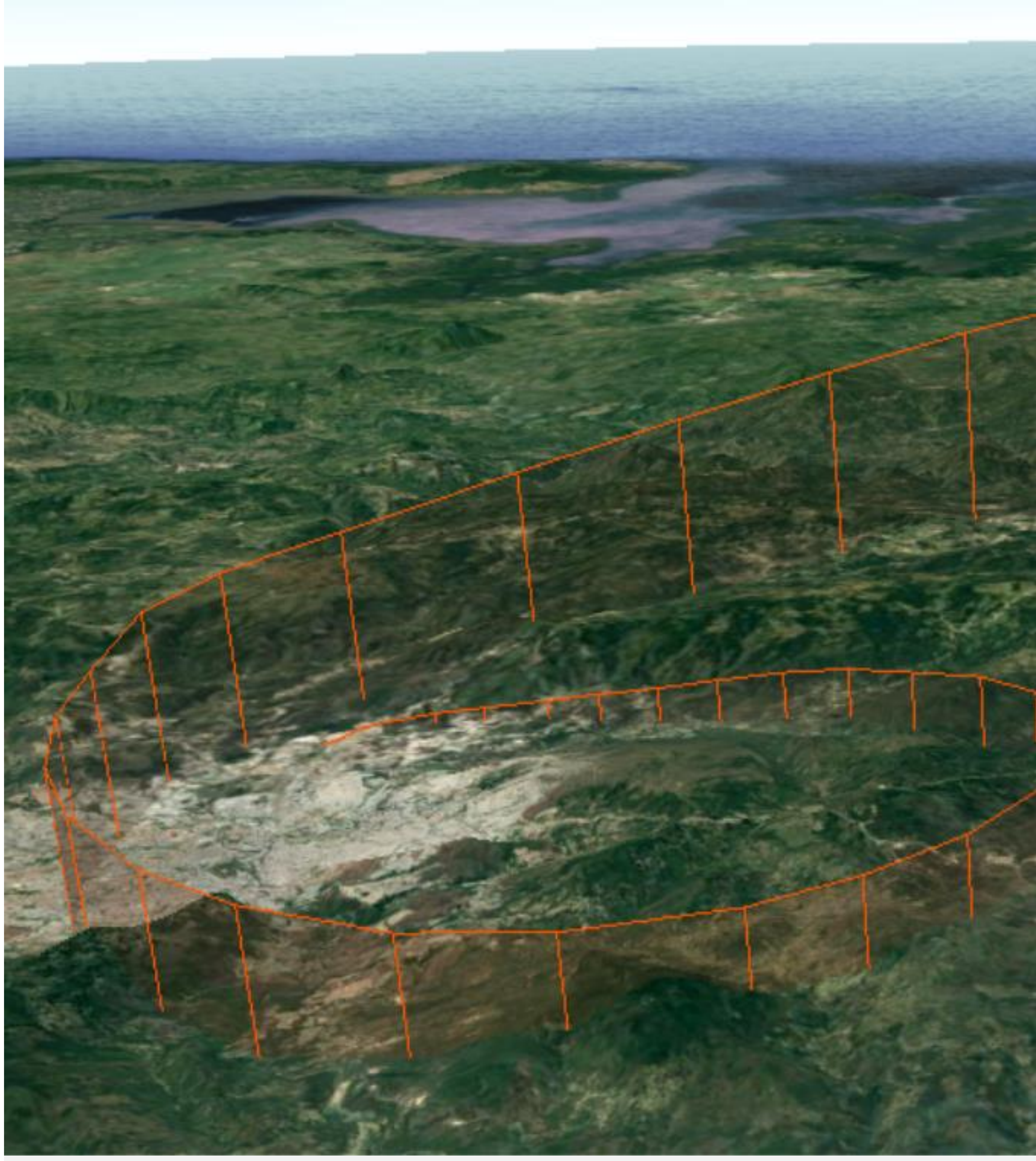
DOC 8168
PANS OPS
RELEVANCE

FLYGHT7

Table Of Content

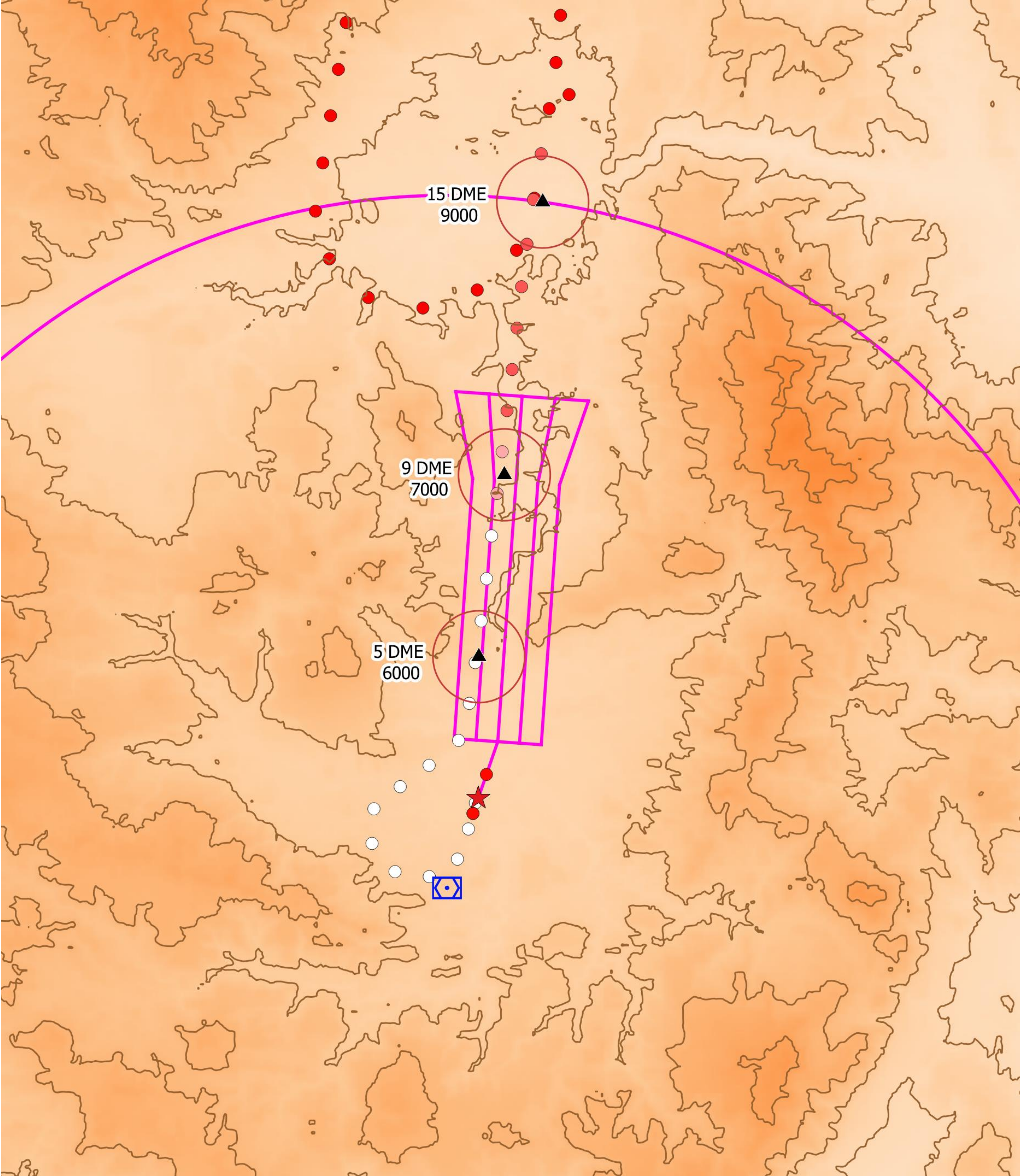


About Us

Expert Advice for when you need it the most

Instrument flight procedure design is a complex subject matter and if you combine it with the fact that you need to deal also with surveys, aeronautical information management, charting, ATC and other disciplines it can sometime become overwhelming.

FLYGHT7 mission is to accompany your vision of a better airspace that is able to cope with demand with safety always first.



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What We Do

FOCUS ON YOUR NEEDS

We are here to improve your operations as such, we will take time to listen and analyze the current baseline and your expected outcome

FIND SOLUTIONS FOR YOUR OPERATION

Once we have gathered the initial data be it on-site or through other means we will work together to bring solutions that benefit your operation

DELIVER

Everything we do is focused on bringing value and delivering the utmost quality, as we work together from day one we believe our service will improve your operations

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Our Services

Instrument Flight Procedure Design (IFPD) - PANS OPS

- Conventional Design
- PBN Design
- 5 year cycle review
- Procedure Audit “Independent Review”
- Training
- On the Job Training
- Aeronautical Obstacle Survey
- Obstacle Limitation Surfaces
- Ad-hoc consulting
- Procedure Flight Validation (Aircraft & Simulator Evaluation) PVS

Aeronautical Information Management

- Aeronautical Charting
- AIXM
- FPL
- NOTAM
- AIP/eAIP
- Training

TRAINING AND SUPPORT

- Help for jump starting your operation with expert advice
- Consulting and Knowledge-transfer

WORKING TOGETHER

Main Stakeholders

AIR TRAFFIC SERVICES

Require the enhancement of operational safety and efficiency

INDUSTRY (Airlines)

Require the improvement of operations as well as reducing issues due to weather that increases revenue

GOAL IS TO HAVE A WIN-WIN SITUATION FOR ALL PARTIES INVOLVED

What is PANS-OPS?

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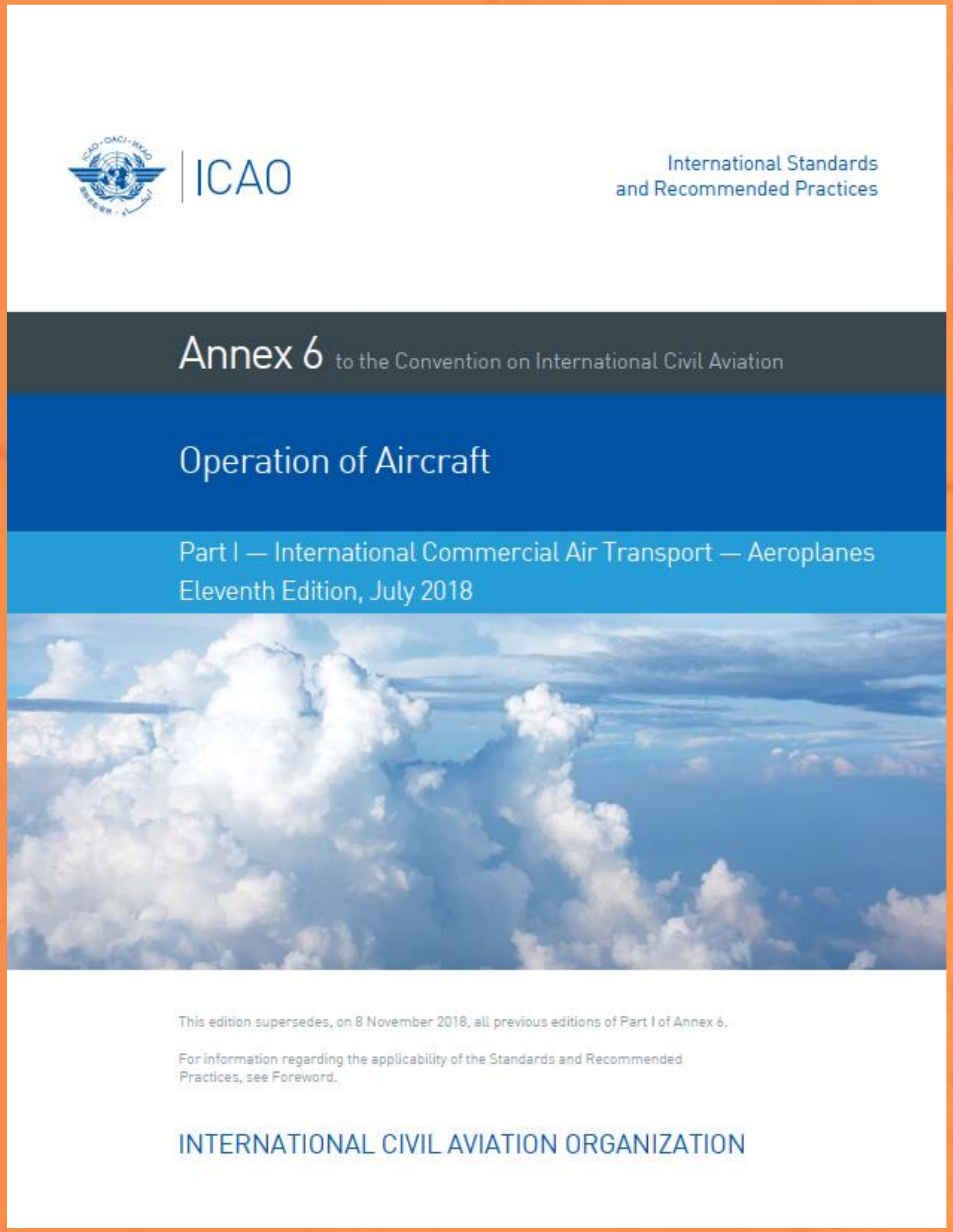
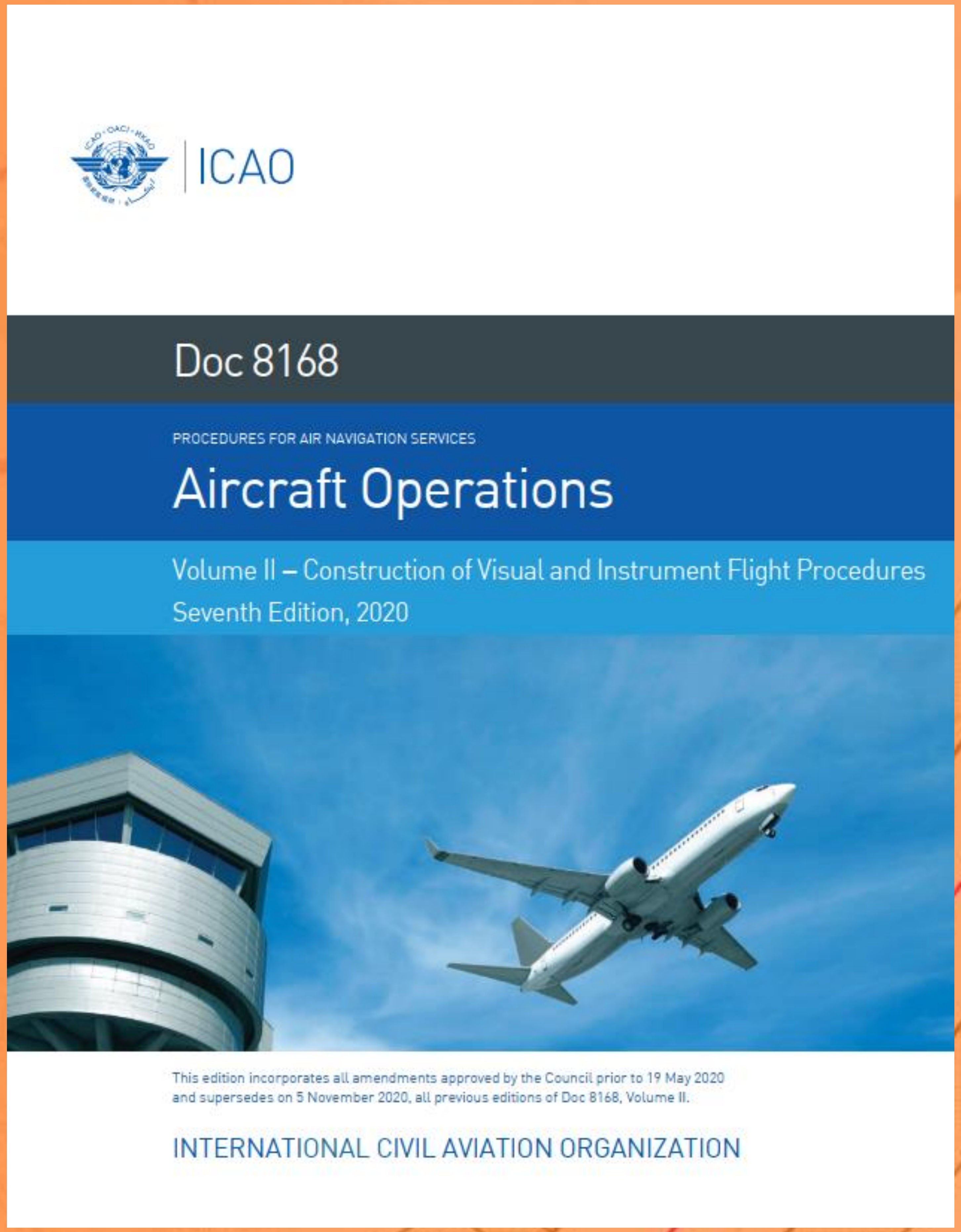
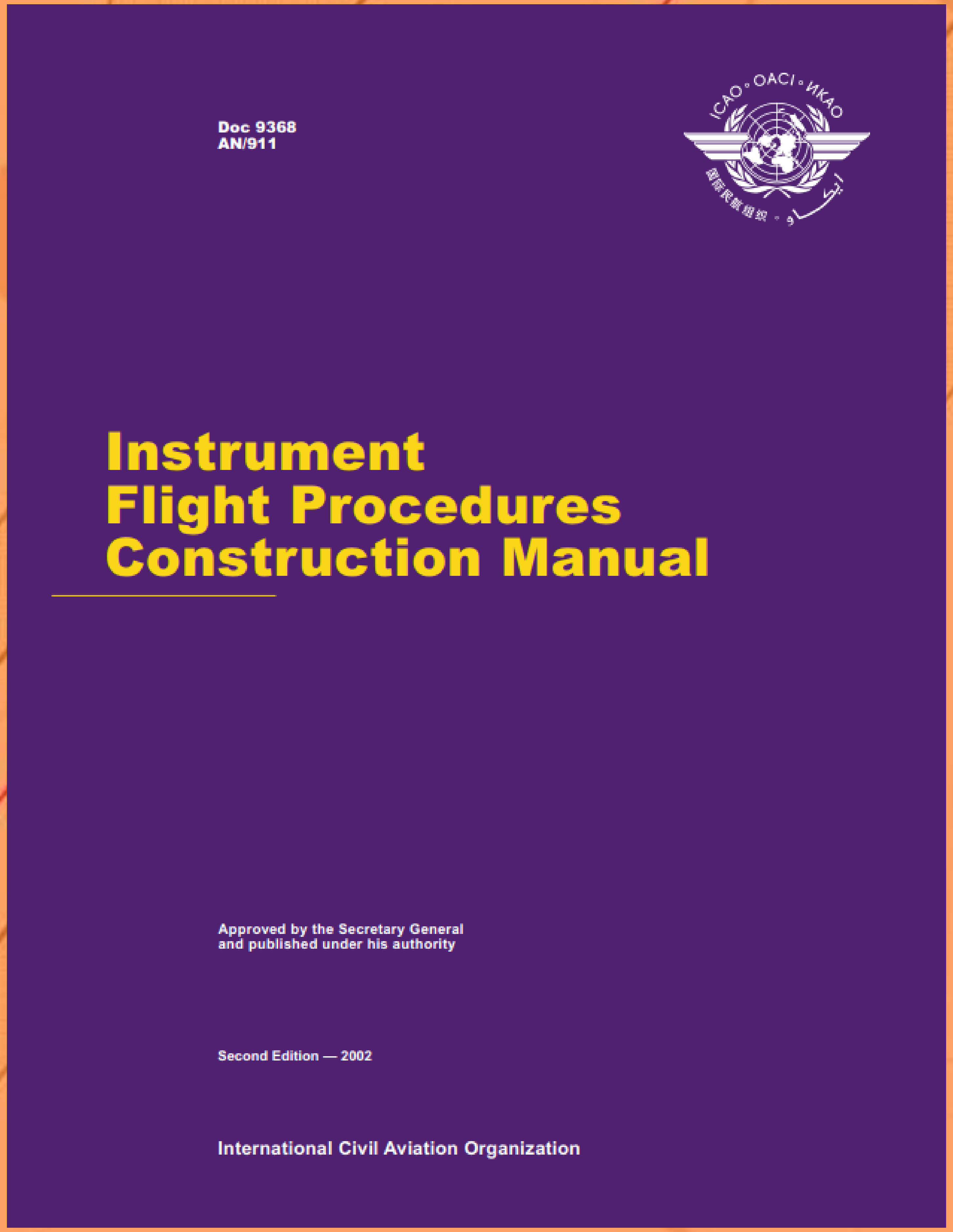
ICAO document hierarchy







