

# **Infraestructures del Transport Aeri**

## **Visual and Instrument Flight Procedures**

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**February 2018– Version 2.4**



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# Introduction



KEEP  
CALM  
AND  
AVIATE, NAVIGATE,  
COMMUNICATE



# Introduction

## VMC: Visual Meteorological Conditions



# Introduction

## IMC: Instrument Meteorological Conditions



# Introduction

## VMC: Visual Meteorological Conditions



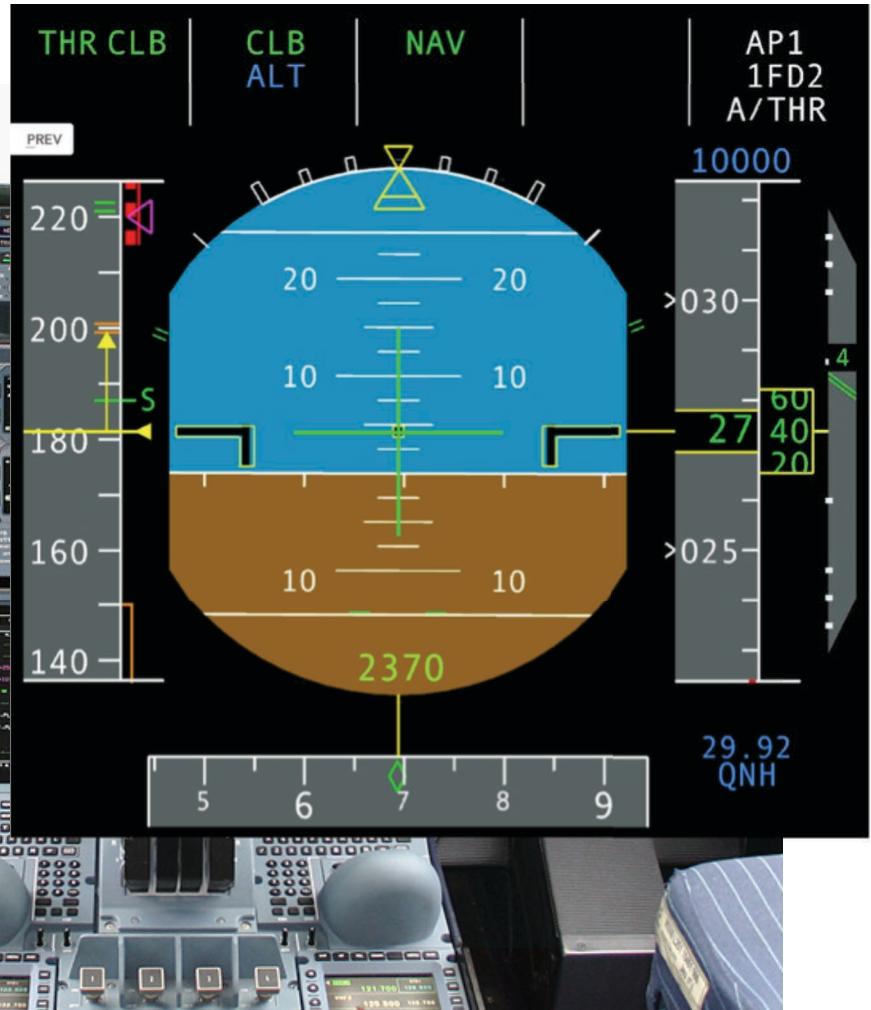
# Introduction

## IMC: Instrument Meteorological Conditions



# Introduction

## IMC: Instrument Meteorological Conditions



# Introduction

## VFR: Visual Flight Rules

- *Visibility better than (5-)8 km (Special VFR)*
- *ATS flight plan optional (in «aeronautically developed» states...)*
- *Fewer training and equipments required*

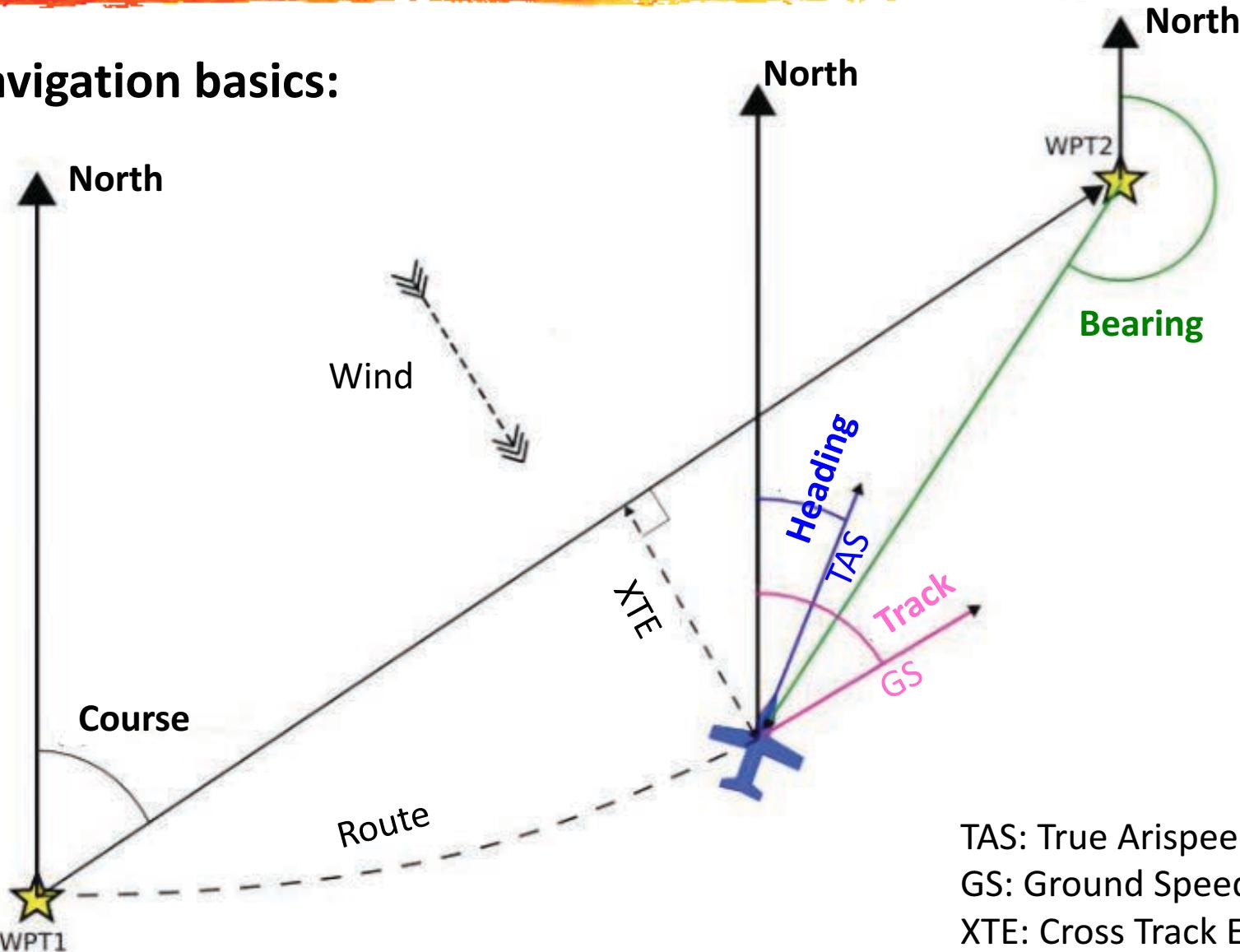
## IFR: Instrumental Flight Rules

- *Use of Radionavigation means*
- *ATS flight plan must be filed AND approved*
- *More training/equipage is required*



# Introduction

## Navigation basics:



TAS: True Airspeed  
GS: Ground Speed  
XTE: Cross Track Error

# IFR navigation

- Radionavigation “landmarks” -> fixes, waypoints, routes
- Instrument flying
- Visual ground contact only required in very specific phases



# VFR navigation

- Visual ground landmarks or references
- Radionavigation as optional means
- Visual contact with the ground (beside VFR “on top”)
- *Dead reckoning* navigation

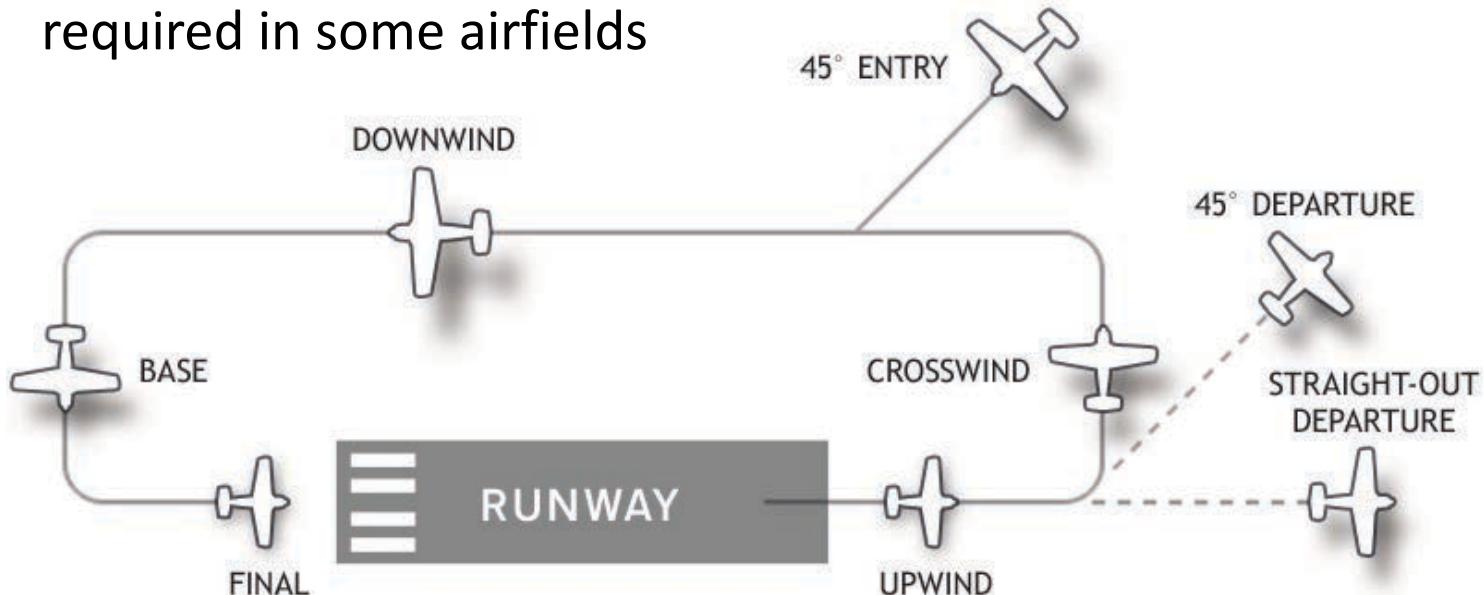


VFR FLIGHT-LOG										Date : .....	Off	On	Flight time	Tot	
Pilot : ..... Inst. : ..... A/C : ..... Reg. : .....										ATIS :	Block	Flight time	Tot		
										Taxi clear. :	Off	On	T/O	Ldg	
CPT	MSA	TAS	T.T.	VAR	Distance P.P. REM	W/V	T.H.	MH CH	GS	EET TOT	ETO ATO	RETO			
E	Raw				0 100										
1	2000	65	211	-3	7 93 260/15	221	224		54	8	8				
2	1500	"	235	"	8 85 "	241	244		50	10	10				
3	"	100	"	"	9 77 270/20	242	245		43	6	24				
4	"	"	151	"	8 69 "	161	164		108	5	29				
5	"	"	"	"	8 61 "	"	"			5	34				
6	1800	"	"	"	9 52 "	"	"			5	39				
7	"	"	110	"	11 41 "	114	117		118	6	45				
8	2000	"	"	"	10 31 "	"	"			5	50				
9	2500	"	138	"	9 23 "	147	150		112	4	54				
10	"	"	141	"	5 18 "	150	153		111	3	57				
11	3000	"	141	"	10 8 "	150	153		"	6	63				
Volmet/FIC freq : 100.5 - 127.8 P										T/O dist	Ldg dist				
T.I.G. 149.9 171.1 122.1										Min	424	Min	459		
T.G. 149.9 171.1 122.1										Avail	1510	Avail	600 - 1000	F	R

