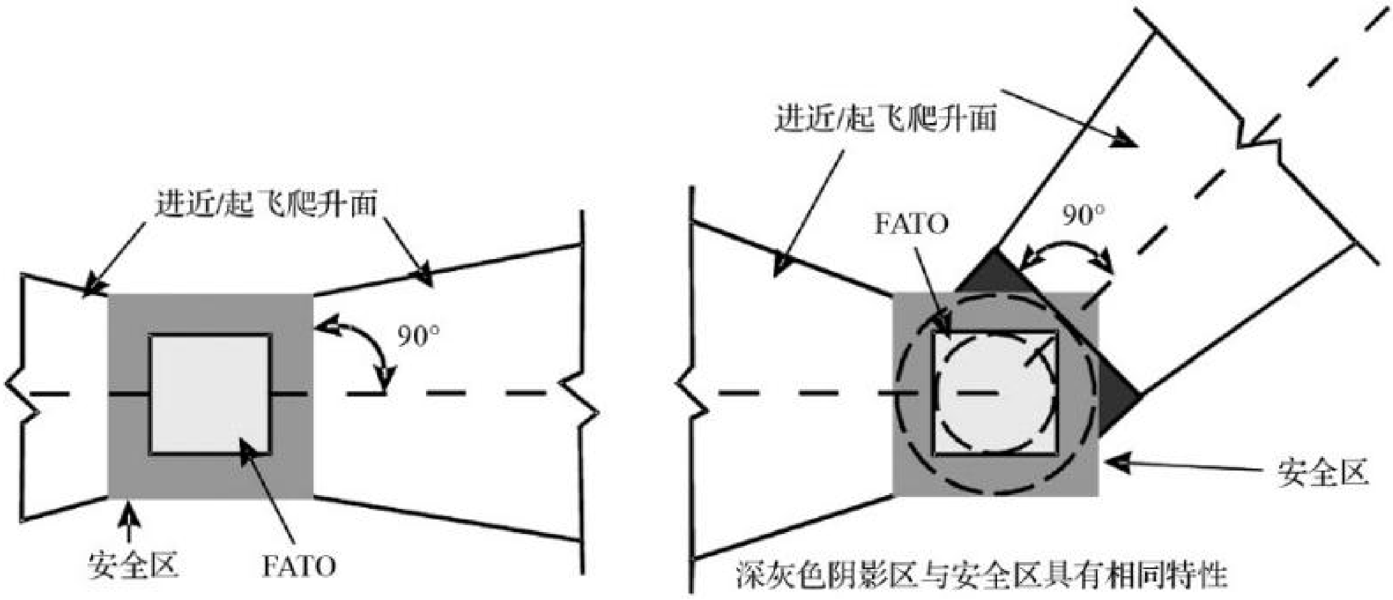

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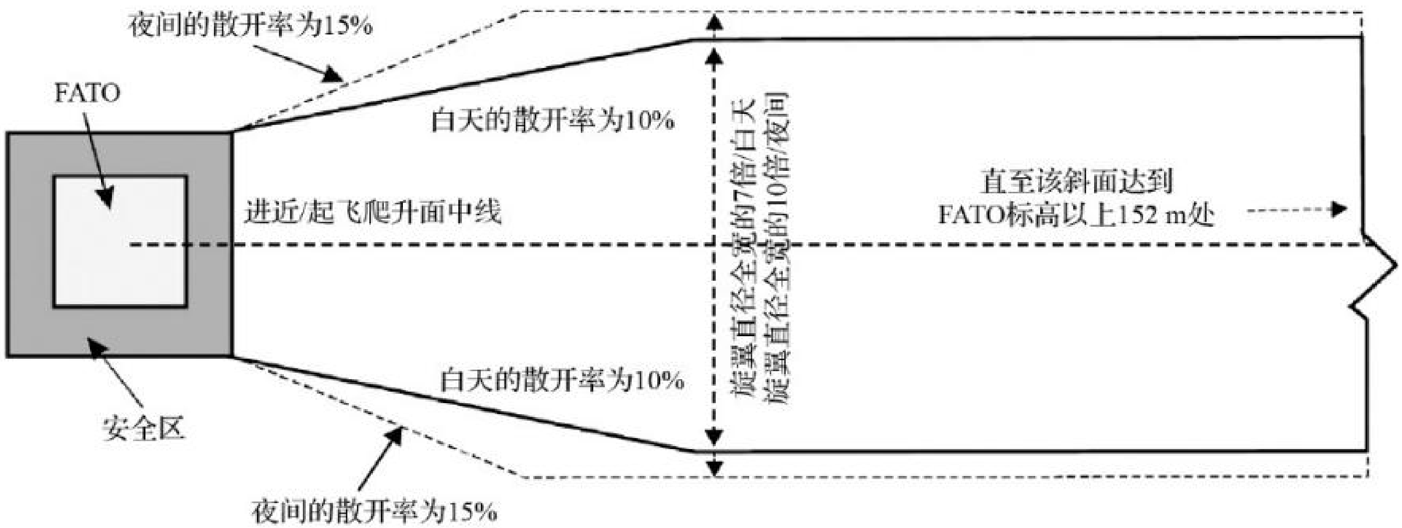

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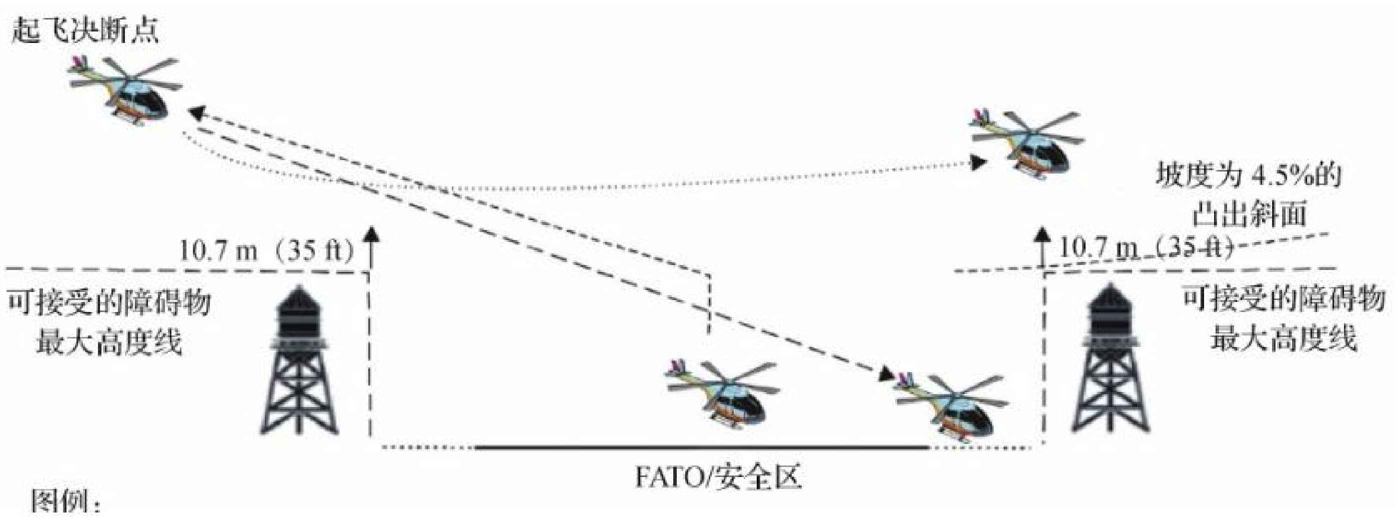

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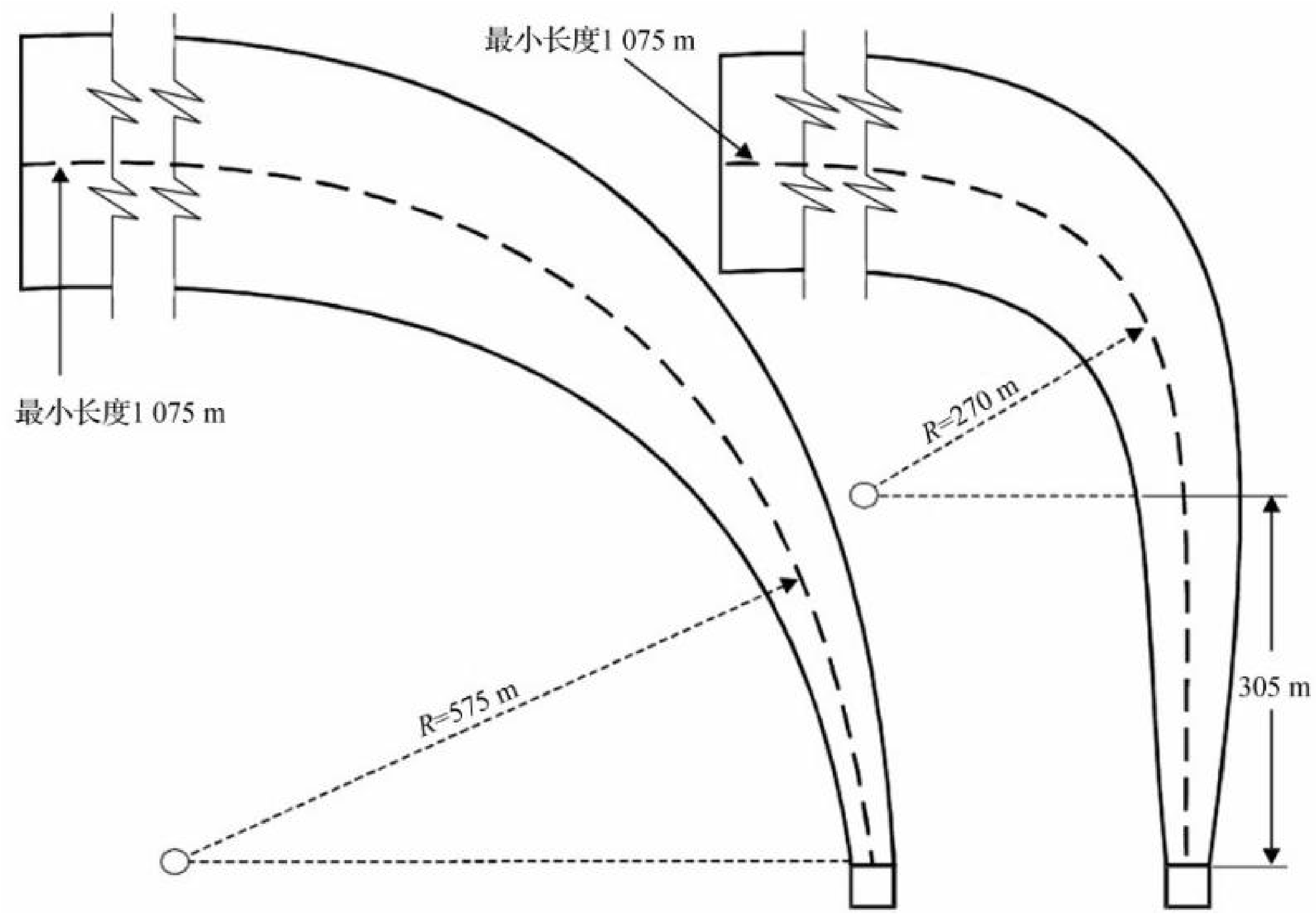

