IFR procedures for helicopters

DEPARTURE

《 PinS Departure 》

Contents

- PinS departure concept
- PinS departure
  - Instrument phase
  - Visual segment
    - Proceed Visually
      - Direct VS
      - Manoeuvring VS
    - Proceed VFR

PinS departure

- A departure procedure designed for helicopters only that includes both a visual and an instrument segment
- The visual segment starts from the heliport or landing location. It consists of a visual segment or VFR segment and ends at the Initial Departure Fix (IDF) at or above the IDF Minimum Crossing Altitude (MCA)
- From IDF, the appropriate helicopter navigation specifications is applied to define the protection of the instrument trajectory of the departure procedure. The trajectory is extracted from the RNAV data base system. Terminal mode is active.
- PinS departure is called “Reverse PinS” if the IDF is the same reference point than the MAPt (PinS) of the approach.

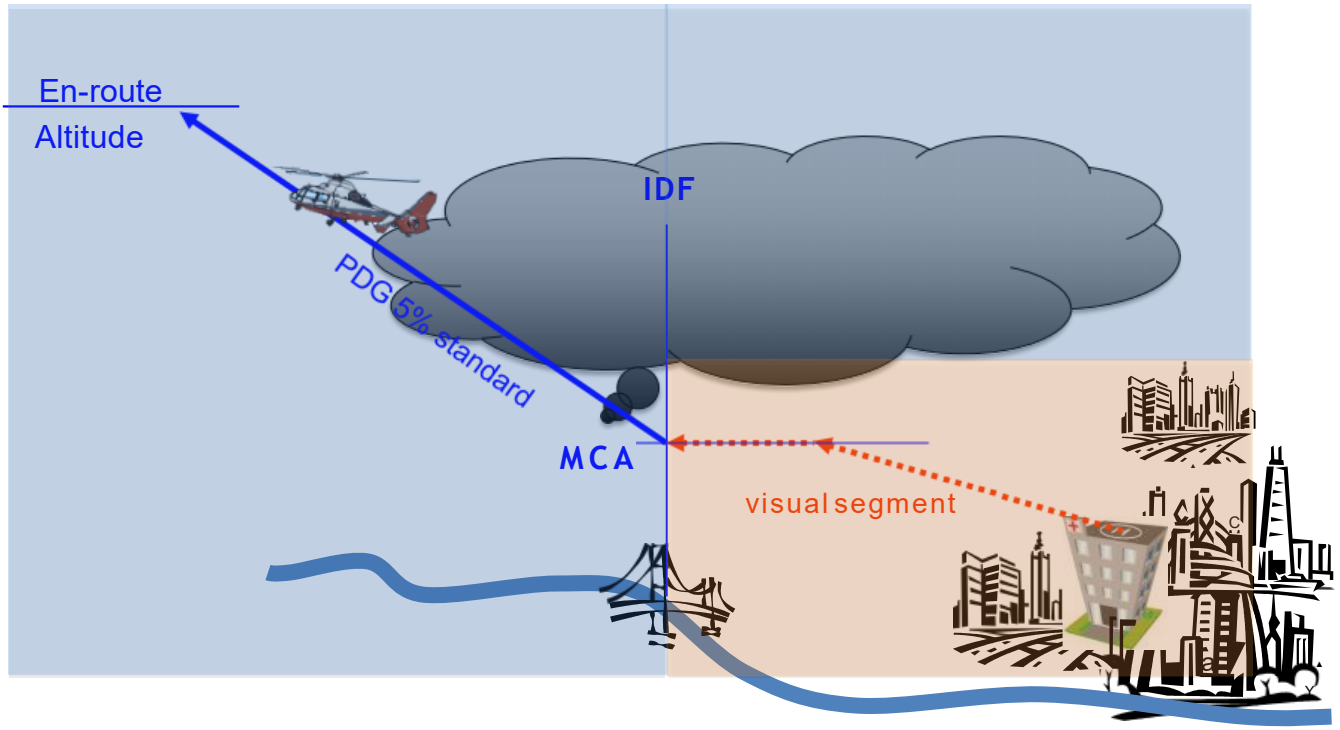
PinS departures : Types

- **« proceed VFR»**
  - *From the heliport or landing location to the IDF, pilot can comply with VFR in the visual segment to see and avoid obstacles until crossing the IDF at or above the IDF MCA. No obstacle protection area in the VFR segment. IFR clearance shall be obtained prior to reaching the IDF*

- **« proceed visually»**
  - *Departing on an IFR clearance, from a single heliport or landing location, a pilot can navigate by visual reference to see and avoid obstacles, with visibility sufficient to return to the heliport or landing location if they cannot continue visually to cross the IDF at or above the IDF MCA. Visual flight may be conducted below minima required for VFR.*
  - 2 types :
    - *Direct visual segment*
    - *Manœuvring visual segment*

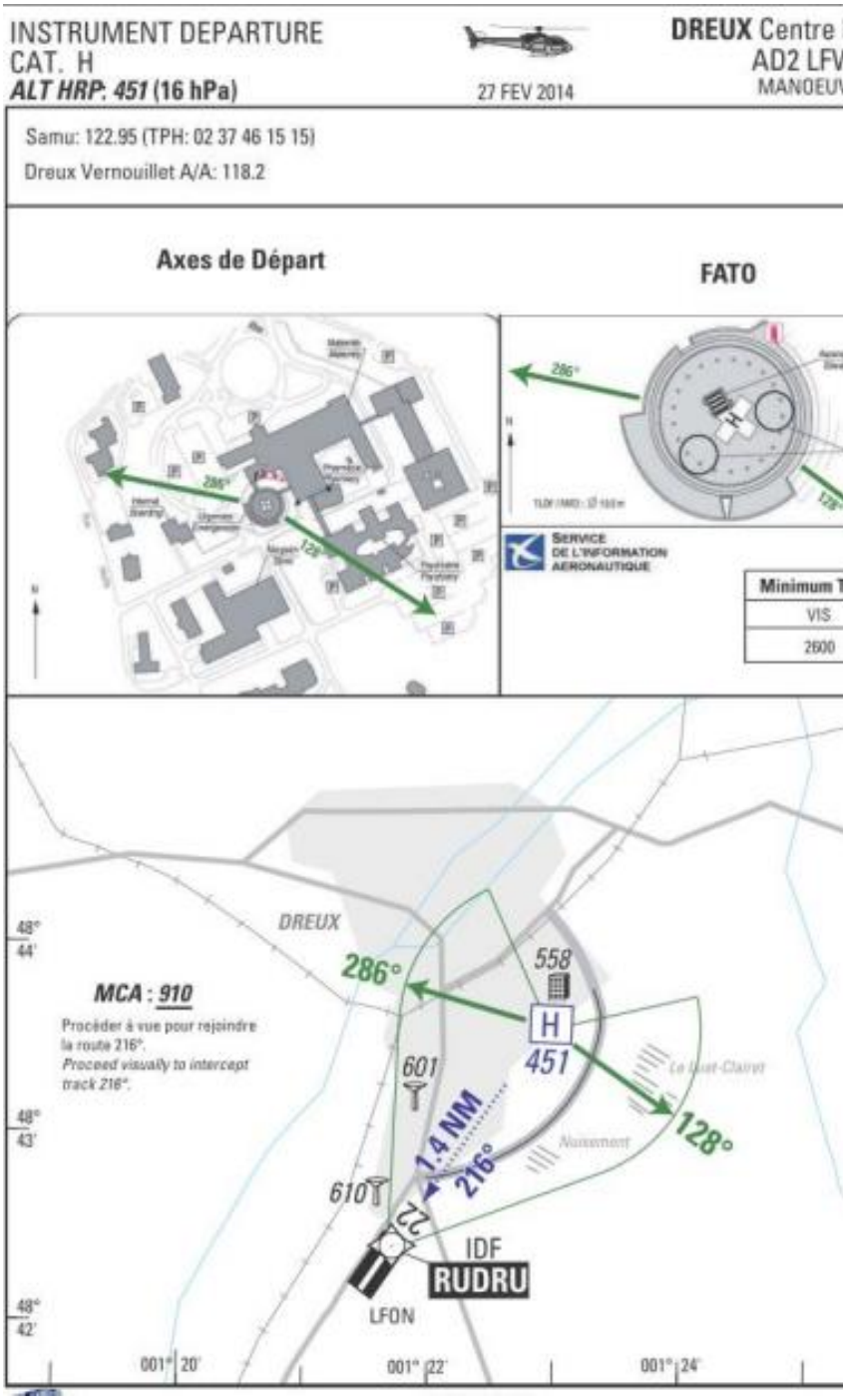
***Note**:*
*"**VFR**" refers to specified minimum meteorological conditions established by the State for the airspace the operation is conducted in or the applicable operating regulation.*
*"**Visual**" refers to meteorological conditions permitting visual reference to the surface but not necessarily meeting specified minimum meteorological conditions for VFR operations.*

