Obstacle Limitation Surfaces

Session 3

Tailoring of OLS

OES

Background

Revised OLS = OFS + OES

OES are surfaces designed based on PANS-OPS criteria and are intended to safeguard the flight procedures at the runway

As it is not possible to design surfaces that safeguard all flight procedures, standard surfaces that could safeguard the common procedures at a runway have been identified

Background

There will be situations when the standard OES may not be sufficient and a specific OES is to be included.

Specific OES refers to

- Adaptation of standard OES
- Designing a new surface tailored to flight procedure conducted on the runway

Why refer to PANS-OPS surfaces

Surfaces stipulated in PANS-Operations (Doc 8168) are important because the criteria used in designing these surfaces are referred to in the development of OES.

However, OES are not intended to replace the PANS-OPS surfaces. They have two different purposes:

- **PANS-OPS surfaces:** Used for designing instrument flight procedures (IFPs)
- **OES:** Surfaces to safeguard flight procedures established at an aerodrome

Why design OES using PANS-OPS criteria?

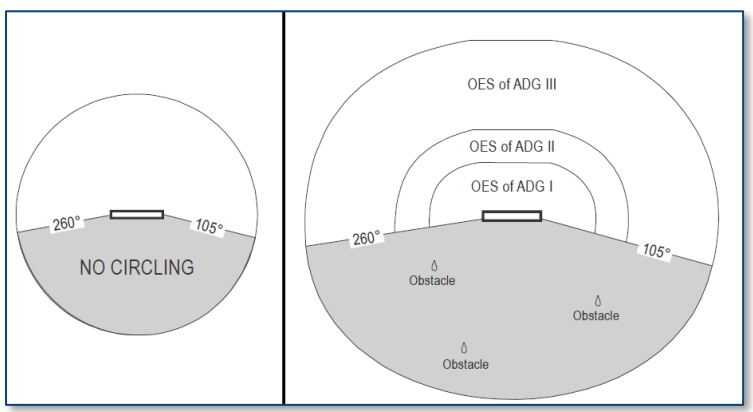
To allow for a more harmonized approach in safeguarding the airspace against obstacles or objects that may affect the safety of aircraft operations and the usability of the flight procedures.

Adapting OES

Adapting OES

The shape and dimensions of the standard OES may be adjusted where needed when operations associated with one surface:

- do not require the whole surface, or
- The existing obstacle environment has penetrated the standard OES



Adapting OES

The shape and dimensions of the standard OES may be adjusted when operations associated with one surface have different minima from those retained for the design of the surface, or if circling for ADG 5 at 300m, PANS-OPS.

Adapting Horizontal OES

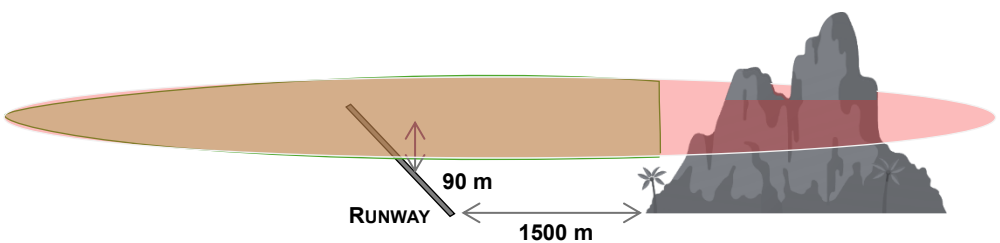
- In most cases, aircraft operations and flight procedures do not require the full extent of the horizontal surface, e.g. when circling minima are higher or circling is available to one side of the aerodrome.
- The standard horizontal surface, due to its size and height, may trigger a significant number of aeronautical studies, especially in urban environments.
- The horizontal surface may be adapted by excluding areas where no flight operations are performed.
- When modifying the horizontal surface special considerations must be made as the surface provides protection not for circling approaches only, but for many other aspects, too

Adapting horizontal OES: Scenario 1

Scenario: A mountain is adjacent to the runway. There is no circling.

What is the option for adapting OES?

Ignore that portion of OES

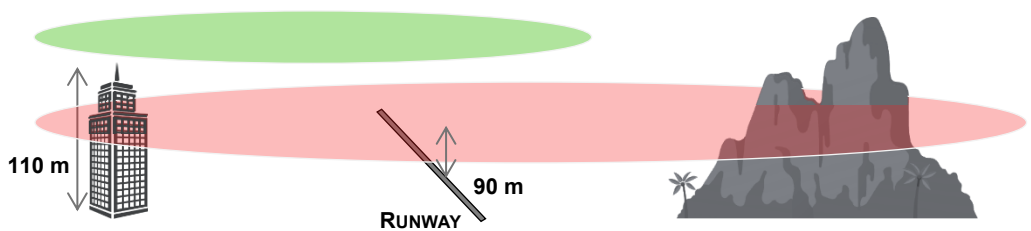


Adapting horizontal OES: Scenario 2

Scenario: There is a building adjacent to the runway which is 110 m.

