PANS-OPS Flight Procedure Design Training for CAAs

23 August – 03 September 2021

11 – Circling

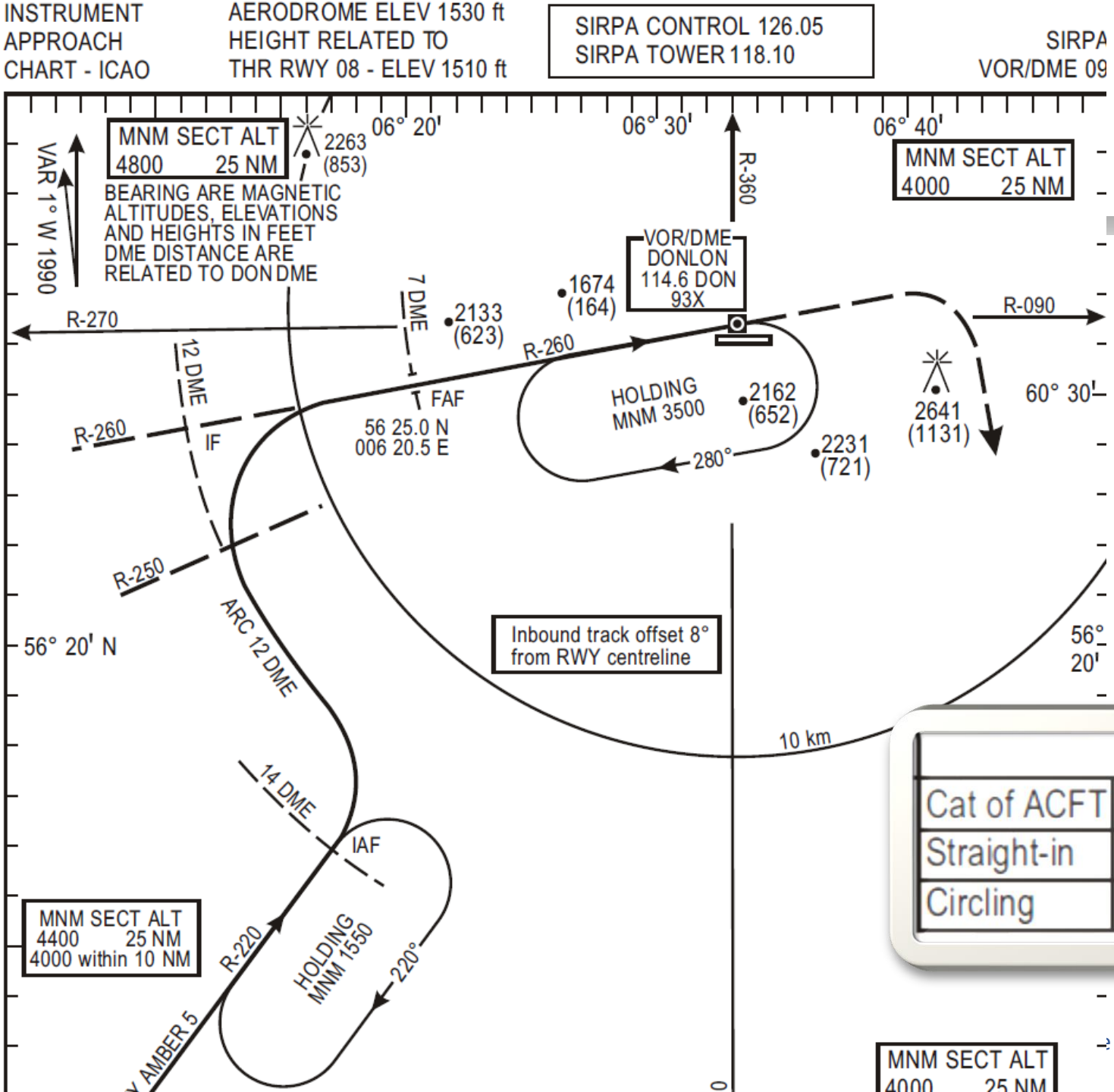
(Doc. 8168, Vol. 2, Part I, Section 4, Chap. 7)

Outlines

1. General
2. Basic circling approach
3. Basic circling protection
4. Circling with prescribed tracks
5. Protection area of circling with prescribed tracks
6. Publication

General

- Visual maneuvering (circling) area :
  - Area is the area in which obstacle clearance shall be considered for aircraft manoeuvring visually (circling).
- Established when runway alignment criteria cannot be met;
- No missed approach segment;
- Two types of visual maneuverings:
  - Basic visual maneuvering;
  - Visual maneuvering using prescribed track.