PinS Departure



Departure Chart Dreux

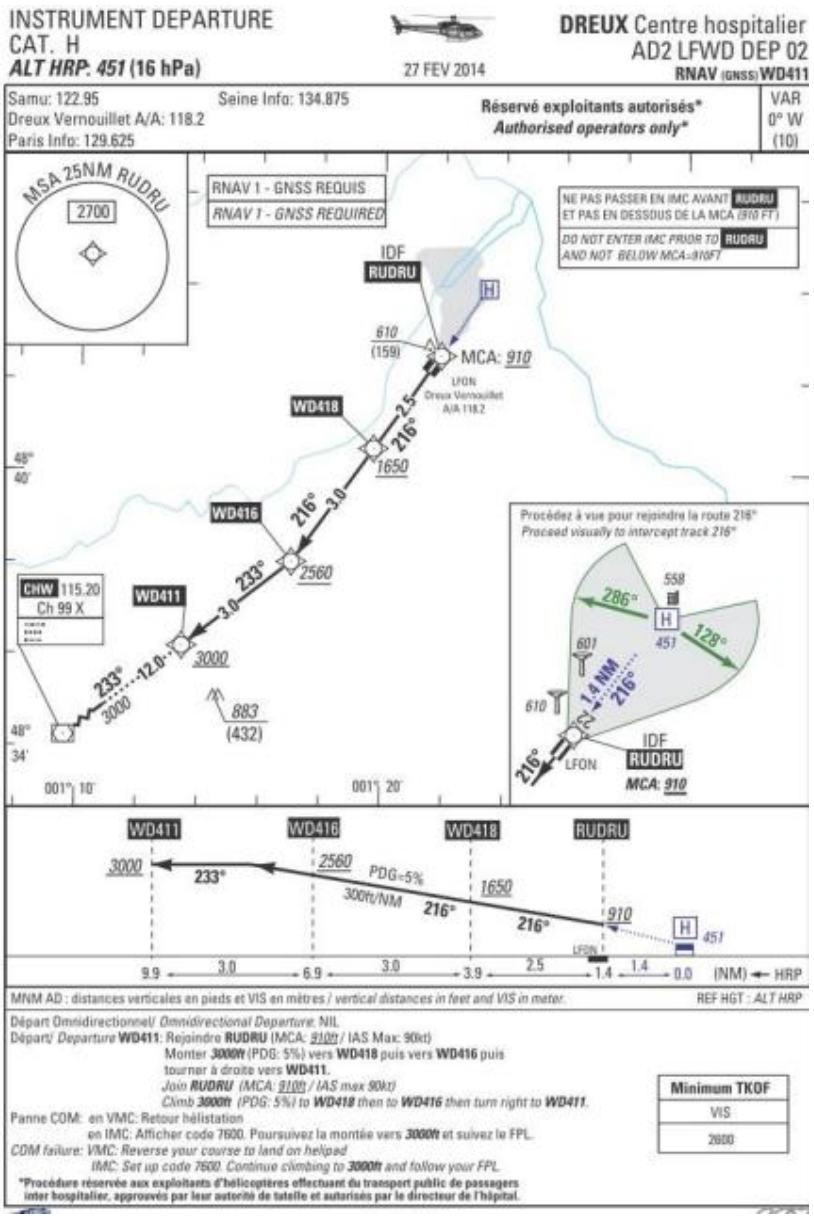
Visual segment



Departure Chart

Dreux

Instrument phase



IFR procedure: Main characteristics

- IDF can be compared to the DER
  - Note: generally charted as a 'fly-by' waypoint. Could be charted as a 'fly-over' for operational reasons only

- Instrument flight procedure begins at IDF at a Minimum Crossing Altitude (MCA). If the minimum PDG along the IFR trajectory is greater than 5%, the minimum PDG shall be annotated on the chart

- The Minimum Crossing Height (MCH) of the IDF for a PinS departure procedure with a manoeuvring visual segment shall not be less than 90 m (295ft) above the heliport/landing location elevation

Criteria for IFR trajectory

- Max IAS in departure
  - 90 kt or
  - 70 kt ; speed *limitation annotated on the chart*
- The navigation specifications applicable to PinS departure are :
  - RNAV 1 / RNAV 2 / RNP 1 / RNP 0.3 / A-RNP
- IDF tolerance depends on application

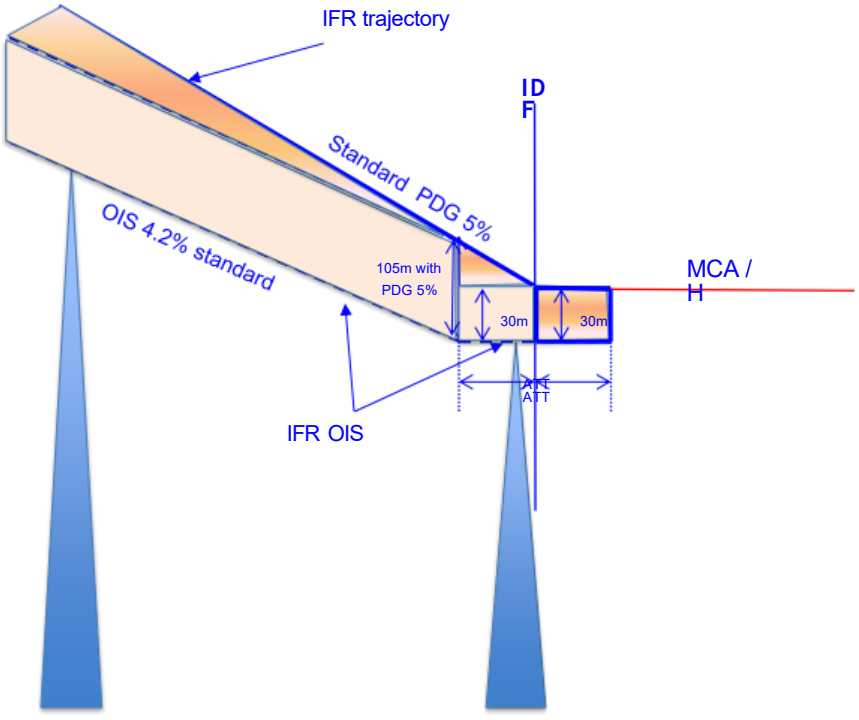
  - *Example : RNAV 1*
    - *ATT = 0.8 NM*
    - *XTT = 1.0 NM*
    - *BV = 0,35 NM*
    - *½ AW = 1.85 NM*
    - *Next WP:*
      - *½ AW = 1,85 NM if less than 15NM from IDF*
      - *½ AW = 2.2 NM if less than 30NM from IDF*
      - *½ AW = 4 NM if more than 30NM from IDF (XTT = 2 and BV = 1)*

PDG and MOC

- Procedure Design Gradient
  - Standard: 5,0%
- MOC
  - Between the earliest IDF and the IDF: **30m**
  - Between the IDF and the latest IDF, the MOC is increased by a value corresponding to the PDG :
    - **30m + [PDG x (distance from IDF)]**
  - from the latest IDF MOC is increased by 0.8 per cent of the distance from the latest IDF until the en-route MOC is reached
    - **30m + [PDG x distance(IDF/latest IDF)] + [0,8% x(distance from latest IDF)]**

  - Remark : An alternative to increasing the PDG above the 5 per cent standard value beyond the IDF, would be to increase the IDF MCA to provide the necessary clearance over an obstacle in the subsequent departure leg while maintaining a lower PDG

PDG and MOC


IFR trajectory
IDF
Standard PDG 5%
OIS 4.2% standard
105m with
PDG 5%
30m
30m
MCA /
H
ATT
IFR OIS

« Proceed visually » Direct VS
Criteria for visual segment

- The pilot will fly directly from the heliport or landing location to the IDF
  - The term "proceed visually" implies that pilots can navigate by visual reference to see and avoid obstacles, with visibility sufficient to return to the heliport if they cannot continue visually to cross the IDF at or above the IDF MCA. Visual flight may be conducted below minima required for VFR
- The Direct-VS is protected by one direct visual OCS and one visual OIS (climbing)
- The maximum track change at the IDF is 30°
- The IDF shall be located to provide sufficient visual reference from the heliport or landing location to the IDF to enable the helicopter to cross the IDF at or above the MCA
- Entering **IMC** on the **Direct VS**.