How could the OES be adapted?

First adapt OES height, which then will affect circling minima.

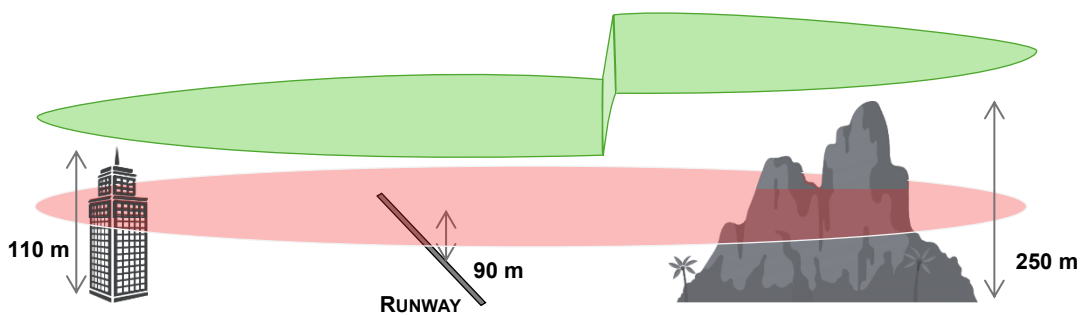


Adapting horizontal OES: Scenario 3

Scenario: One side of OES is higher than other.

What is the option to adapt the OES?

You may have OES whose heights are not uniform



Horizontal OES – Design Criteria

When adapting the horizontal surface to align with circling approach minima, a minimum obstacle clearance shall be assured as per PANS-OPS criteria, i.e.:

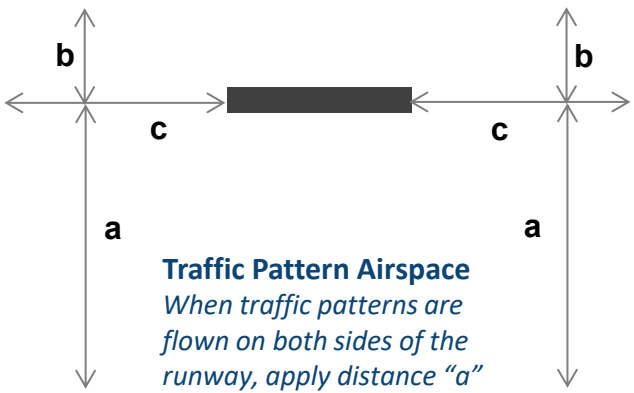
- 90 m (295 ft) for aircraft speed categories A and B, ADG I-IIB respectively
- 120 m (394 ft) for aircraft speed categories C and D, ADG IIC-V respectively The horizontal surface may be adapted by excluding areas where no flight operations are performed

Typically, the horizontal surface provides adequate protection for visual circuit patterns for the related aircraft speed categories and ADG.

When establishing and/or modifying the horizontal surface, VFR operations at an aerodrome to be considered.

Surface to protect visual circuits

- For States having only circuits without circling procedures.
- Visual circuit do not have any known specific design criteria. Only best practices are available.
- Only when there is no Horizontal OES.