Basic circling approach

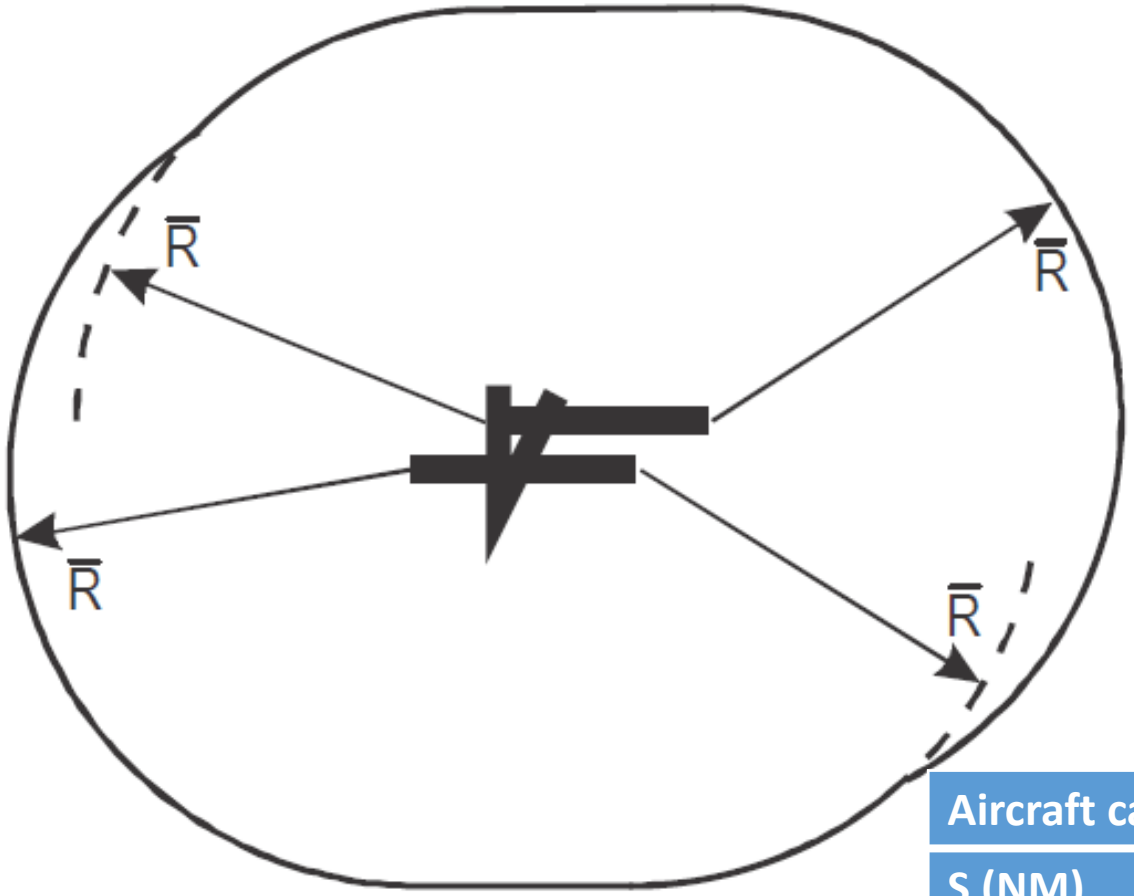
African Flight Procedure Programme (AFPP)

OCA(H)				
Cat of ACFT	Cat A	Cat B	Cat C	Cat D
Straight-in	1990 (480)	2020 (510)	2060 (550)	2060 (550)
Circling	2460 (950)	2530 (1020)	3040 (1530)	3040 (1530)

Basic circling protection

- Parameters :
  - Altitude: Aerodrome elevation + 1 000 ft;
  - Speed : Speed table
  - Wind : 25 kt;
  - Bank angle : Max (radius bank angle (20°); radius (turn rate of 3°/s));
  - Temperature : ISA + 15° (or computed one).
- Protection method:
  - Draw arc of radius Rc from the threshold of each runway;
  - From the extremity of the adjacent arcs draw tangent to the arc
  - Connect the tangent lines

Category E aircraft
$\overline{R}$ = 12.2 km
or 6.94 NM
(at 600 m
(2 000 ft) MSL)



$$Rc = 2r + S$$

Where:

- **r: radius of turn**
- **S: last straight segment length (Constant value for each aircraft category**