# VFR departures and approaches

## Airfield traffic pattern

- Default traffic pattern: turns to the left
- For non controlled airfields: standard integration procedures exist (may slightly differ at each country).
- For controlled airfields: direct integrations to downwind and eventually base or final.
- Right traffic patterns, or irregular traffic patterns may be required in some airfields



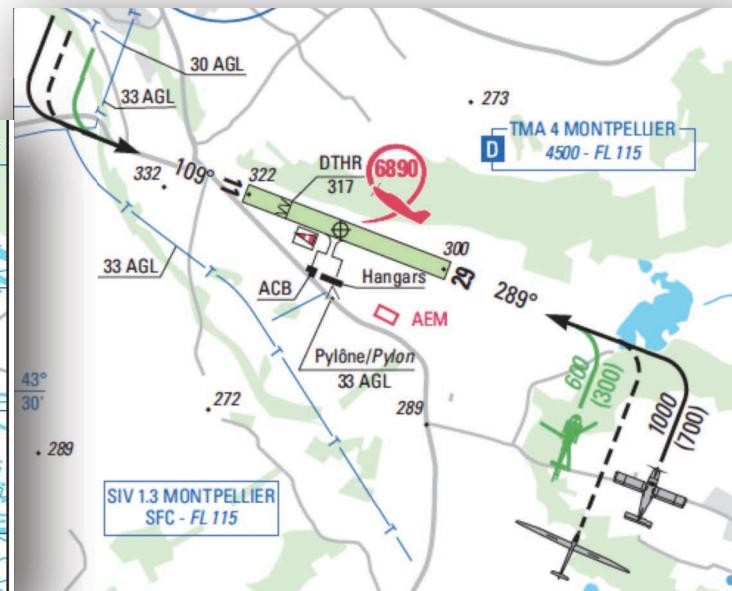
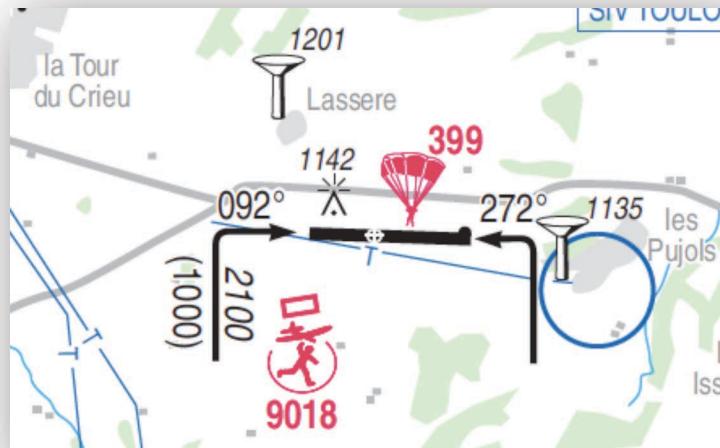
# VFR departures and approaches

## Airfield traffic pattern



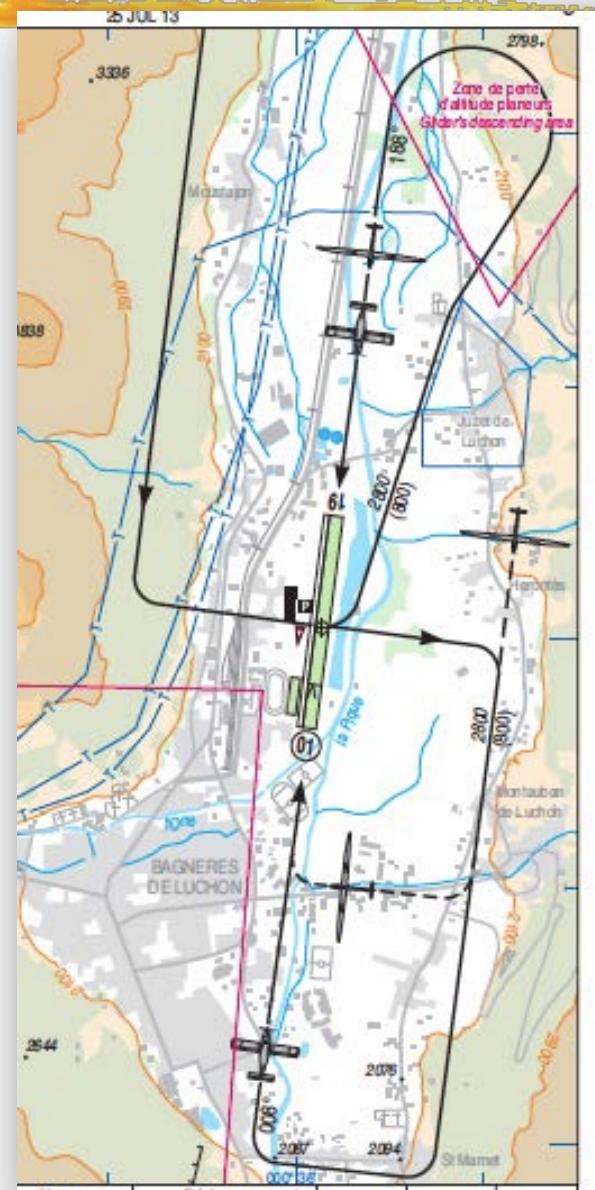
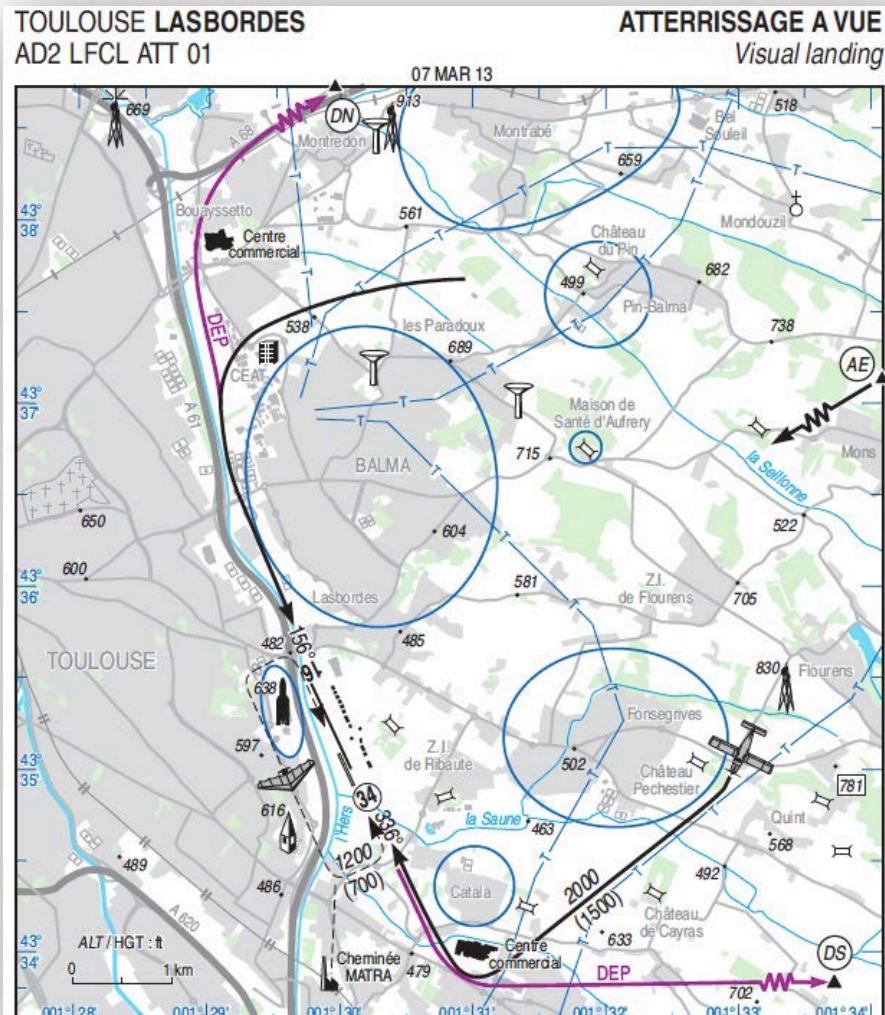
# VFR departures and approaches

# Airfield traffic pattern



# VFR departures and approaches

## Airfield traffic pattern



# VFR departures and approaches

## US sectional charts...

### AIRPORT DATA

Box Indicates F.A.R. 93  
Special Air Traffic Rules & Airport Traffic Patterns  
Airport Surveillance Radar  
Runways with Right Traffic Patterns (public use)  
RP \* (See Airport/Facility Directory)

FSS NO SVFR NAME (NAM) Location Identifier  
CT -118.3 \* C ATIS 123.8  
285 L 72 122.95 RP 23,34 UNICOM  
VFR Advsy 125.0 Airport of Entry

FSS - Flight Service Station

NO SVFR - Fixed-wing special VFR flight is prohibited.

CT -118.3 - Control Tower (CT) - primary frequency

NFCT - Non-Federal Control Tower

\* - Star indicates operation part-time. See tower frequencies tabulation for hours of operation.

C - Indicates Common Traffic Advisory Frequencies (CTAF)

ATIS 123.8 - Automatic Terminal Information Service

ASOS/ AWOS 135.42 - Automated Surface Weather Observing Systems. Some ASOS/AWOS facilities may not be located at airports.

UNICOM - Aeronautical advisory station

VFR Advsy - VFR Advisory Service shown where ATIS not available and frequency is other than primary CT frequency.

285 - Elevation in feet

L - Lighting in operation Sunset to Sunrise

\*L - Lighting limitations exist, refer to Airport/Facility Directory.