[illegible] 1[illegible] S+R≥575m[illegible] S=305m[illegible] R≥270m[illegible] S [illegible] R[illegible] ≥575m[illegible]

2[illegible] 1075m[illegible] 6.2.1-1[illegible]

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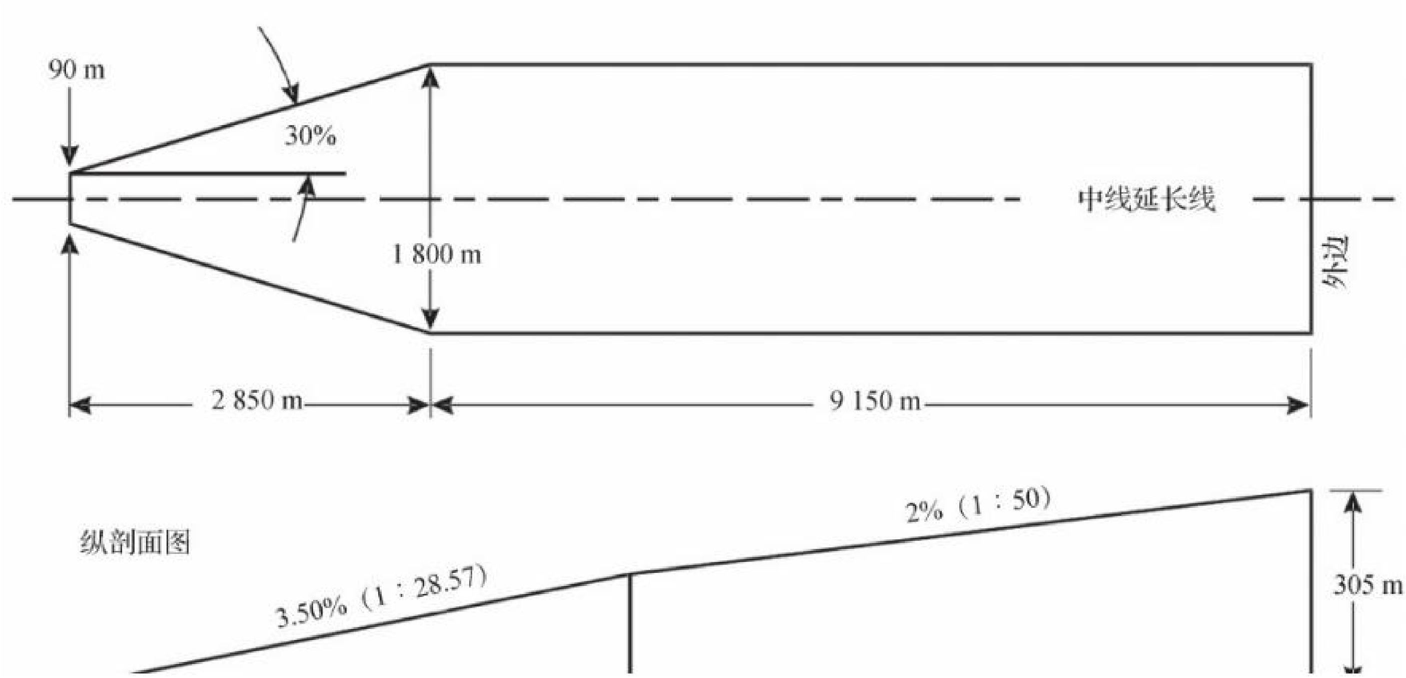

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FAA [illegible] FAA EB105A [illegible] 14 CFR Part 77 heliportimaginary surfaces[illegible] primary surface[illegible] approach/departure surface[illegible] transitional surfaces [illegible] VFR vertiport [illegible] 2:1 [illegible] primary surface [illegible] approach surface [illegible] Part 77[illegible] ICAO/MH5013 [illegible] vertiport [illegible]

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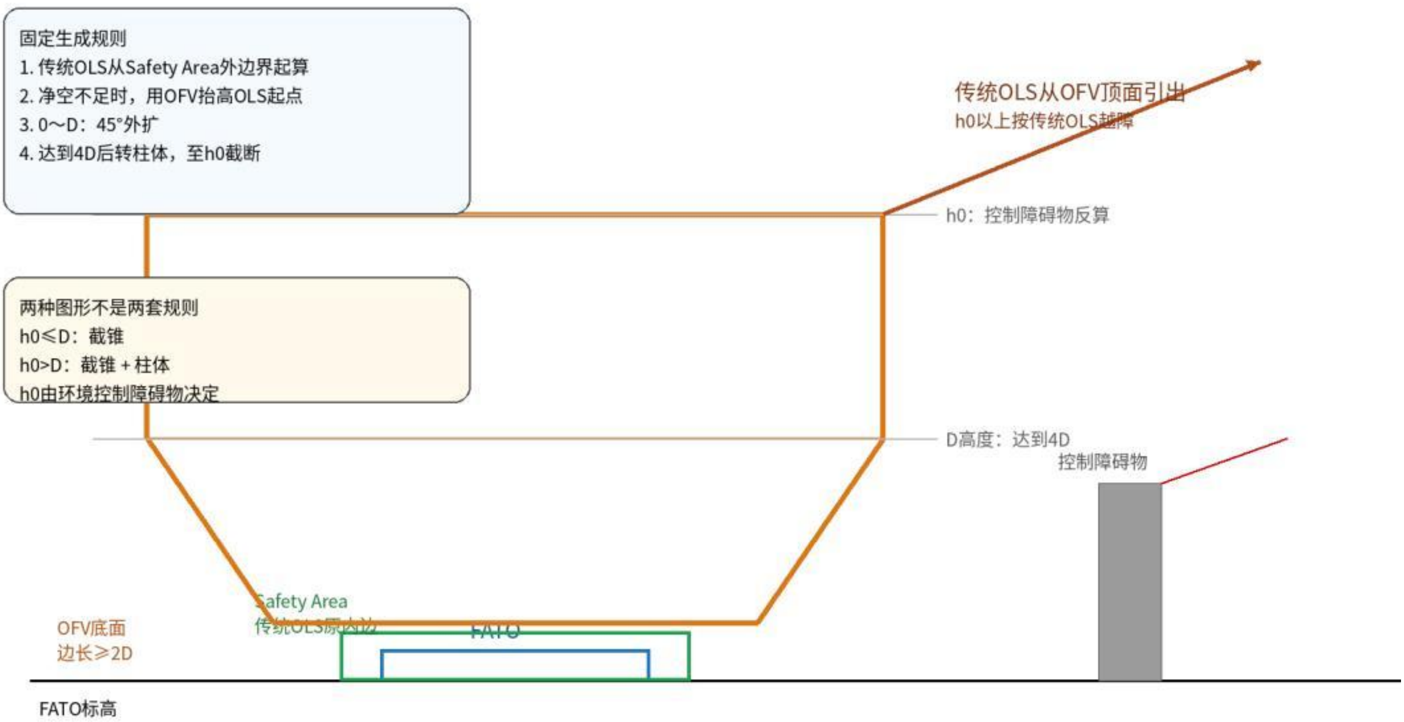
图3 团标OFV：抬高传统OLS起点，保护垂直拉升过程



□□ OFV□□□□□□□□□□□□□□□ OLS□□□□□ ICAO/MH5013□□□□□□□□□□□□□□ OFV □□□

□ 8 OFV □□□□□□□□□□□□□□□□□□

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???EASA???? OFV

EASA PTS-VPT-DSN □ Chapter D □□ OLS □ OFV □□□□□□□□□□□□□ EASA□□ ICAO□□ OLS □□□□□□□□□□□□□□□□ OFV□ EASA□□□□□□□□□□ PTS□□ EASA ADR/CS-HPT-DSN□ ICAO Annex 14 Volume II □ ICAODocument 9261 Heliport Manual□□□ Chapter D □□ Subpart 1 □ Annex 14 □ Doc 9261 □□□□□□ OLS□ Subpart 2 □ vertiport □□ OFV□□□□ OFV □□□□□□□□□□□□□□□□□□□□□ AFM□□□□□□□□□□□□□□□□□□□□□□□□□

h1□ h2□ TOwidth□ TOfront□ TOback□ FATOwidth□ FATOfront□ FATOback□ θapp□ θdep □□□

PTs VPT-DSN.D.455 Obstacle-free volume (OFV)