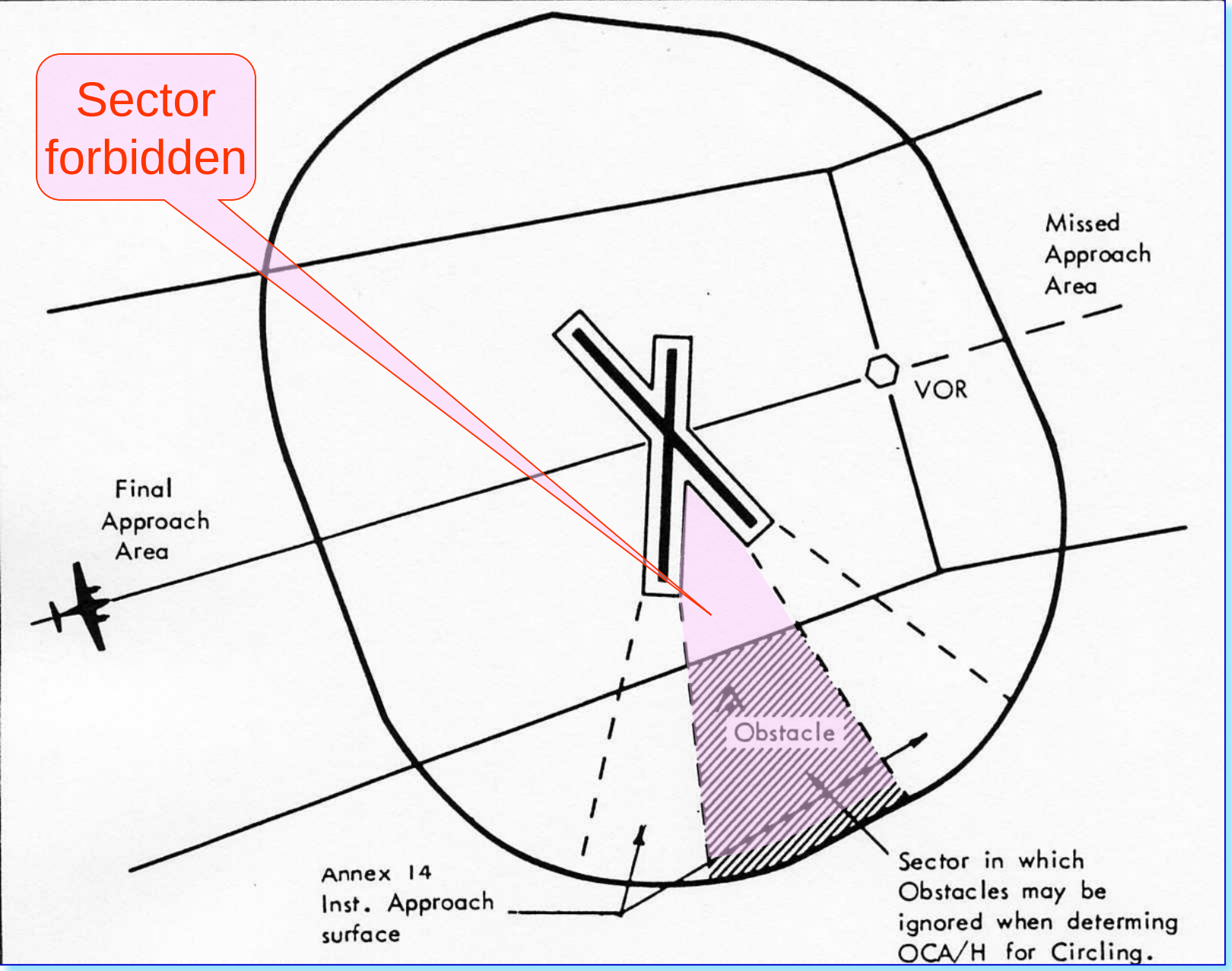
Aircraft category	A	B	C	D	E
S (NM)	0.30	0.40	0.50	0.60	0.70

The OCH shall not be less than the OCH calculated for the instrument approach procedure leading to the visual manoeuvres

Obstacle clearance (MOC and OCA/H)

Table I-4-7-3. MOC and OCA/H for visual manoeuvring (circling) approach

Aircraft category	*Minimum obstacle clearance m (ft)*	*Lower limit for OCH above aerodrome elevation m (ft)*	*Minimum visibility km (NM)*
A	90 (295)	120 (394)	1.9 (1.0)
B	90 (295)	150 (492)	2.8 (1.5)
C	120 (394)	180 (591)	3.7 (2.0)
D	120 (394)	210 (689)	4.6 (2.5)
E	150 (492)	240 (787)	6.5 (3.5)



The published procedure must prohibit the pilot from circling within the total sector where the obstacle exists

Circling with prescribed tracks

- General:
  - Specific tracks for visual maneuvers are provided in addition to the circling:
    - If operational benefits are demonstrated;
  - Need of clearly defined visual references:
    - Visual reference may be improved with fixes (but no fix without corresponding visual reference).
  - Go-around procedure mandatory (joining sometimes the IP missed approach);