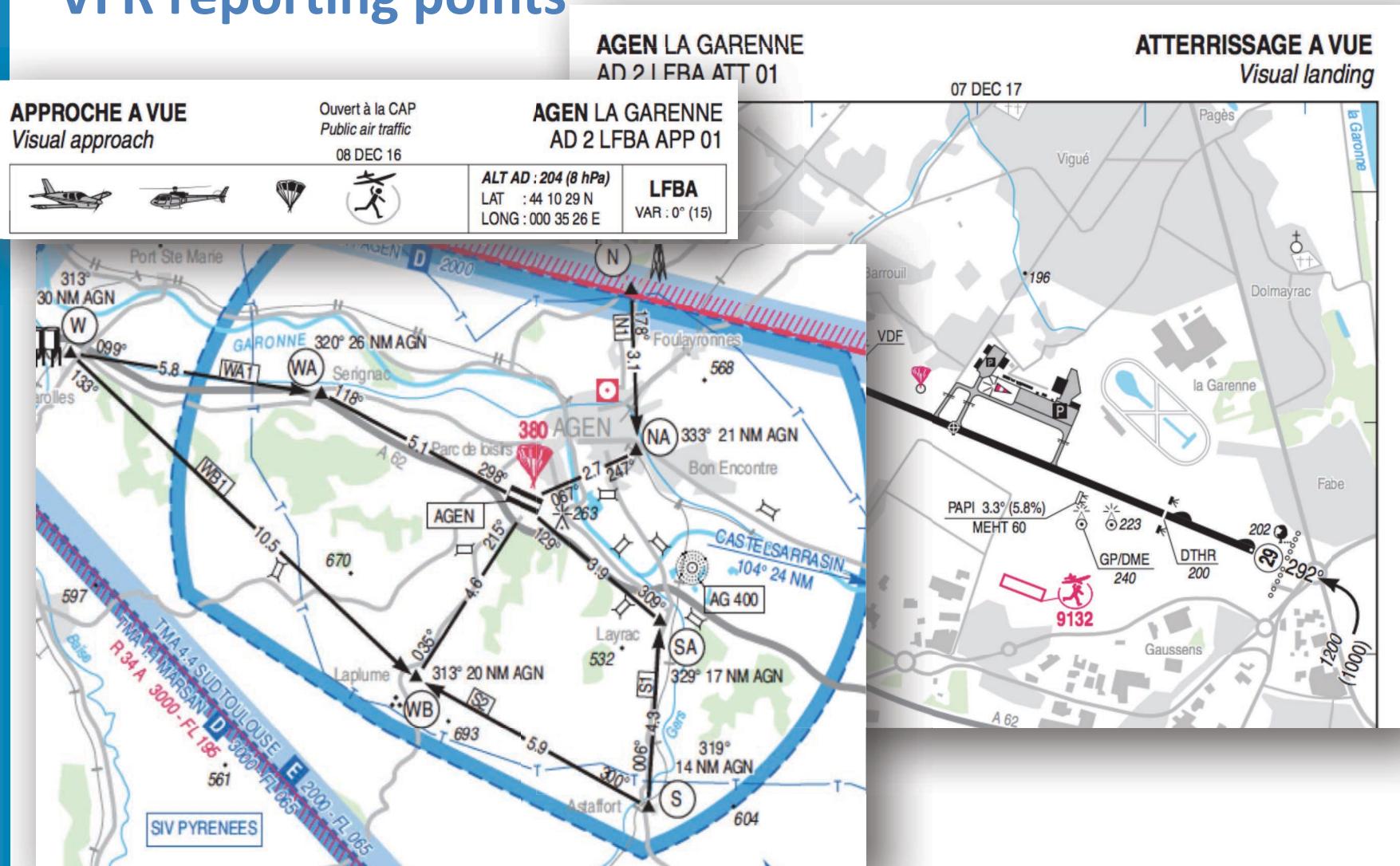
72 - Length of longest runway in hundreds of feet; usable length may be less.

When facility or information is lacking, the respective character is replaced by a dash. All lighting codes refer to runway lights. Lighted runway may not be the longest or lighted full length. All times are local.



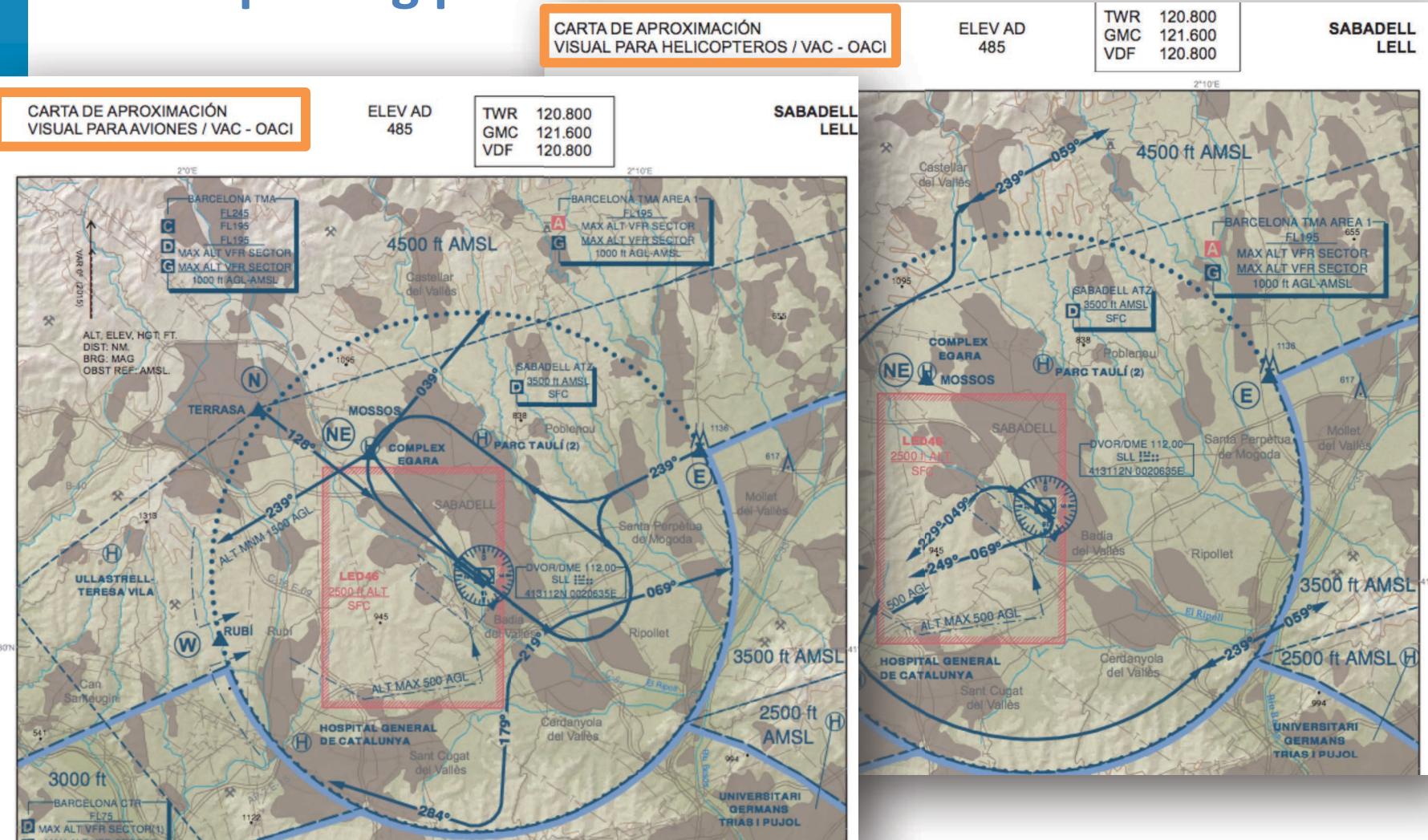
# VFR departures and approaches

## VFR reporting points



# VFR departures and approaches

## VFR reporting points



# Instrument flight procedures

- Provide flight guidance under IMC
- Provide obstacle clearance
- Provide separation with other procedures
- Help in managing air traffic
- Ensure proper radionavigation coverage