IMC may be entered on the **Direct VS**, prior to the IDF, when the following conditions are all met:

- the procedure description shall start with a prescribed course from the heliport or landing location to the IDF; and
- the direct visual segment shall have additional obstacle protection with a second OCS (level)

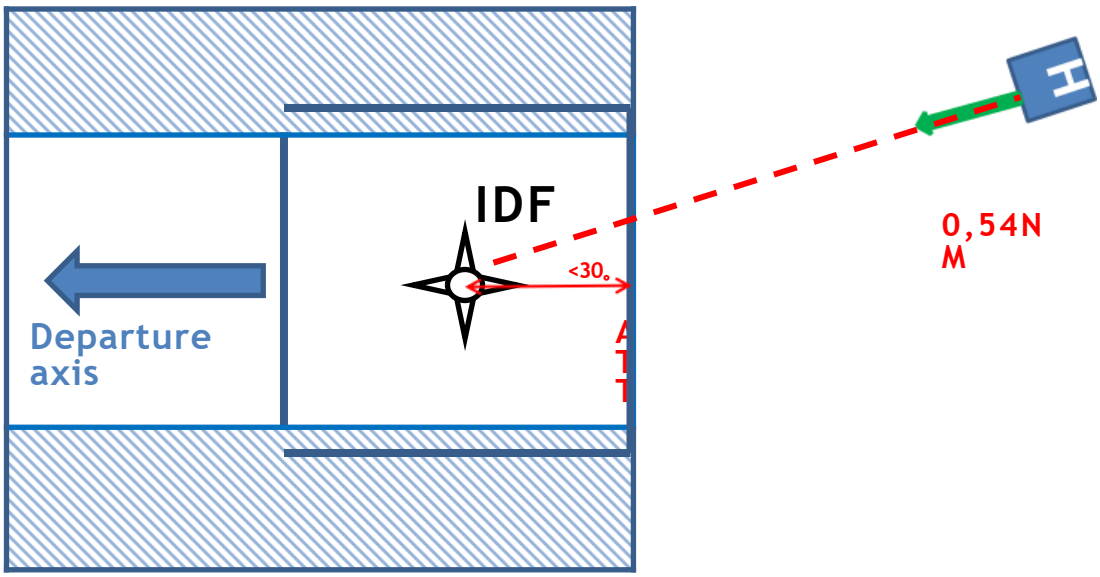
« Proceed visually » Direct VS
Criteria for visual segment

- The length of the visual segment shall be measured from the outer edge of the heliport or landing location safety area to the IDF. The length of the visual segment should permit the helicopter to climb to the IDF MCA and to accelerate to Vmini by the IDF. The minimum visual segment length shall be 1.00 km (0.54 NM).
- The maximum length shall be 13 km (7 NM) for departures based on RNP 1/RNAV 1 and 5.6 km (3 NM) for departures based on RNP 0.3.

Note.— For visual segment lengths greater than the length of the Annex 14 take-off climb surface, the extension of the Annex 14 take-off surface should be considered (see the Heliport Manual *(Doc 9261).*

- A climbing gradient is defined for the visual segment : VSDG (VSDG: Visual Segment Designed Gradient)

Direct VS : Minimum visual segment length

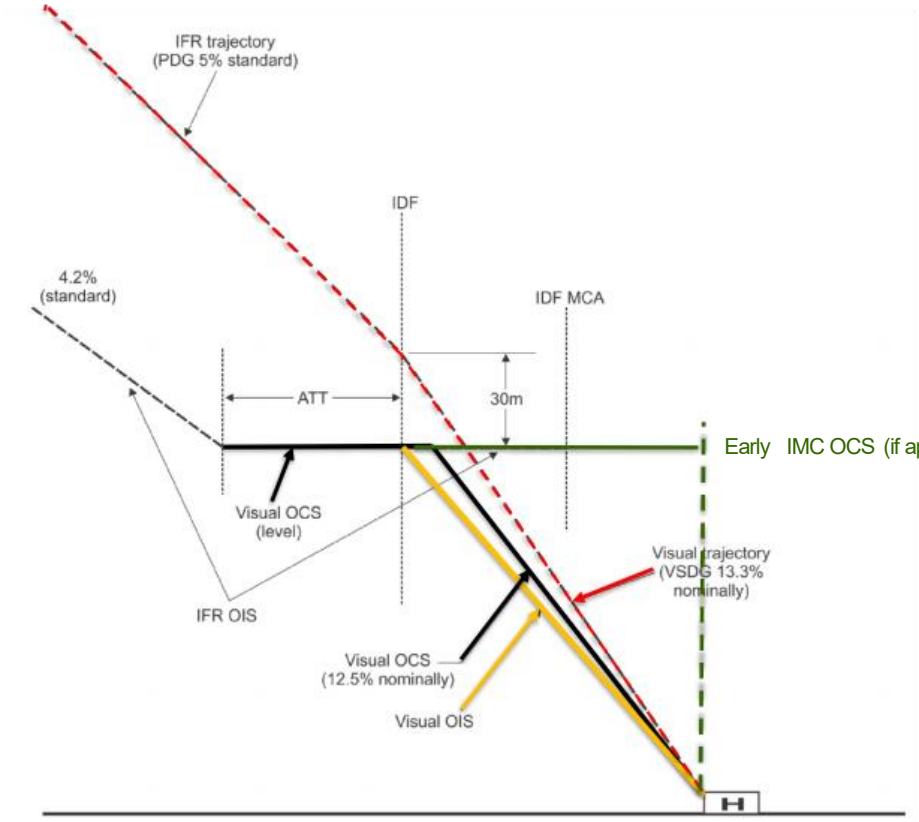


Proceed visually

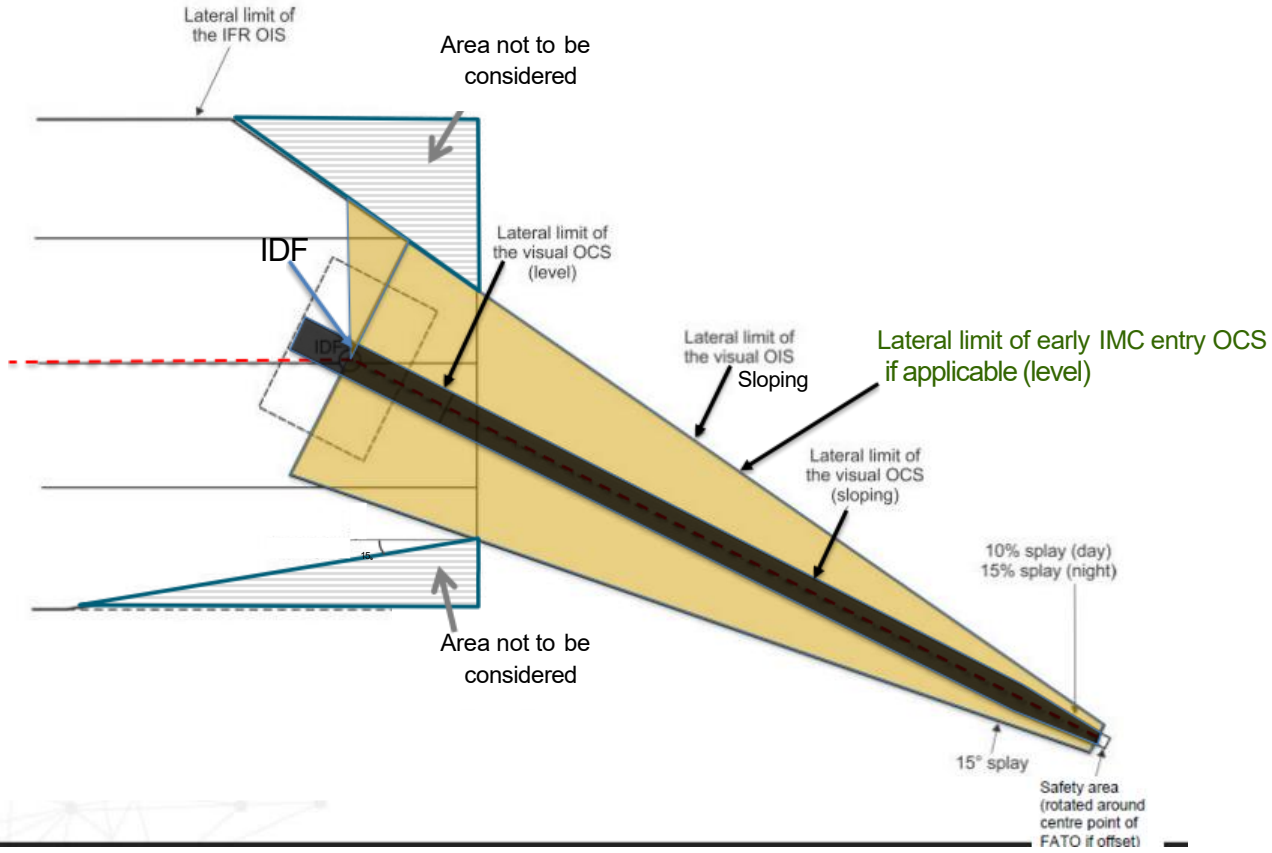
Direct VS： Maximum visual segment length