APPROCHE AUX INSTRUMENTS
CAT. A B C

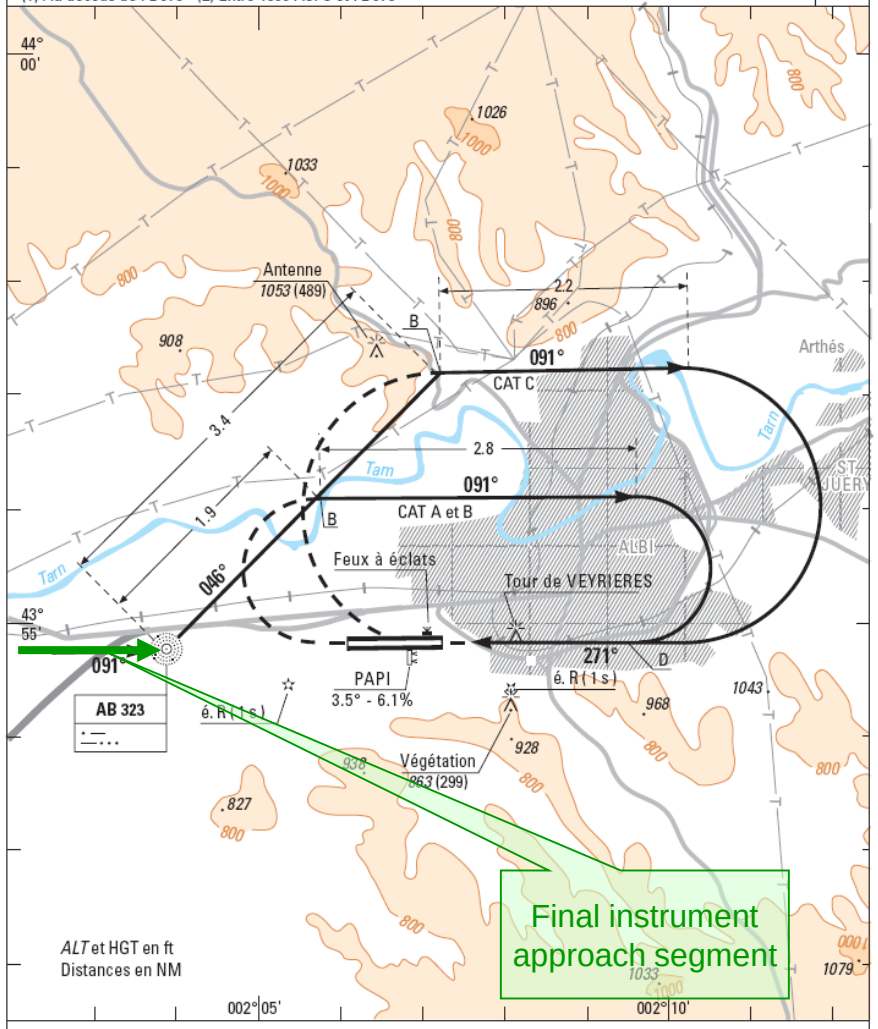
ALBI LE SEQUESTRE
AD2 LFCI IAC 03

ALT AD : 564 (21 hPa), *DTHR : 563* 22 JAN 04

VPT RWY27

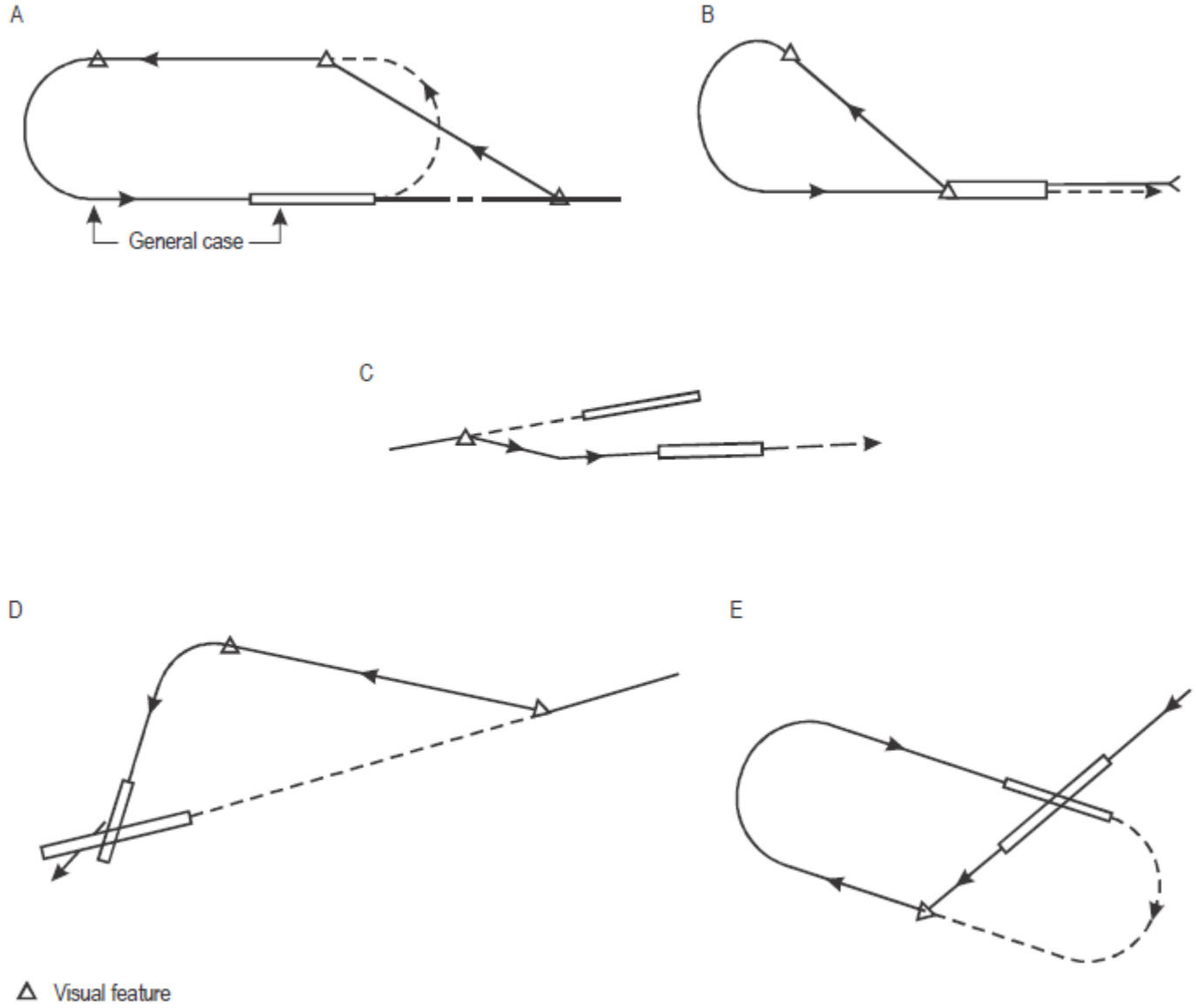
APP : TOULOUSE Approche 129.3 (1) 123.85 (2)
TWR : NIL
AFIS : ALBI Info 118.95
(1) Au dessus de FL 075 - (2) Entre 1500 ASFC et FL 075