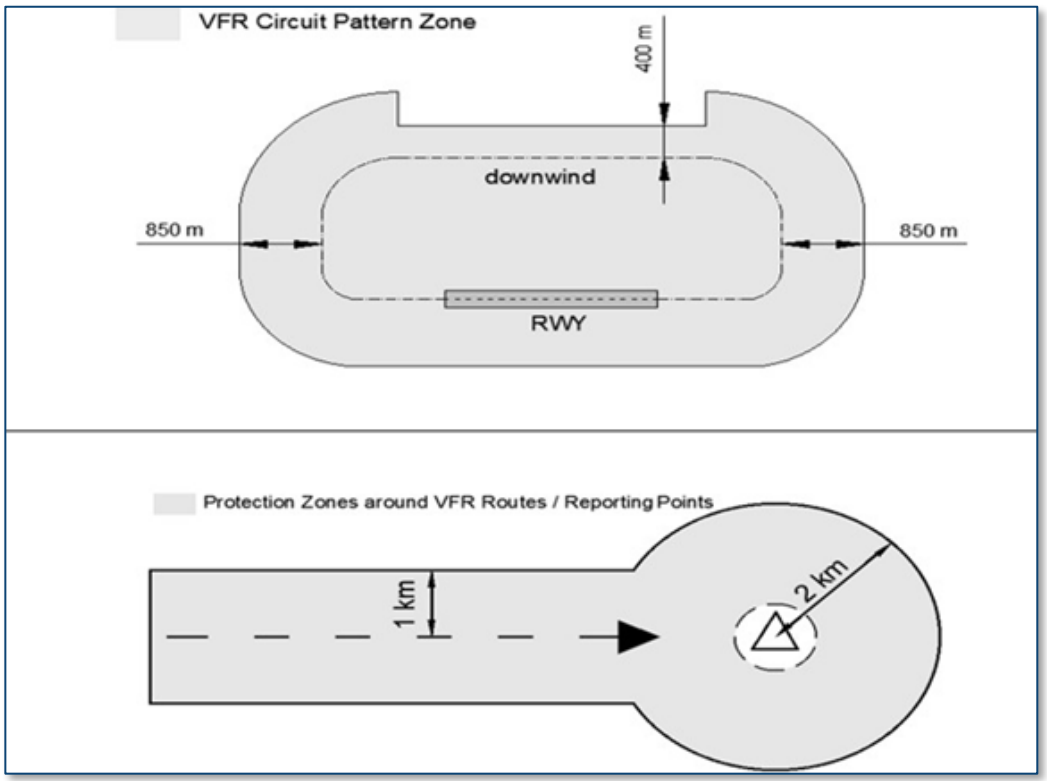


Traffic Pattern Airspace
When traffic patterns are flown on both sides of the runway, apply distance "a" on both sides of extended runway centerline

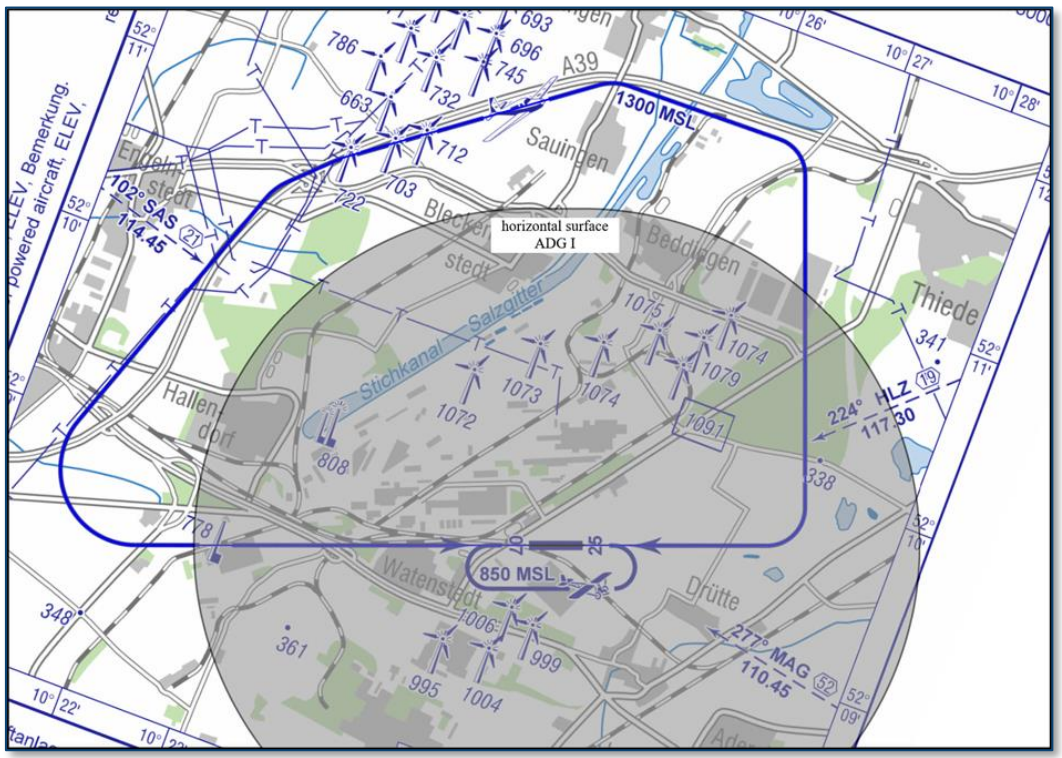
Aircraft Category	Distance (Nautical Miles)			
	a	b	c	d
A	1.25	.25	1.25	.375
B	1.5	.25	1.5	.5
C	2.25	.5	2.25	.875
D	4.0	.5	3.0	1.0

Surface to protect visual circuits

For States having only circuits without circling procedures.