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Instrument Flight Procedure Design

Definition and Areas where you can apply it

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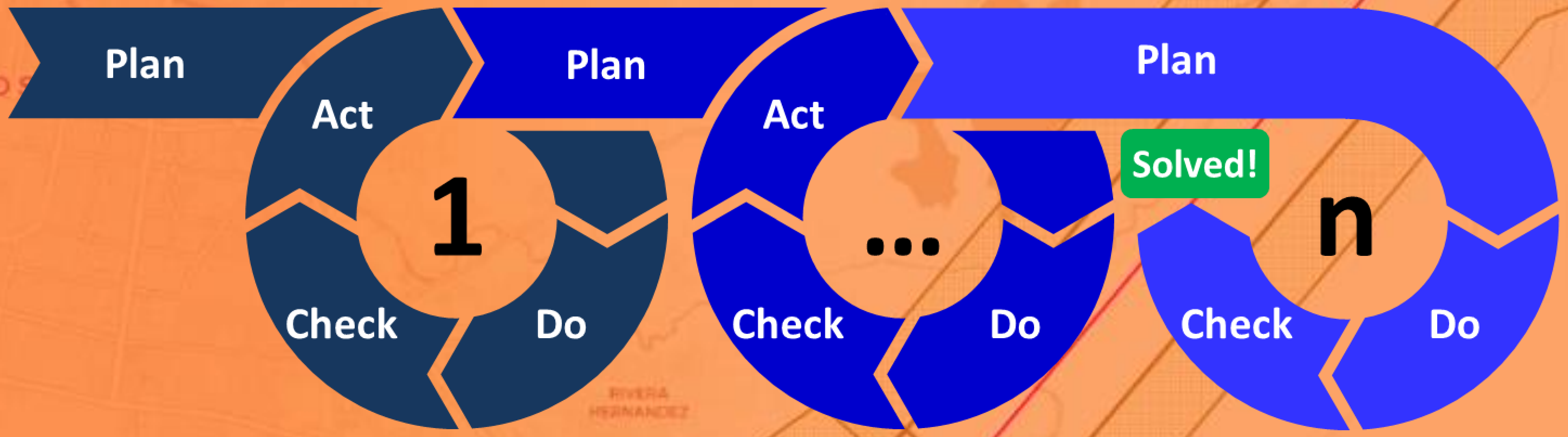
Definition

Instrument flight procedure design (IFPD) can be inferred from the definition provided for Instrument flight procedure design service (IFPDS) and we can say that IFPD is involved in the design, documentation, validation, continuous maintenance and periodic review of instrument flight procedures necessary for the safety, regularity and efficiency of air navigation



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Areas where IFPD can be used

- IFP Design
- 5-Yearly reviews
- OLS review
- Feasibility Studies

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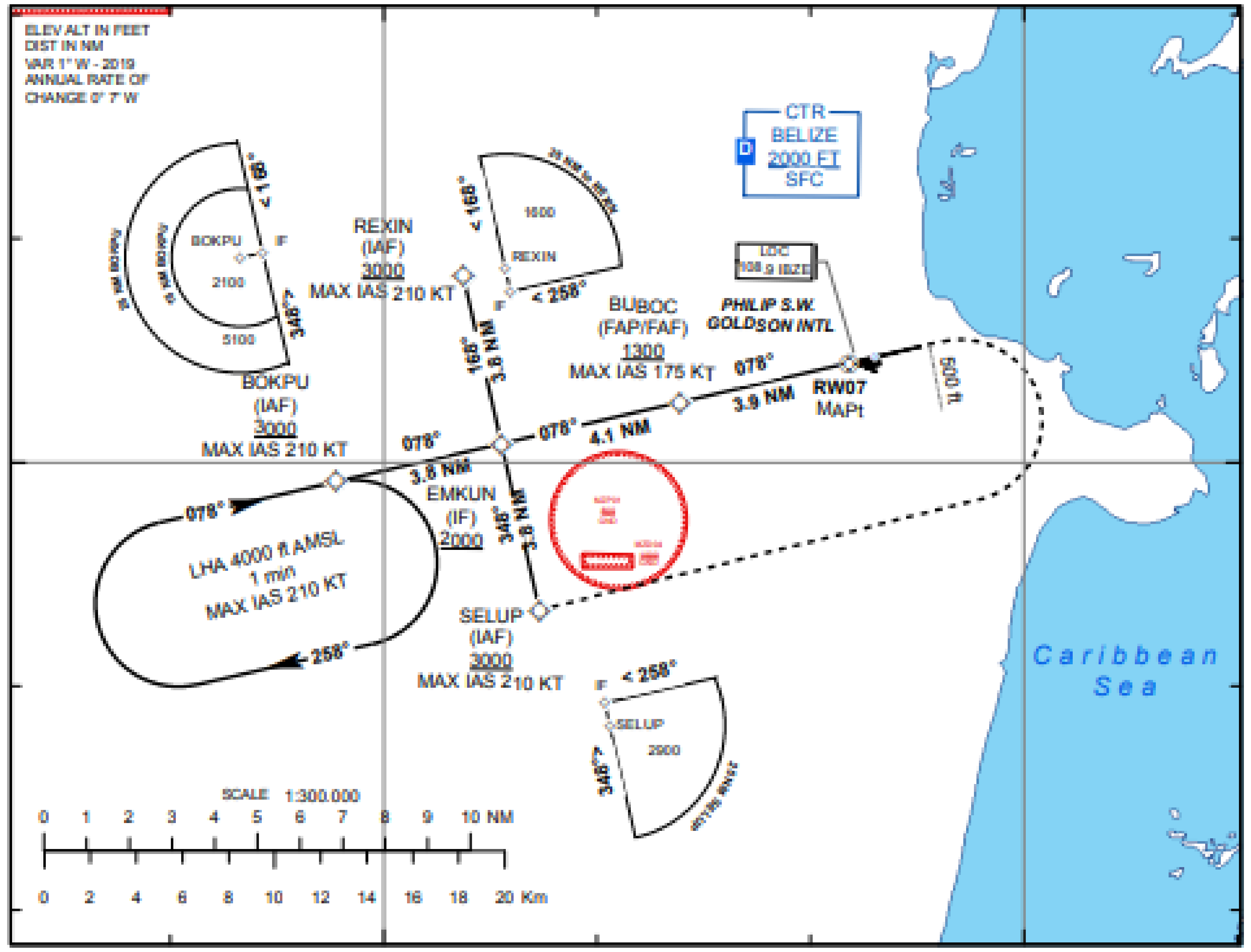
INSTRUMENT APPROACH CHART

AERODROME ELEV 4.57 m (15 ft)
HEIGHTS RELATED TO
THR RWY 07 ELEV 15 ft

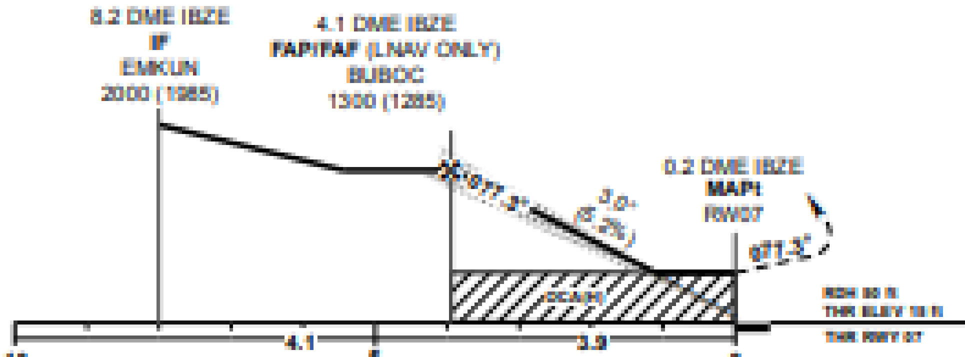
APP	121.0
TWR	118.0
GND	121.9
ATIS	132.75

BELIZE CITY
PHILIP S. W. GOLDSON INTL/
RNAV (GNSS) RWY 07



RECOMMENDED PROFILE - (LNAV 5.2%), 320 ft/NM		
DIST THR	3	2
ALTITUDE	1030 (1015)	710 (695)

TRANSITION ALT 19 500 ft



MISSED APPROACH:
Climb on RWY heading to at or above 500 ft turn Right direct to SELUP +4000 ft and request ATC instructions.

For loss of RNAV capability
Climb on RWY heading to 1500 ft and request ATC instructions.

OCA/H	A	B	C	D
LNAV/VNAV	320 (305)	320 (305)	320 (305)	320 (305)
LNAV	420 (405)	420 (405)	420 (405)	420 (405)
VM(C) OCA	500 (485)	510 (495)	610 (595)	710 (695)

Ground Speed	70	90	100	120	140	160
Rate of Descent FAF-MAPt 3.0° (5.2%)	372	478	531	637	743	849

Note:
1. No Turn before MAPt 2. Timing not authorized for defining the MAPt 3. NM to/from THR RWY 07 4. Visual Circling not allowed North of Runway
5. BARO-VNAV NOT AVAILABLE BELOW 0°C

CHANGES: EDITORIALS, VAR MAG AND HDG

INSTRUMENT APPROACH CHART

AERODROME ELEV 4.57 m (15 ft)
HEIGHTS RELATED TO
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BELIZE CITY
PHILIP S. W. GOLDSON INTL/
RNAV (GNSS) RWY 07

IAF REXIN

Designator	Path Descriptor	Waypoint Identifier	Latitude	Longitude	Flyover	Course °M (°T)	Turn Direction	Altitude (ft)	Distance (Nm)	Speed Limit (Kt)	Magnetic Variation	VPA(°)/ TCH (ft)	Navigation Specification
RNAV (GNSS) RWY07	IF	REXIN	173407.9423N	0882808.2145W	-	-	-	+ 3 000	-	210	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	EMKUN	173024.8410N	0882714.7734W	-	168 (167.1)	L	+ 2 000	3.8	-	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	BUBOC	173120.1927N	0882303.9023W	-	078 (077.0)	-	+ 1 300	4.1	-	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	RW07	173212.8422N	0881905.2488W	Y	078 (077.0)	-	@ 65	3.9	-	1°00' W	-3°/50'	RNP APCH
RNAV (GNSS) RWY07	CA	-	-	-	-	078 (077.0)	-	+ 500	-	175	-	-	RNP APCH
RNAV (GNSS) RWY07	DF	SELUP	172641.7344N	0882621.3685W	-	-	-	+ 4 000	-	210	1°00' W	-	RNP APCH

IAF BOKPU

Designator	Path Descriptor	Waypoint Identifier	Latitude	Longitude	Flyover	Course °M (°T)	Turn Direction	Altitude (ft)	Distance (Nm)	Speed Limit (Kt)	Magnetic Variation	VPA(°)/ TCH (ft)	Navigation Specification
RNAV (GNSS) RWY07	IF	BOKPU	172933.5424N	0883107.2699W	-	-	-	+ 3 000	-	210	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	EMKUN	173024.8410N	0882714.7734W	-	078 (077.0)	-	+ 2 000	3.8	-	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	BUBOC	173120.1927N	0882303.9023W	-	078 (077.0)	-	+ 1 300	4.1	-	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	RW07	173212.8422N	0881905.2488W	Y	078 (077.0)	-	@ 65	3.9	-	1°00' W	-3°/50'	RNP APCH
RNAV (GNSS) RWY07	CA	-	-	-	-	078 (077.0)	-	+ 500	-	175	-	-	RNP APCH
RNAV (GNSS) RWY07	DF	SELUP	172641.7344N	0882621.3685W	-	-	-	+ 4 000	-	210	1°00' W	-	RNP APCH

IAF SELUP

Designator	Path Descriptor	Waypoint Identifier	Latitude	Longitude	Flyover	Course °M (°T)	Turn Direction	Altitude (ft)	Distance (Nm)	Speed Limit (Kt)	Magnetic Variation	VPA(°)/ TCH (ft)	Navigation Specification
RNAV (GNSS) RWY07	IF	SELUP	172641.7344N	0882621.3685W	-	-	-	+ 3 000	-	210	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	EMKUN	173024.8410N	0882714.7734W	-	348 (347.1)	R	+ 2 000	3.8	-	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	BUBOC	173120.1927N	0882303.9023W	-	078 (077.0)	-	+ 1 300	4.1	-	1°00' W	-	RNP APCH
RNAV (GNSS) RWY07	TF	RW07	173212.8422N	0881905.2488W	Y	078 (077.0)	-	@ 65	3.9	-	1°00' W	-3°/50'	RNP APCH
RNAV (GNSS) RWY07	CA	-	-	-	-	078 (077.0)	-	+ 500	-	175	-	-	RNP APCH
RNAV (GNSS) RWY07	DF	SELUP	172641.7344N	0882621.3685W	-	-	-	+ 4 000	-	210	1°00' W	-	RNP APCH

CHANGES: EDITORIALS, VAR MAG AND HDG

Instrument approach procedure (IAP)

A series of predetermined maneuvers by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply.