VAR
1° W
(00)

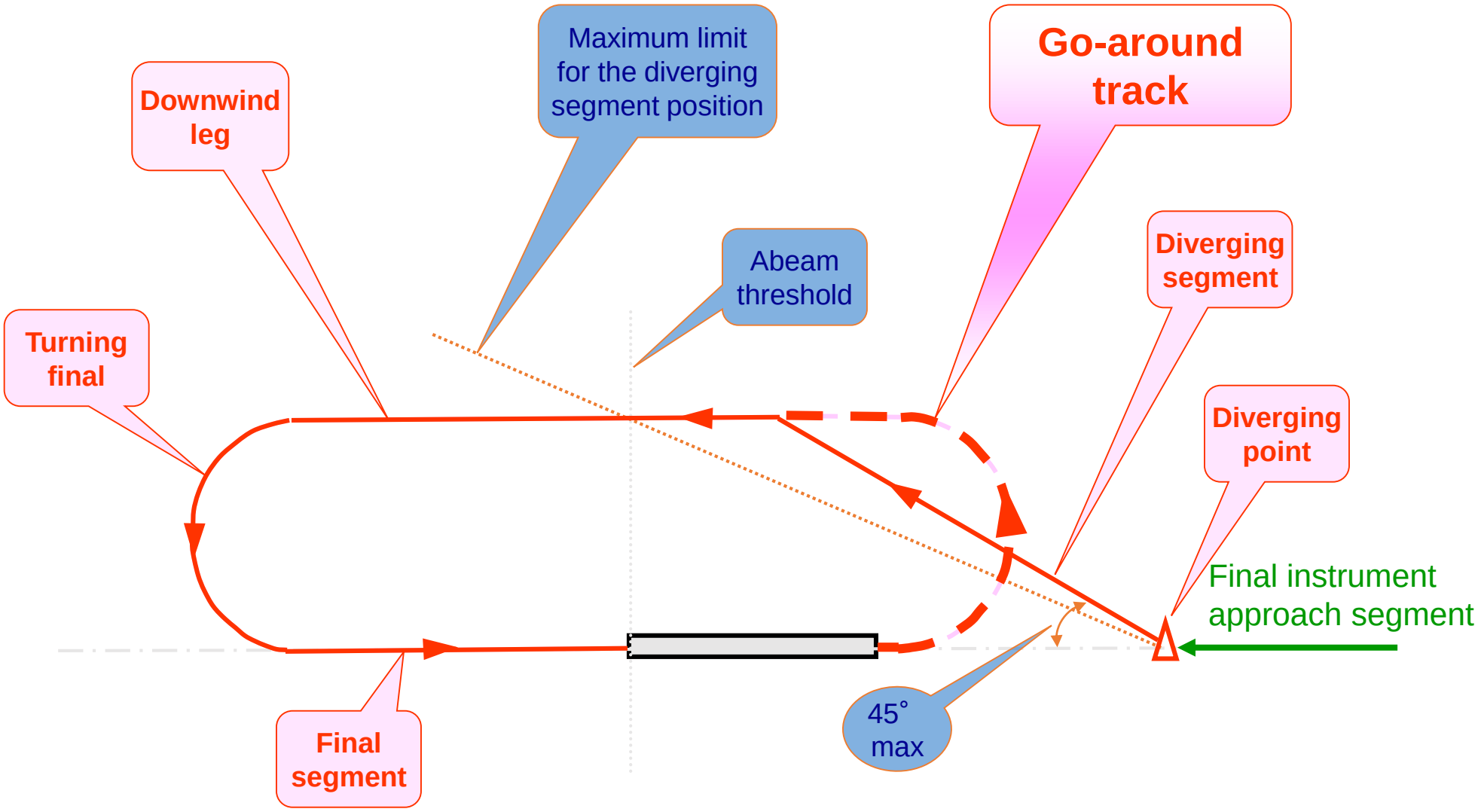


MNM AD : distances verticales en pieds, VIS en mètres — REF HGT : *ALT AD*

CAT	After ILS		After NDB	
	MDA (H)	VIS	*MDA* (H)	VIS
A	*1180* (610)	1500	*1260* (690)	1500
B	*1180* (610)	1600	*1260* (690)	1600
C	*1460* (890)	2400	*1460* (890)	2400