IMC: Instrument Meteorological Conditions



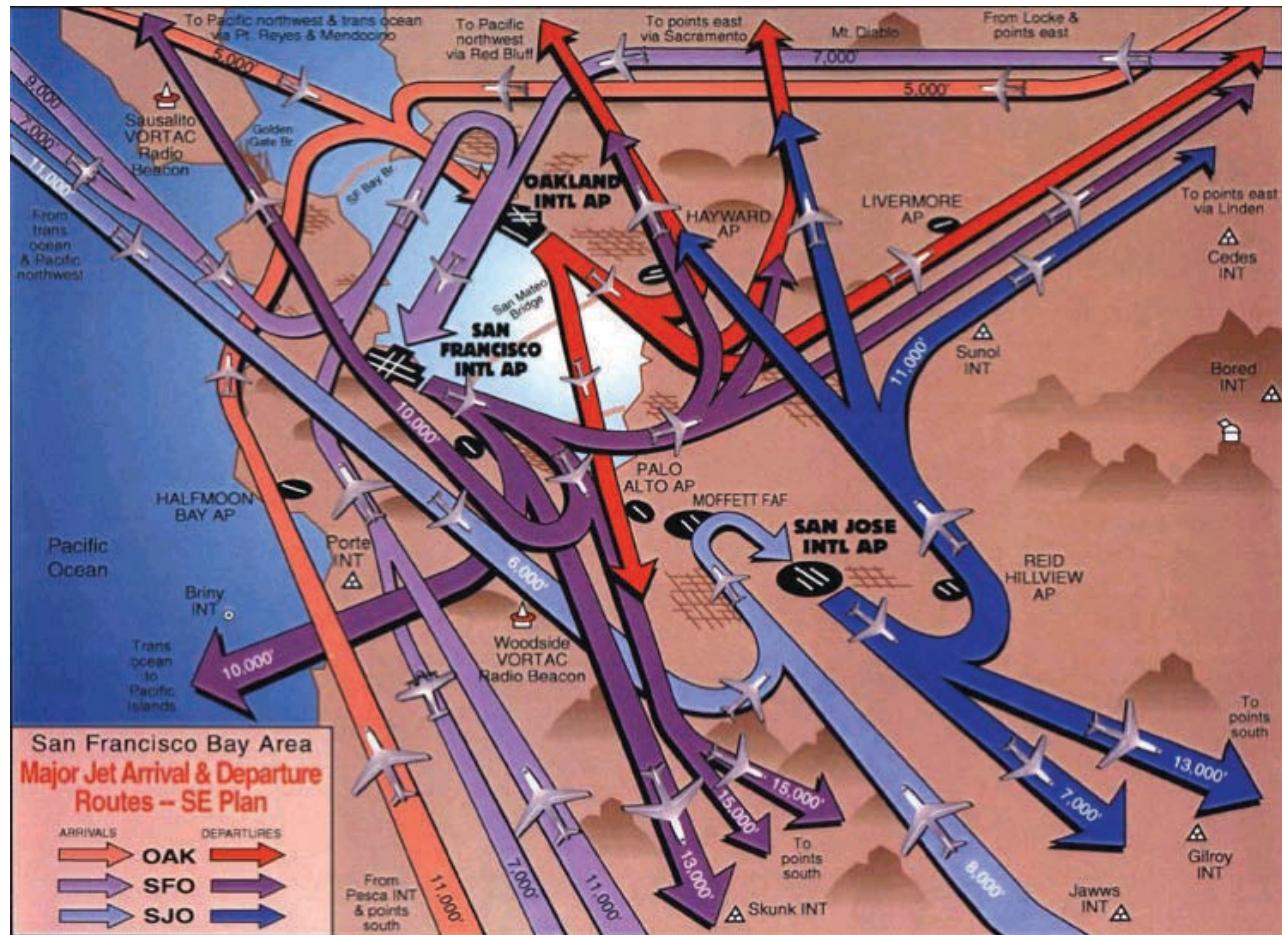
# Instrument flight procedures

# Air Traffic Management Example

# **BAY TRACON**

## **Traffic Flow**

### **South East Plain**



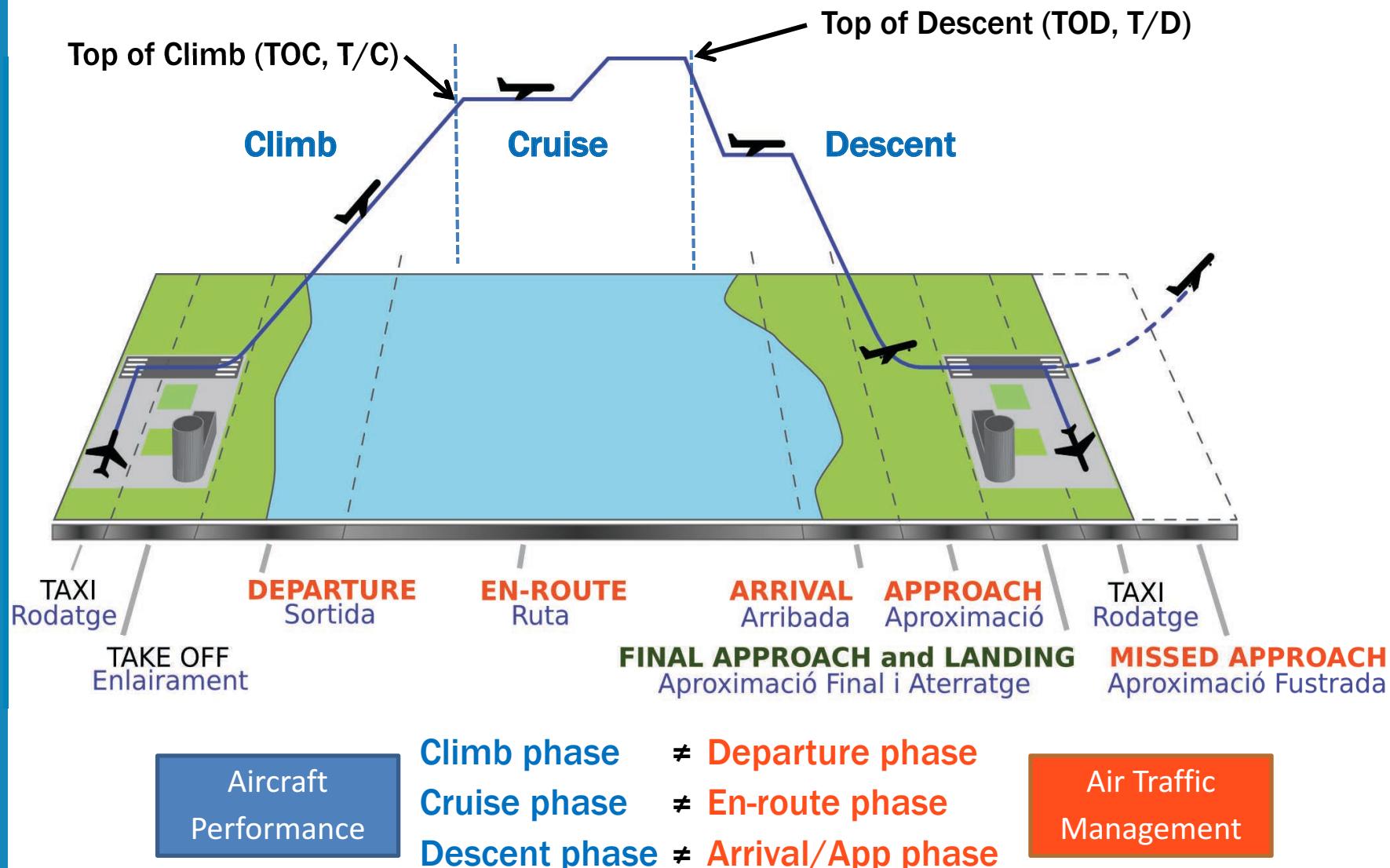
# Instrument flight procedures

# Air Traffic Management Example

**VFR flights do  
also exist in the  
Bay area!!**



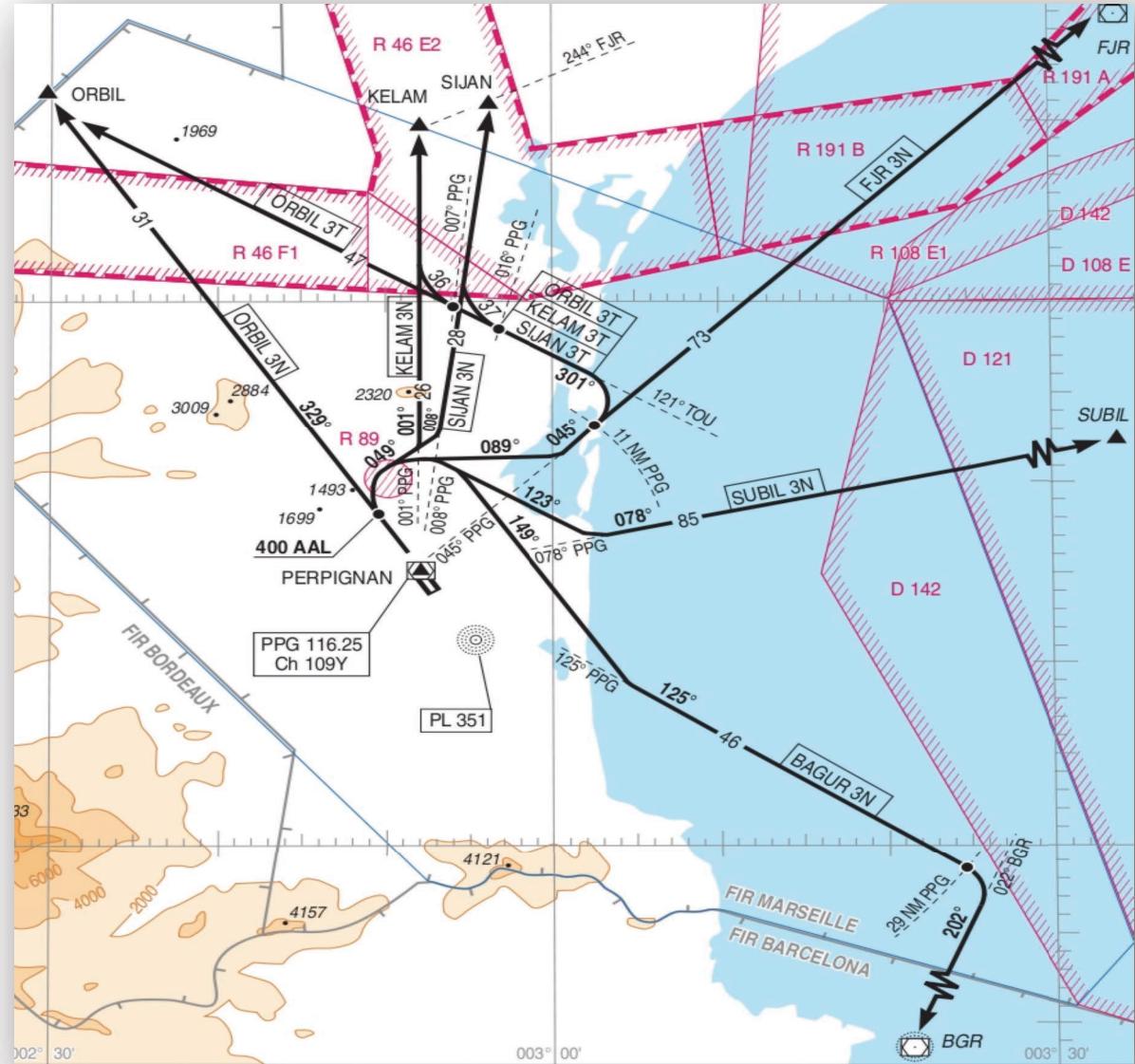
# Flight Phases & Procedures



# Flight procedures

## Departure Procedures

Standard  
Instrumental  
Departures (SID)



# Flight procedures

## Departure Procedures

National administration responsibility (procedure published in the AIP):

- normal operations assumed
- minimum climb gradient (3.3%) assumed; or
- bigger gradient used to clear obstacle AND published in the chart

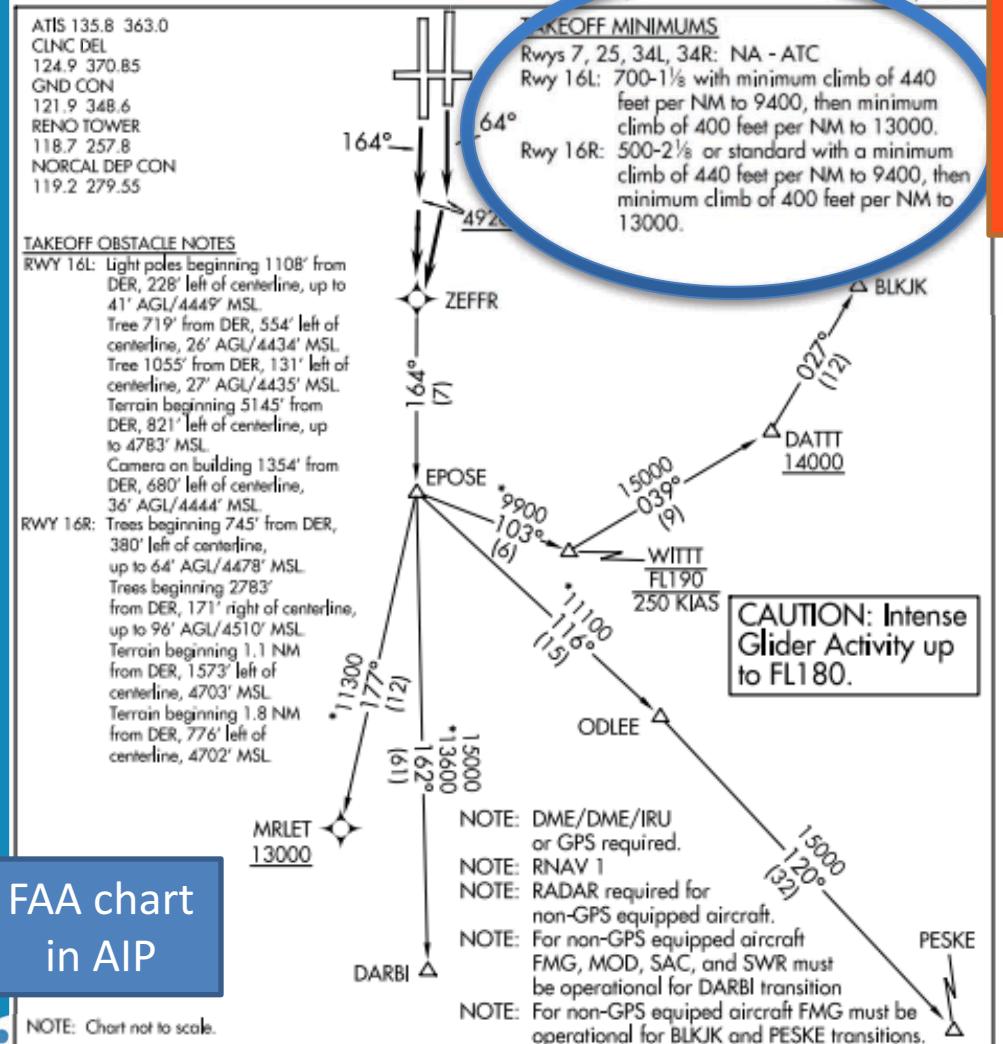
OPERATOR's Responsibility:

- contingency procedures to cover case of engine failure or an emergency in flight after take-off decision is made
- minimum visibility conditions