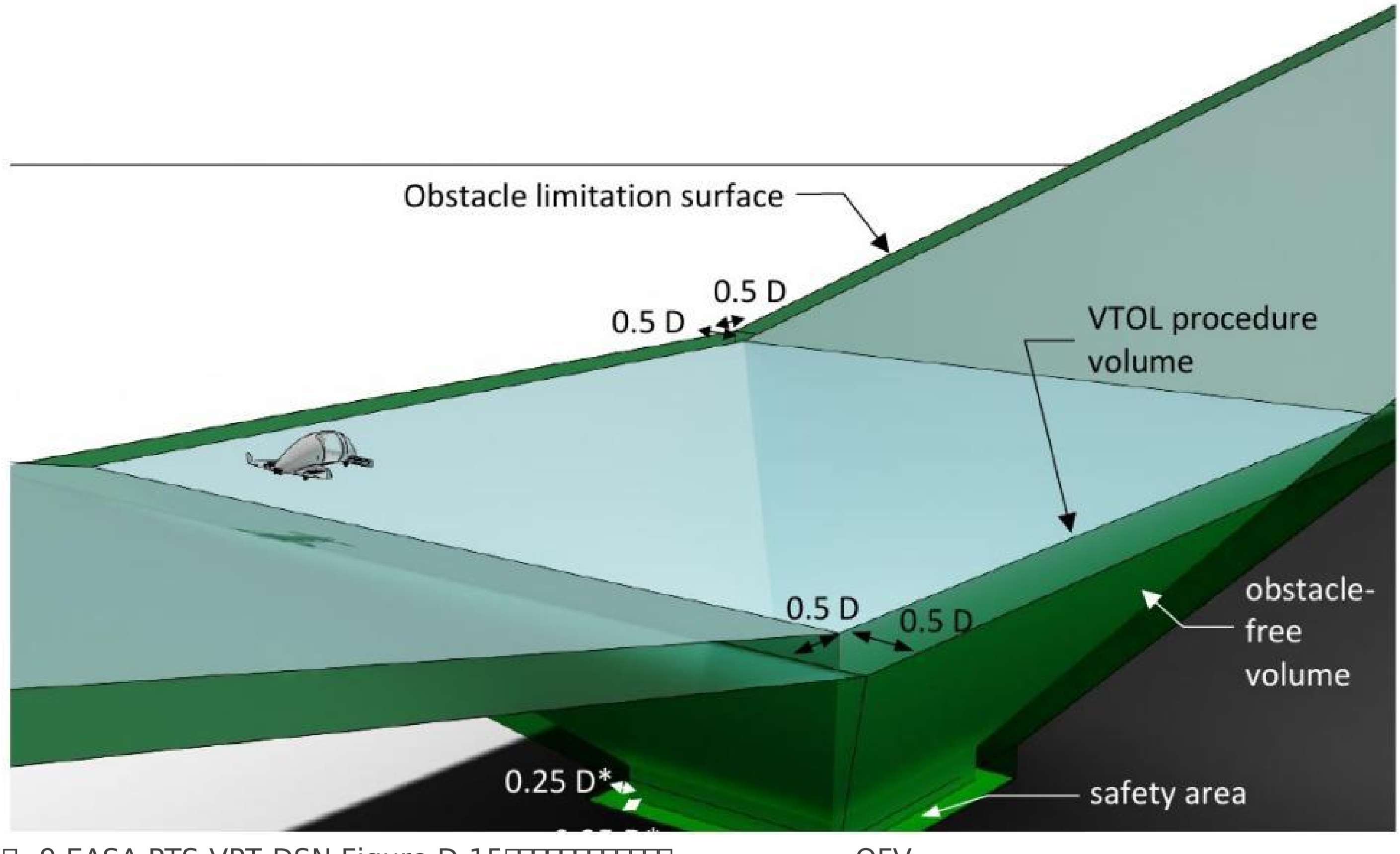
(a) The obstacle-free volume, as depicted in Figure D-15, is created by extending vertically upward the outside edges of the SA up to height h1. The edges at height h1 are then extended upwards linearly up to height h2 to provide a funnel-shaped volume. At height h2, 0.5 D are added on each side of the VTOL procedure volume so that the dimensions of the obstacle-free volume at height h2 are:

(1) the length $(\mathsf{TO}_{\mathsf{back}} + 0.5\,\mathsf{D})$ behind the aircraft and the length $(\mathsf{TO}_{\mathsf{front}} + 0.5\,\mathsf{D})$ in front of the VTOL-capable aircraft, referenced to the aircraft centre of the smallest enclosing circle when positioned on the FATO; and

(2) the width $(\mathsf{TO}_{\mathsf{width}} + 1\,\mathsf{D})$

(b) The obstacle-free volume should not be penetrated by obstacles.

Note: A larger SA may be warranted for specific local conditions, e.g. severe aerology.



□ 9 EASA PTS-VPT-DSN Figure D-15□□□□□□□□□□□ OFV

□□□□□□ EASA□□□ OLS□□□□□□□ “visual $\mathrm{FATOs''}$ □□□□□ PTS-VPT-DSN □□□□□ VFRvertiports□ Chapter D □ Table D-1 □□□□ “Dimensions andslopes of OLSs for all visual $\mathrm { F A T O s ^ { \prime \prime } }$ [illegible] EASA [illegible] OLS [illegible] vertiport[illegible]

ICAO/Doc 9261 [illegible] OLS [illegible] VFR vertiport [illegible]

(g) The issues involved with such deviations from the basic configurations are:

(1) where the inner edge should be located; and

(2) the shapes and sizes of the shaded areas may vary considerably.

(h) To identify the shaded areas, if any, it is necessary to consider their side edges as extending from the ends of the inner edge to points where they meet the tangent of the reference circle at right angles to the centre line of the surface. The shaded areas willthen be bounded by these side edges, the inner edge and the edges of the SA.

(i) Where the FATO is elongated, there should be two reference circles within the SA, each located at the appropriate approach end of the SA (see Figure D-4).

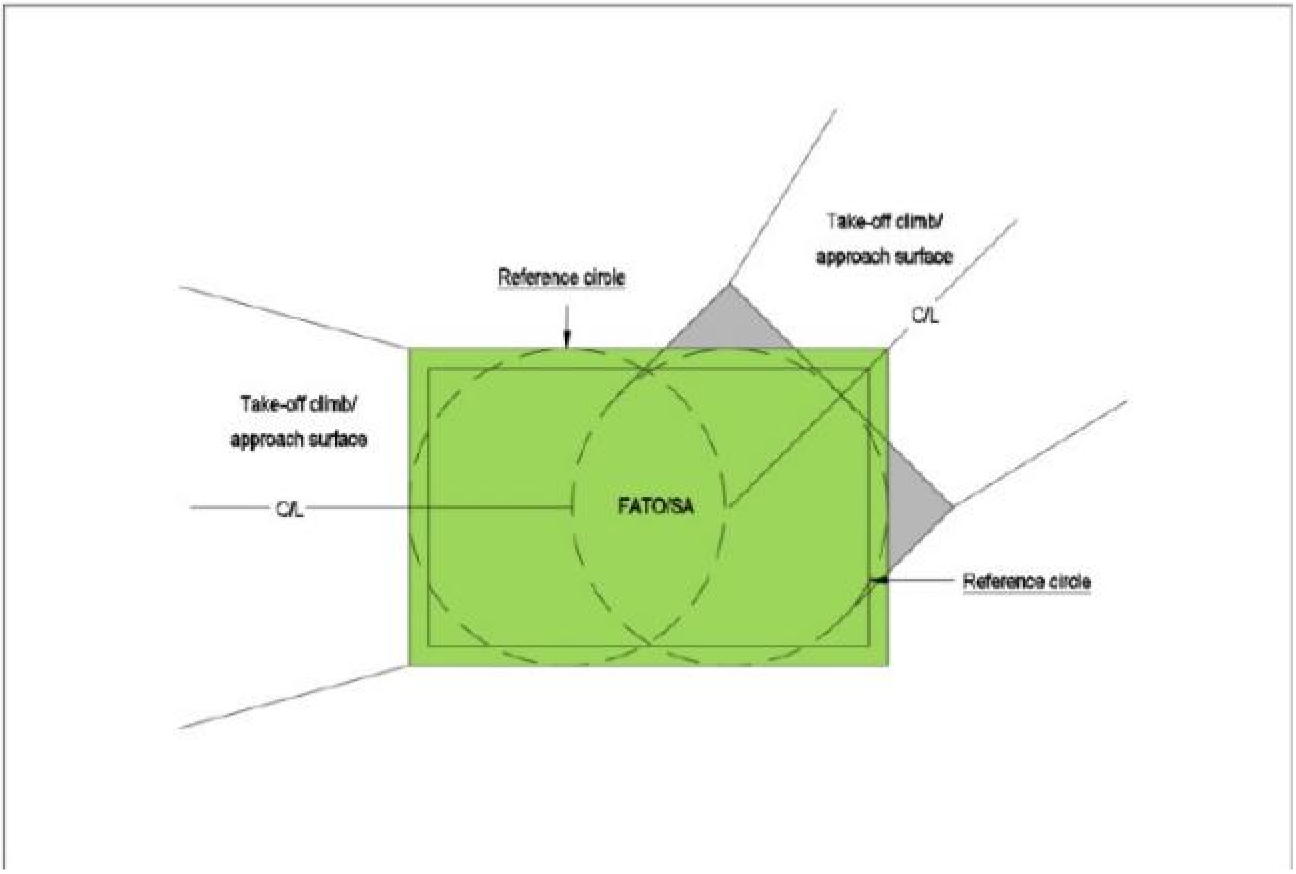


Figure D-4. Rectangular FATO with two reference circles and surfaces separated by 135°

(j) Where a clearway has been established, the shaded area should be between the FATo/SA and clearway (see Figure D-5); the inner edge of the approach or take-off climb surface willabut the clearway.