~~*No more maximum lenght*~~

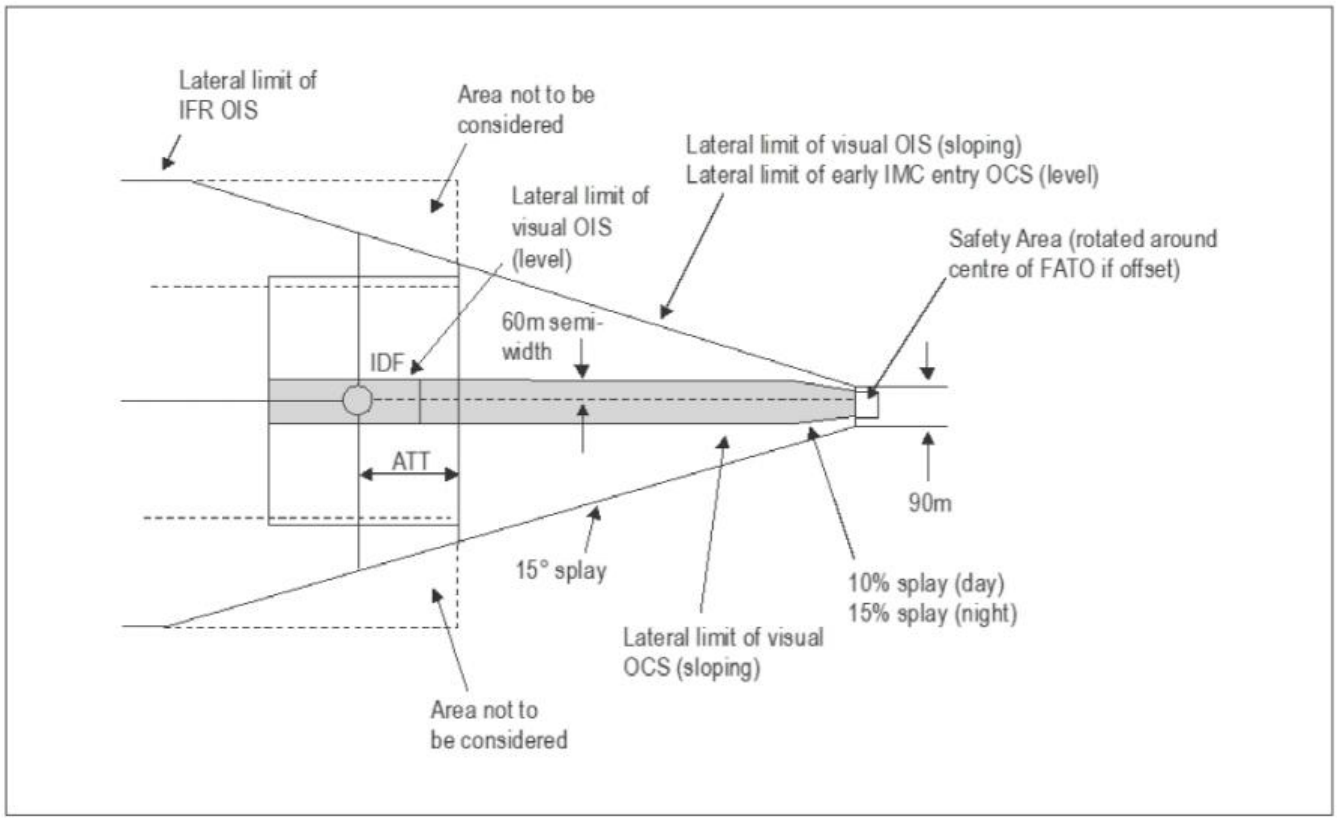
Direct VS: OCS + OIS



Direct VS: OCS + OIS

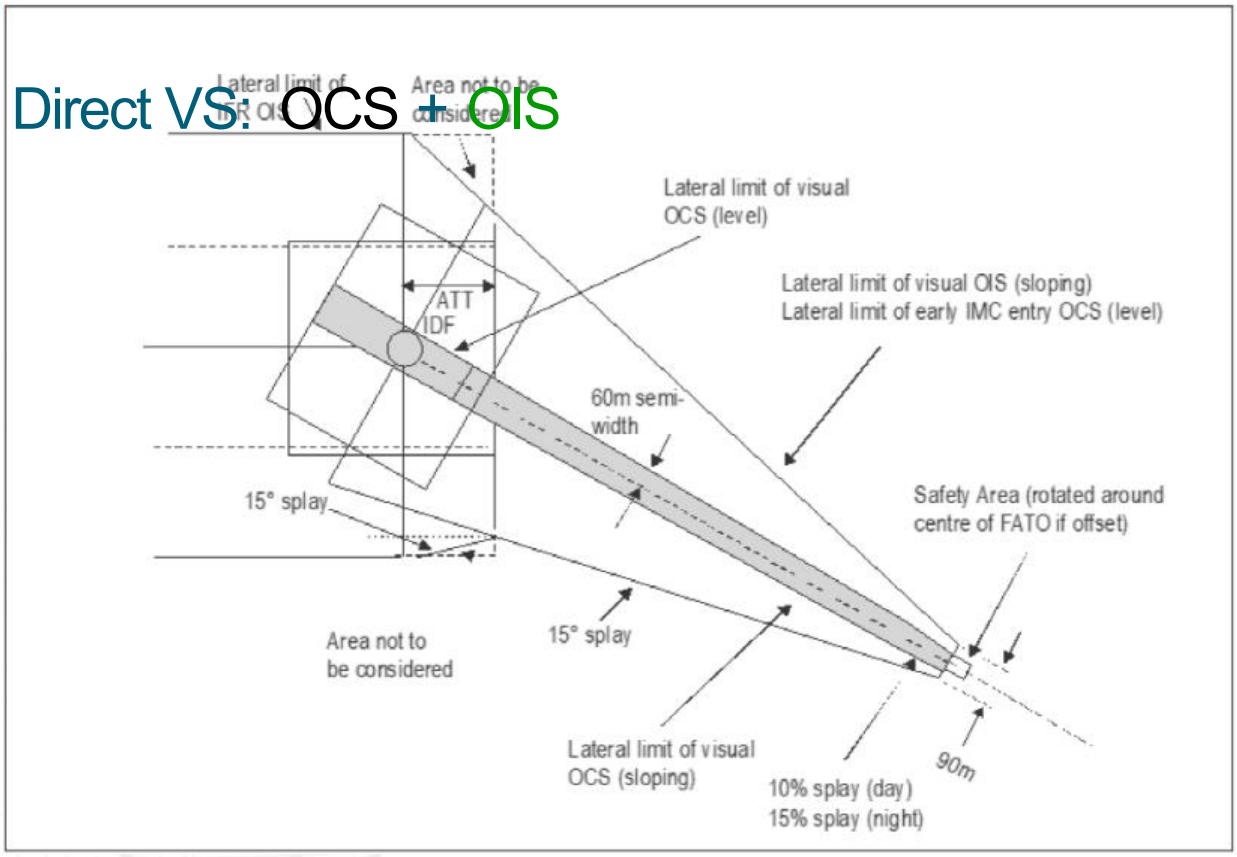


Direct VS: OCS + OIS



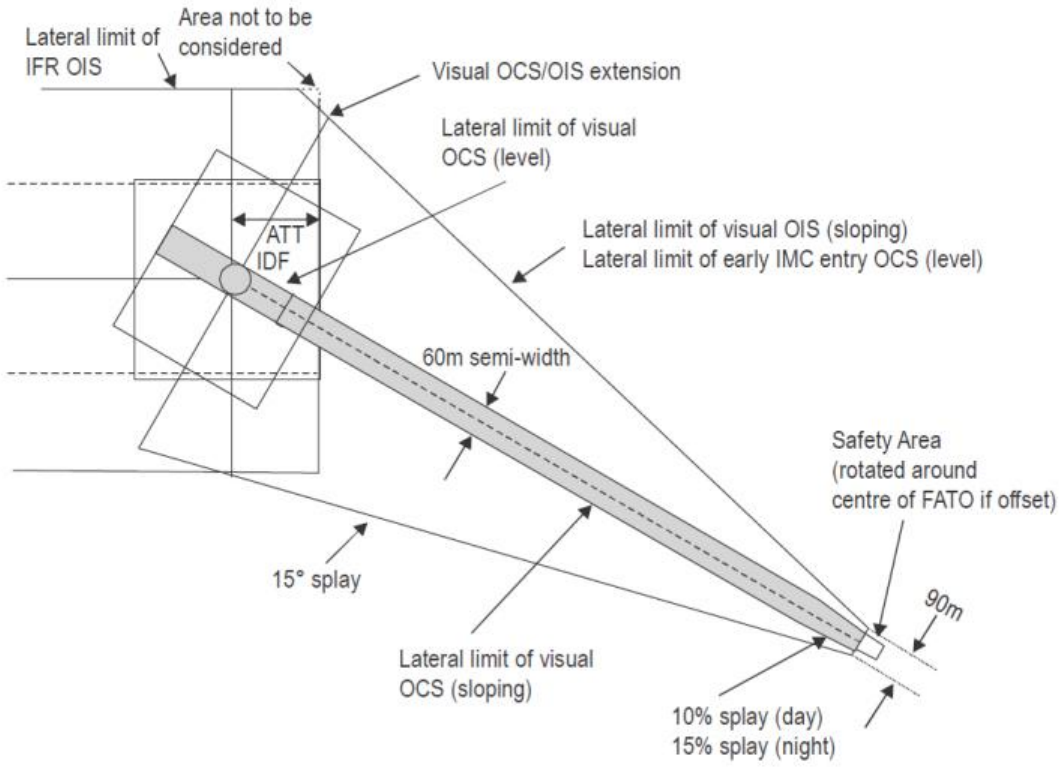
Lateral blending with no track change at the IDF

Direct VS: OCS + OIS



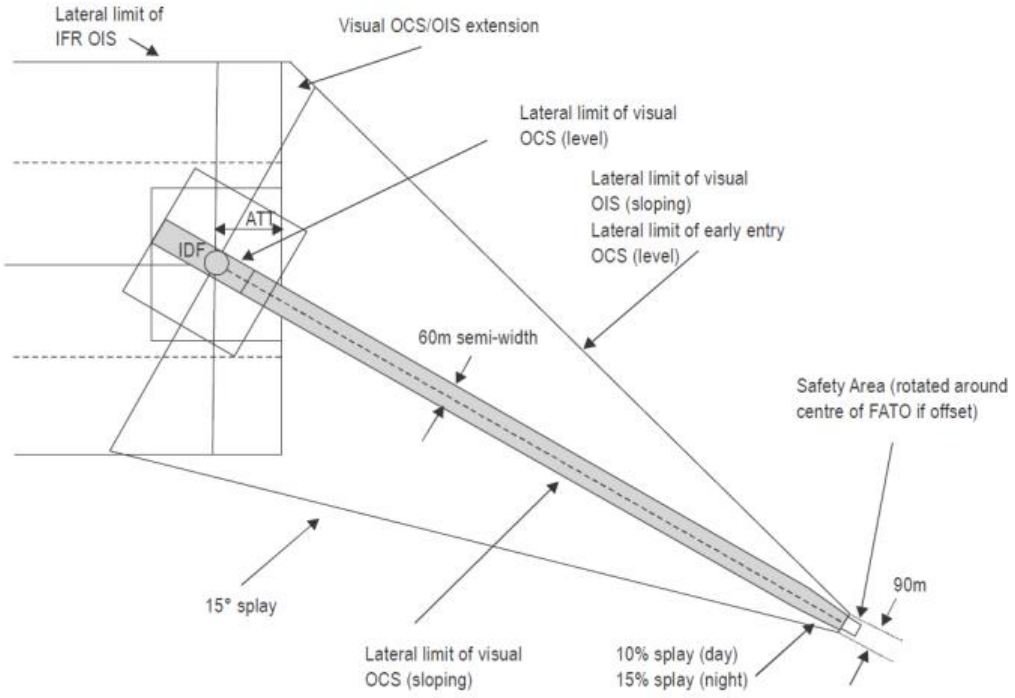
with track change at the IDF and small length of the visual segment

Direct VS: OCS + OIS



with track change at the IDF and large length of the visual segment

Direct VS: OCS + OIS



Lateral blending with large track change at the IDF and large visual segment lengthfor RNP 0.3

Direct VS : Visual OCS (sloping surface)

- The width of the direct visual OCS at the origin is equal to the width of the SA. The outer edges splay from their origins at the edge of the SA, symmetrically around the centre line of the take-off climb surface, to an overall maximum width of 120 m, at which point the outer edges parallel the centre line. For day-only operations, the splay is 10 per cent; for night operations, the splay angle is increased to 15 per cent

- The elevation of the origin of the direct visual OCS is equal to the heliport or landing location elevation. It inclines at VSDG minus 0.8 per cent (nominally 12.5 per cent) from the heliport/landing location elevation to the point where the surface reaches the height of
  30 m (100 ft) below the IDF MCA, at which it becomes level