# Flight procedures

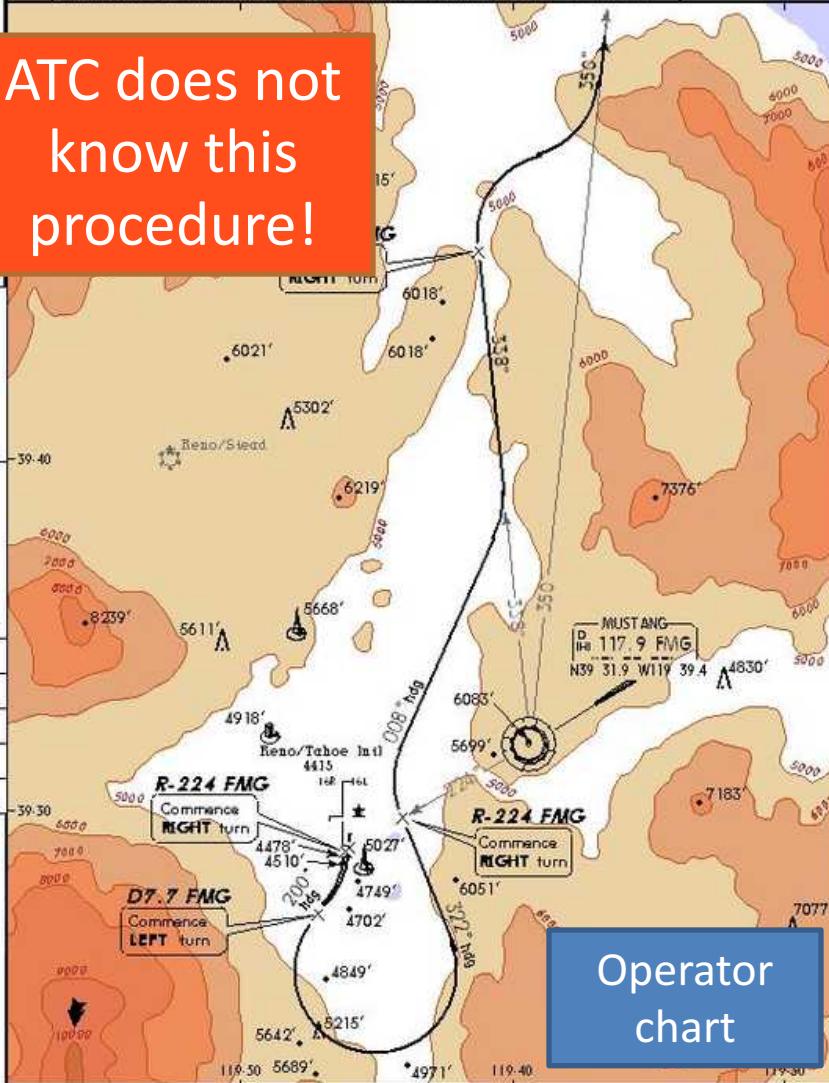
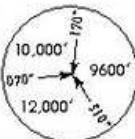
(ZEFFR4.ZEFFR) 15120

## ZEFFR FOUR DEPARTURE (RNAV)



FAA chart  
in AIP

RWY	PROCEDURE
16L	Climb runway heading. Upon crossing R-224 FMG VOR, RIGHT turn heading 200 degrees. At D7.7 FMG VOR, LEFT turn heading 322 degrees. Cross R-224 FMG VOR, RIGHT turn to 008 degree heading. Intercept R-338 FMG VOR. At D14.1 FMG VOR, RIGHT turn to intercept R-350 FMG VOR outbound. Use 15 degree bank all turns. MAX V2 = 180 knots.
16R	Climb runway heading. Upon crossing R-224 FMG VOR, RIGHT turn heading 200 degrees. At D7.7 FMG VOR, LEFT turn heading 322 degrees. Cross R-224 FMG VOR, RIGHT turn to 008 degree heading. Intercept R-338 FMG VOR. At D14.1 FMG VOR, RIGHT turn to intercept R-350 FMG VOR outbound. Use 15 degree bank all turns. MAX V2 = 180 knots.