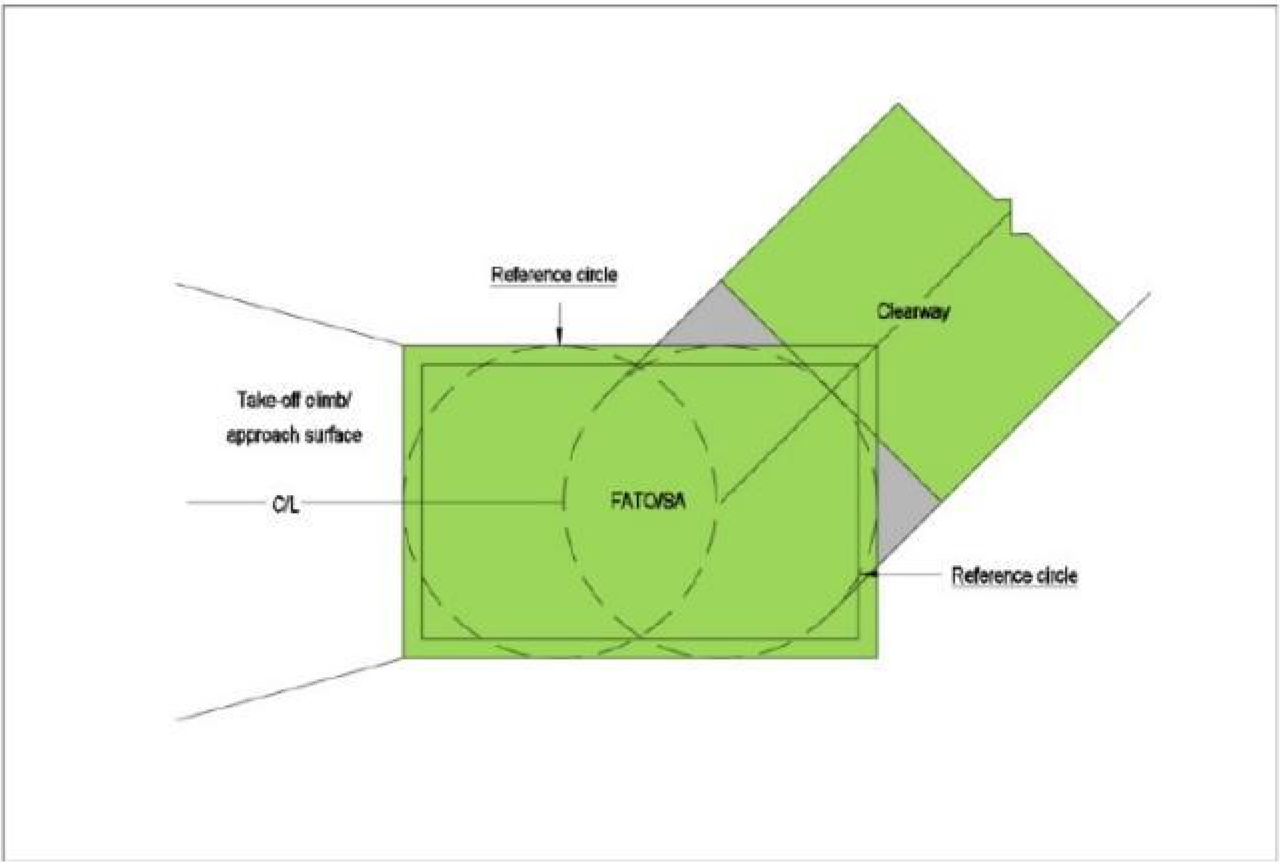


Figure D-5. Rectangular FATO with two reference circles and helicopter clearway

□ 10 EASA Table D-1□ all visual FATOs □ OLS □□□□□

□□□□□□□□□□□□ EASA PTS□□□□ VFRvertiports□□□□□□□□ VTOL □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ EASA□ D.405 □□□□□□□□□□□□□□□□ /□□□□□□□□□□□□□ EASA □ D.410 □□□□ ICAO □□□□□□□□□ FATO □□□□□□□ Safety Area□□□□□ Safety Area □□□□□□□□□□□□□□□□□□□□□□□ ICAO Doc 9261□

SURFACE AND DIMENSIONS	SLOPE DESIGN CATEGORIES		
	A	B	C
Outer width	N/A	(b)	N/A
Total length from inner edge (a)	3 386mc	1075m^	1220m^
TRANSITIONAL SURFACEd:			
Slope:	50%	50%	50%(1:2)
	(1:2)	(1:2)	
Height:	45m	45m	45m

Table D-1. Dimensions and slopes of OLSs for allvisual FATOs

PTS VPT-DSN.D.410Approach surface

(a) Applicability

The purpose of the approach surface is to protect a VTOL-capable aircraft during the final approach to the FATo by defining the area that should be kept free from obstacles to protect a VTOL-capable aircraft in the final phase of the approach-to-land manoeuvre.

(b) Description

An incline plane or a combination of planes or, when a turn is or turns are involved, a complex surface sloping upwards from the inner edge and centred on a line passing through the centre of the FATO.

□ 11 EASA D.410□□□□□□ Safety Area/□□□□

□□□□□ EASA□□□□□□□□□□□□□□□□□□□ OLS□ D.415□□□□□□□□□□□□ verticalprocedures include lateral transit □□□□□□□□□□□ whereappropriate□□□ VFR vertiports □□□ lateral transit □□□□□□□ Table D-1□□□□□□ VTOL□□□□□□□□□ transitional surface may be provided□□□□ EASA □□ OLS□□□□□□□ “VFR □□□□ + □□ / □□□□□□□ +□□□□□□□□□□□ ”□

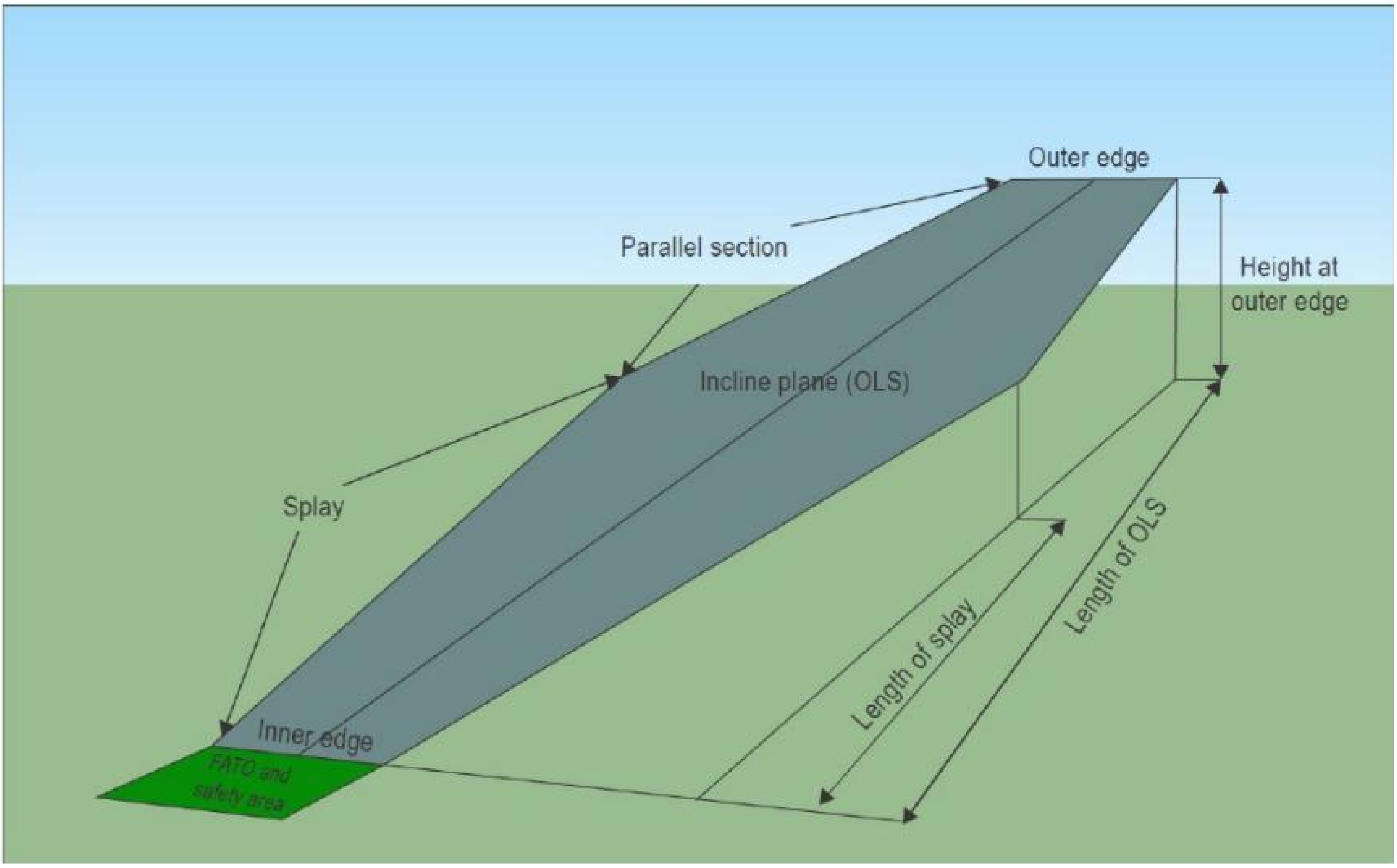


Figure D-6. Generic approach/take-off climb surface

(c) Characteristics

(1) The limits of an approach surface should comprise:

(i) an inner edge, horizontal and equal in length to the minimum specified width of the FATO plus the SA, perpendicular to the centre line of the approach surface and located at:

(A) for a runway-type FATO, the outer edge of the SA; or

(B) for other than a runway-type FATO, the outer edge of the reference circle;

(ii) two side edges originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane, containing the centre line of the FATO to a specified width and continuing thereafter at that width for the remaining length of the approach surface; and

(ii) an outer edge horizontal and perpendicular to the centre line of the approach surface at a specified height above the elevation of the FATO.