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Conventional vs RNAV vs PBN

What is the difference?

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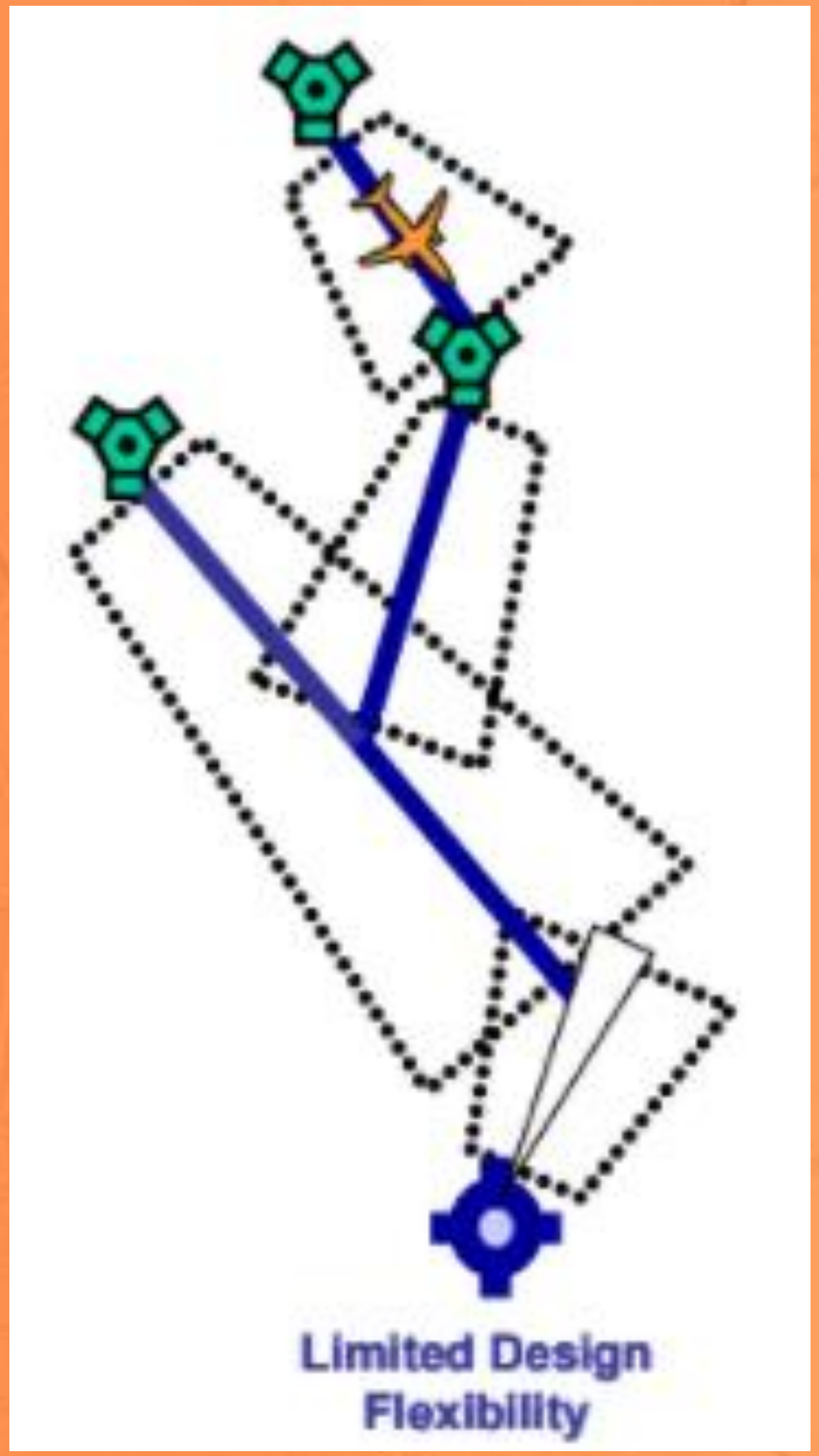
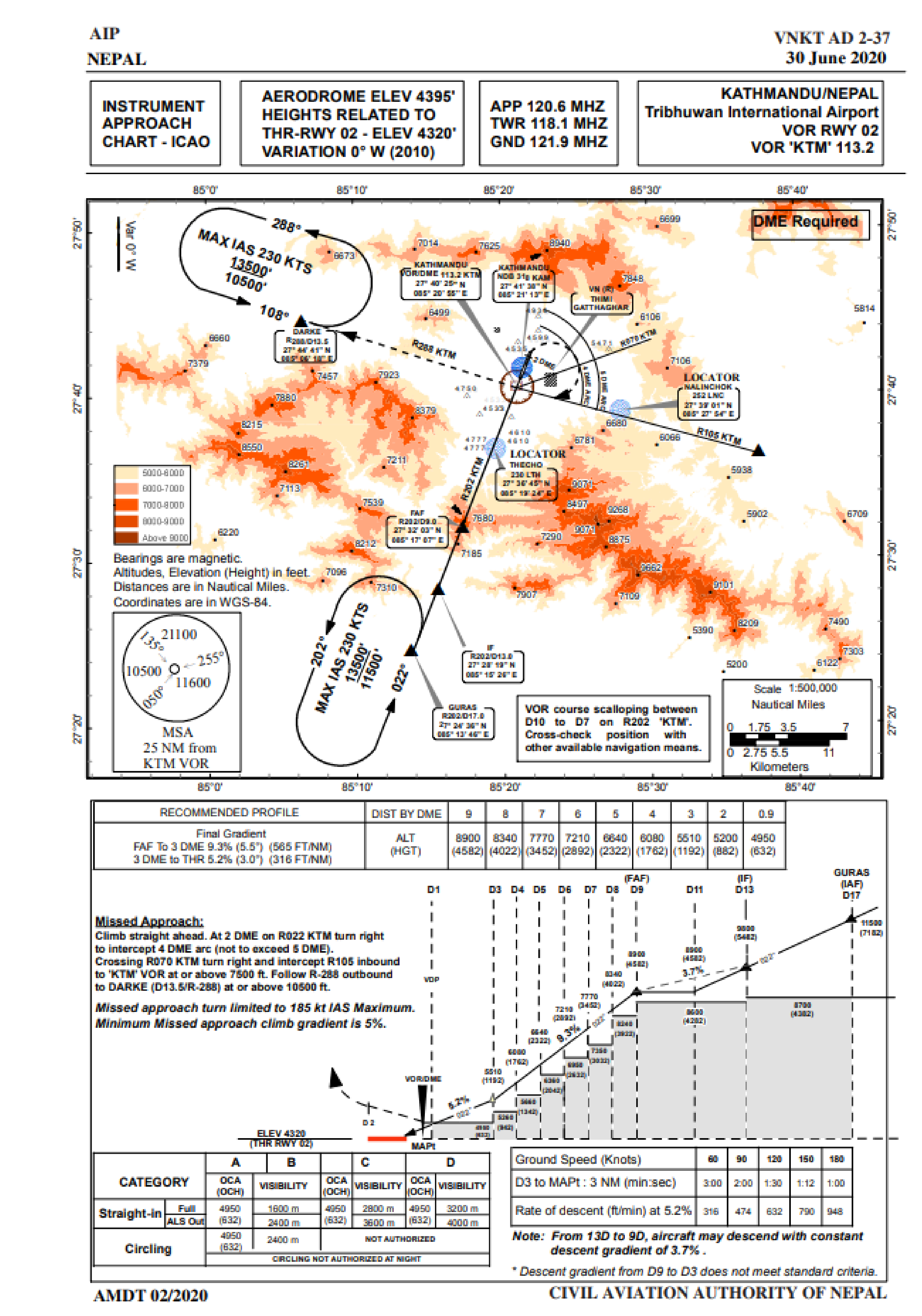
Conventional Navigation





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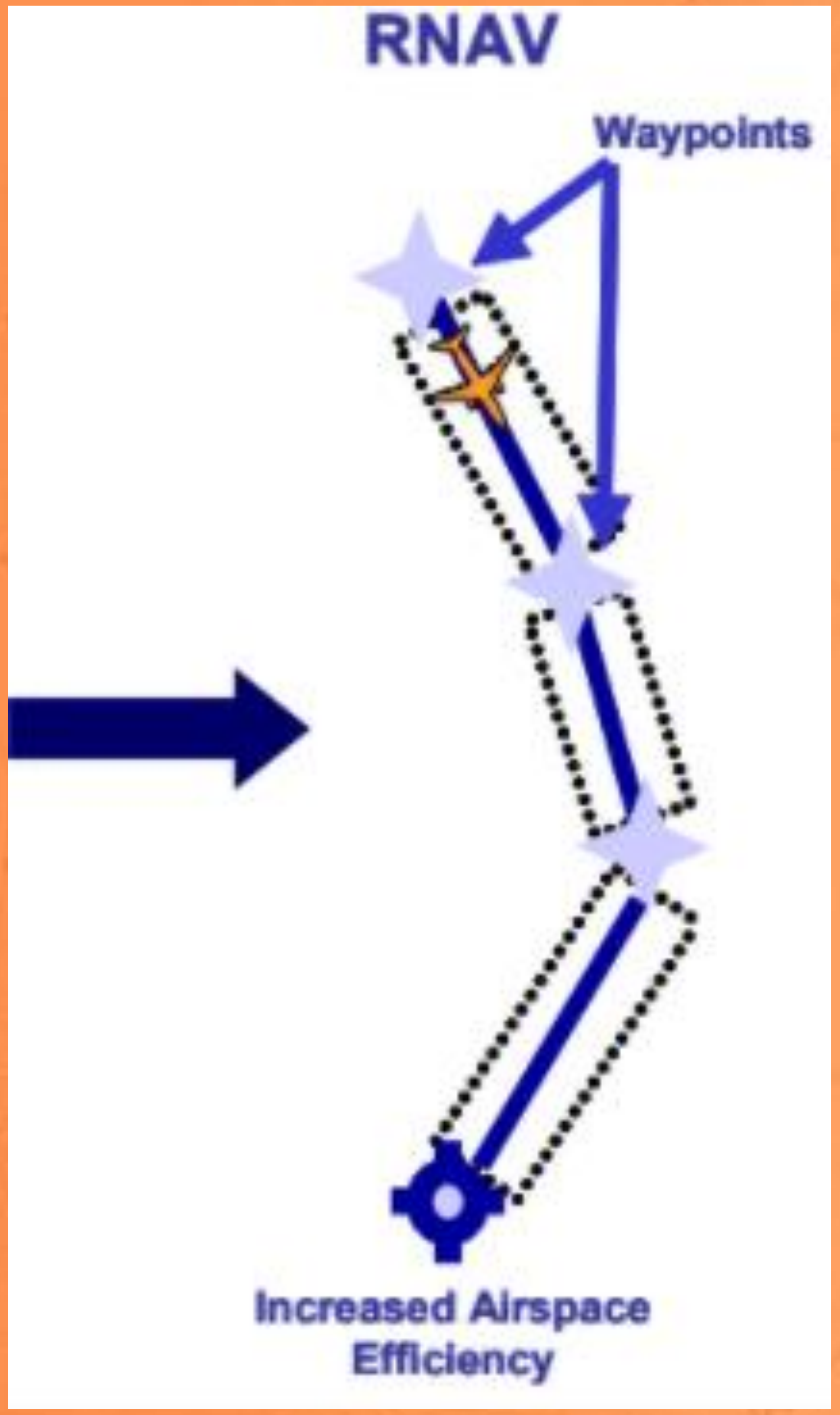
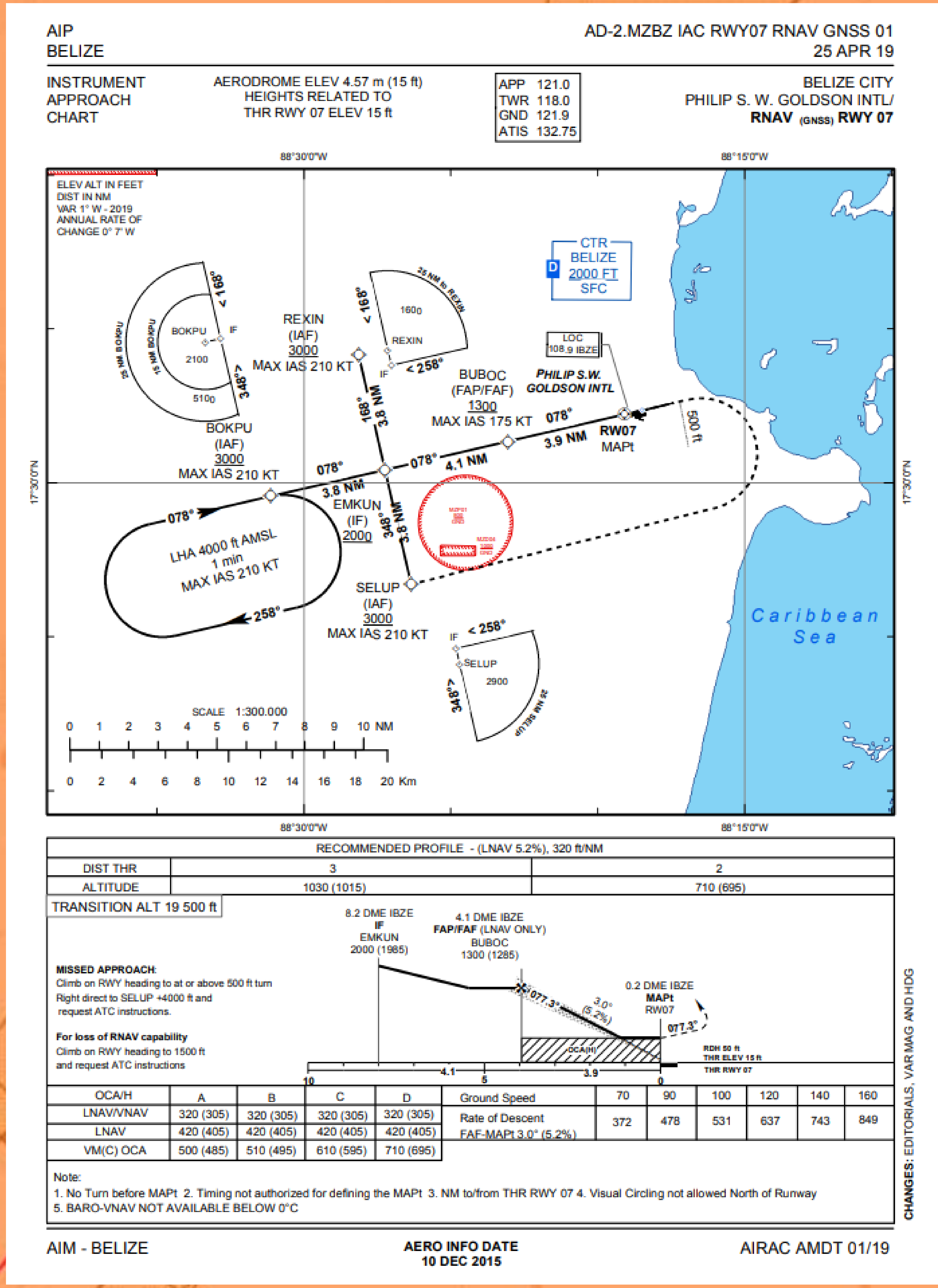
Area Navigation (RNAV)