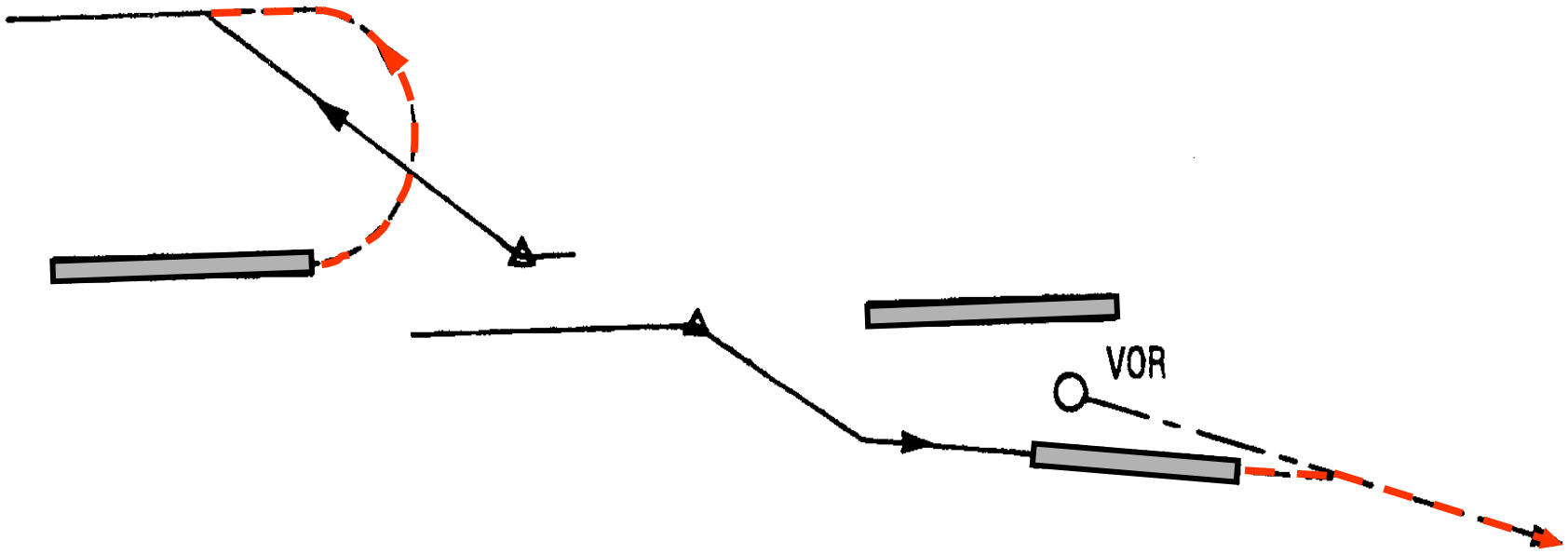


Standard Case



Nominal trajectories parameters

- Final segment:
  - ☞Length : 30 s of flight ;
  - ☞ IAS : Max speed for final approach ;
  - ☞ Temperature : ISA + 15° (or computed one);
  - ☞ Altitude : Altitude of the aerodrome + 1 000 ft
    - When an altitude has to be maintained at the beginning of this segment the final descent slope must be less than 10% (optimum : 5%).
- Turn radius Max (radius(bank of 25°) , radius(3°/s)):
  - ☞Refer to above; except,
  - ☞Speed: Max speed for circling (speed table).

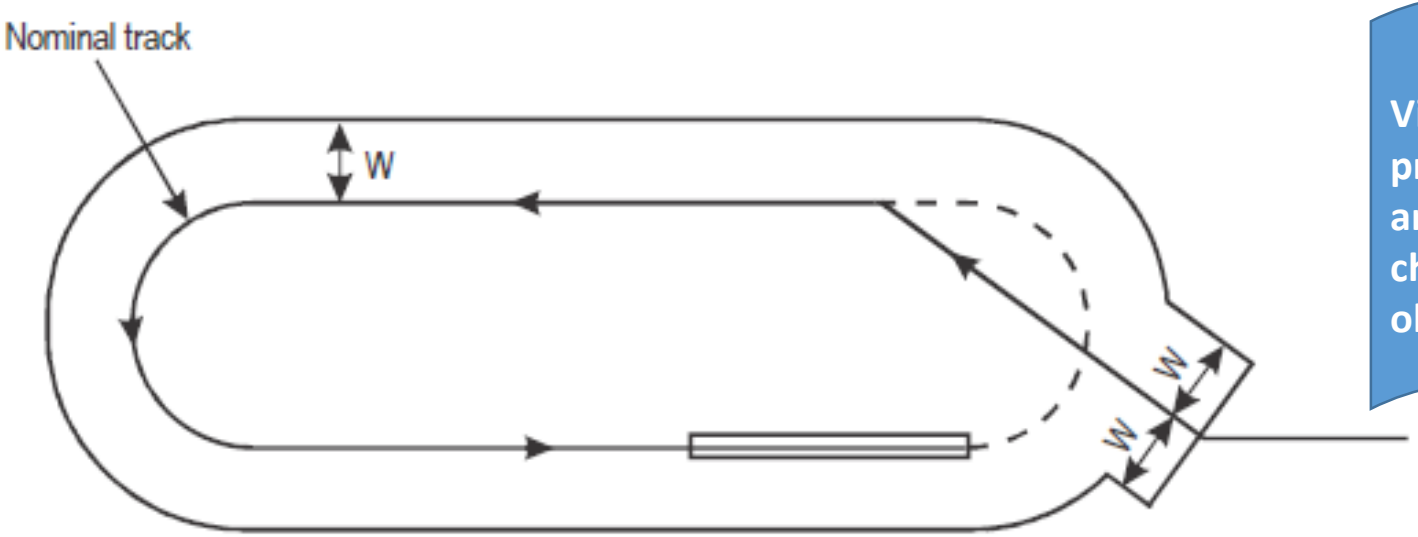


Go-around track

Protection area of circling with prescribed tracks

The protection area is based on a corridor with a constant semi-width W centered on the nominal track.