- The direct visual OCS ends at ATT after the nominal IDF

- No obstacles shall penetrate the direct visual OCS. Eventual penetrations can be eliminated by increasing the slope of the direct visual OCS and a resulting increase of the VSDG if operationally feasible. Such an increase shall be coordinated with the operators concerned

Direct VS : Visual OIS (sloping surface)

- The visual OIS segment is used to identify obstacles for charting (from origin at elevation of the heliport/landing location to the nominal IDF MCA minus 30m (100ft))
- The semi-width of the at the origin is 45 m (150 ft) and the area splays at 15 until the area connects with the instrument segment protection
- The visual segment OIS gradient shall be lower or equal to the visual direct OCS gradient. As a result, some combinations of IDF MCA, VSDG and VS length will not be feasible
- Remark: The Visual OIS shall be evaluated and any penetrating obstacles shall be documented and charted. The Visual OIS shall be evaluated and if recommended by an aeronautical study any penetrating obstacles should be lit and marked

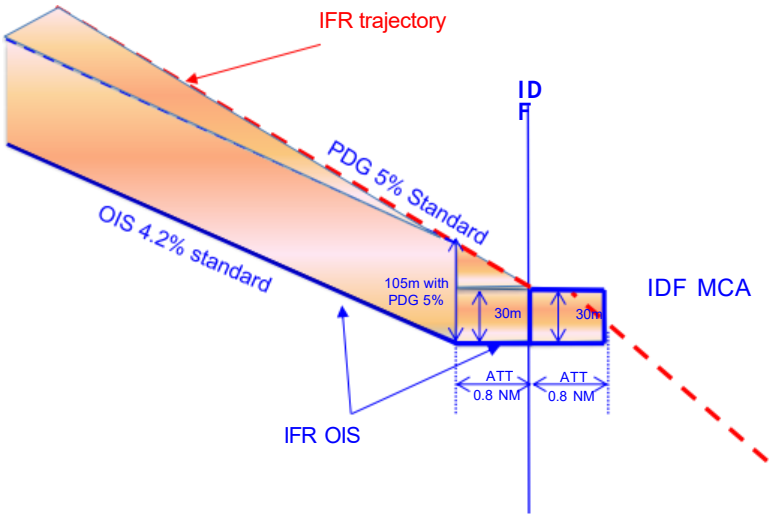
Proceed visually

Direct VS： Early entry OCS (level surface) required for IMC prior to the IDF

- The lateral dimensions of the early IMC entry OCS are the same than the direct visual segment OIS.
- The elevation of the early IMC entry OCS is the elevation of IDF MCA minus 30m.
- No obstacles shall penetrate the IMC entry OCS.