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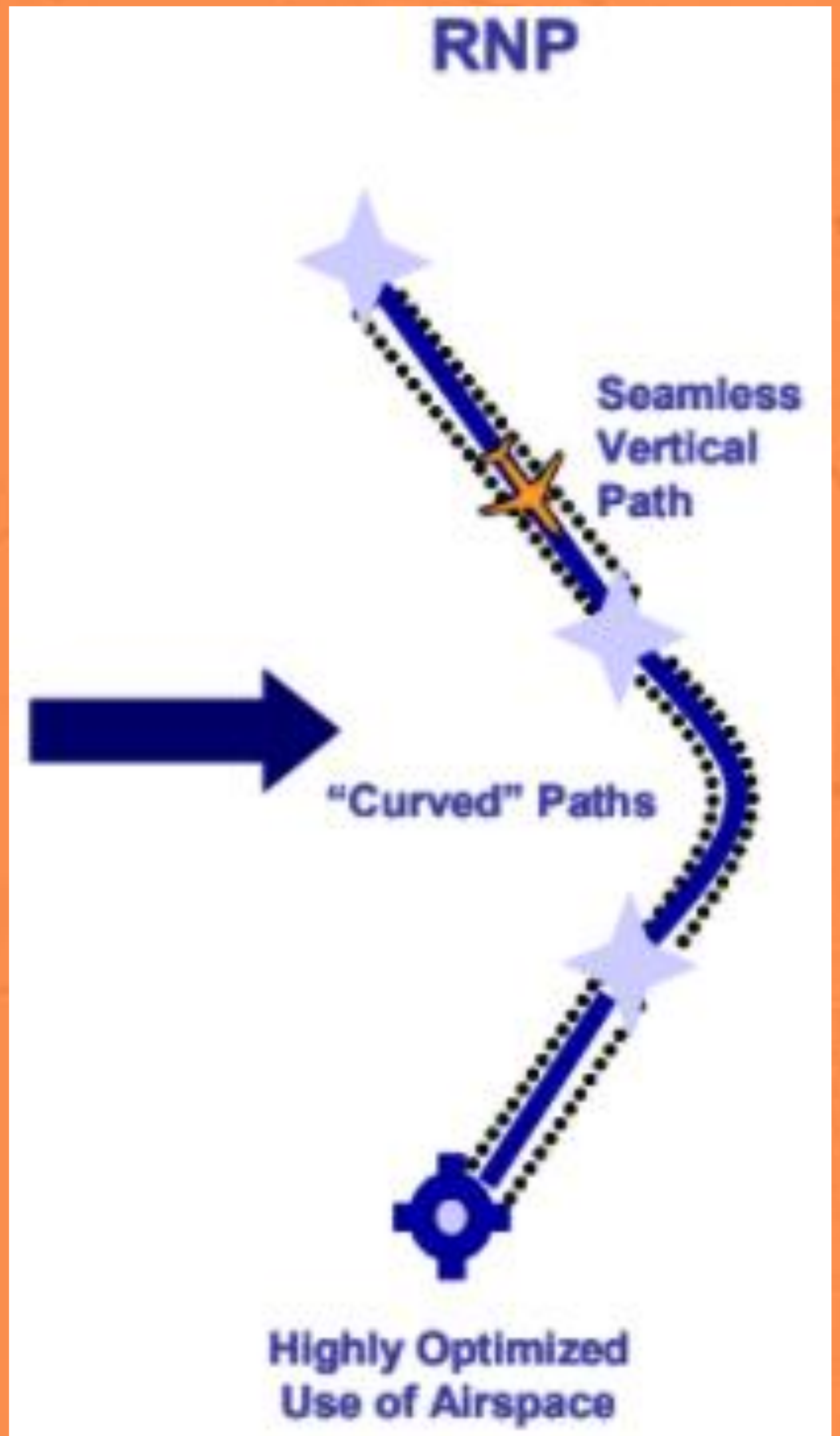
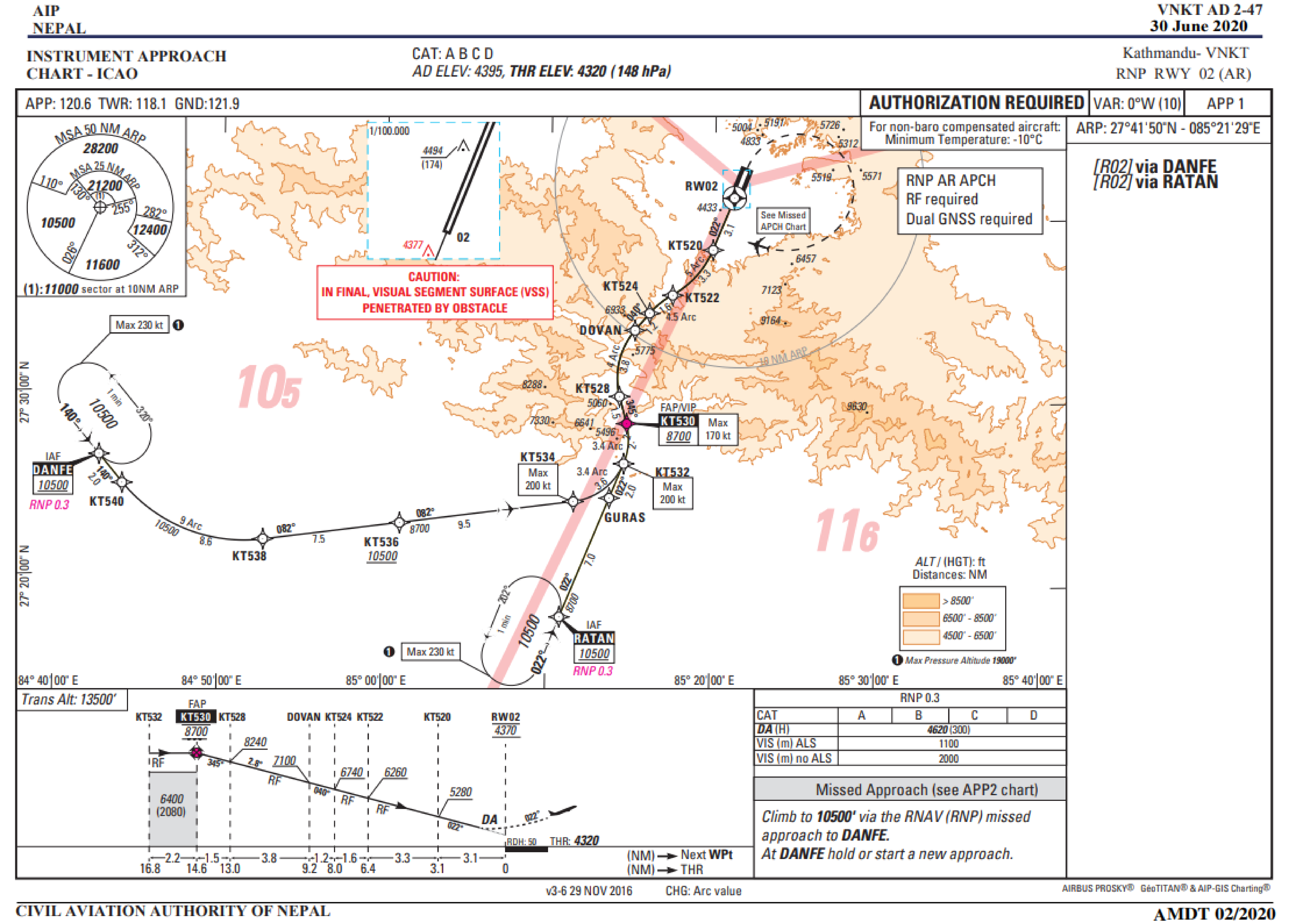
Required Navigation Performance (RNP)





CAT	A	B	C	D
DA (H)	4620 (300)			
VIS (m) ALS	1100			
VIS (m) no ALS	2000			

Basic PANS-OPS Principles

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Important

The design of procedures in accordance with PANS-OPS criteria assumes normal operations.

It is the responsibility of the operator to provide contingency procedures for abnormal and emergency operations

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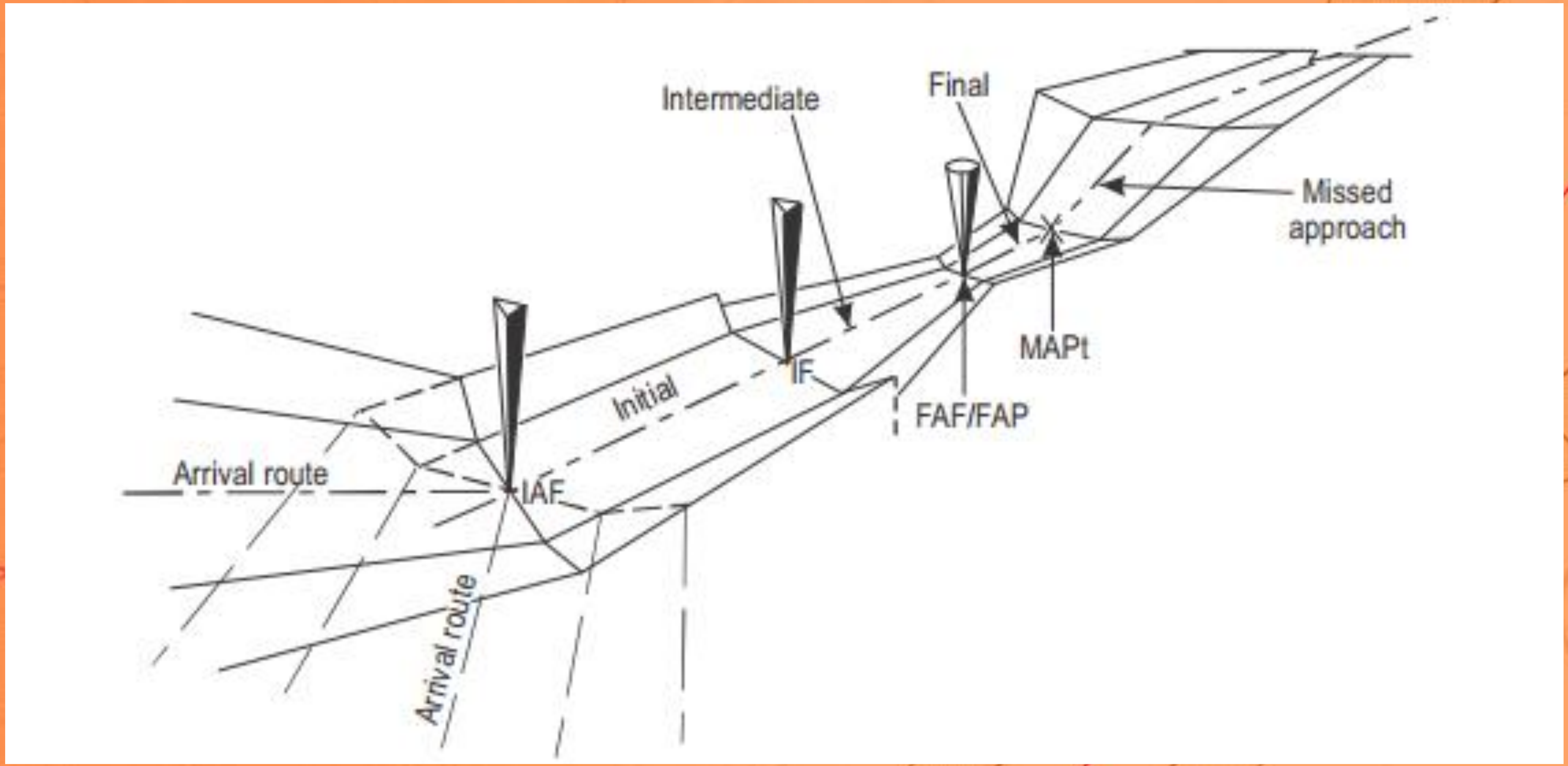
Segments of Instrument Approach Procedures



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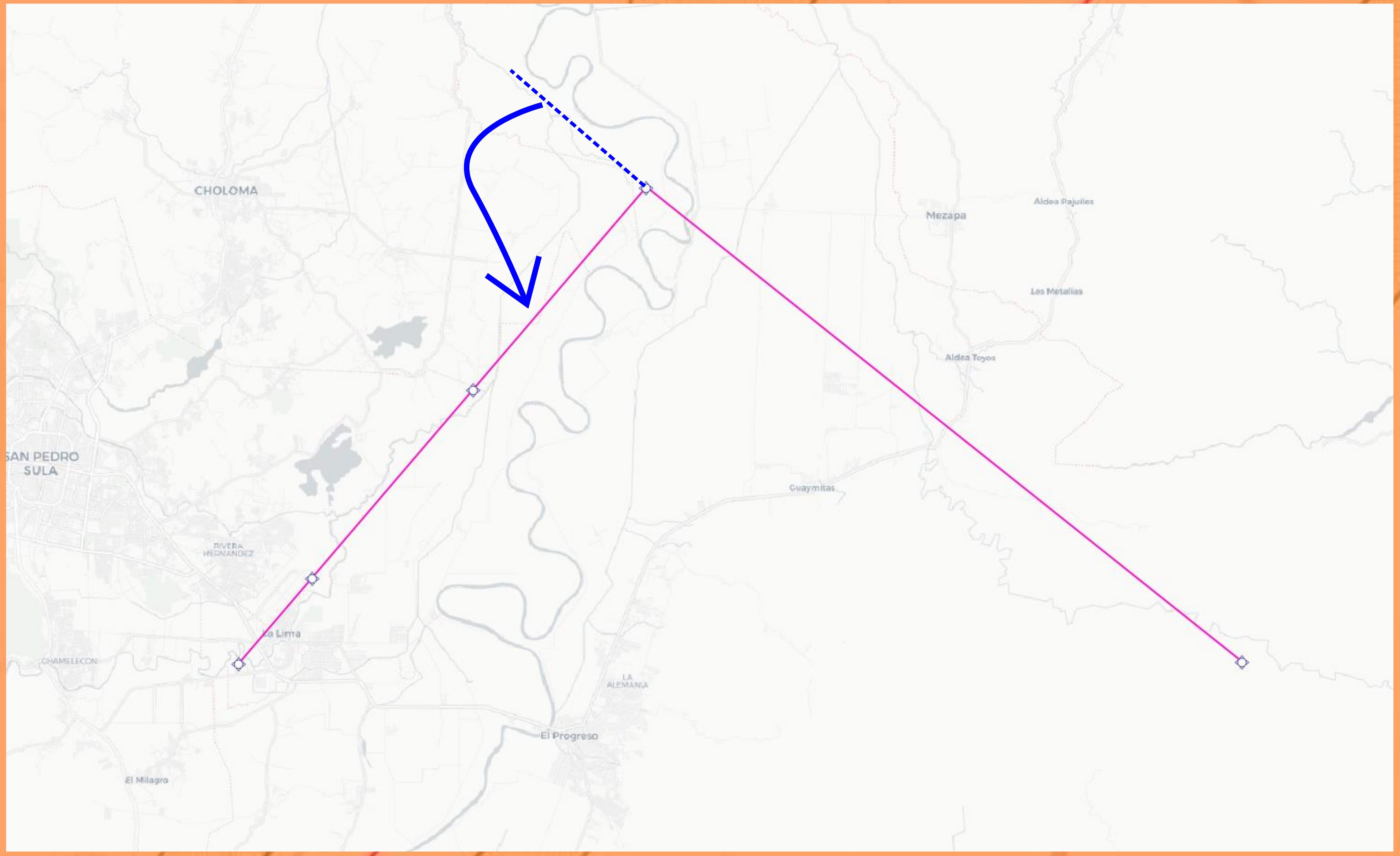
Alignment

This is the angle we have in between one segment and the next segment.