Aircraft category	A	B	C	D	E
W (m)	1 400	1 500	1 800	2 100	2 600



Visual aids associated with the runway used for the prescribed track (i.e. sequenced flashing lights, PAPI, VASIS) are shown on the approach chart with their main characteristics (i.e. slope of the PAPI or VASIS). Lighting on obstacles is specified on the approach chart.

Publication

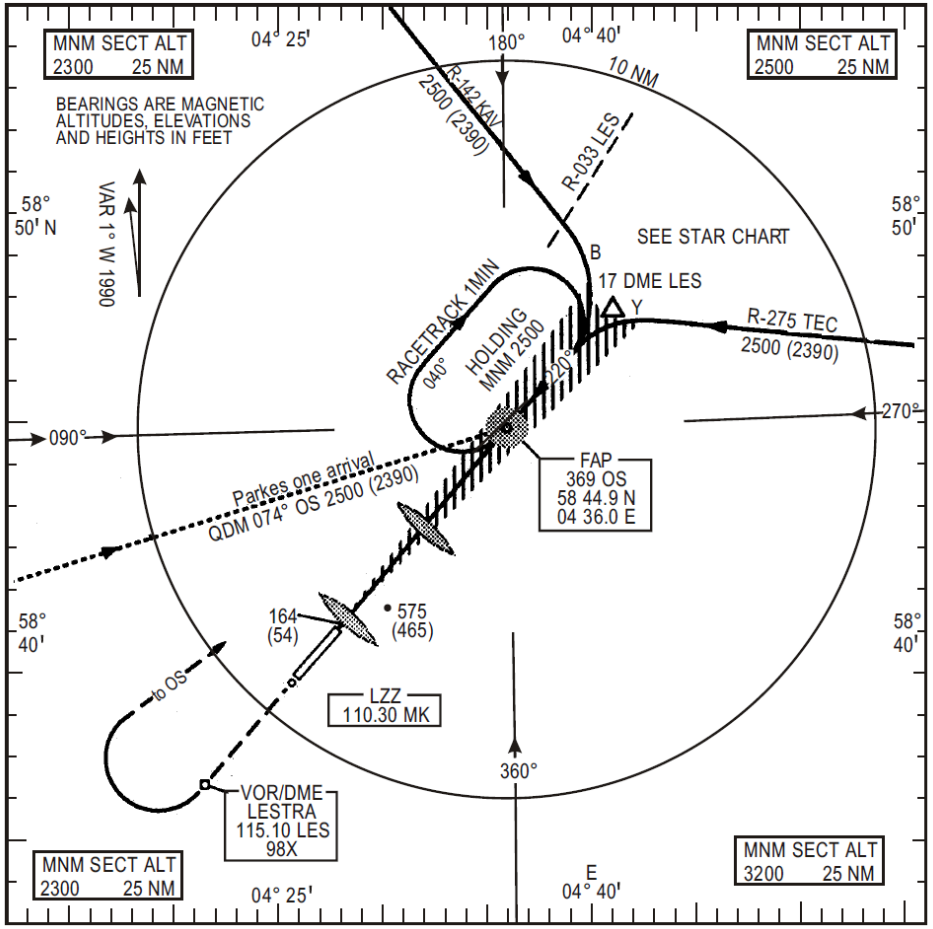
- Basic circling approaches published on the same chart than the instrument approach procedure:
  - In the minima line
- Prescribed track published on a separate chart:
  - Visual aids associated with the runway used for the prescribed track (i.e. sequenced flashing lights, PAPI, VASIS) are shown on the approach chart with their main characteristics (i.e. slope of the PAPI or VASIS). Lighting on obstacles is specified on the approach chart.

INSTRUMENT APPROACH CHART - ICAO

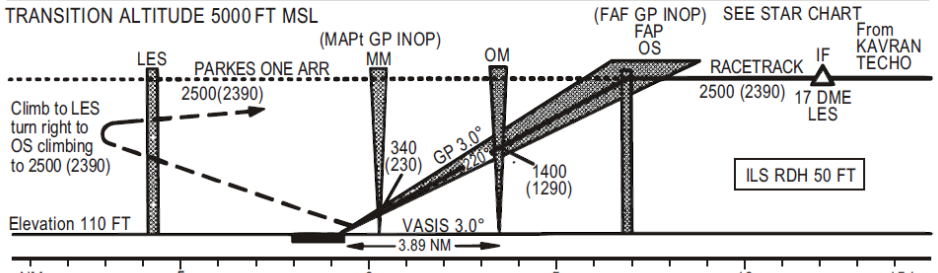
AERODROME ELEV 130 FT
HEIGHTS RELATED TO THR RWY 22 - ELEV 110 FT