(2) The elevation of the inner edge should be the elevation of the SA at the point on the inner edge that is intersected by the centre line of the approach surface. When safety assessment determines that it would not adversely affect the safety or significantly affect the regularity of operations of VTOL-capable aircraft at vertiport, the origin of the inclined plane may be raised directly above the FATO.

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

(4) In the case of an approach surface involving a turn, the surface should be a complex

[illegible] 12 EASA D.415[illegible] lateral transit [illegible]

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CASA AC139.V-01 EASA FPA VPS OFV FPA FATO Protection Area VPS Vertical Procedure Surface OFV

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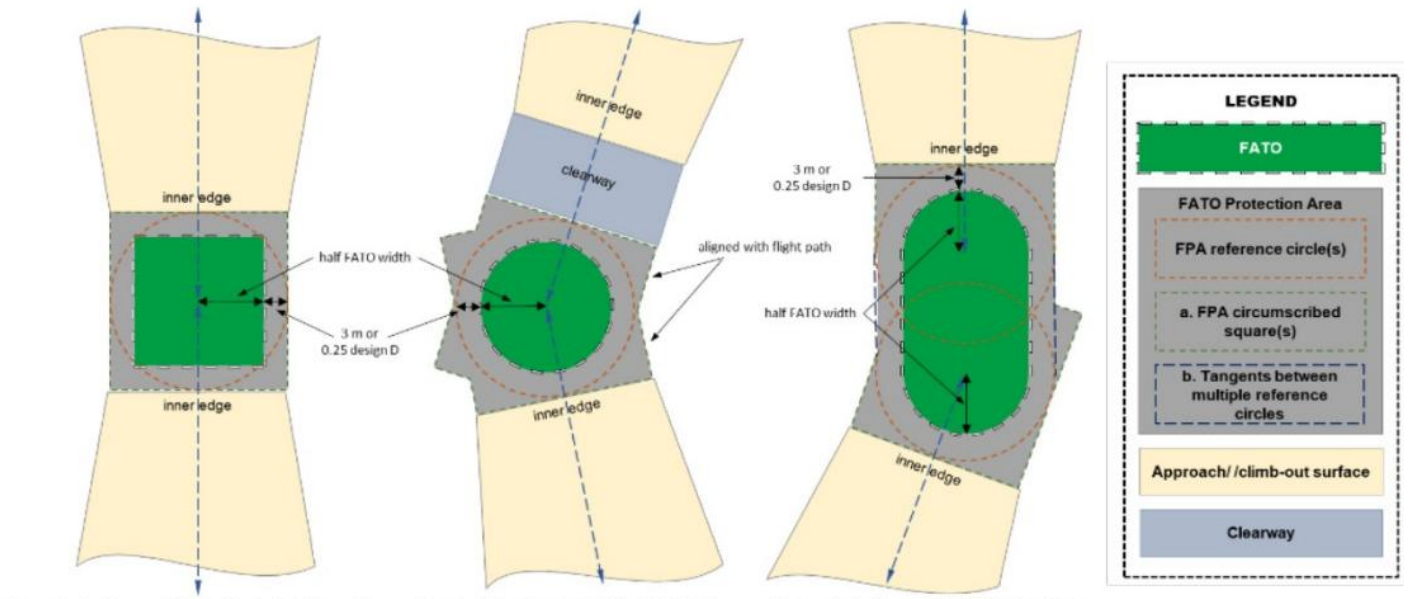


Figure 7 - Protection surfaces for vertiports without vertical procedures

4.2.3 Vertical Procedure Surface

4.2.3.1 A vertical procedure surface (VPS) should be established for where vertical procedures are used for landing or take-off from the vertiport.

4.2.3.2 The VPS is a surface that encompasses the area bordered by a circumscribed square(s) aligned with the intended aircraft flight path(s) centred on the VPS reference circle, as shown in Figures 8, 9 and 11.

4.2.3.3 A VPS should be free of obstacles.

4.2.3.4 A VPS reference circle should be established above and centred on the FATO.

4.2.3.5 The diameter of a VPS reference circle should be the diameter of the associated FPA reference circle, plus 1 Design D per 100 ft increase in height above the FATO.

4.2.3.6 The vertiport operator should determine the elevation of the VPS subject to the performance characteristics of the most demanding VCA intended to use the vertiport or the VCA operator's intended operational requirements.

4.2.4 Obstacle Free Volume (OFV)

4.2.4.1 An OFV should be established between a VPS and the associated FPA.

4.2.4.2 An OFV should be free of obstacles.

4.2.4.3 The OFV is a truncated cone extending between the edge of the FPA reference circle to the edge of the VPS reference circle, as shown in Figure 8, 9 and 11.

□ 13 CASA AC139.V-01 □□ FPA□ VPS□ OFV □□□□□□

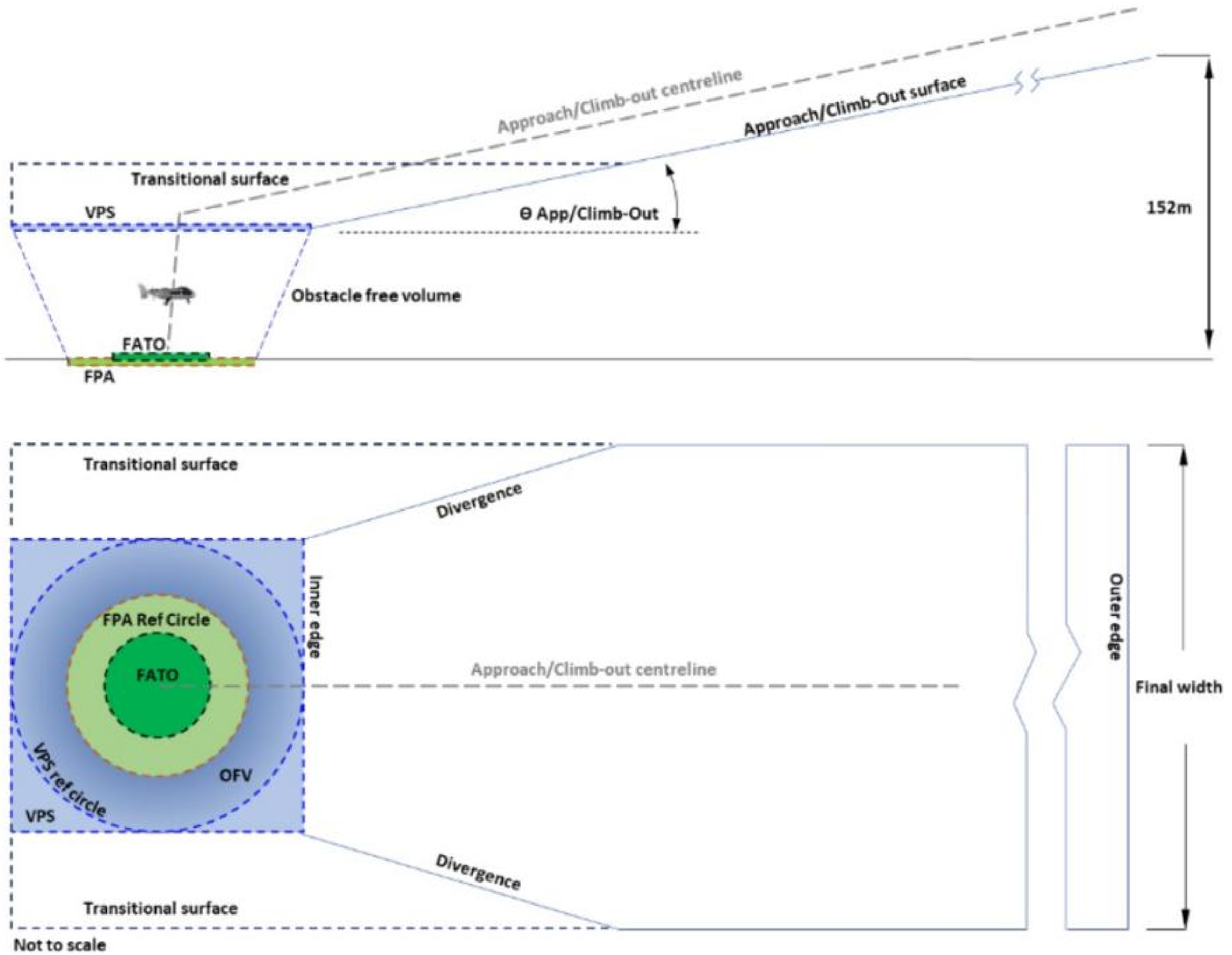
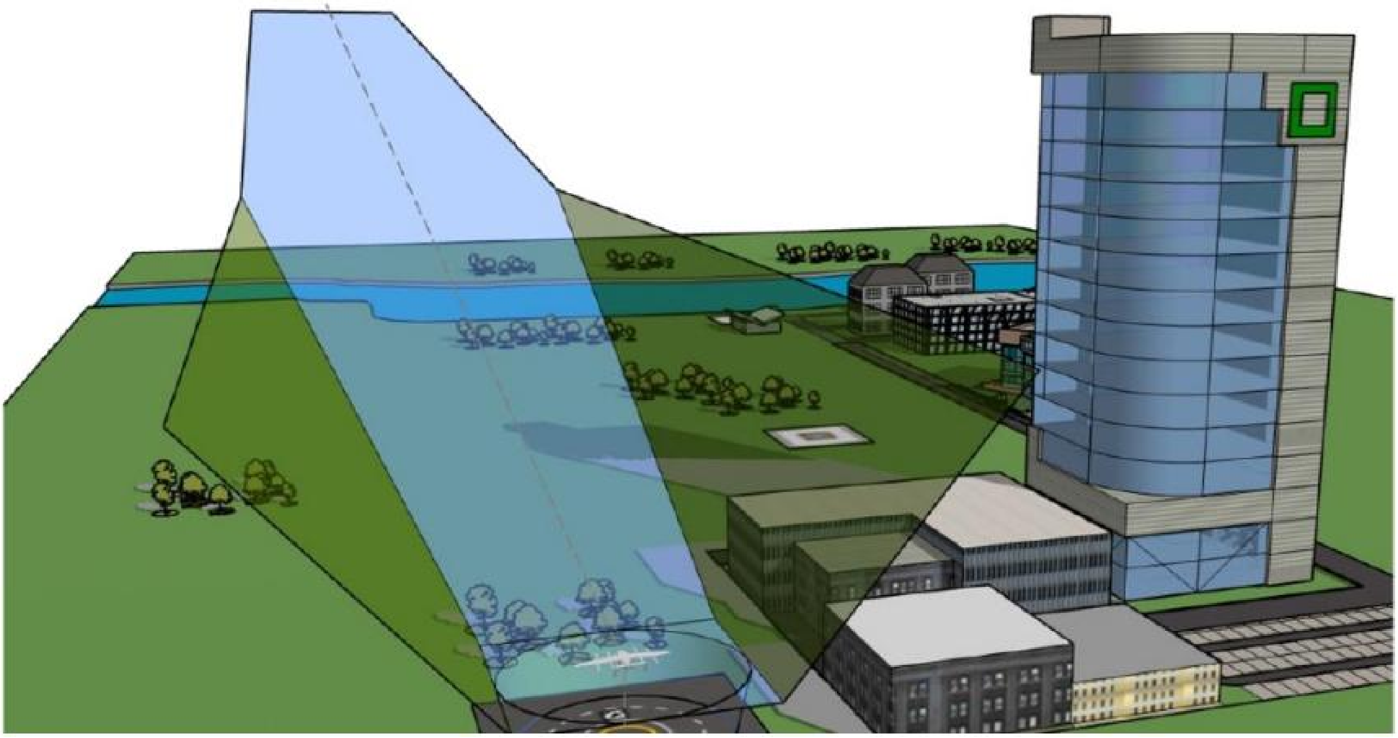