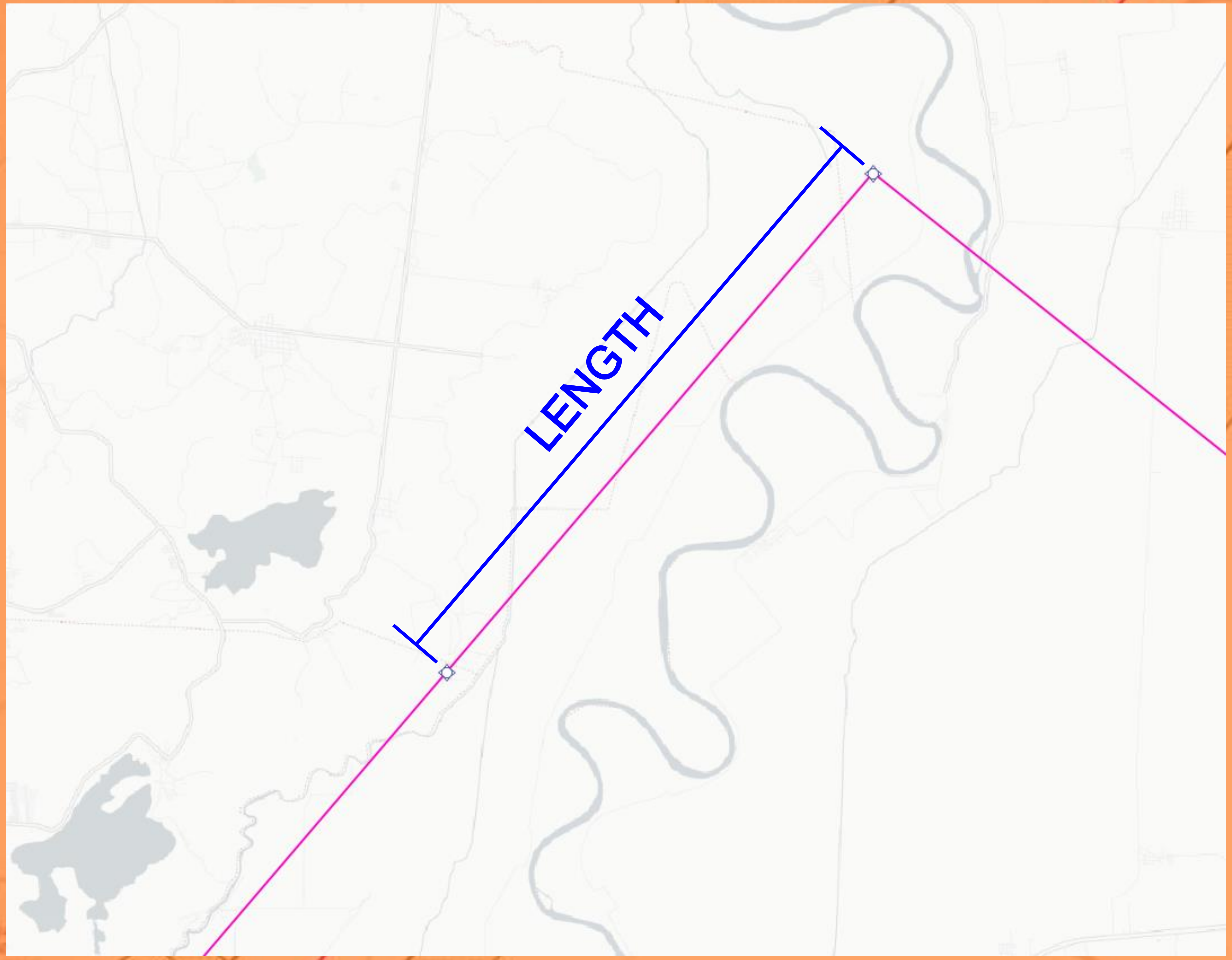
What we are looking for is that a maximum angle of turn is never to be exceeded and this will depend on the type of procedure and in what part of the procedure the aircraft is



Length

Each track that we design has a distance between the start and the end points.

The length needs to accommodate any descent that we require, and it is influenced by the gradient if its is acceptable or not and in PBN the minimum stabilization distance is also a factor



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Gradient

The change in altitude divided by the overall length or the rise over run is one of those criteria that will make us iterate over the length specially in challenging terrain

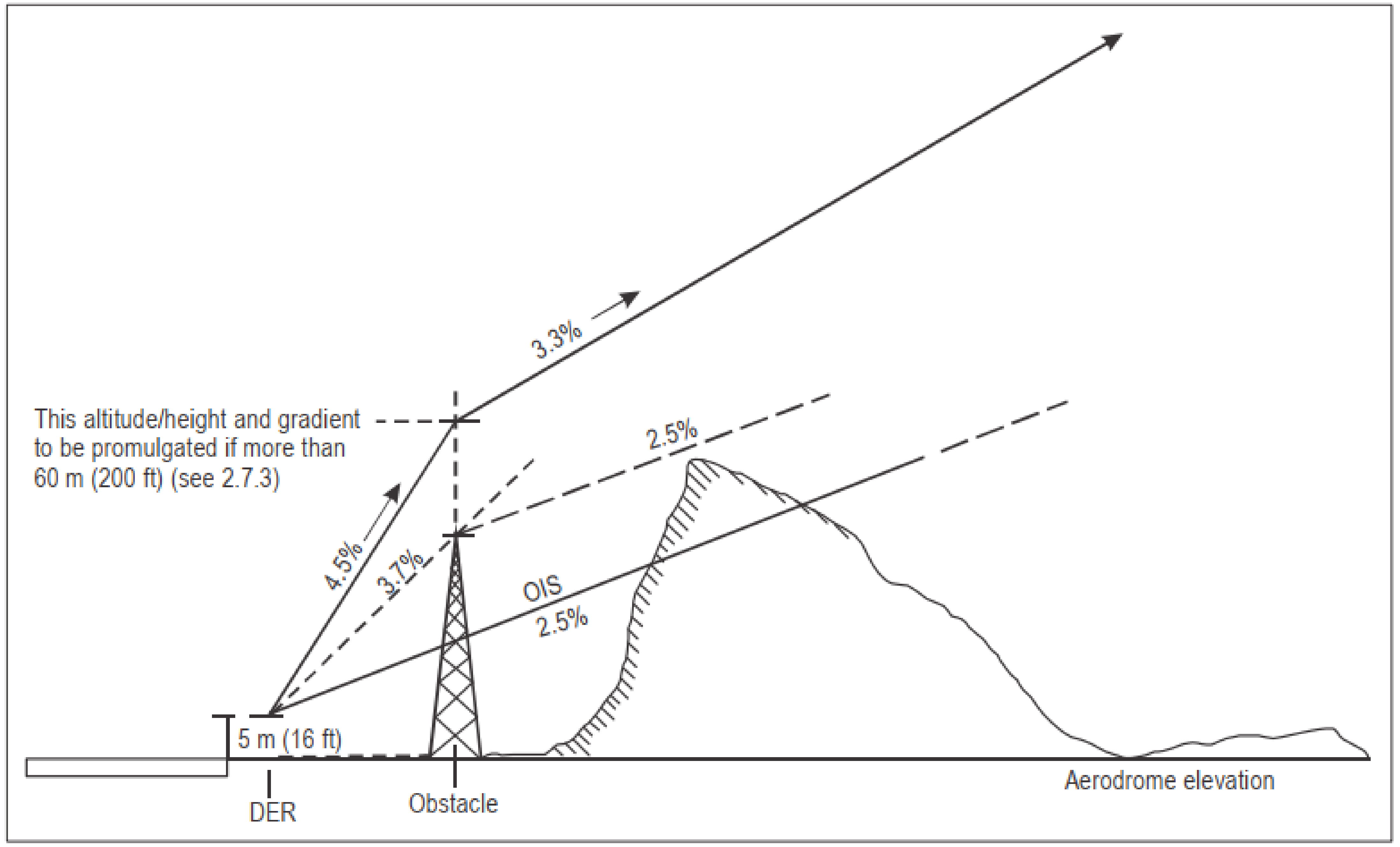

Figure I-3-2-2. Procedure design gradient

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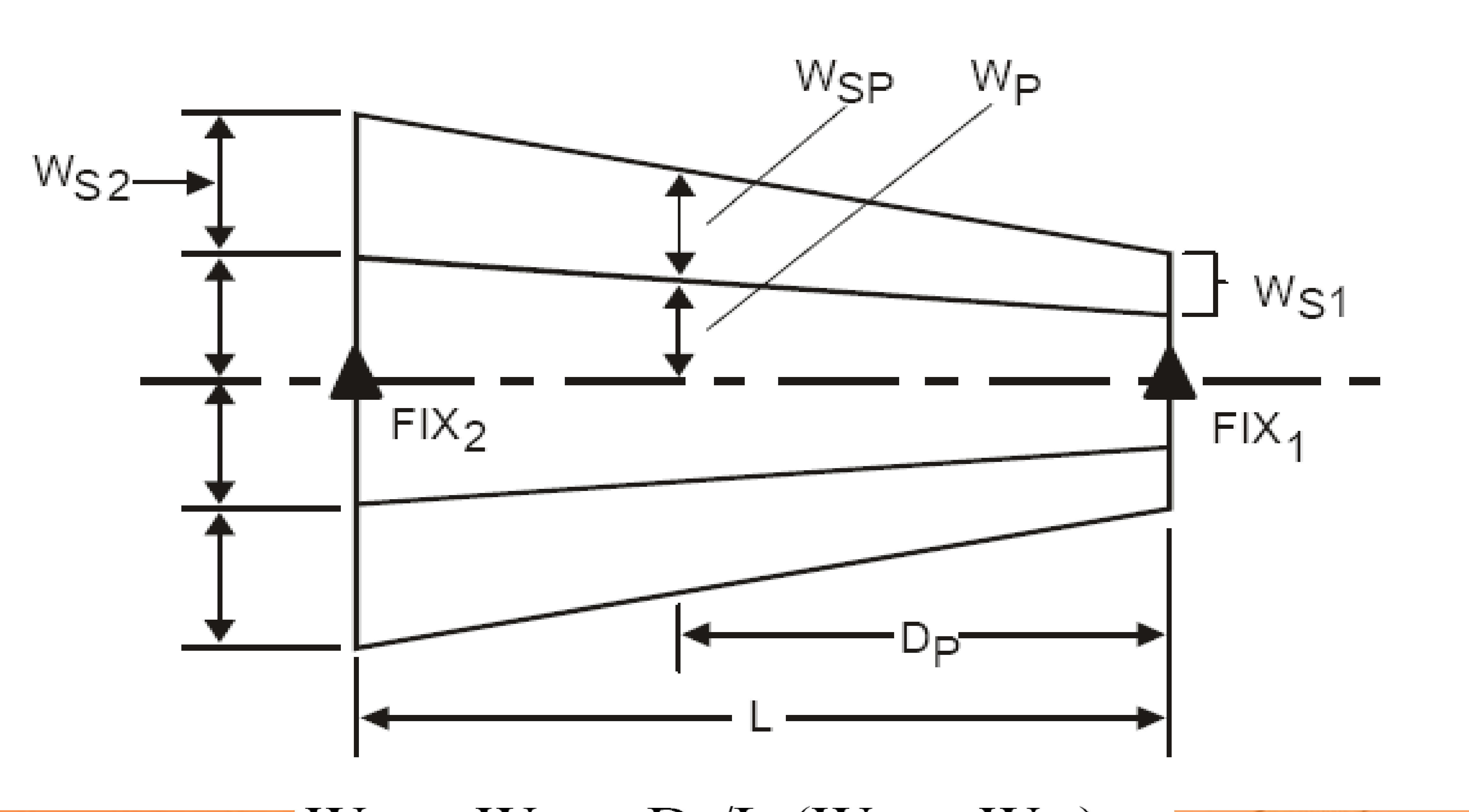
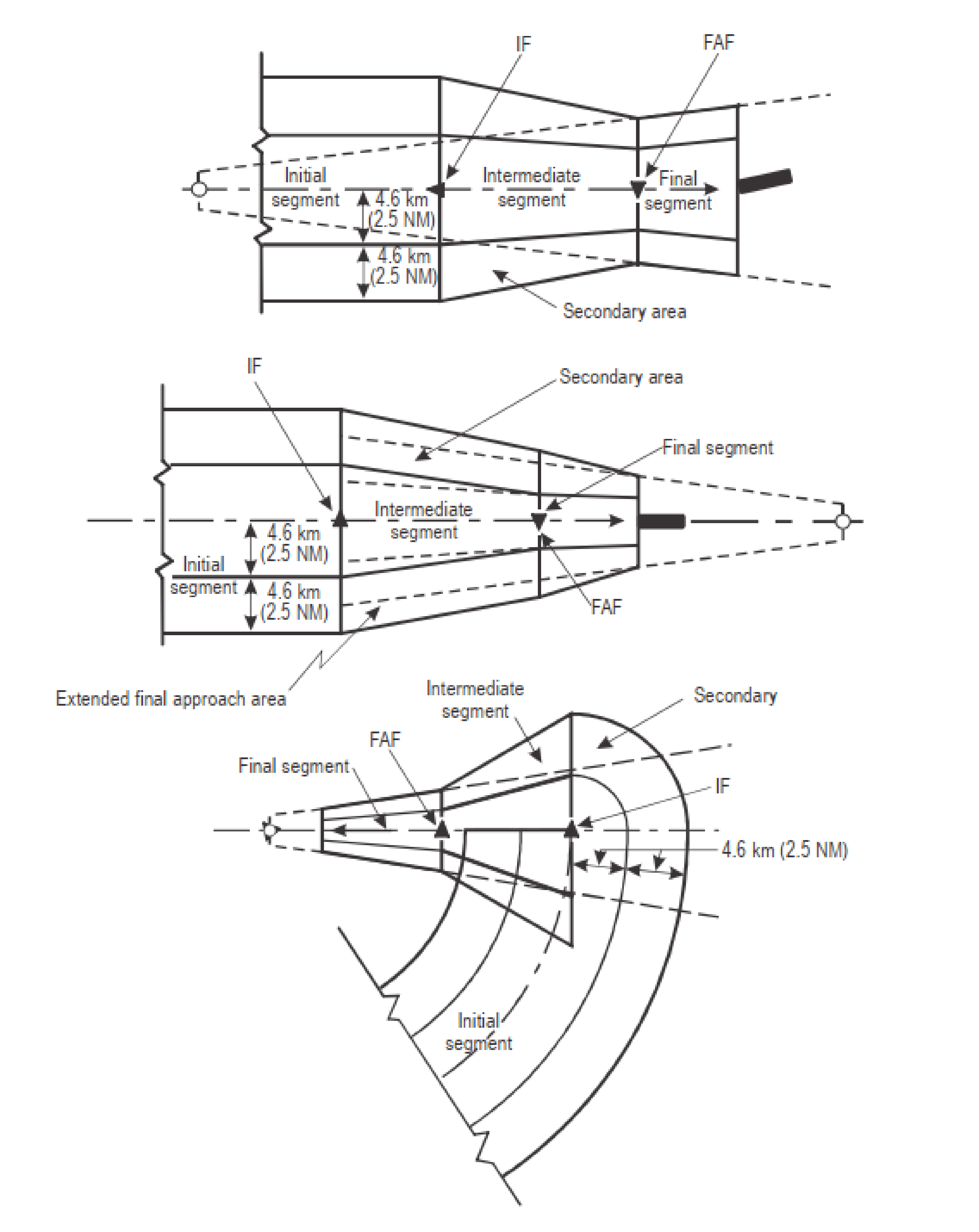
Area