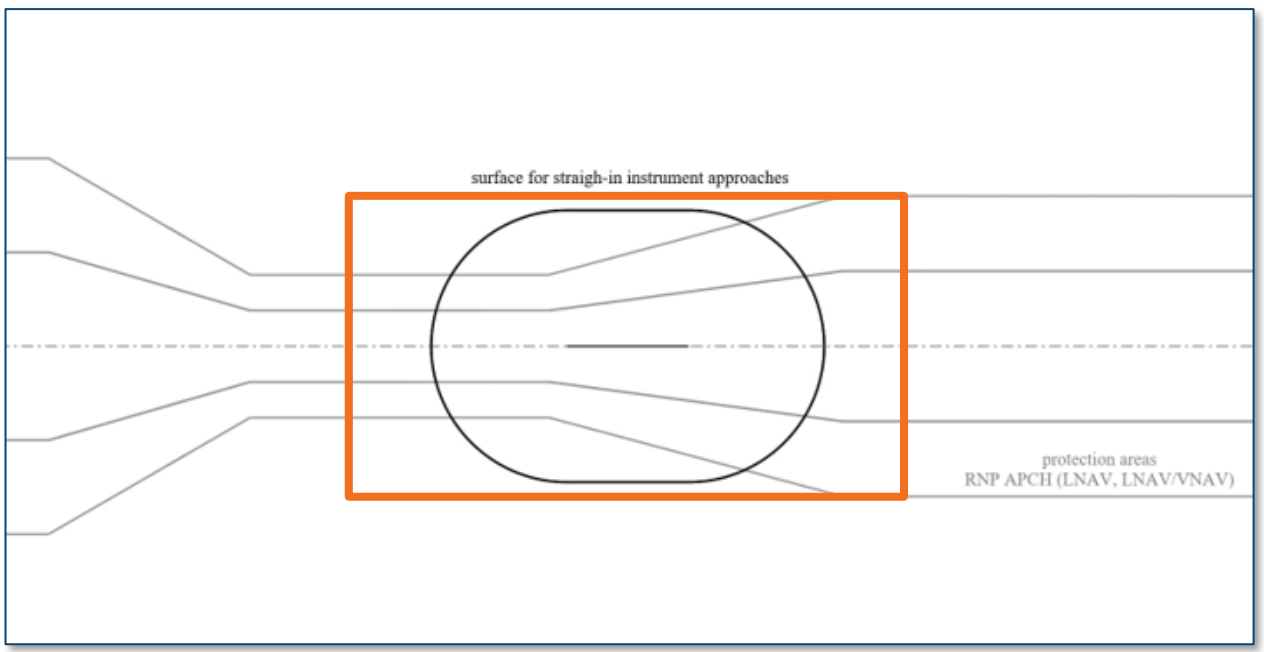


Adaptation of visual circuit pattern

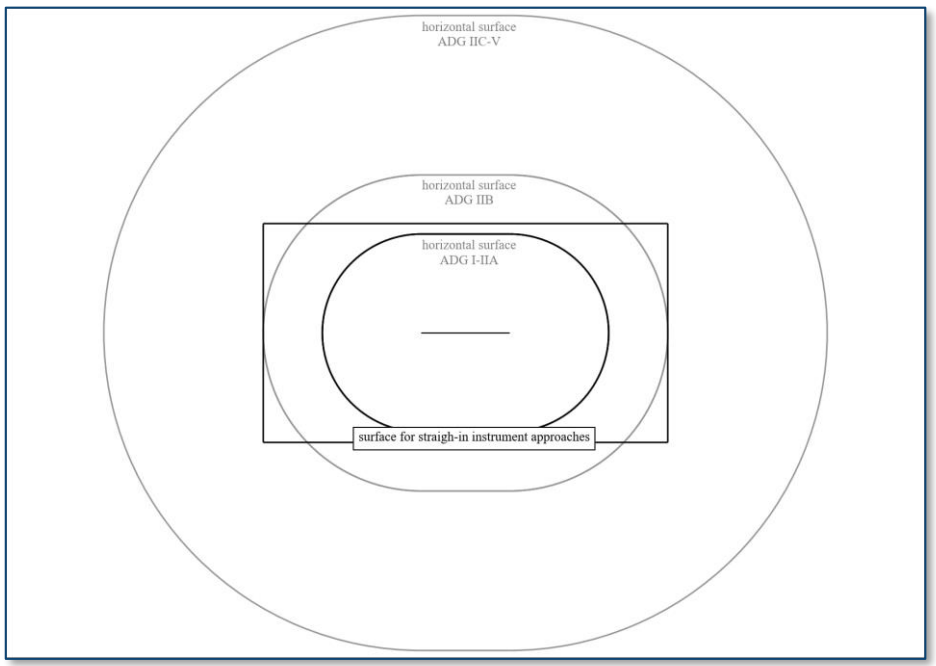


The horizontal surface is not protecting the visual circuit pattern in this instance