Figure 8 - An example OLS design for a vertiport accommodating vertical procedures



□ 14 CASA AC139.V-01 □□ OFV □□□□□□□□

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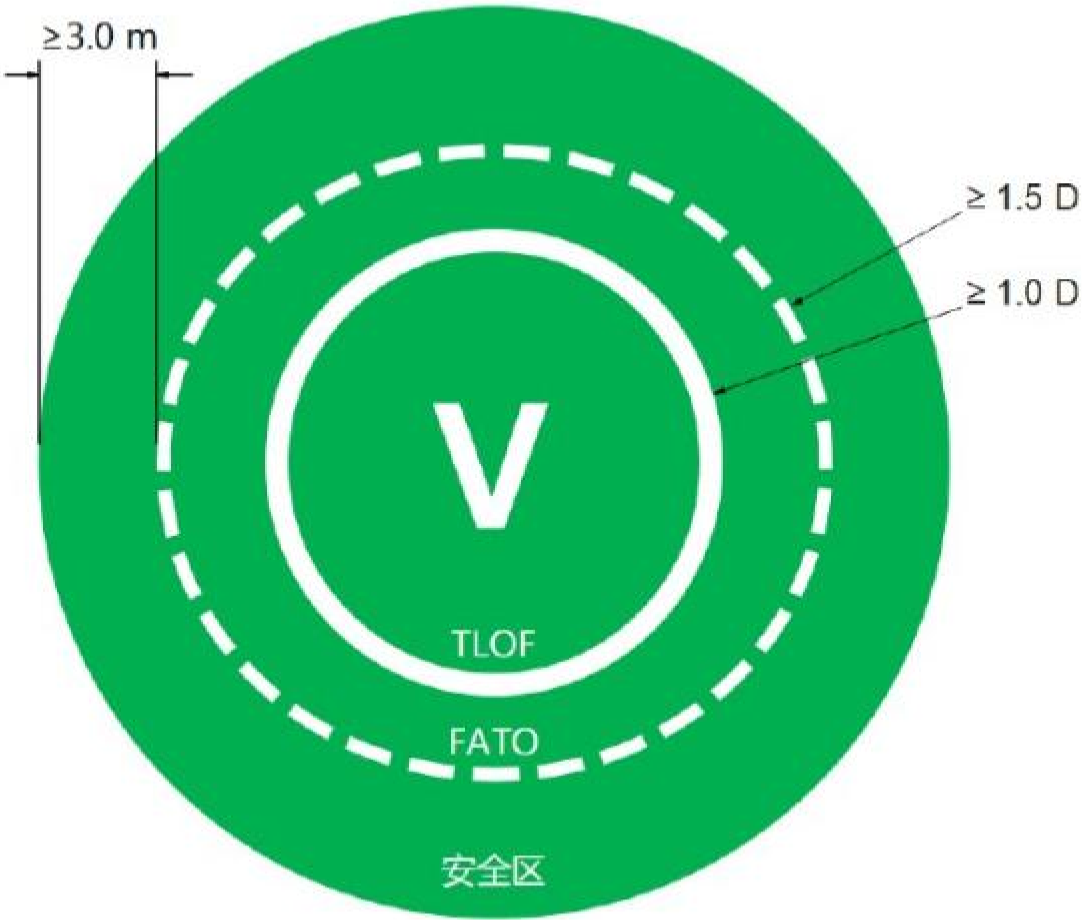

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5.5.3[illegible] eVTOL[illegible]

5.6?????

5.6.1 [illegible]

5.6.2[illegible] eVTOL[illegible]

5.6.3 [illegible] eVTOL[illegible] eVTOL[illegible] 2[illegible]

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6.1???????

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6.1.2eVTOL[illegible]/[illegible]135°[illegible]

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6.2.2[illegible] eVTOL [illegible]

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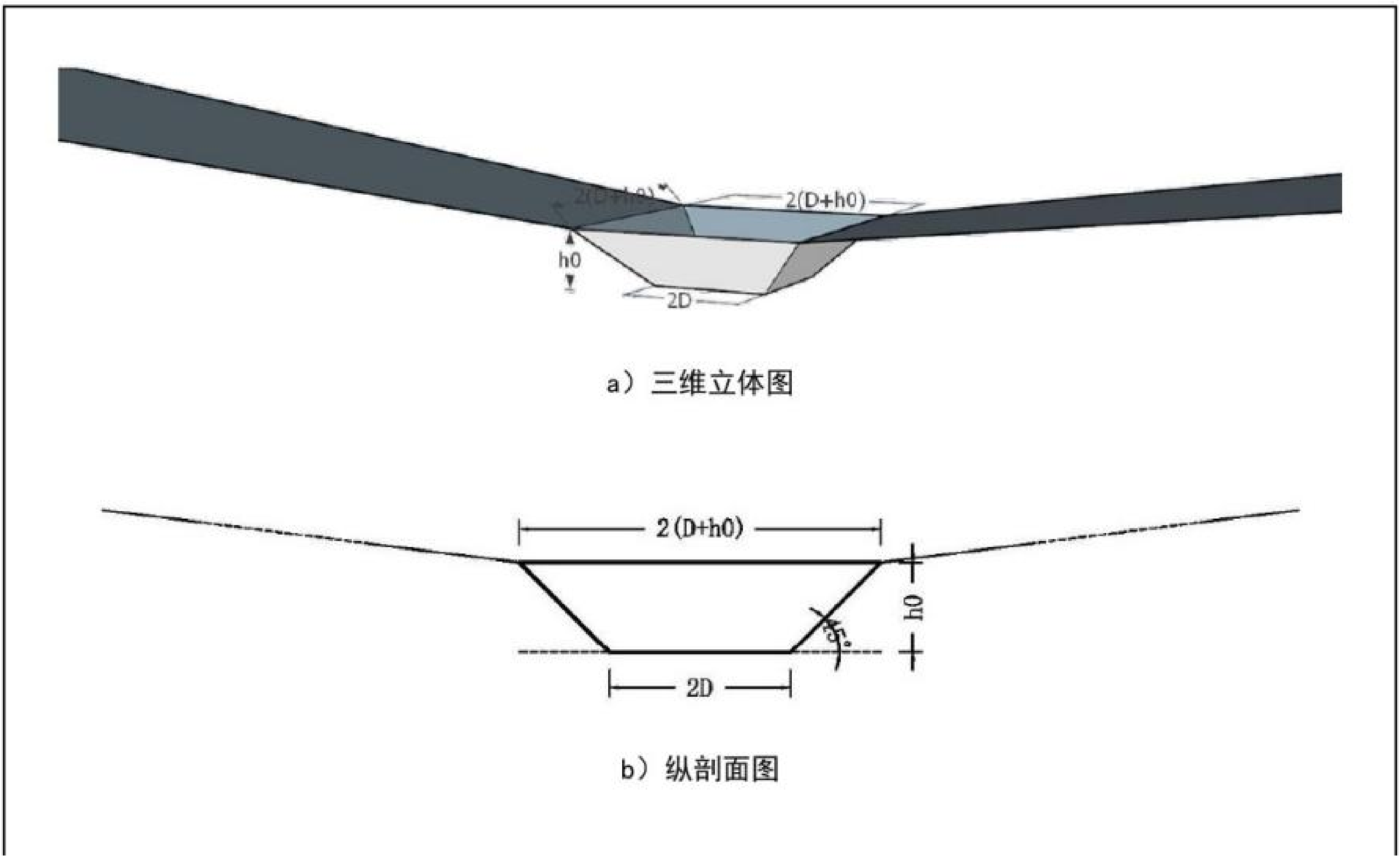