$$W_{sp} = W_{s1} + D_p/L\ (W_{s2} - W_{s1})$$

Area



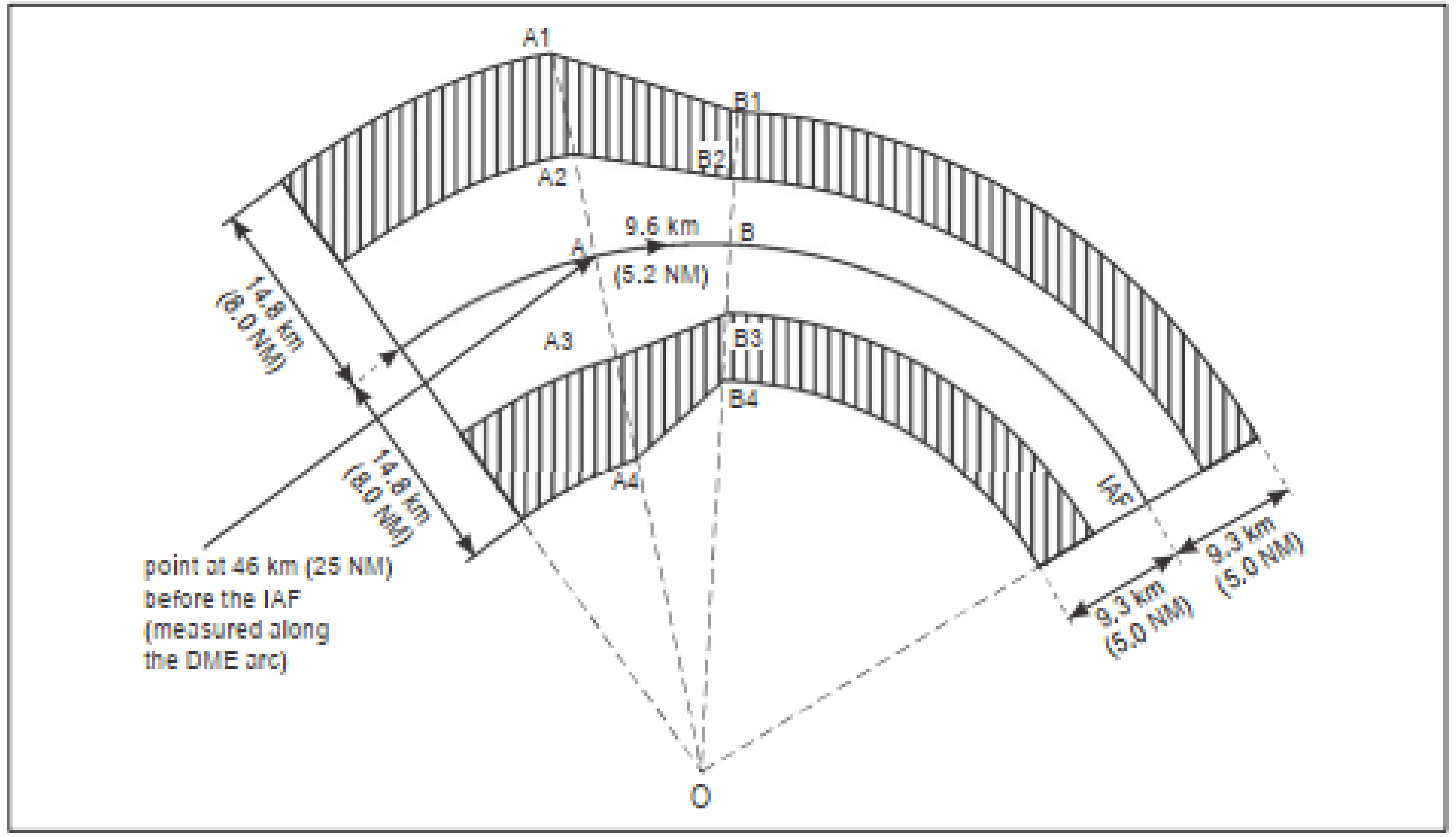


Figure I-4-2-3. DME arc — length of the arrival segment greater than or equal to 46 km (25 NM)

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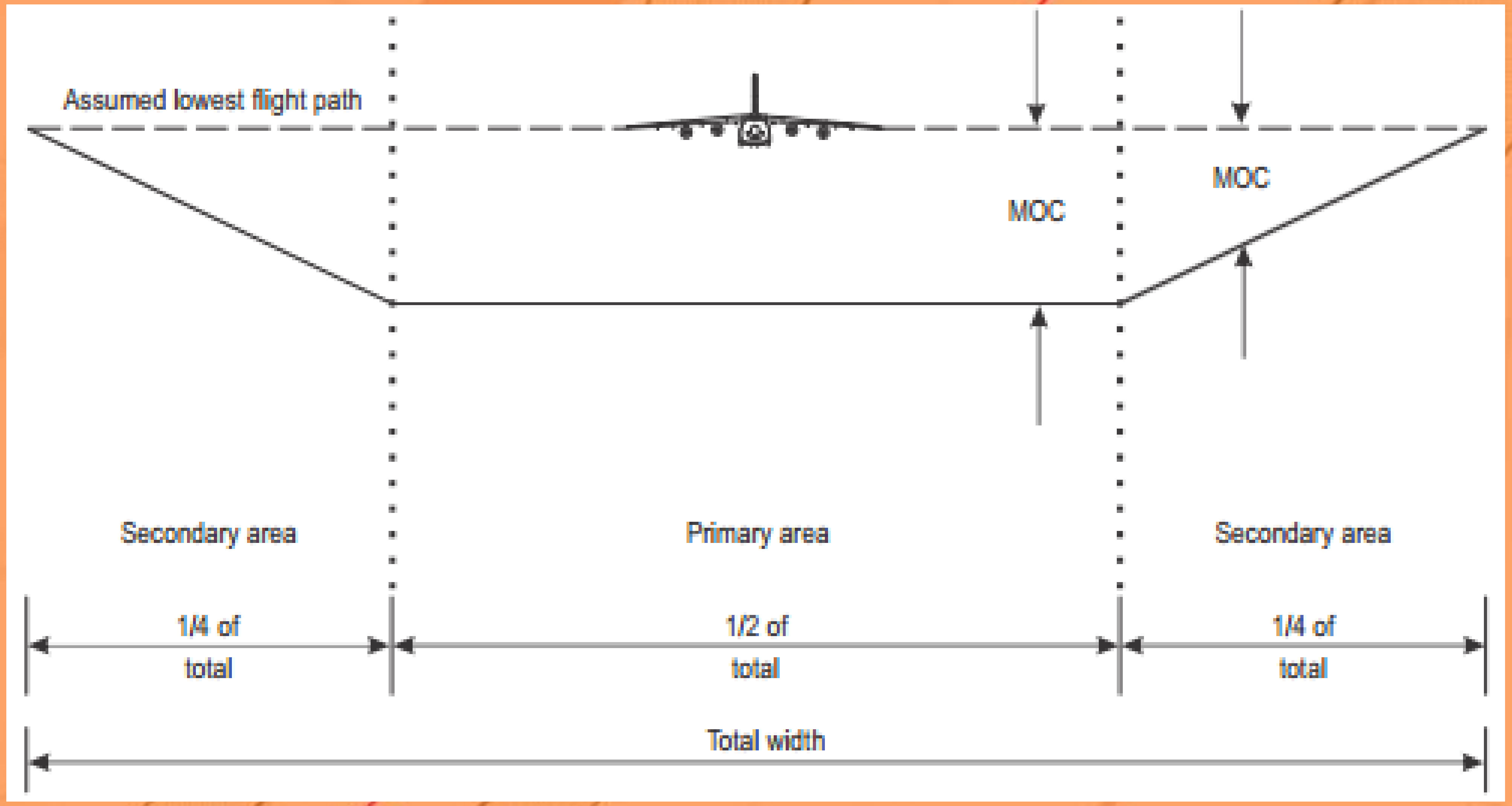
Minimum Obstacle Clearance (MOC)

The MOC is the minimum obstacle clearance will provide the vertical distance that we need to apply that will allow to fly the aircraft safely over terrain or obstacles.

There are different variables that were factored in when determining the values that are applicable that included the terrain, aircraft characteristics and pilot ability, so the values that are mentions in PANS OPS are to be considered the minimum which included also considerations for communications (COM) and aerodromes and ground aids (AGA) so they can't be reduced further in a safe way.

In the primary areas the **full** MOC is to be applied while in the secondary areas we will reduce this value linearly from 100% at the edge of the primary area to 0% at the outer edge of the secondary area, always considering perpendicular to the nominal track.



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Sample MOC applied per segment

Initial	300m	
Intermediate	150m	
NPA Final Approach	75m (with FAF) / 90m (without a FAF)	
Missed Approach		
	- Initial Phase	Same as Final Approach*
	- Intermediate Phase	30m
	- Final Phase	50m

*** There is an exception if the extension of the intermediate missed approach surface backwards requires less clearance**

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Mountainous Area

What is it?

How do we calculate it?

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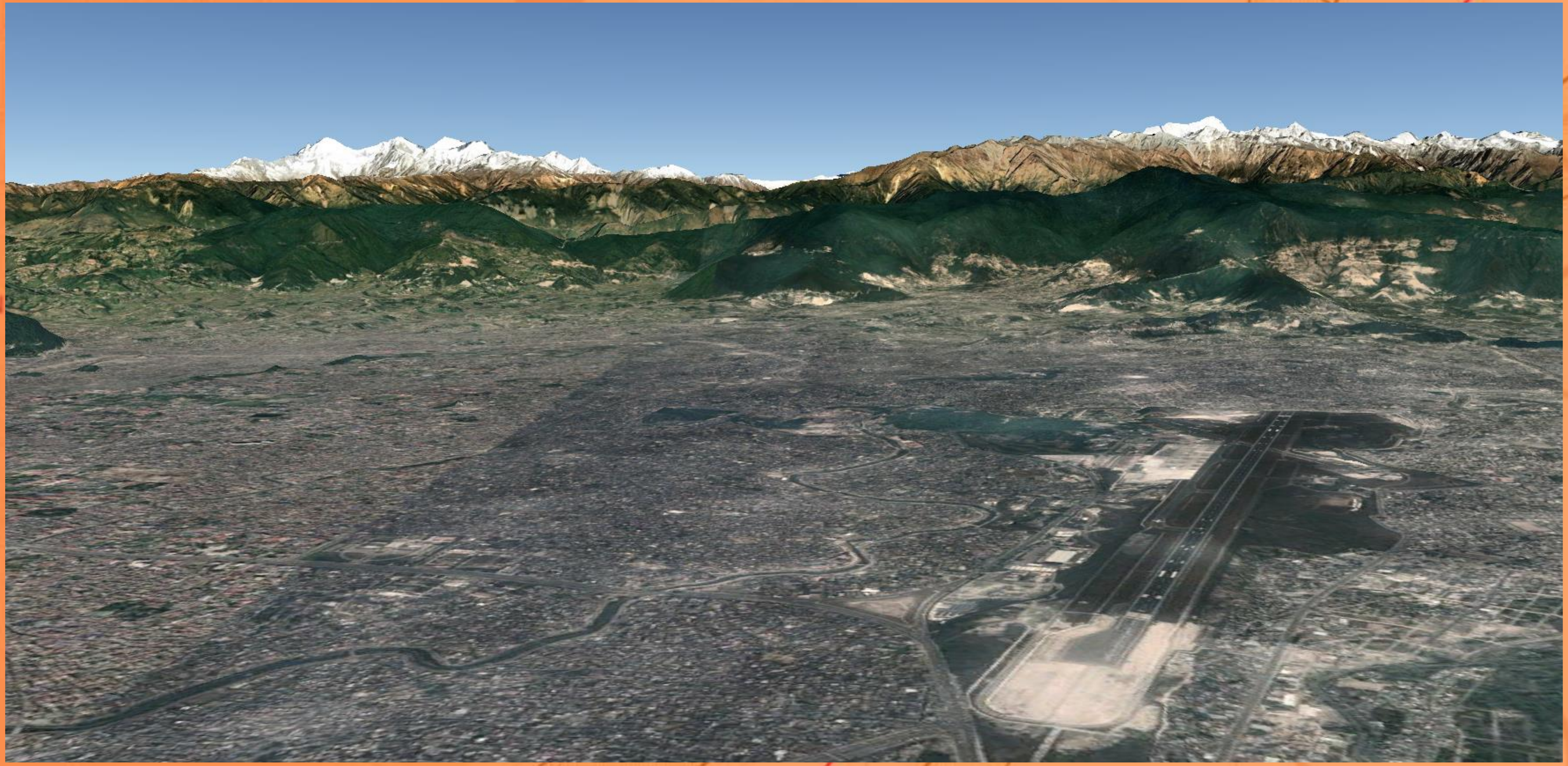
What do we have to do in mountainous areas?

In mountainous areas due to the nature of the terrain there are considerations like altimeter error and pilot control issues due to bad weather (winds over 20KTS) that will require the increase of the MOC by as much as 100%



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Mountainous Terrain

1.3.2 MOC in mountainous areas

1.3.2.1 In mountainous areas, the MOC shall be increased, depending on variation in terrain elevation as shown in the table below. The MOC in the buffer area is half the value of the primary area MOC (see Figure II-3-1-1).

Elevation	*MOC*
Between 900 m (3 000 ft) and 1 500 m (5 000 ft)	450 m (1 476 ft)
Greater than 1 500 m (5 000 ft)	600 m (1 969 ft)

1.3.2.2 Mountainous areas shall be identified by the State and promulgated in the State Aeronautical Information Publication (AIP), section GEN 3.3.5, “Minimum flight altitude”.

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What exactly are mountainous areas?

Mountainous area

An area of changing terrain profile where the changes of terrain elevation exceed 900 m (3 000 ft) within a distance of 18.5 km (10.0 NM).