Adapting surface for Straight-In Instrument and RNP protection areas



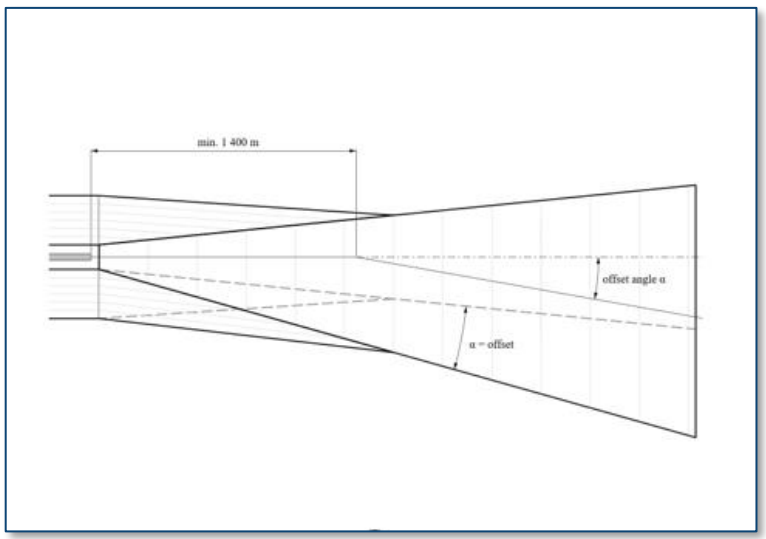
Adapting Surface for Straight-in Instrument Approaches



- The surface for straight-in instrument approaches is a subsection of the horizontal surface
- Only most common straight-in instrument approaches are considered, including straight-in RNP and VOR approaches.
- The adaptation will depend on the minima for the approaches

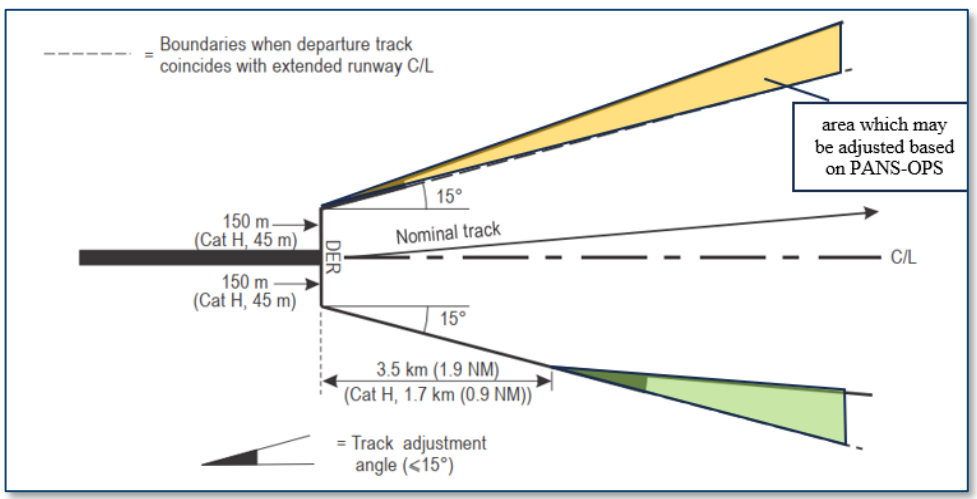
Adapting Surface for Precision Approaches

- The surface is designed based on the PANS-OPS Basic ILS surfaces
- The surface for precision approaches shall be established when a runway is served by such procedures (i.e. ILS, SBAS CAT I, GLS)
- When offset approaches are utilized for category I precision approaches, the surface for precision approaches should be adjusted to match the requirements of PANS-OPS



Adapting Departure Surface

The instrument departure surface is based on the criteria for omnidirectional departures and is consistent with the dimensions defined in PANS-OPS (Volume II, Part 1, Section 3, Chapter 4)