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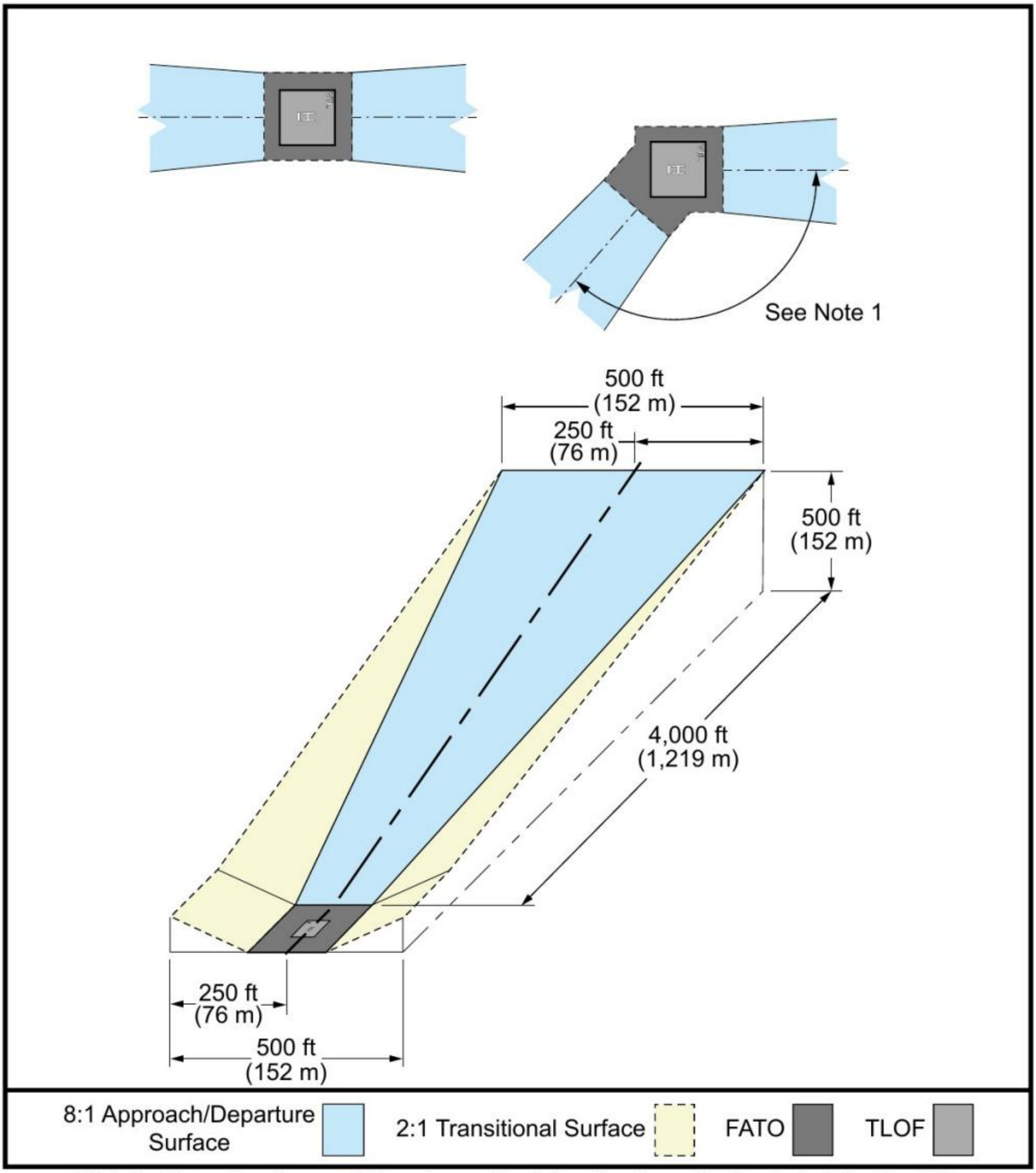
Figure 2-5: VFR Vertiport Approach/Departure Surfaces

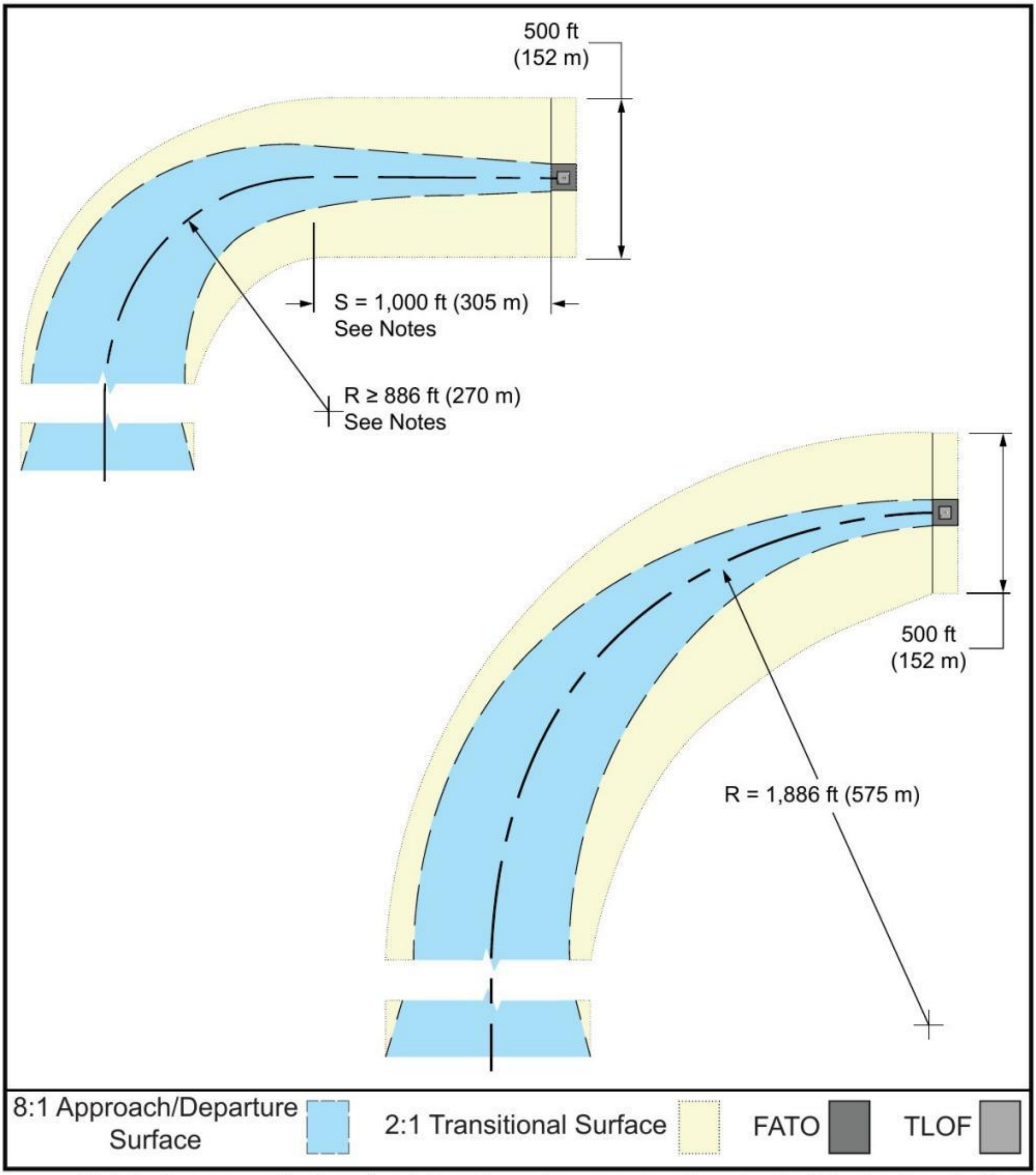


Note 1: The preferred approach/departure surface is based on the predominant wind direction. Where a reciprocal approach/departure surface is not possible in the opposite direction, use a minimum 135-degree angle between the two surfaces.

□ 14 FAA EB105A Figure 2-5□ VFR Vertiport □□ /□□□

□□□□□□ FAA □ VFR □□□□□□□□□ FAAEB105A/Part 77 □□□□ primary surface □□ FATO□ approach/departure surface □ FATO □□□□□□□ 4000ft□ 1219 m□□□□□ 500 ft□ 152 m□□□□ 8:1□ transitionalsurface □ primary surface □ approach surface □□□□□□□□□□□ 2:1□□□□□ 250 ft□ 76 m□□□□□□□□□ FAA □□□□□□□□ ICAO/MH5013 □□□

Figure 2-6: VFR Vertiport Curved Approach/Departure and Transitional Surfaces



Note 1: Use any combination of straight portions of one curved portion using the following formula: S + R ≥ 1,886 ft (575 m) and R ≥ 886 ft (270 m), where S is the length of the straight portion(s) and R is the radius of the turn. Note that any combination ≥ 1,886 ft (575 m) will work.

Note 2: The minimum total length of the centerline of the straight and curved portion is 4,000 ft (1,219 m).

Note 3: VTOL takeoff performance may be reduced in a curve. Consider a straight portion along the takeoff climb surface prior to the start of the curve to allow for acceleration.