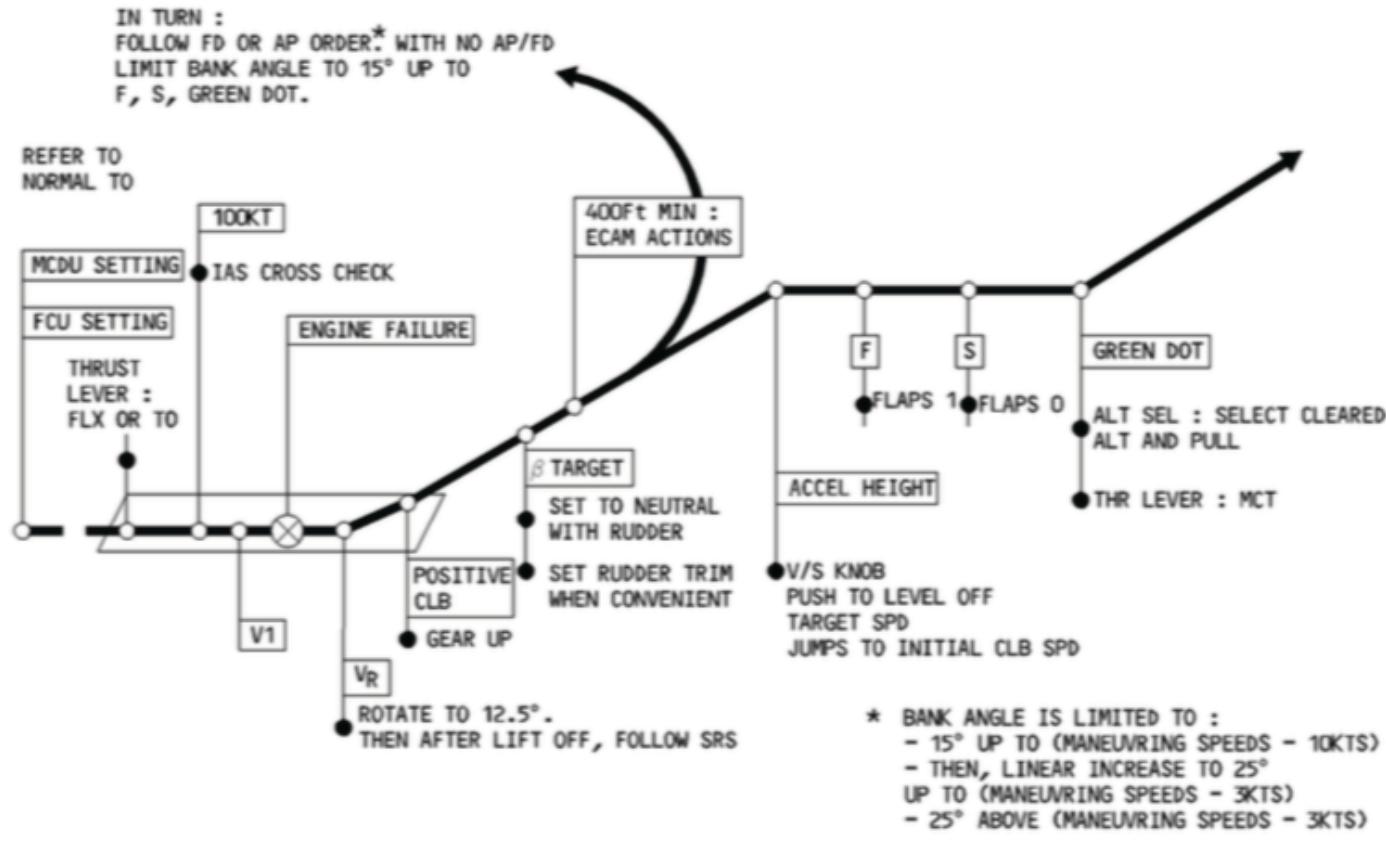


Operator  
chart

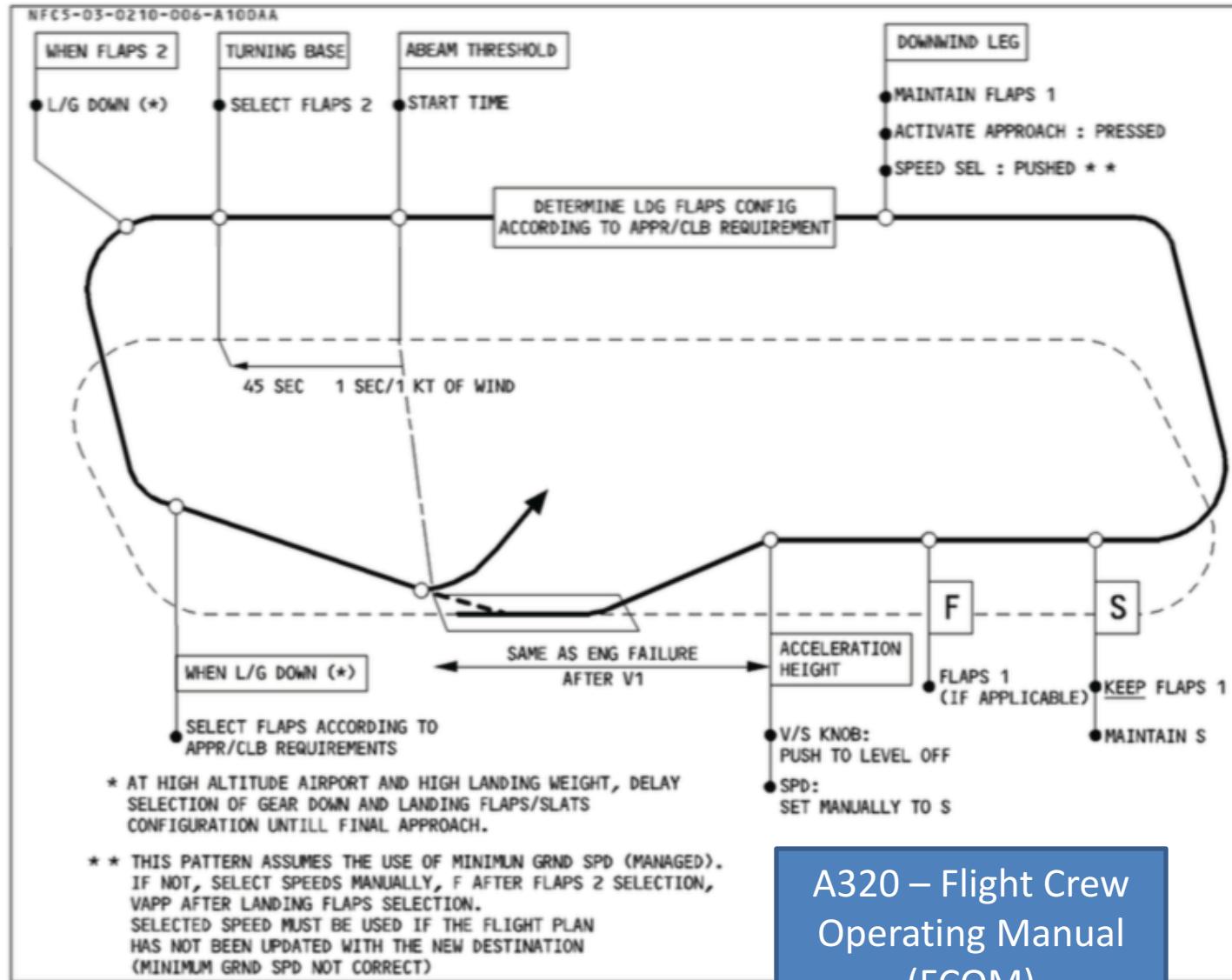
# Flight procedures

## A320 – Flight Crew Operating Manual (FCOM)

**ENG FAILURE AFTER V1 – CONTINUED TAKEOFF (CONT'D)**  
ENGINE OPERATION AT MAX T.O. THRUST IS LIMITED TO  
10 MINUTES



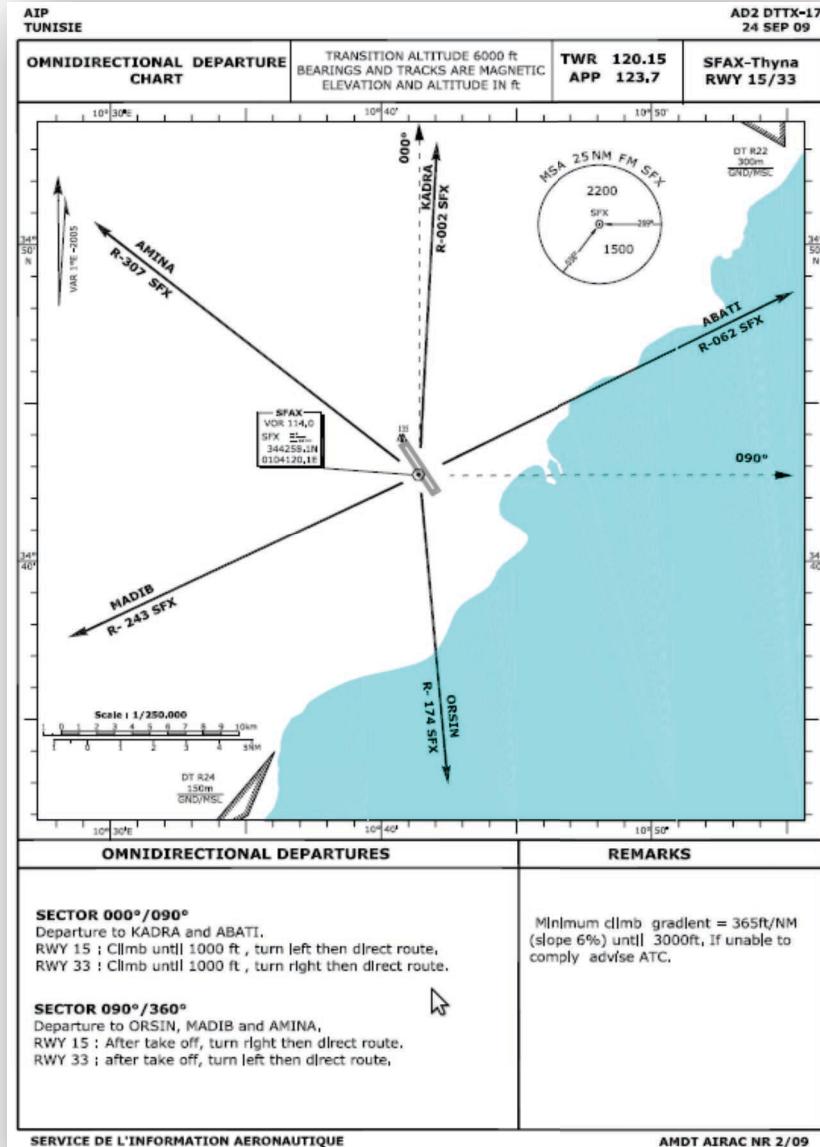
# Flight procedures



# Flight procedures

## Departure Procedures

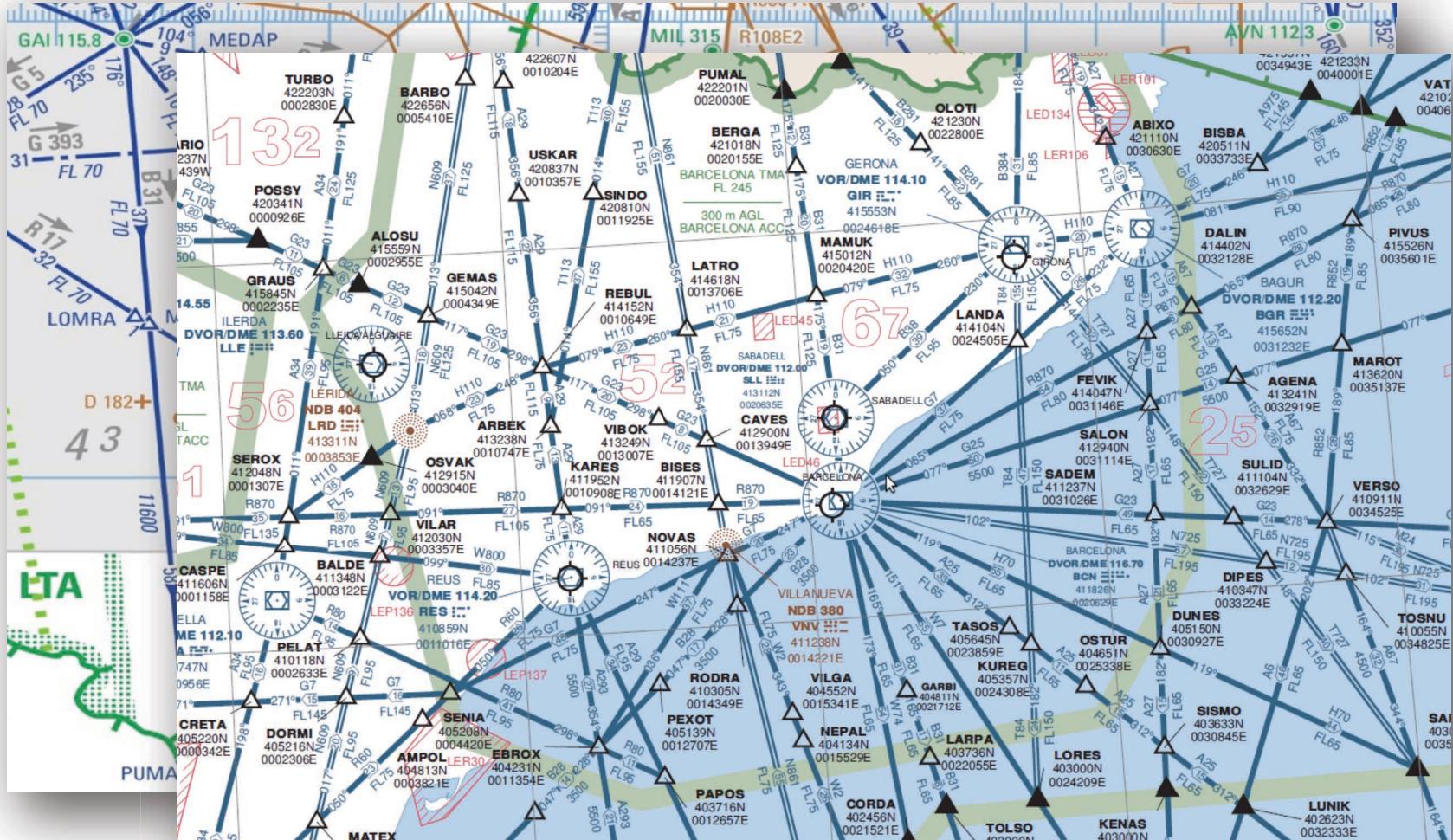
### Omnidirectional Departures



# Flight procedures

## En-route procedures

Airways

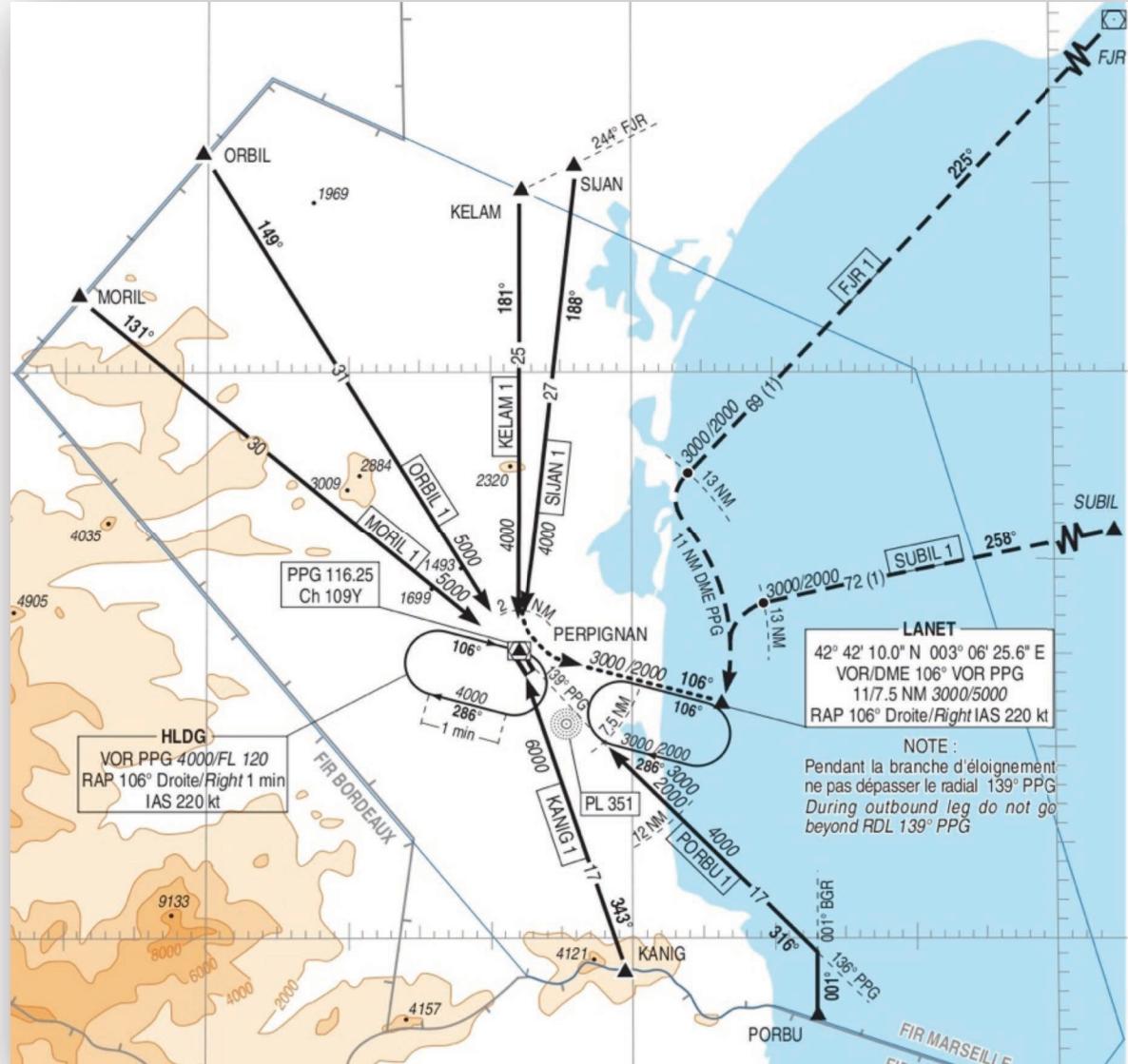


# Flight procedures

## Arrival

## Procedures

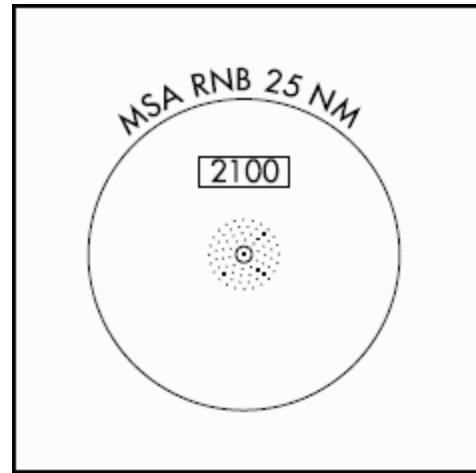
Standard  
Terminal Arrival  
Routes (STAR)