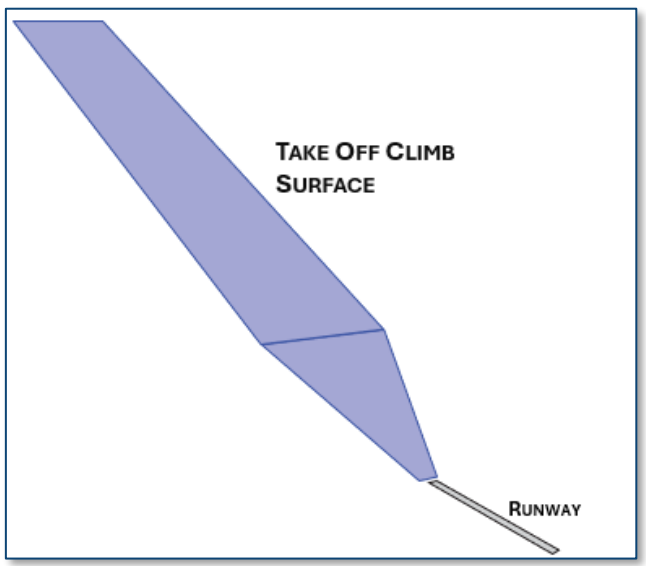


The surface needs to be adjusted when:

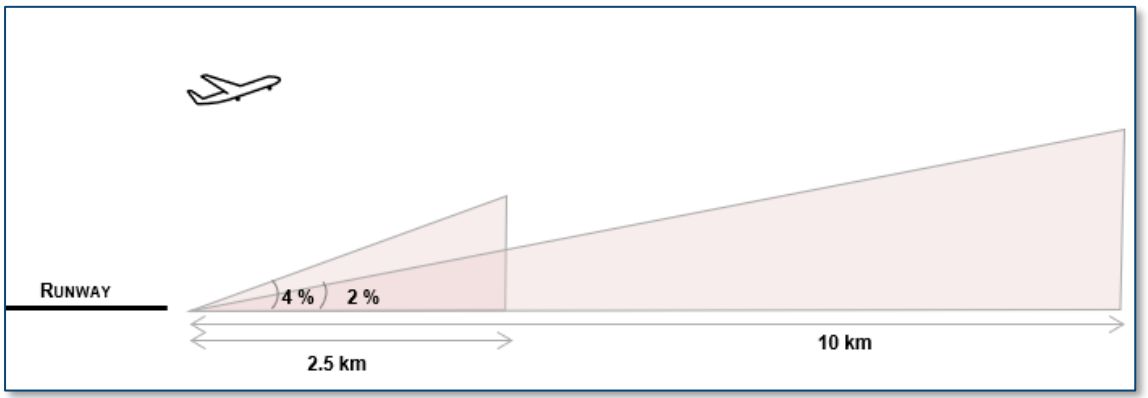
- No omnidirectional departures are utilized. The surface may be adjusted to match the relevant obstacle protection surfaces for the standard instrument departures (SIDs)
- When offset departures are utilized
- Turning instrument departure procedures is published
- The slope of PDG is different from 3.3%

Adapting Take-off Climb Surface

- The take-off climb surface is designed based on ICAO Annex 6 and Aeroplane Performance Manual Doc 10064
- It is an OES as the take-off operations is dependent on the aircraft's performance and the local condition such as temperature. Aircraft do not lift off the runway from the same point and climb performance varies significantly.
- Hence, an object may be an obstacle for an aircraft with low performances on take-off but not to another aircraft with higher performances.



Take-off Climb Surface



The surface may be adjusted when:

- The local condition requires the slope to be adjusted lower. (Potentially to 1.6%)
- The take-off flight path is not straight. (The take-off climb surface to consider the curved track)
- There is a need to consider obstacles relevant to aircraft operators, e.g. in mountainous environments (The length of the take-off climb surface may be extended)
- When a 2% slope is not required. (A higher slope may be defined)

Tailored OES

Where the modification of the standard OES is not sufficient to comply with the operations intended at the aerodrome, tailored OES can be specified to match the operational needs.

Tailored OES may support balancing the needs of protecting the airspace needed to ensure safety and regularity of flight operations on the one side, and the needs of developments around aerodromes which often demands release of airspace.

When developing tailored OES, all relevant stakeholders shall be consulted as their competencies are necessary, particularly those of flight procedure design specialists.