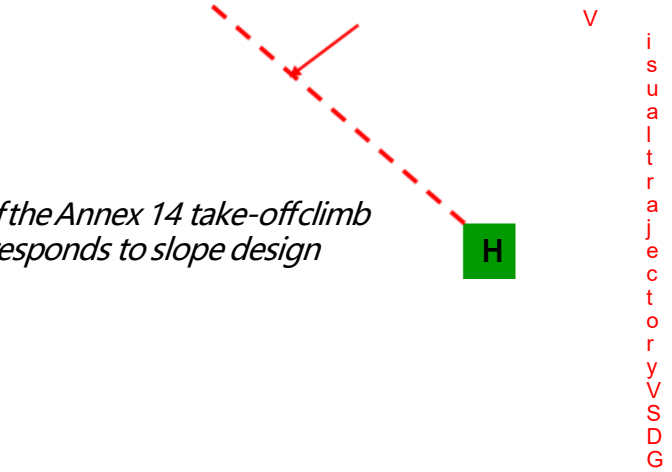
Proceed visually

Direct VS: VSDG

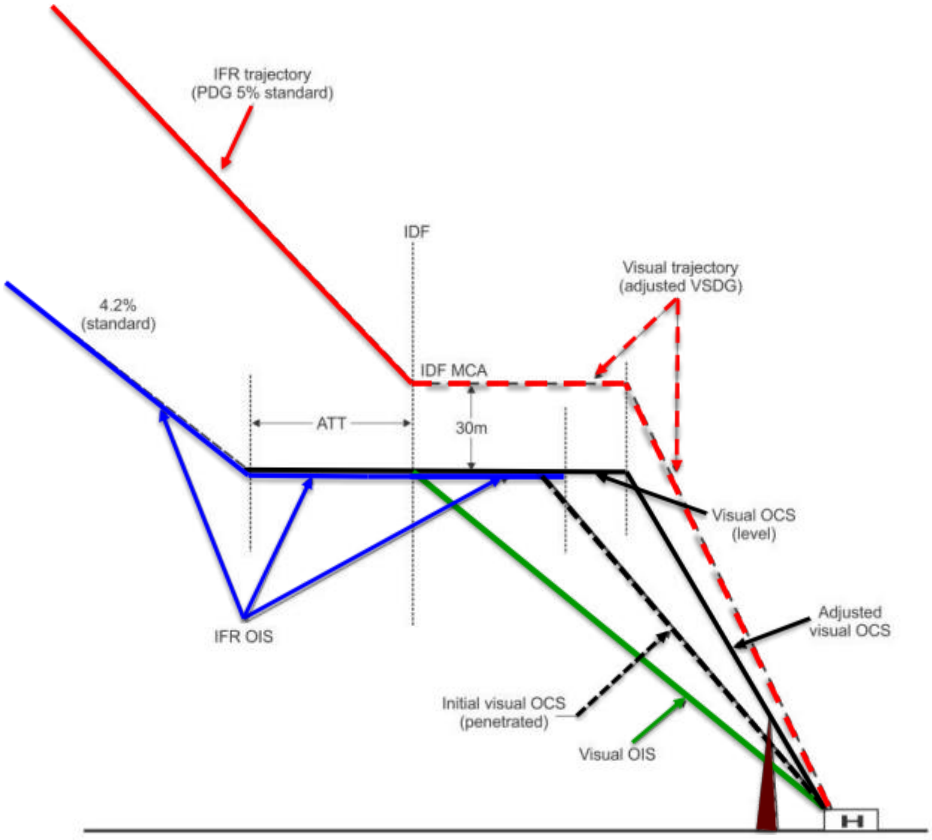


The VSDG is the Visual Segment Designed Gradient. In the direct visual segment it is established by connecting the edge of the heliport or landing location safety area to the nominal IDF (or before) at the IDF MCA.
The nominal VSDG shall be 13,3% until reaching the IDF MCA
Consistent with an obstacle clearance of 0.8% above the direct visual OCS (which is 12,5% for category C Annex 14 take-off climb surface)

Note : The VSDG may be lowered if the Annex 14 take-off climb surface of the landing location corresponds to slope design category A or B



Direct VS: adjusted VSDG (OCS penetrated)



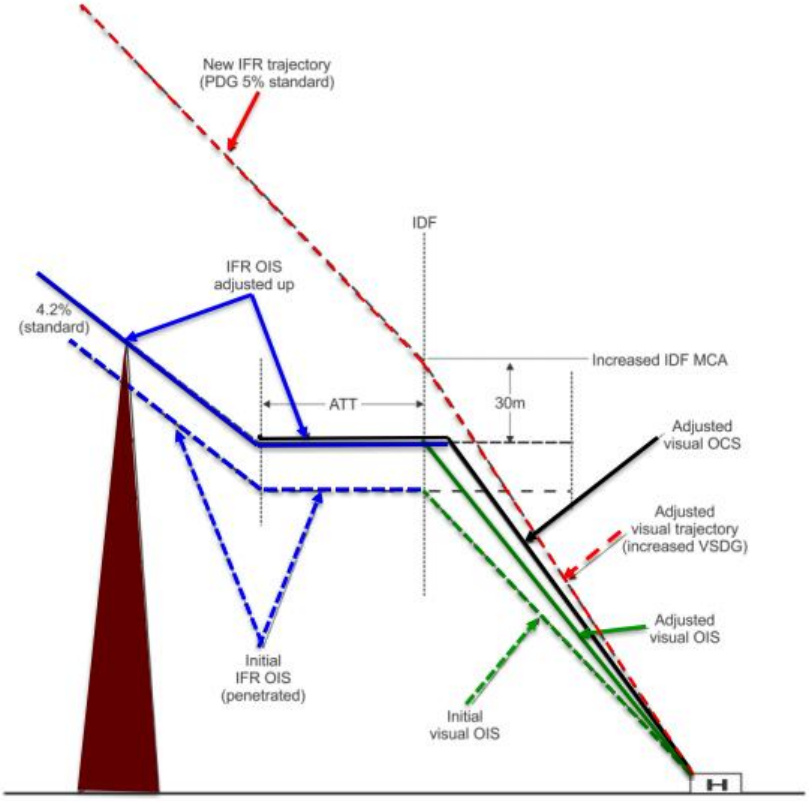
Direct VS: Obstacle penetration in the instrument segment: adjusted OIS, OCS and VSDG

- To avoid obstacle penetration of the IFR OIS, the IDF MCA should be increased such that the IFR OIS remains clear, or a turn initiated, in preference to increasing the PDG above the standard 5 per cent

- The resulting VSDG is increased and is determined by the elevation change between the boundary of the heliport or landing location safety area and the revised IDF MCA

Proceed visually

Direct VS: Obstacle penetration in the instrument segment: adjusted OIS, OCS and VSDG



Note : Visual OCS and VSDG will be ajusted if necessary only. Don't forget that OCS slope is more or equal than OIS slope

« Proceed visually » Manoeuvring VS

- The pilot takes-off in a direction other than directly to the IDF and then visually manoeuvres to join the initial instrument segment at the IDF
  - The pilot shall navigate by visual reference to the earth's surface and the visibility shall be sufficient to see and avoid obstacles, and return to the heliport or landing location if it is not possible to continue visually

- This manoeuvring VS is protected by **one sloping initial Visual OCS and one Visual OIS**
  - Note: The protection provided for this visual segment is comparable with the one provided for PinS approaches followed by a manoeuvring visual segment