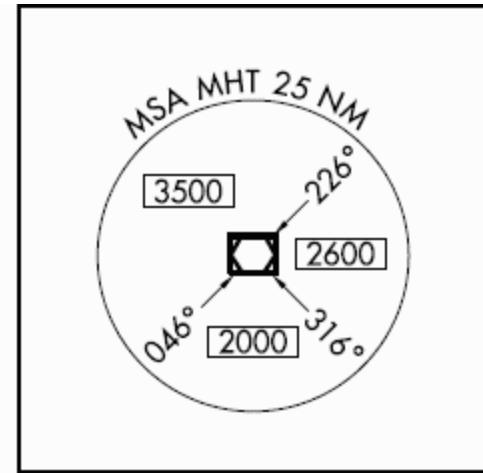
# Flight procedures

## Arrival Procedures

Omnidirectional  
Arrivals



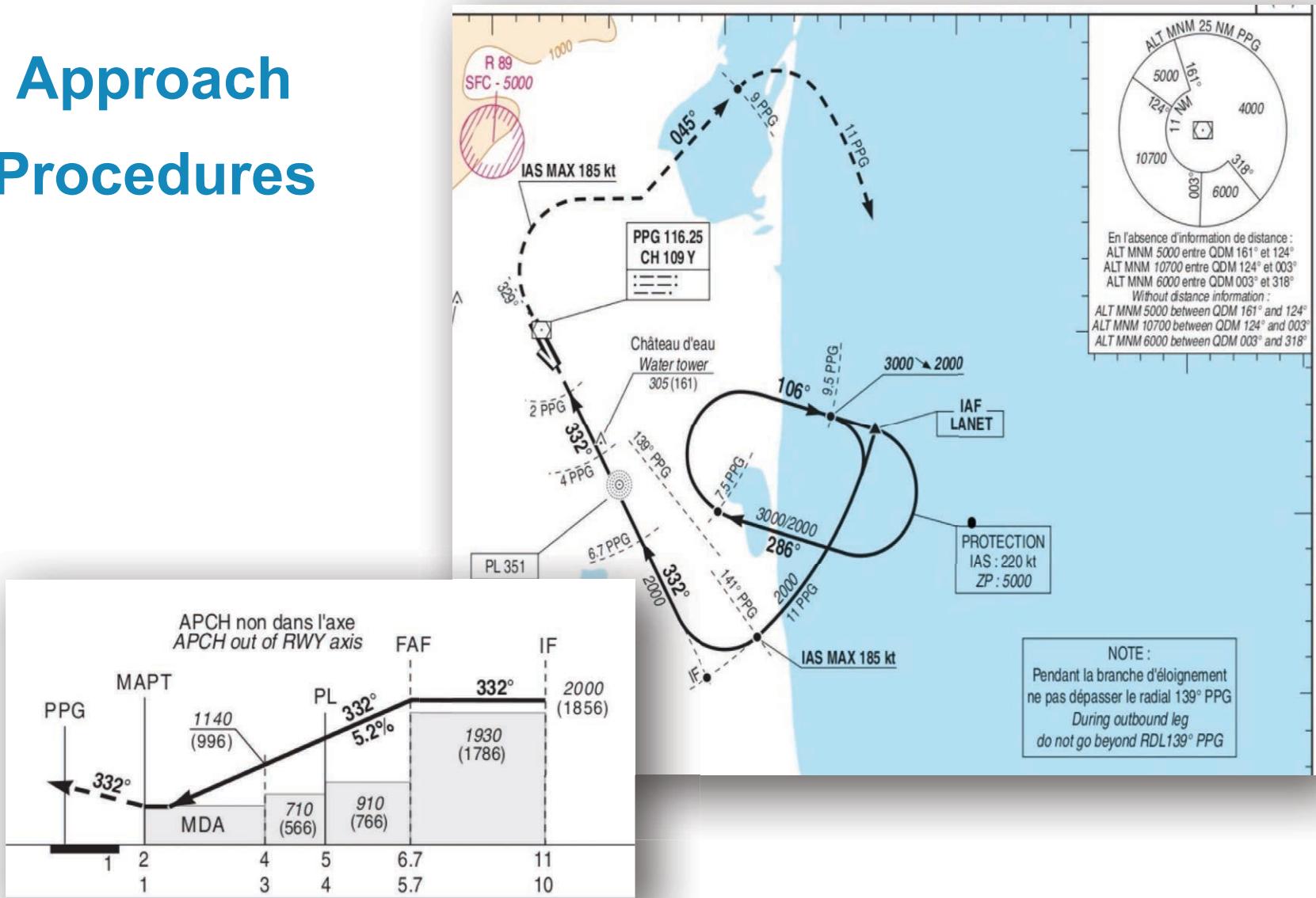
Millville MSA



Manchester MSA

# Flight procedures

# Approach Procedures



# Flight procedures

## Approach Procedures

National administration responsibility  
(procedure published in the AIP):

- obstacle clearance altitude computation
- minimum climb gradient in missed approach (3.3%) assumed; or
- bigger gradient used to clear obstacle AND published in the chart

OPERATOR's Responsibility:

- contingency procedures to cover case of engine failure or an emergency in flight
- minimum descent altitude / decision altitudes
- minimum visibility conditions

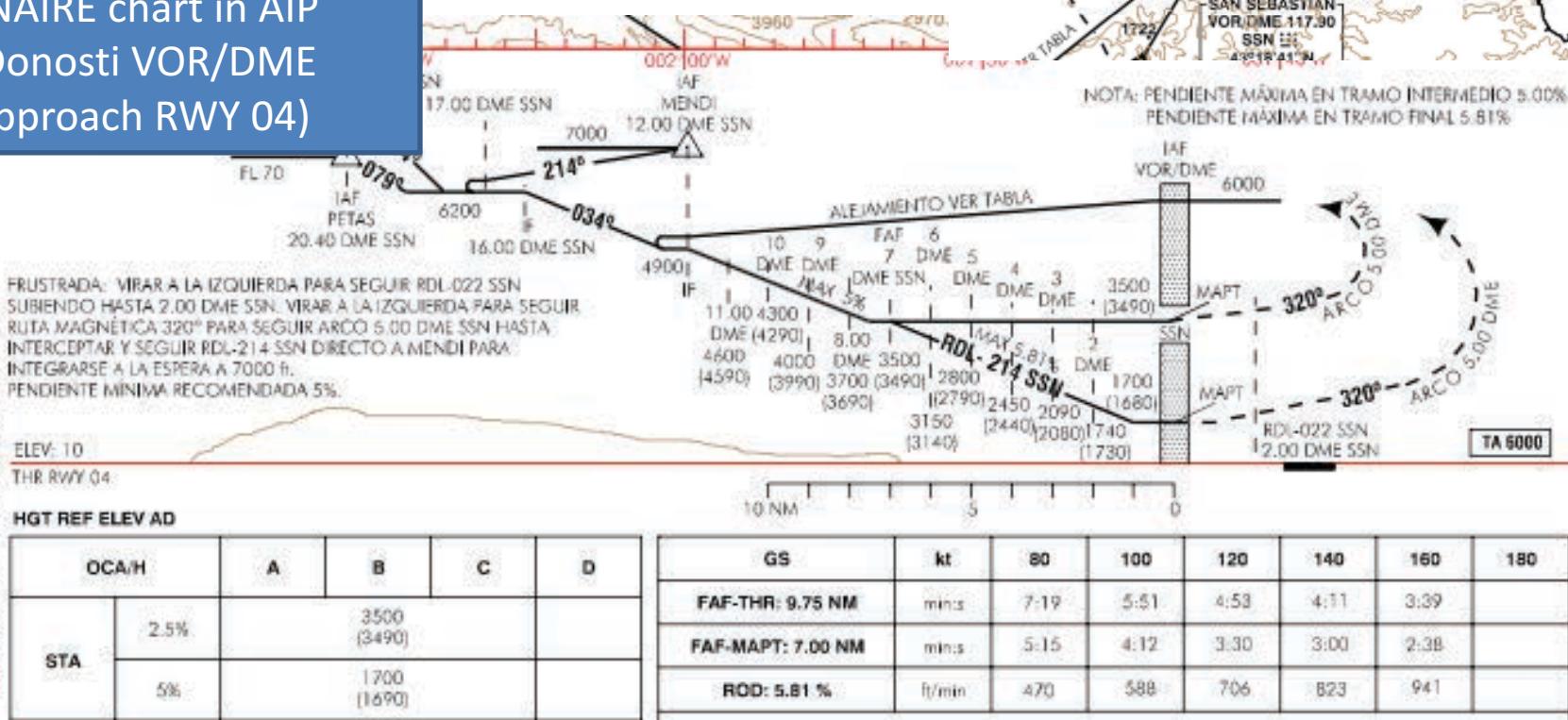
→ *(more details in the IFR-approaches lecture!)*

# Flight procedures

## Approach Procedures

ENAIKE chart in AIP  
(Donosti VOR/DME approach RWY 04)