Tailored OES

The surface for Straight-In Instrument approaches (as well as the horizontal surface) address common straight-in instrument approaches. However, some instrument approaches may not be fully addressed needing tailored OES to be established:

- Approach procedures with low minima (OCH – obstacle clearance height)
- RNP approaches with LNAV/VNAV minima at high elevation aerodromes
- RNP approaches with LPV minima at aerodromes with a short runway
- Missed approach procedure with an early turn
- Approach procedures with significant offsets
- Curved approaches

Tailored OES (1/2)

Tailored OES should be considered for aerodromes with scenarios such as:

- Approach procedures with low approach minima (other than precision approaches)
- Variety of flight procedures with diverging flight tracks including early turning departures and missed approaches
- Independent operations on parallel or near parallel runways
- Operations of other aircraft such as helicopters and eVTOL operations (reconsider having this point as it may create confusion, better talk only about fixed wing operations)

Tailored OES (2/2)

Tailored OES should be considered for aerodromes with scenarios such as:

- Procedures for flights according to VFR (e.g. non-standard traffic circuits or routes)
- Non-standard flight procedures (RNP-AR (0.1,0.5))
- Demanding environment where a given flight procedure needs to be protected (e.g. RNP AR APCH in mountainous terrain)
- Protection for future aircraft operations and flight procedures
- New runway or runway extension programs to be protected for

Tailored OES: Operational considerations (1/2)

When establishing tailored OES all aircraft operations and flight procedures should be considered, including existing as well as intended. These include:

- Visual flight operations and procedures (e.g. traffic circuits and routes)
- Instrument flight procedures including
  - Approach and missed approach procedures
  - Departure procedures
  - Arrivals and holdings, when necessary

Tailored OES: Operational considerations (2/2)

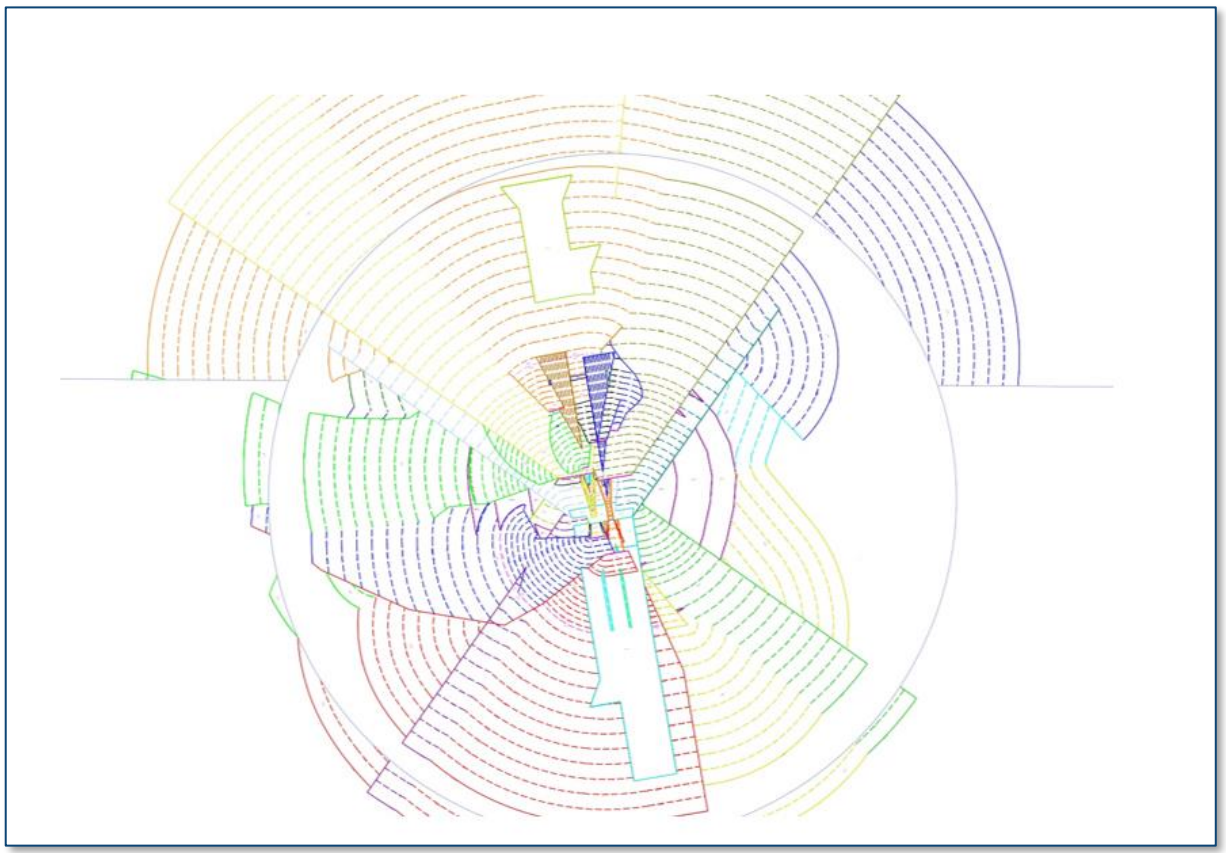
When establishing tailored OES all aircraft operations and flight procedures should be considered, including existing as well as intended. These include:

- Minimum sector altitudes (MSA) and terminal arrival altitudes (TAA), when necessary
- ATC surveillance minimum altitudes, when necessary
- Contingency procedures (e.g. take-off with one engine inoperative);
- Operations of other aircraft (e.g. helicopters)
- Military and government operations (e.g. low flying flight routes)

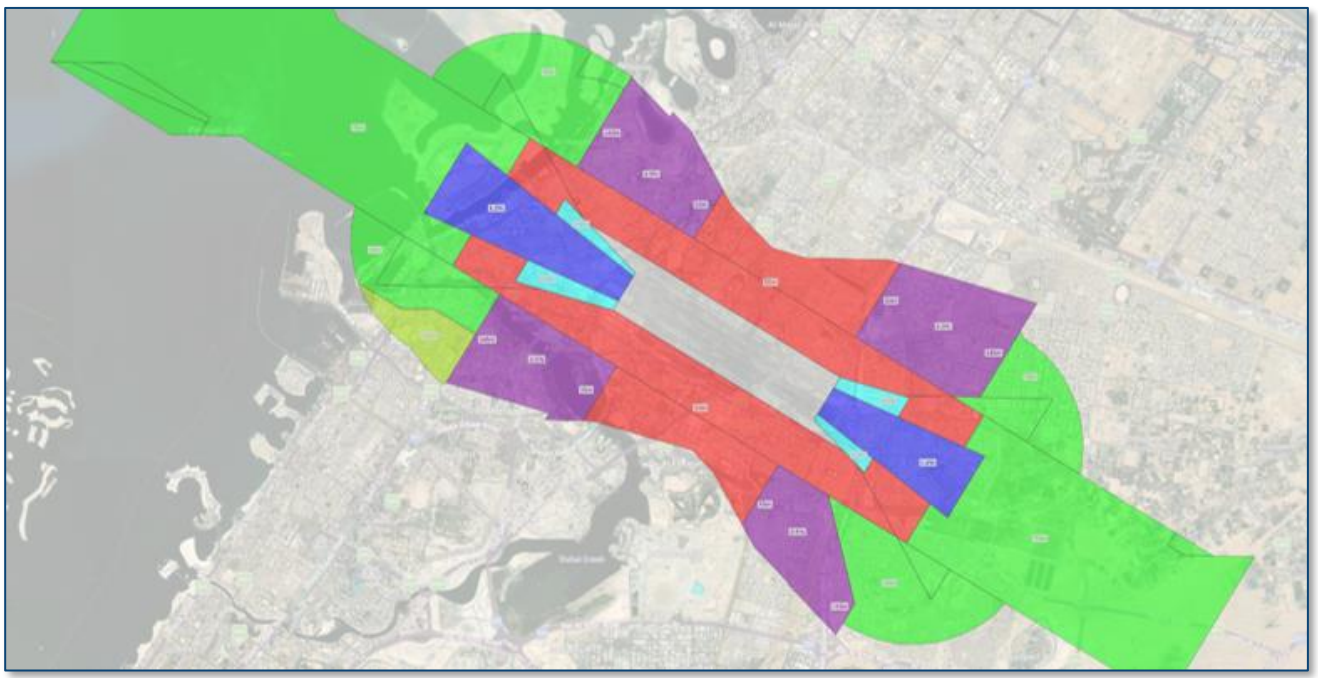
Tailored OES: drawing surfaces

- The resulting set of surfaces may be very complex. Contributing factors are aircraft operations, flight procedures and other aspects considered when designing tailored OES for an aerodrome.
- Geographic information systems (GIS) can support such complexity. Digital tools are especially useful where aeronautical data quality assurance is given.
- For ease of use, tailored OES with complex surfaces may be simplified. Special consideration can be made so that the lowest surface(s) of the underlying complex set is controlling

Example of tailored OES: Flight procedures



Example of tailored OES: Flight procedures



Summary

- PANS-OPS criteria are referred to in the adaption of OES.
- Specific OES could either be an OES that has been adapted or a new tailored OES.