15 FAA EB105A Figure 2-6 /

□□□□□□□ FAA □□ S+R≥1886 ft□ 575 m□□ R≥886ft□ 270 m□□□□□□□□ 4000 ft □ 1219 m□□□

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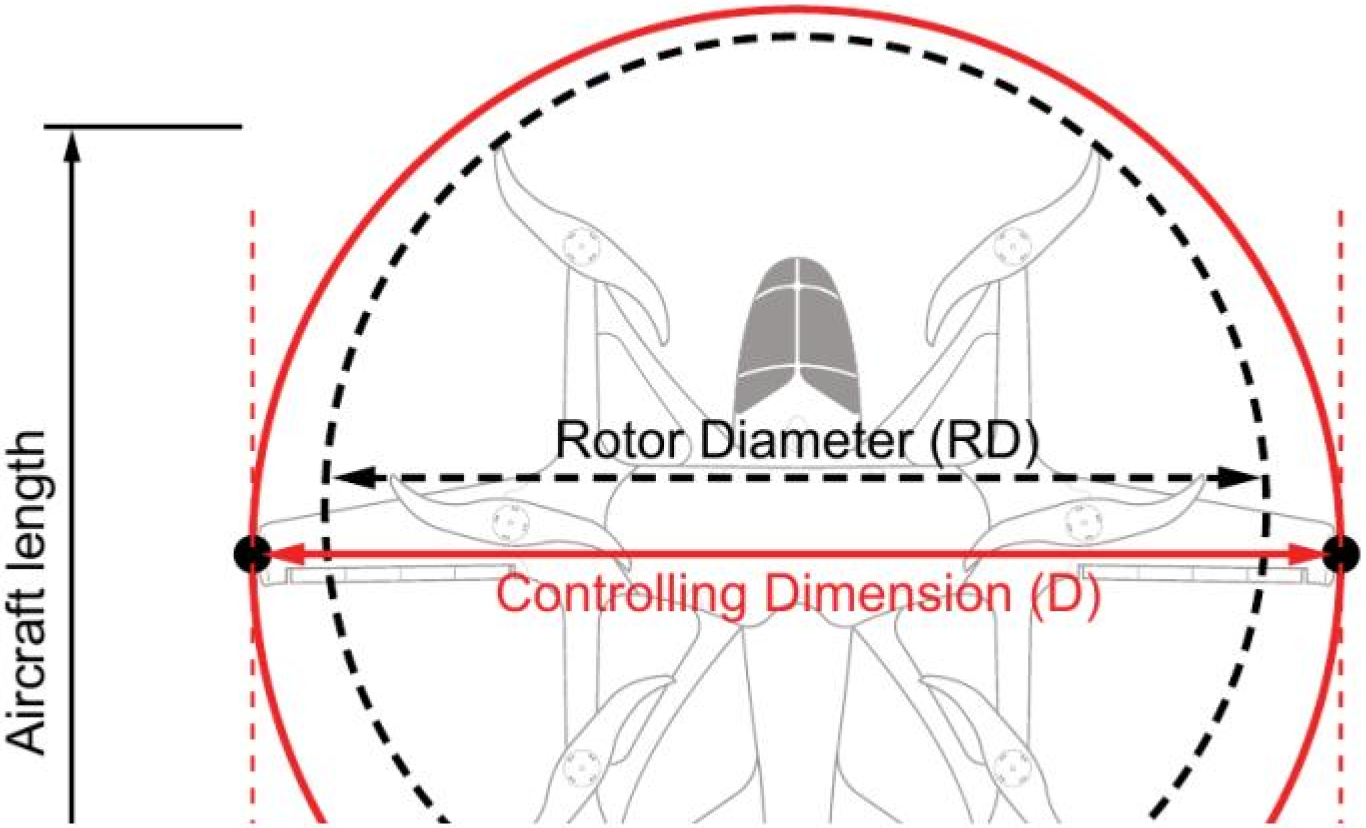
4. Battery system: Comprised of the battery, the battery charger, and any protective, monitoring, and alerting circuitry or hardware inside or outside of the battery. It also includes vents (where necessary) and packaging.
5. Controlling dimension (D): The diameter of the smallest circle enclosing the entire VTOL aircraft projection on a horizontal plane, including all possible configurations with rotors/propellers turning, if applicable. See Figure 1-1.

Figure 1-1: Controlling Dimension



□ 16 FAA EB105A □□ D □ RD □□□□□

DCA□ Downwash/Outwash Caution Area□□□□□□□□□□□□□□□ eVTOL□□ / □□□□□□□□□□□□□□□ 34.5 mph□ 55.5 kph□□□□□□ DCA□ FAA □□□□□□□□□□□□□ Part 77□□□□ eVTOL□□□□□□□□□□ DCA□□□□□

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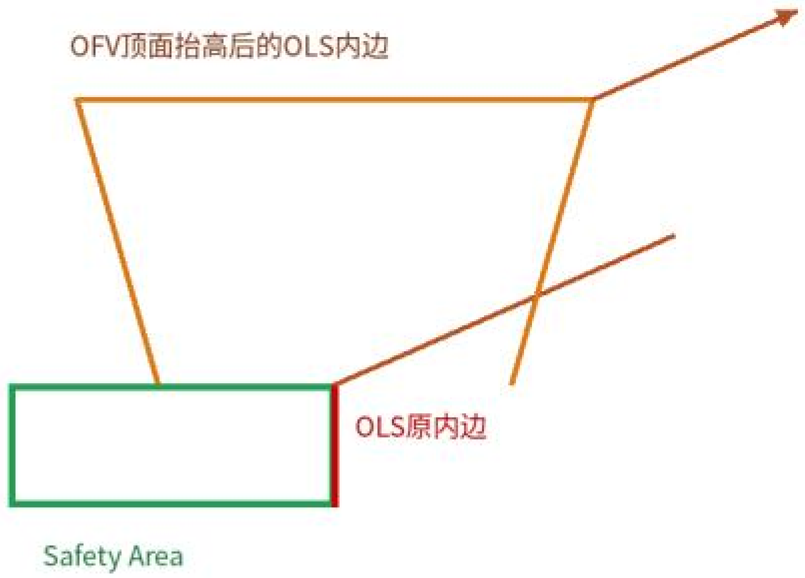
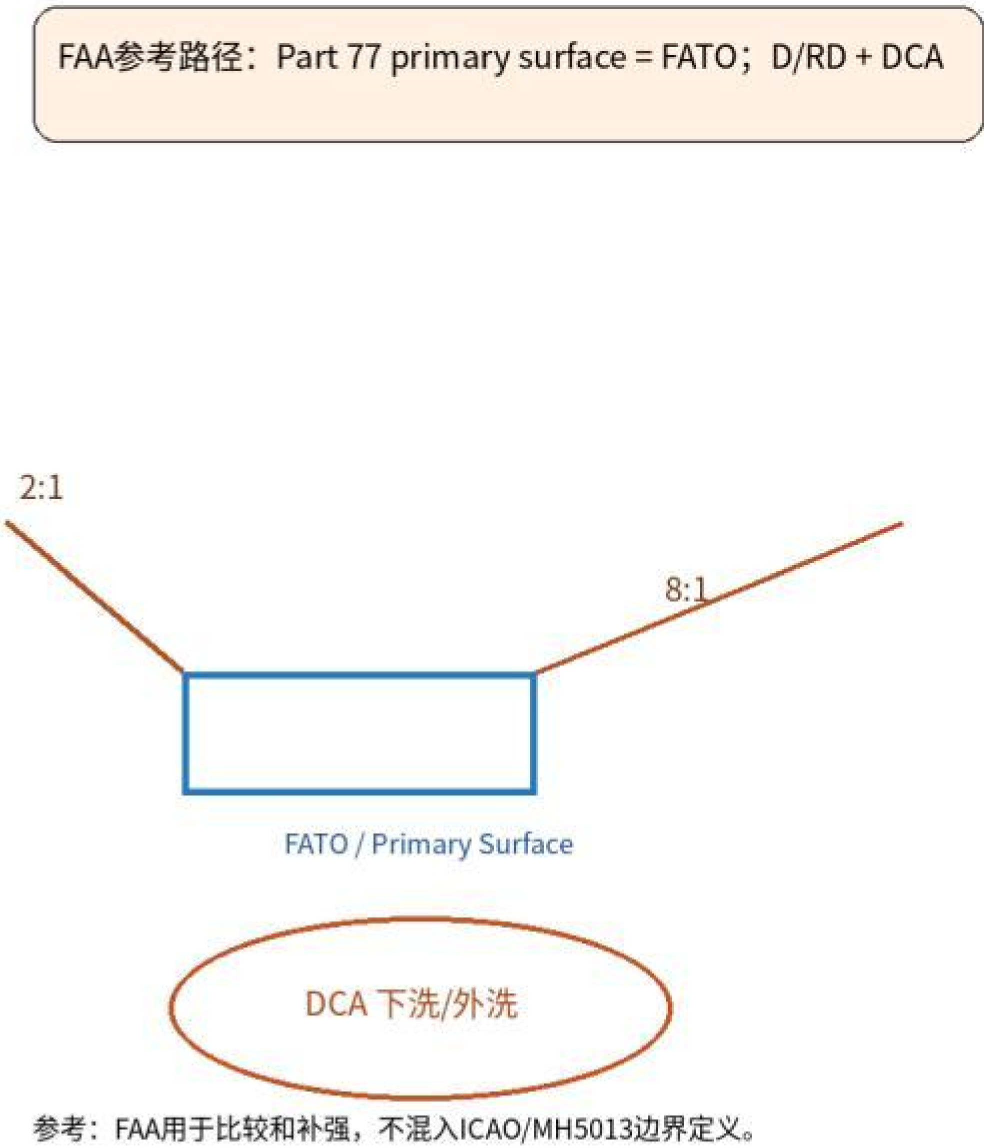


主线：我国净空体系宜采用ICAO/EASA/CAAC方向，OFV服务于传统OLS。



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ICAO Annex 14 Volume II — Heliports[illegible]

ICAO Doc 9261 Heliport Manual, Fifth Edition, 2021[illegible]

FAA Engineering Brief No.105A, Vertiport Design, 2024[illegible]

FAA AC 150/5390-2D, Heliport Design[illegible]

EASA PTS-VPT-DSN, Prototype Technical Specifications for Vertiport Design[illegible]

CASA AC139.V-01, Guidance on Vertiport Design, 2023[illegible]

T/CCAATB 0062-2024[illegible]

MH5013-2023[illegible]