- The length of the visual segment should permit the helicopter to climb to the IDF MCA and to accelerate to Vmini by the IDF. The minimum visual segment length shall be 1.00 km (0.54 NM)

- IMC shall not be entered prior to crossing the IDF at or above MCA

Proceed visually

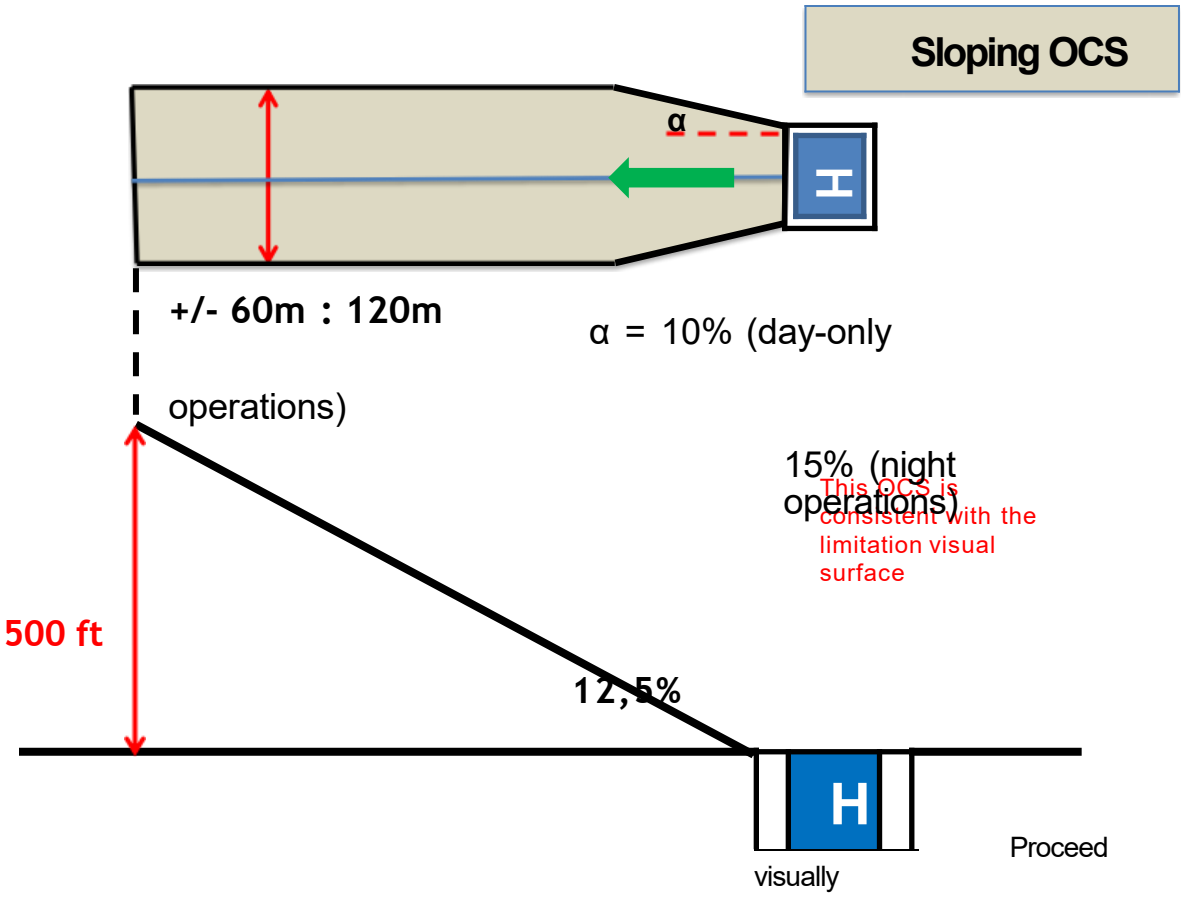
« Proceed visually » Manoeuvring VS

- The nominal VSDG shall be 13.3 per cent. This is consistent with an obstacle clearance of 0.8 per cent above the sloping initial visual OCS (see 1.3.4.5). The VSDG shall not be less than 0.8 per cent above the Annex 14 take-off climb surface

- The Minimum Crossing Height of the IDF for a PinS departure procedure with a manoeuvring visual segment shall not be less than 90 m (295 ft) above the heliport/landing location elevation.

Proceed visually

Manoeuvring VS



Manoeuvring VS : Manoeuvre area

The “manoeuvre area” is defined based on the following rules:

- Before manoeuvring towards the IDF, the pilot climbs initially on the centre line of the take-off climb surface to reach the greater of the two following heights :
  - **The IDF MCH /2**
  - **90 m (295 ft) above the heliport/landing location elevation**

then the pilot continues to climb and accelerates so as to cross the IDF at or above the IDF MCA

- the “manoeuvre area” is the area representing all the lines that originate at the IDF and connect with a “turn area” aligned symmetrically around the centre line of the take-off climb surface

Proceed visually

Manoeuvring VS : Manoeuvre area

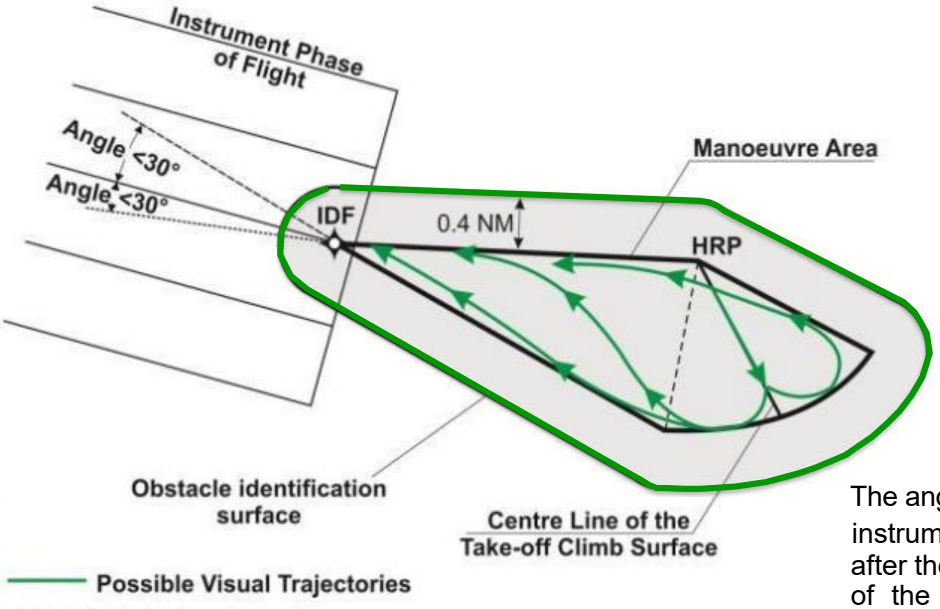
- r: radius from HRP of the ‘turn area’
- α : angle from centre line of the take-off approach

IDF MCH	300ft	400ft	500ft	600ft	700ft	800ft	900ft	1000ft	>1000
r	0.8 NM	0.8 NM	0.8 NM	0.8 NM	0.9 NM	1.0 NM	1.1 NM	1.2 NM	+0,1 NM
α	50°	50°	50°	50°	45°	40°	35°	30°	Constant 30

Note.— Where operationally beneficial, in order to extend the resulting “manoeuvring area”, the “turn area” can be extended by using wider angles on one side or on both sides of the centre line of the take-off climb surface.

If the IDF MCH of the procedure is more than 600 ft above the heliport/landing location elevation, r increases linearly (0.1NM) for each additional 30 m above 600 ft.