The increased used and areas of applicability is to be published in the Aeronautical Information Publication (AIP) GEN 3.3.5 Minimum Flight Altitude

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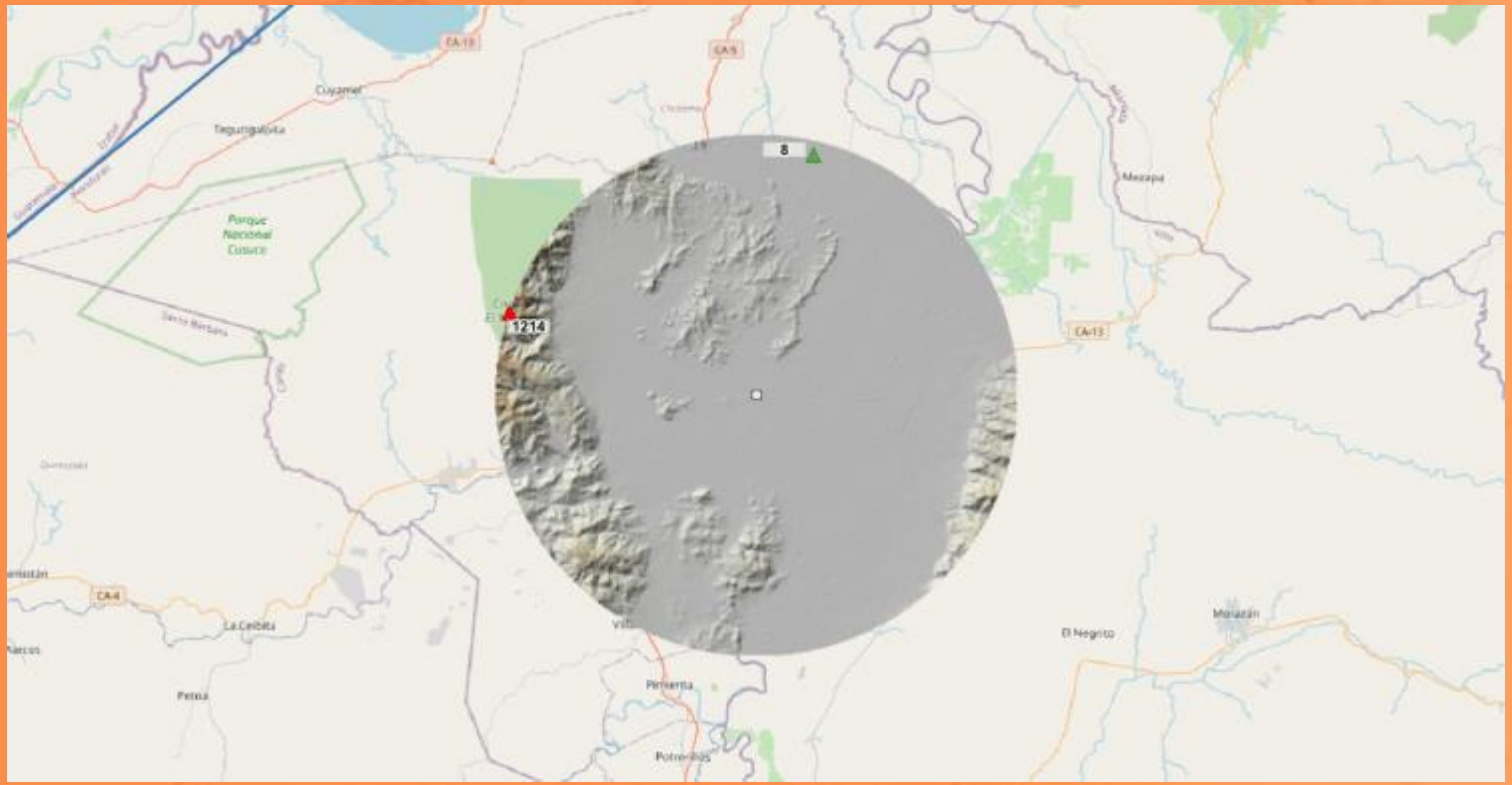
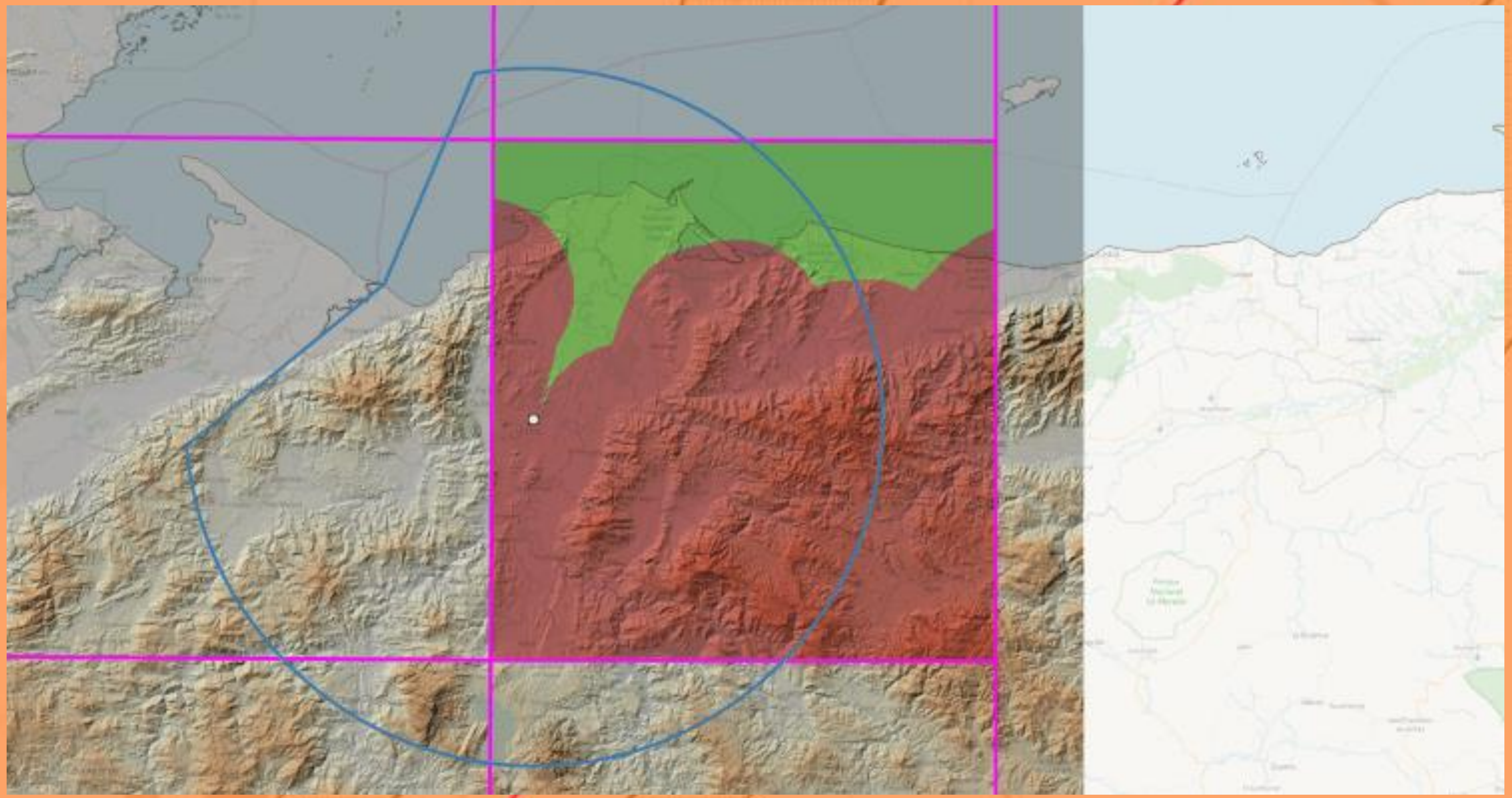
Mountainous Area Calculation





https://flyght7.com/pans-ops-mountainous-area-calculation-for-instrument-flight-procedure-design-ifpd-part-i/

https://flyght7.com/pans-ops-mountainous-area-calculation-for-instrument-flight-procedure-design-ifpd-part-ii/

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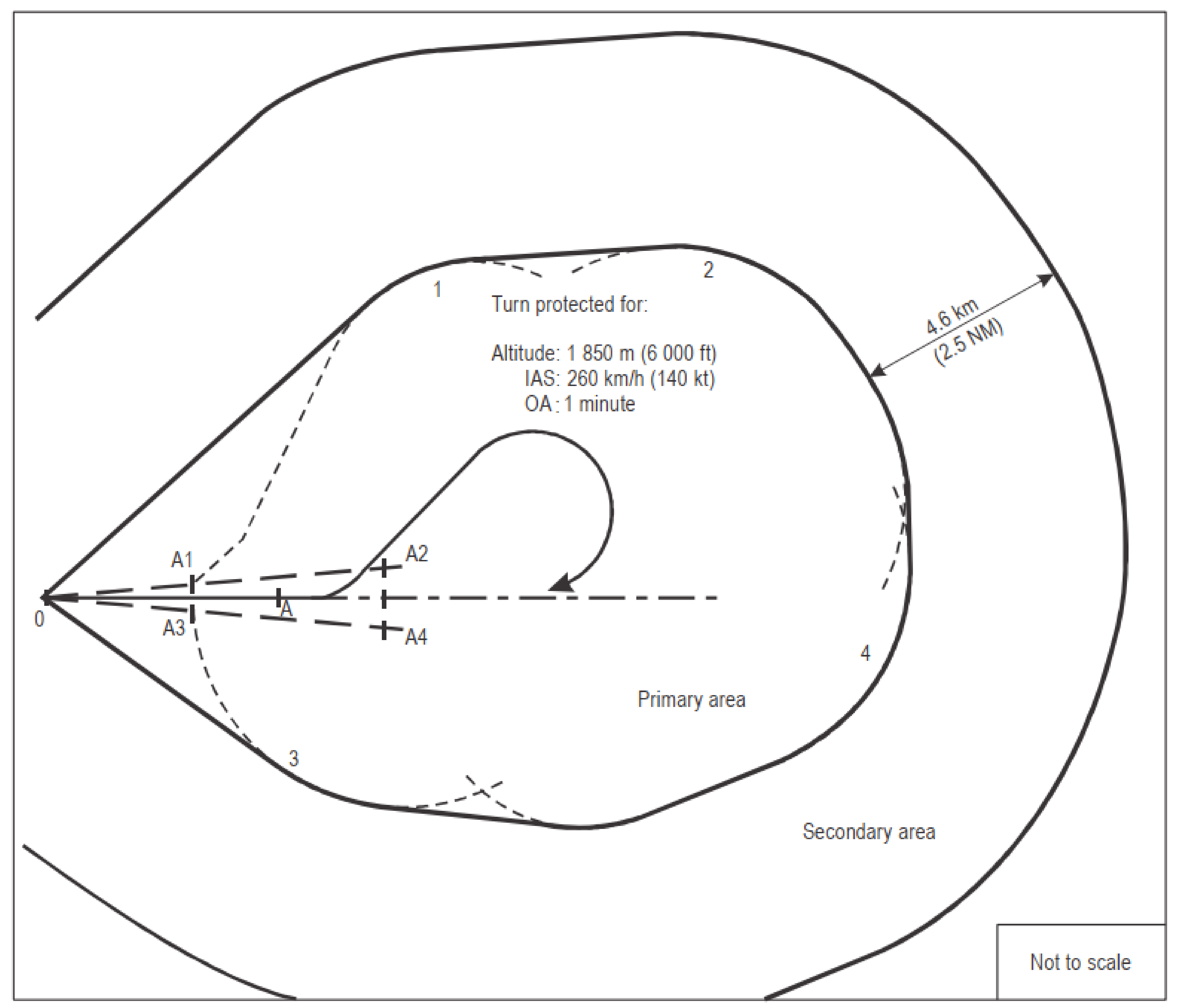
What about turns?

Wind Spirals

Turn Protection



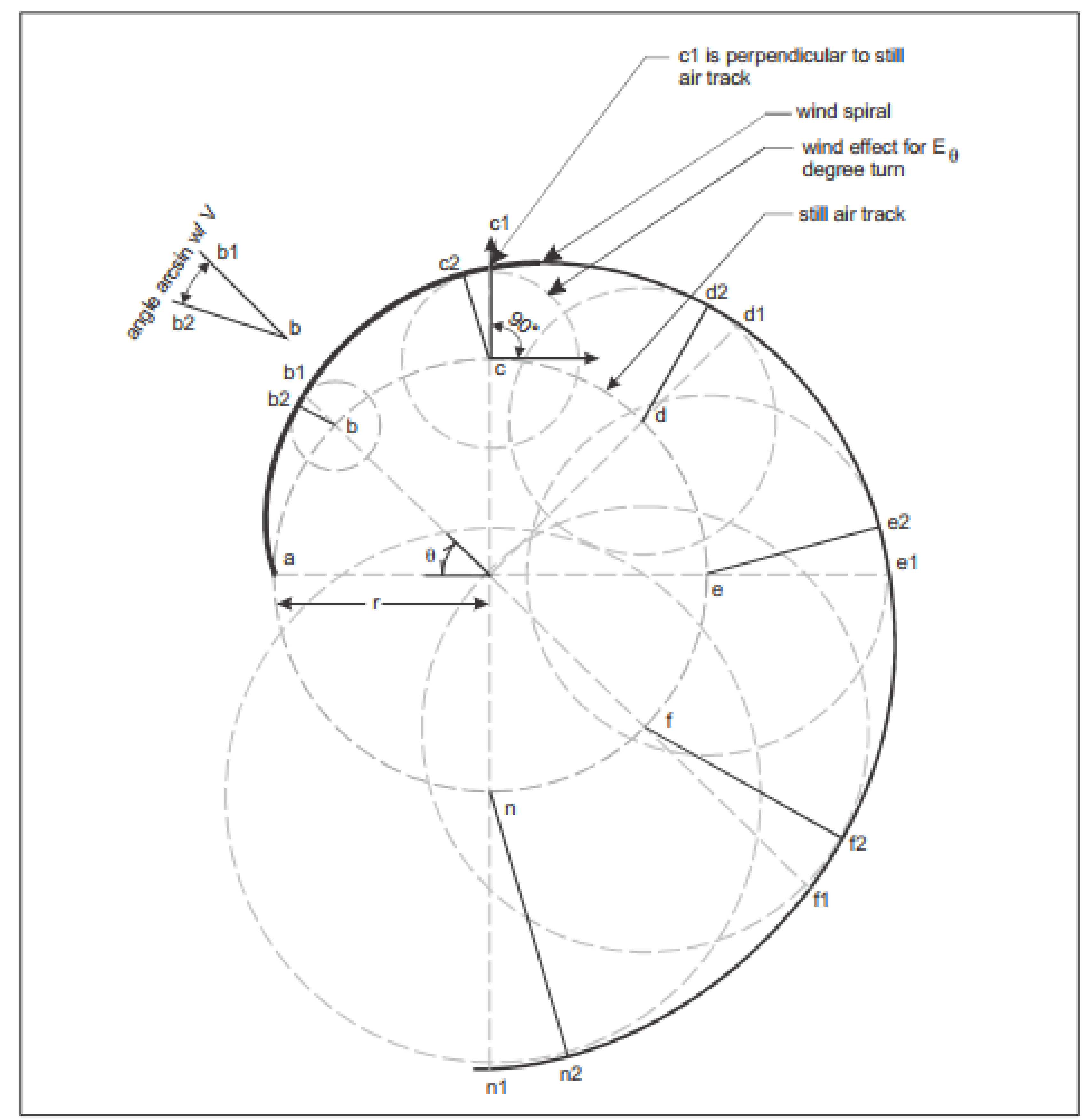


Figure I-2-3-4. Wind spiral

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Relationship with Aeronautical Charts

What does the aeronautical cartographer needs to do?