AROM TWR 116.10
AROM APP 118.50

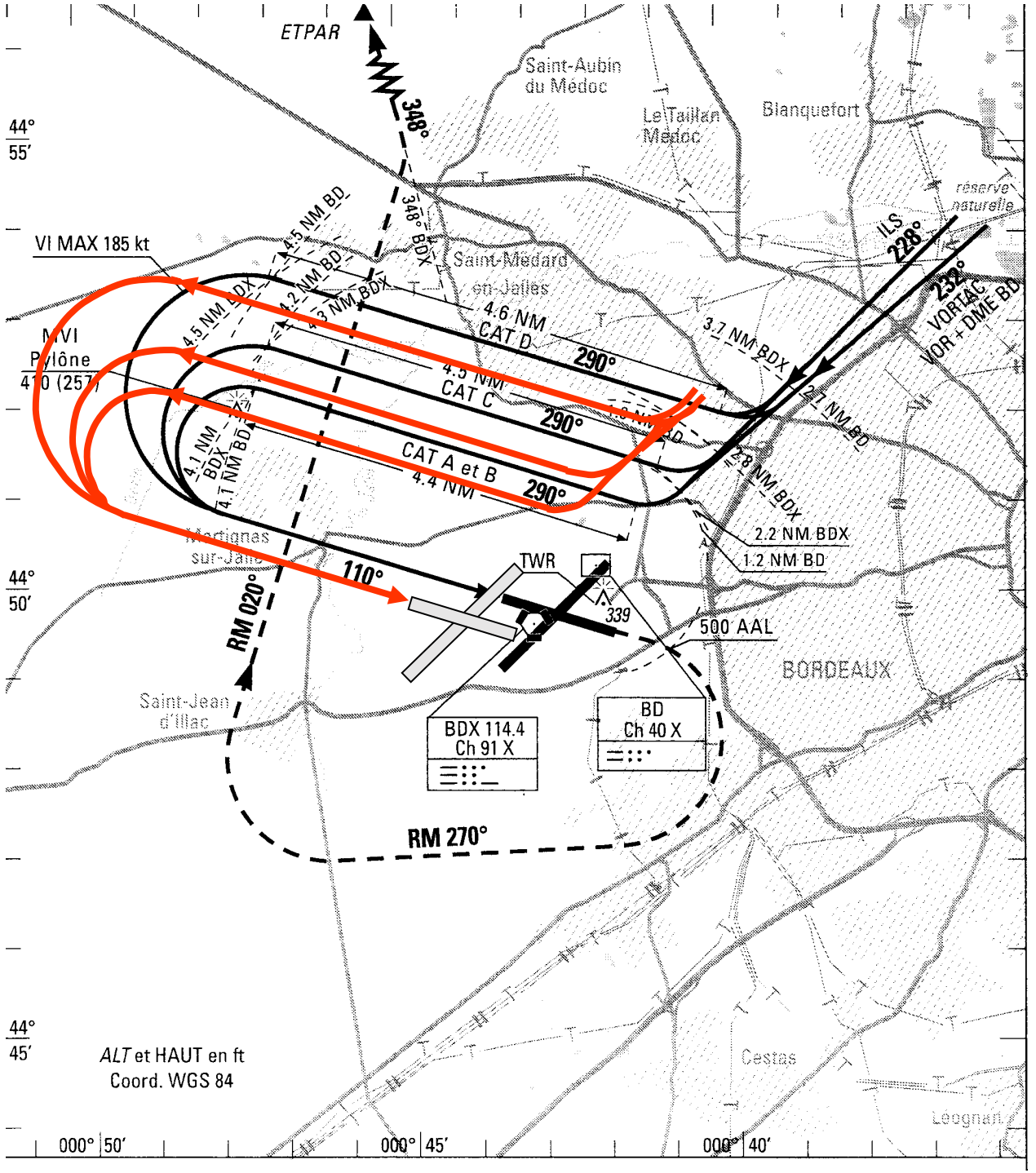
AROM ILS 22



TRANSITION ALTITUDE 5000 FT MSL



OCA(H)						Distance OS-MM 6.76 NM							
Cat of ACFT		Cat A	Cat B	Cat C	Cat D	Speed	KT	80	100	120	140	180	220
Straight-in	Cat I	278 (168)	284 (174)	293 (183)	303 (193)	Time	min:s	5:04	4:03	3:23	2:54	2:32	2:15
	Cat II	152 (42)	169 (59)	181 (71)	195 (85)	Rate of descent / GS	ft/min	425	530	635	740	850	956
	GP INOP	850 (740)											
Circling		870 (760)	870 (760)	970 (860)	970 (860)								



Summary

- General:
  - Definition and why a cricling approach is established
  - Two types of circling
- Basic circling approach :
  - Area and protection
- Circling with prescribed tracks
  - Area and protection
- Publication

Publication

- Naming convention
  - Chart identification:
    - Type of Navaid used as lateral guidance in final approach +
    - Single letter suffix starting with the letter A.
    - The suffix shall not be used again for any other airport in the State.
    - E.g.: VOR A RWY 31
- OCH:
  - Max (OCH approach; OCH missed approach).
- For visual maneuvering with prescribed tracks:
  - Length and magnetic orientation:
    - Diverging segment, downwind leg.
  - Radius of turn if critical.

Questions:

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