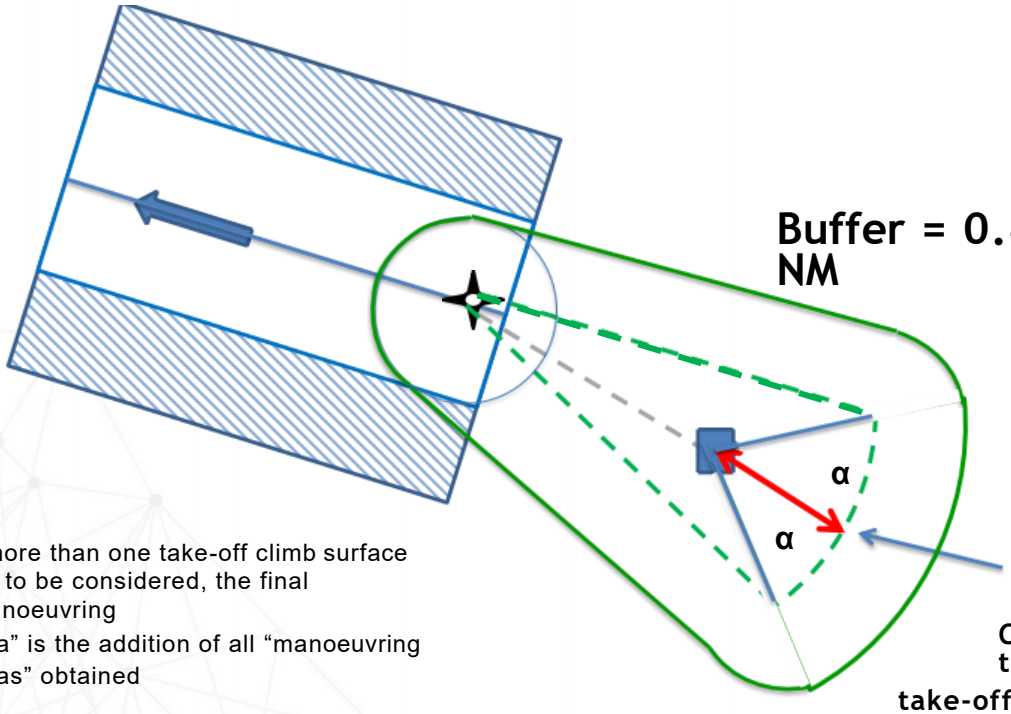
Manoeuvring VS : OIS (Manoeuvre area + buffer)



The angle between the initial instrument segment direction after the IDF and the direction of the "extreme" visual trajectories corresponding to the limits of the "manoeuvring area" shall be less than 30°

Proceed visually

Manoeuvring VS : OIS (Manoeuvre area + buffer)

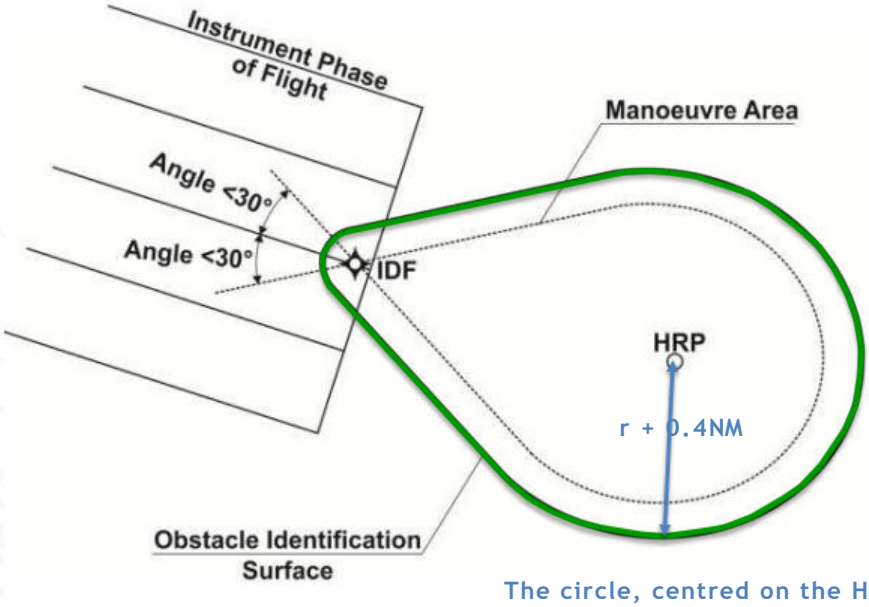


If more than one take-off climb surface has to be considered, the final "manoeuvring area" is the addition of all "manoeuvring areas" obtained

Proceed visually

Manoeuvring VS : OIS (Manoeuvre area + buffer)

The initial take-off can be performed in an omni-directional way

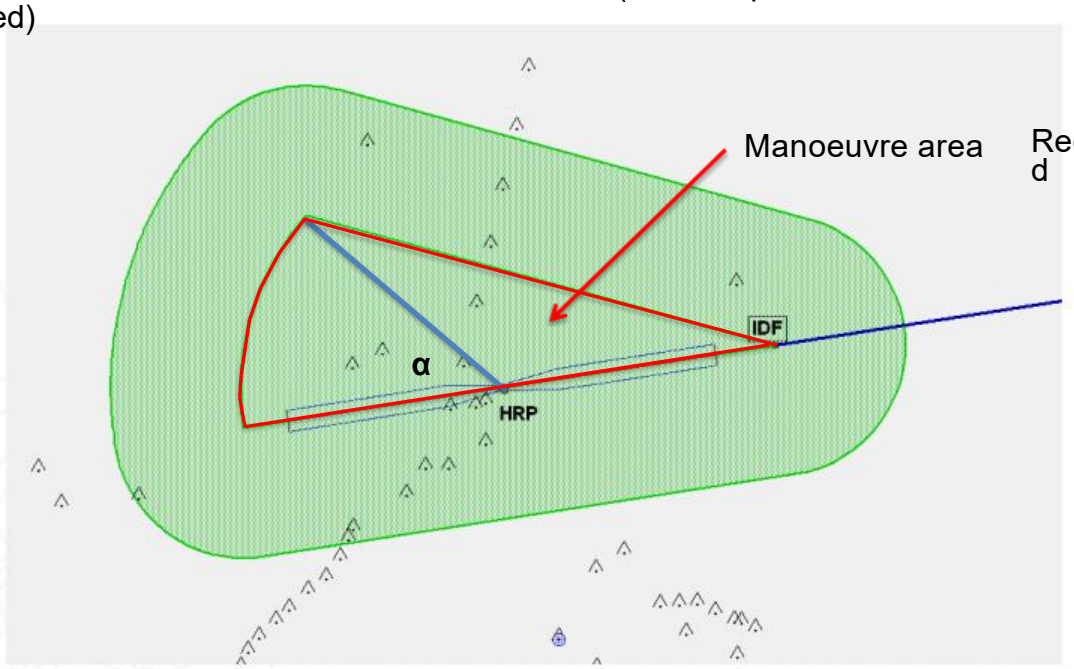


The circle, centred on the HRP, has a radius equal to (r + 0.4NM)

Proceed visually

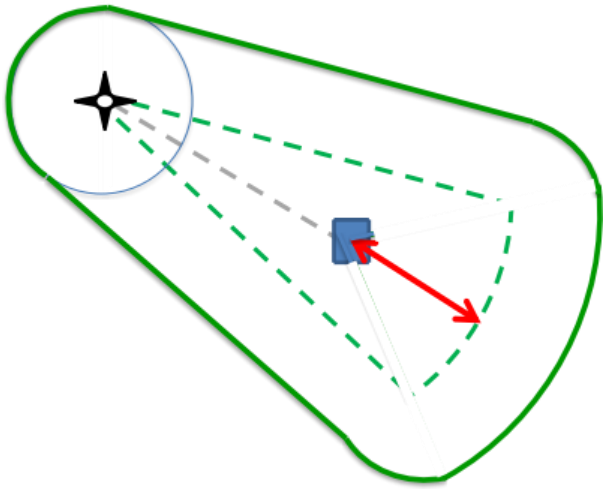
OIS : Manoeuvre area + buffer

2 take-off axis. Reduction of the manoeuvre area (West departure: left turn prohibited)



Proceed visually

OIS : Manoeuvre area + buffer



Obstacles penetrating OIS shall be charted and may be marked and/or lighted when feasible

The OIS is a level surface at a height of the maximum between :

1- IDF MCH (actual height of MCA above the heliport/landing location)/2 - 150 ft

2- 150 ft above the heliport/landing location elevation

Proceed visually

Proceed VFR

- From the heliport or landing location to the IDF, pilot can comply with VFR to see and avoid obstacles until crossing the IDF at or above the IDF MCA. It is based on State regulatory for VFR operations. No obstacle protection area in the VFR segment. IFR clearance shall be obtained prior to reaching the IDF

- Since there is no obstacle protection area, IMC shall not be entered until crossing the IDF

Questions ?