AIP
BELIZE

AD-2.MZBZ IAC RWY07 RNAV GNSS 01
25 APR 19

INSTRUMENT
APPROACH
CHART

AERODROME ELEV 4.57 m (15 ft)
HEIGHTS RELATED TO
THR RWY 07 ELEV 15 ft

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PHILIP S. W. GOLDSON INTL/
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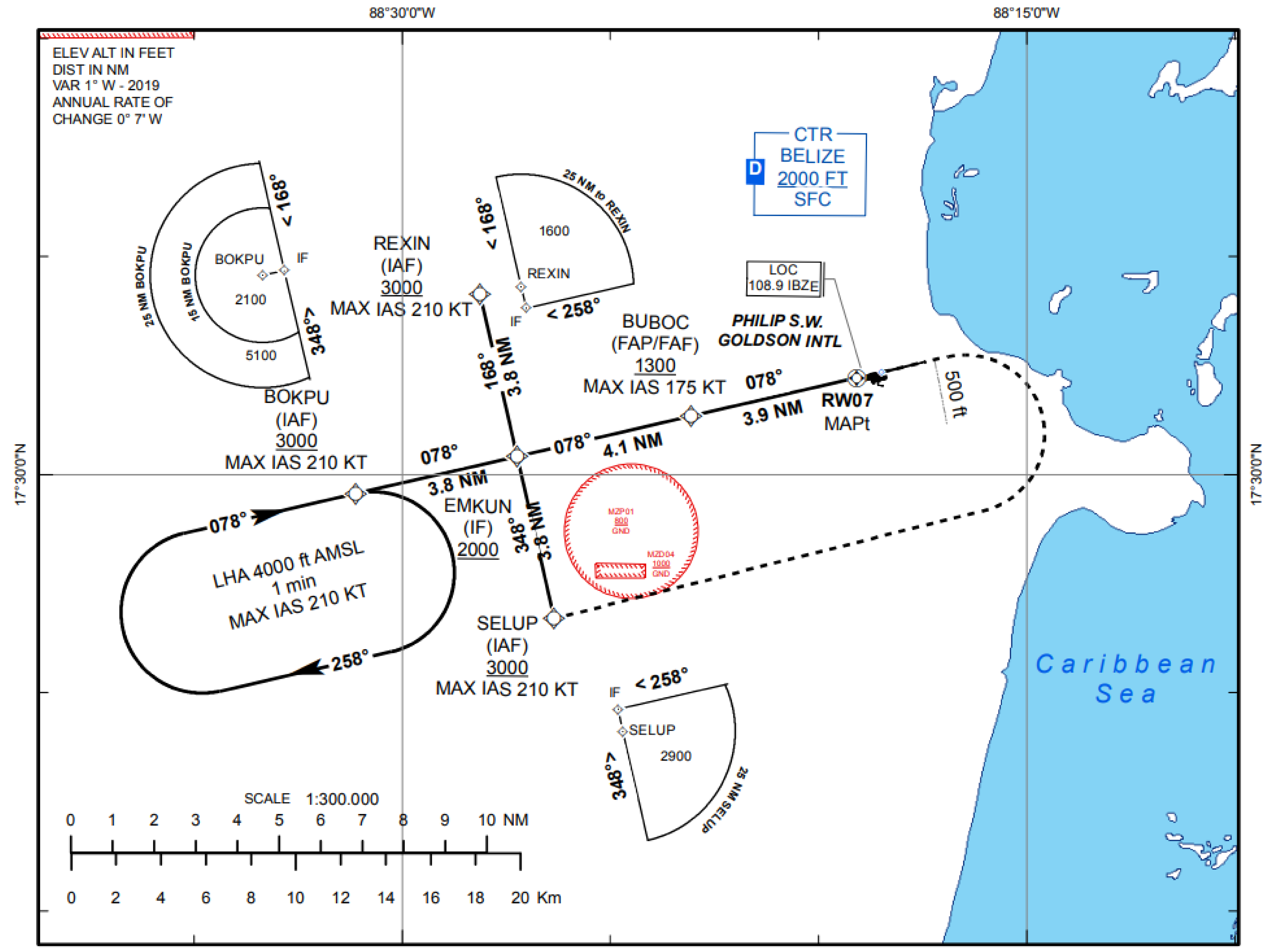

88°30'0"W
88°15'0"W
17°30'0"N
ELEV ALT IN FEET
DIST IN NM
VAR 1° W - 2019
ANNUAL RATE OF
CHANGE 0° 7' W
CTR
BELIZE
2000 FT
SFC
D
LOC
108.9 IBZE
PHILIP S.W.
GOLDSON INTL
REXIN
(IAF)
3000
MAX IAS 210 KT
BOKPU
(IAF)
3000
MAX IAS 210 KT
BUBOC
(FAP/FAF)
1300
MAX IAS 175 KT
EMKUN
(IF)
2000
SELUP
(IAF)
3000
MAX IAS 210 KT
RW07
MAPt
500 ft
078°
4.1 NM
3.9 NM
3.8 NM
168°
348°
LHA 4000 ft AMSL
1 min
MAX IAS 210 KT
258°
25 NM BOKPU
15 NM BOKPU
2100
5100
IF
25 NM to REXIN
1600
< 258°
< 168°
348°>
2900
25 NM SELUP
Caribbean
Sea
SCALE 1:300.000
0 1 2 3 4 5 6 7 8 9 10 NM
0 2 4 6 8 10 12 14 16 18 20 Km

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RECOMMENDED PROFILE - (LNAV 5.2%), 320 ft/NM		
DIST THR	3	2
ALTITUDE	1030 (1015)	710 (695)

TRANSITION ALT 19 500 ft

MISSED APPROACH:
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For loss of RNAV capability
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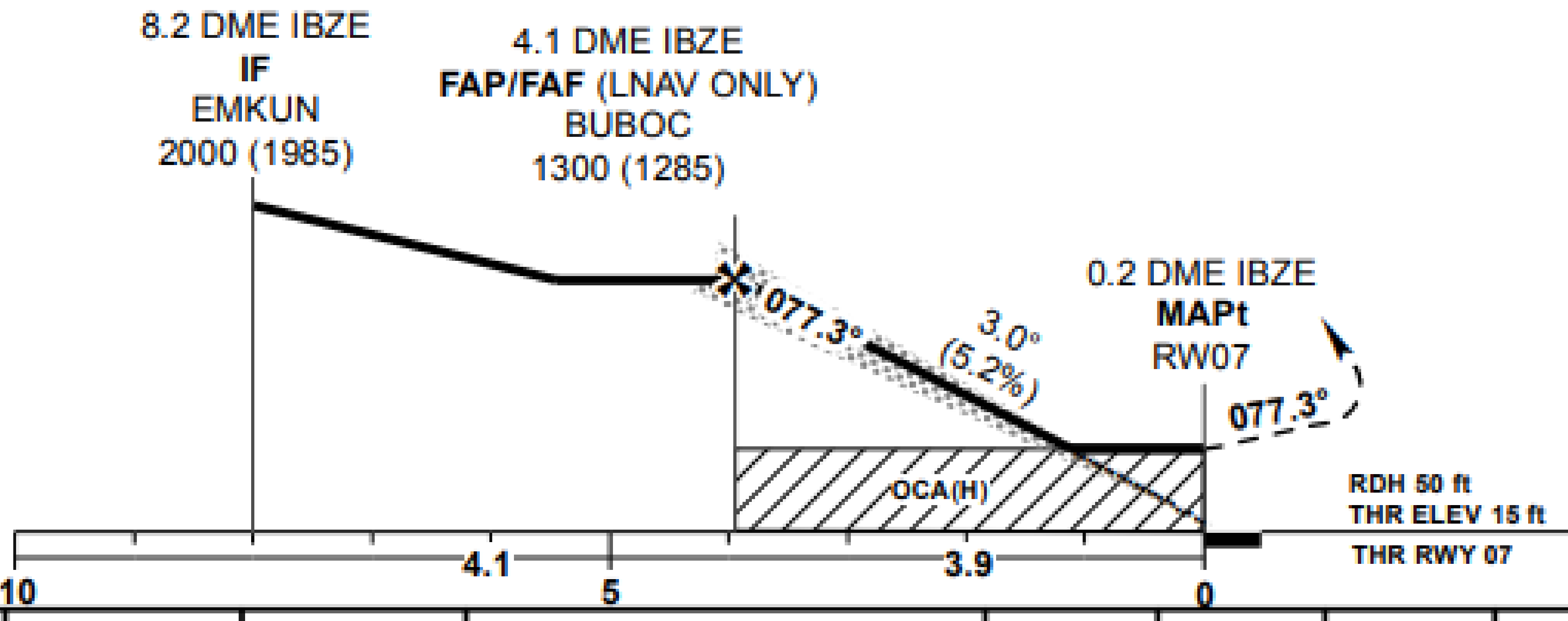

OCA/H	A	B	C	D
LNAV/VNAV	320 (305)	320 (305)	320 (305)	320 (305)
LNAV	420 (405)	420 (405)	420 (405)	420 (405)
VM(C) OCA	500 (485)	510 (495)	610 (595)	710 (695)

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5. BARO-VNAV NOT AVAILABLE BELOW 0°C

CHANGES: EDITORIALS, VAR MAG AND HDG

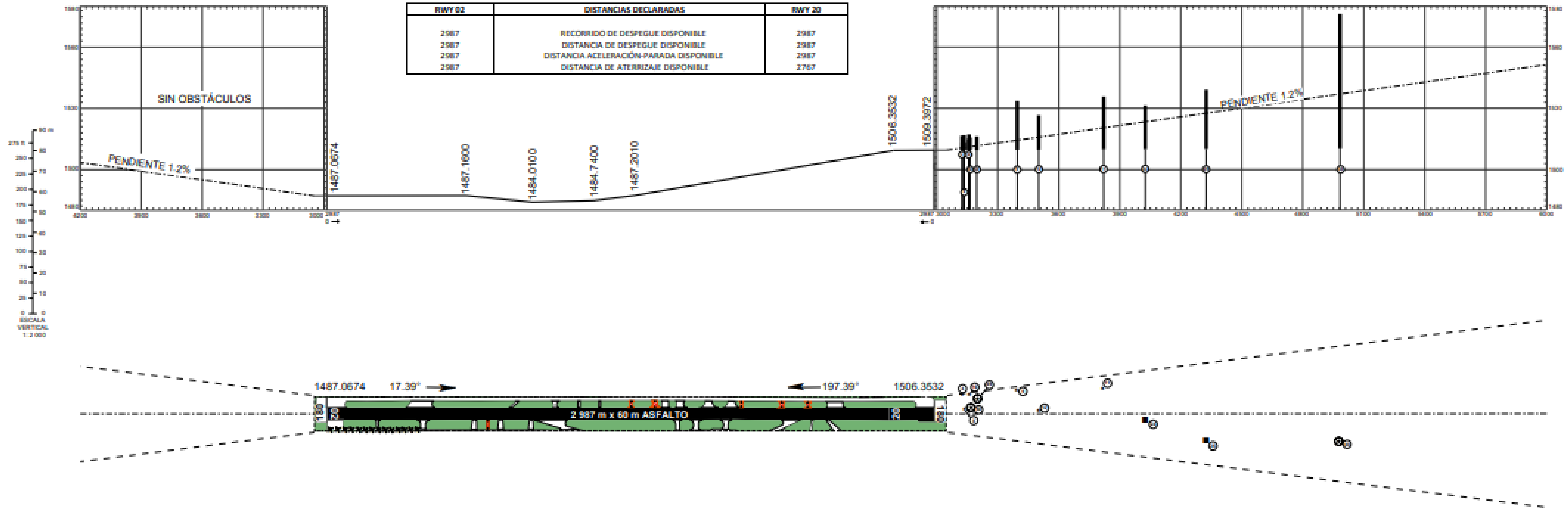
PLANO DE OBSTÁCULOS DE AERÓDROMO - TIPO A
(LIMITACIONES DE UTILIZACIÓN)

GUATEMALA CITY/
LA AURORA INTL

DECLINACIÓN MAGNÉTICA 1° E
DIMENSIONES Y ELEVACIONES EN METROS

RWY 02/20

RWY 02	DISTANCIAS DECLARADAS	RWY 20
2987	RECORRIDO DE DESPEGUE DISPONIBLE	2987
2987	DISTANCIA DE DESPEGUE DISPONIBLE	2987
2987	DISTANCIA ACELERACIÓN-PARADA DISPONIBLE	2987
2987	DISTANCIA DE ATERRIZAJE DISPONIBLE	2767



CLAVE	
NÚMERO DE IDENTIFICACIÓN	①
POSTE, TORRE, CAMPANARIO ANTENA, ETC.	⊙
EDIFICIO O ESTRUCTURA GRANDE	■
ÁRBOL O ARBUSTO	✱
CURVA DE NIVEL DEL TERRENO	∼
TERRENO PENETRANDO PLANO DE OBSTÁCULO	

CHANGES: EDITORIAL FOR eAIP

ESCALA HORIZONTAL 1:20,000

0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000 m

0 700 1,400 2,100 2,800 3,500 4,200 4,900 5,600 6,300 7,000 ft

ORDEN DE PRECISIÓN

HORIZONTAL 00m.
VERTICAL 00m.

REGISTRO DE ENMIENDAS		
No.	FECHA	ANOTADA POR
1	31/JAN/15	AIS GUATEMALA
2	26/OCT/15	AIS GUATEMALA
3	04/JAN/18	AIS GUATEMALA
4	16/OCT/18	AIS GUATEMALA
5	12/SEP/19	AIS GUATEMALA
6	30/JAN/20	AIS GUATEMALA

AIP
HONDURAS

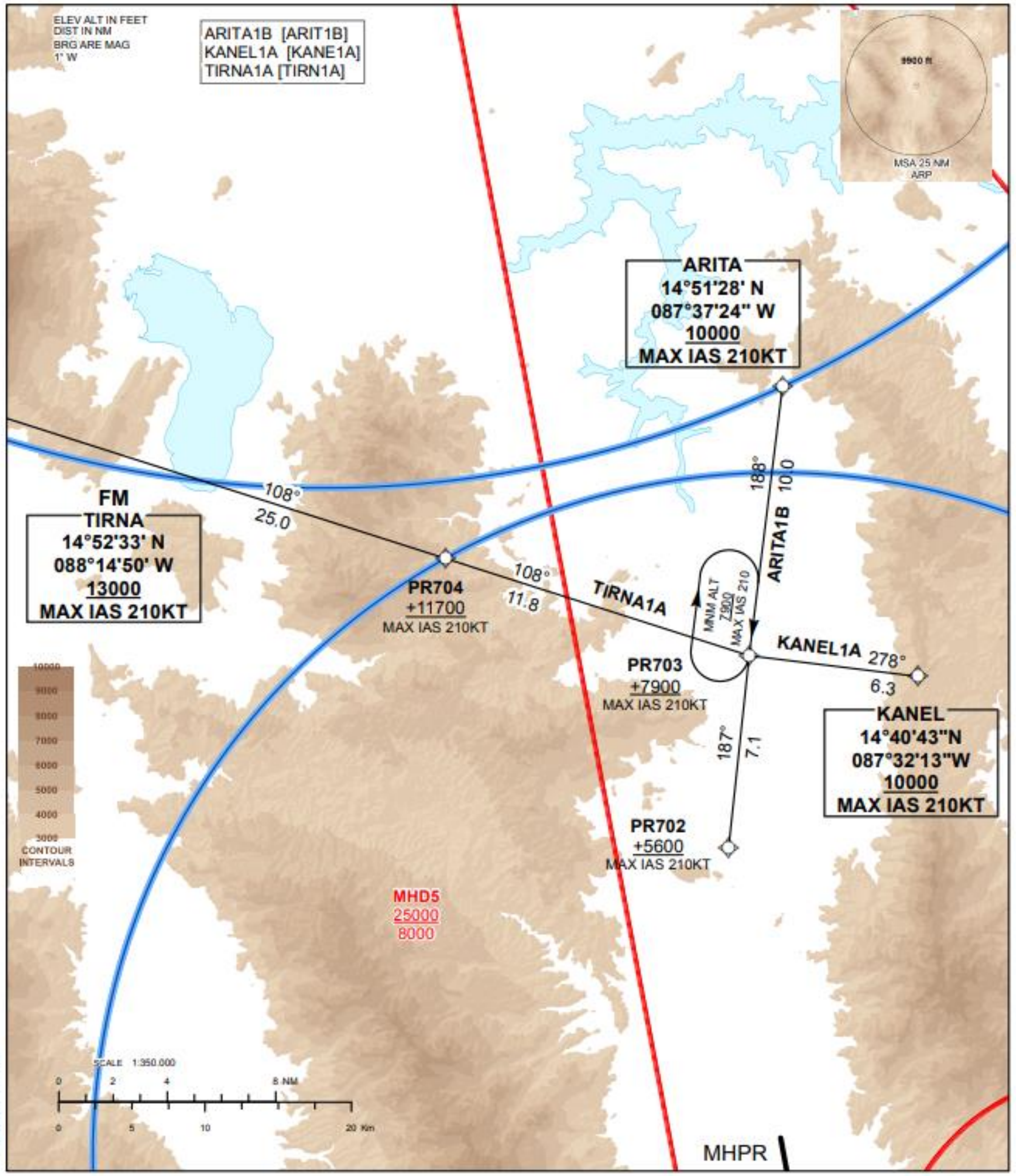
AD-2.MHPR STAR RNAV RWY17 A
07 OCT 21

STANDARD ARRIVAL CHART-INSTRUMENT (STAR) - ICAO

TRANSITION ALTITUDE 19000 FT

CTL	126.7
APP	119.1
TWR	118.9
GND	121.7

COMAYAGUA, PALMEROLA INTL
RNAV RWY 17
ARITA1B KANEL1A TIRNA1A



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