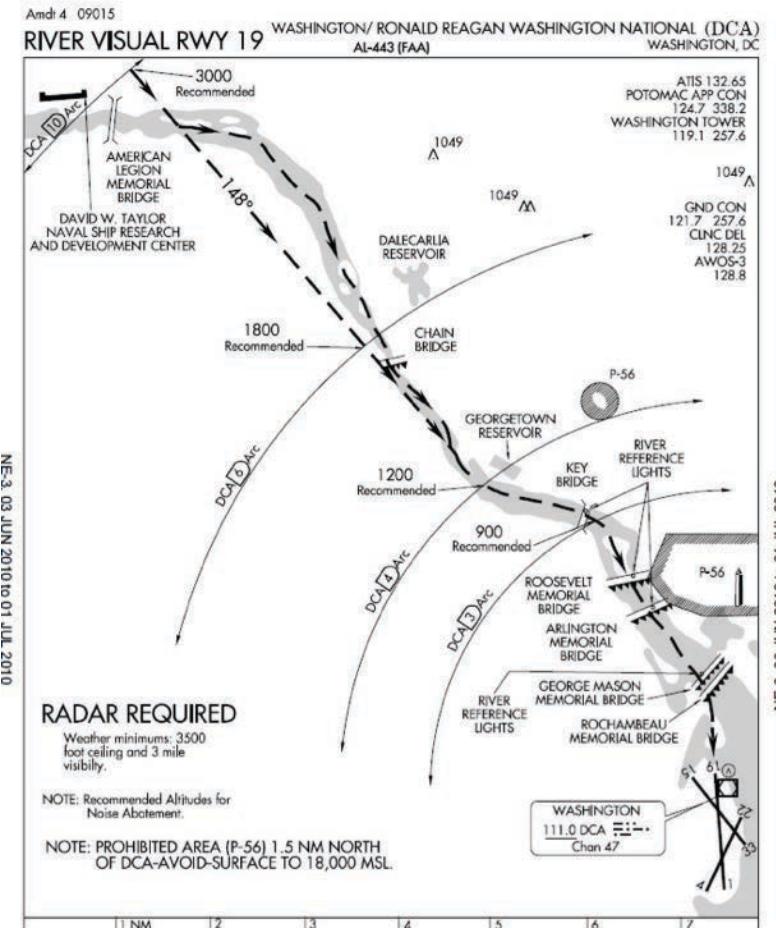
CAMBIOS: DECINCIÓN MAGNÉTICA ELEV AD



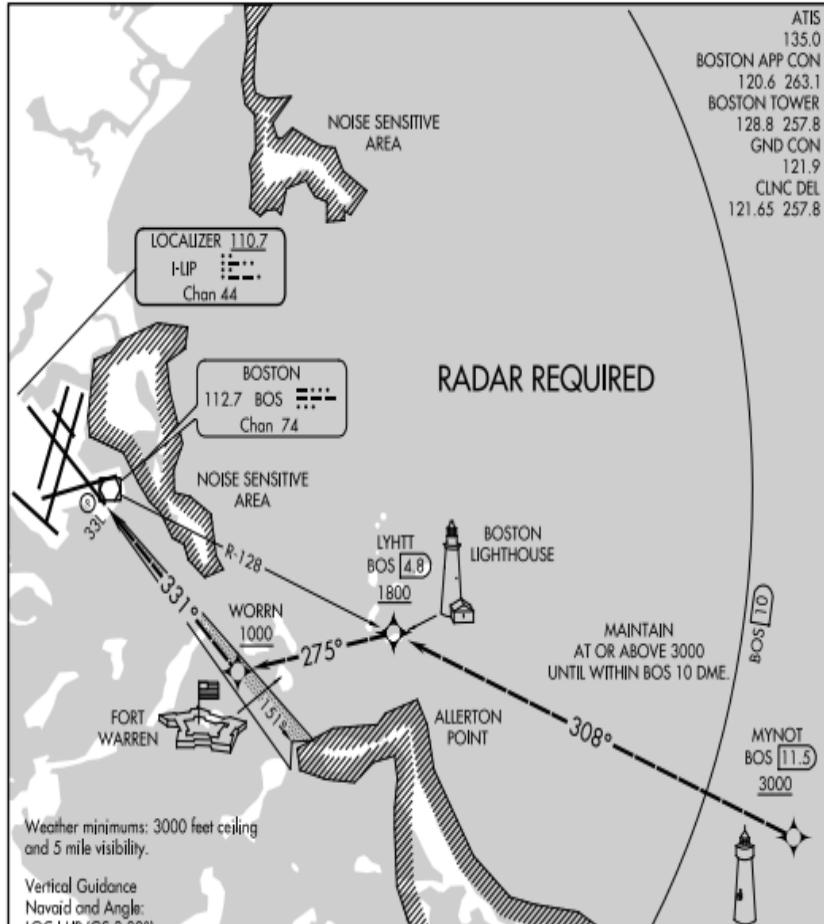
# Flight procedures

## Visual approaches with prescribed tracks

Widely used in the US



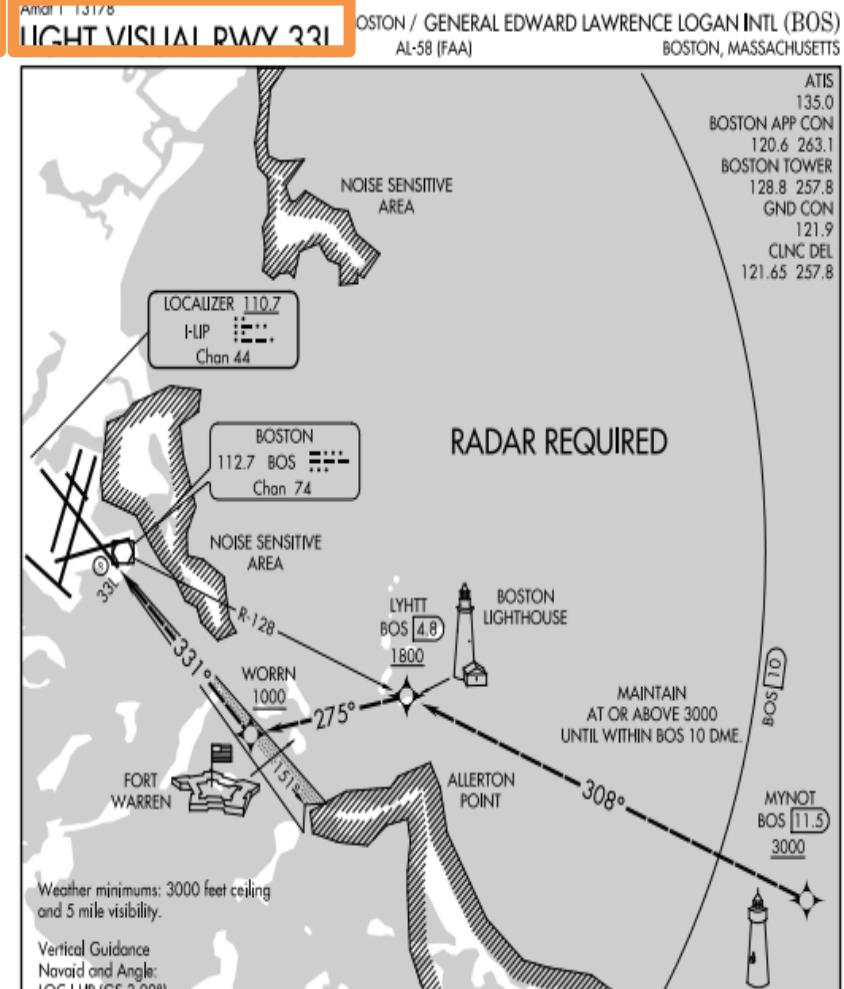
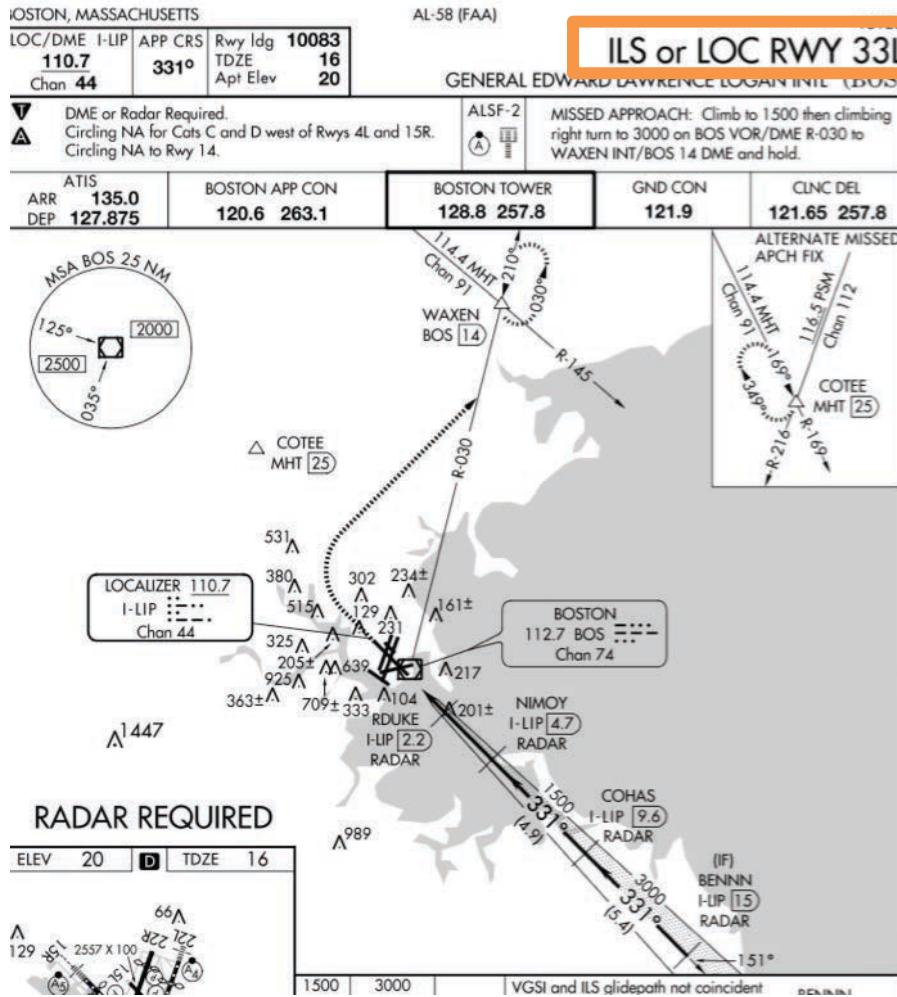
Amdt 1 13178  
LIGHT VISUAL RWY 33L  
BOSTON / GENERAL EDWARD LAWRENCE LOGAN INTL (BOS)  
AI-58 (FAA)  
BOSTON, MASSACHUSETTS



# Flight procedures

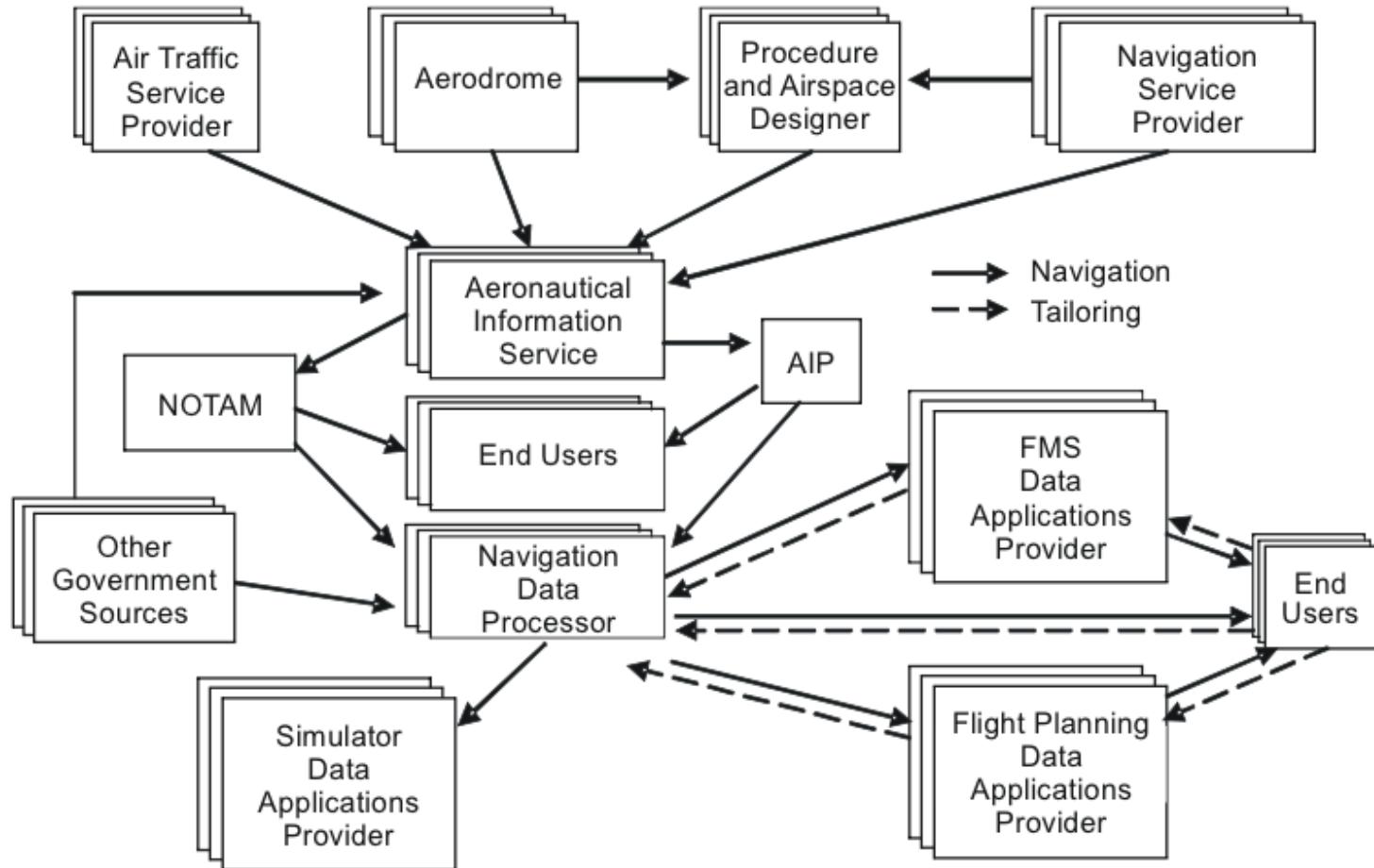
## Visual approaches with prescribed tracks

Widely used in the US



# Flight procedures

## Participants in the development of an Instrumental Flight Procedure



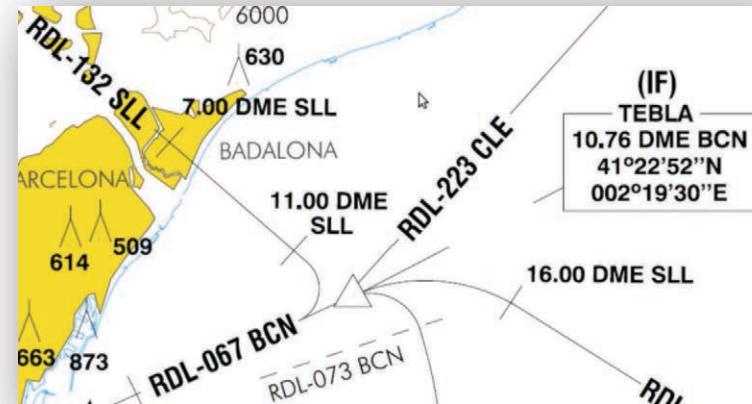
# Conventional instrument procedures

## FIXES

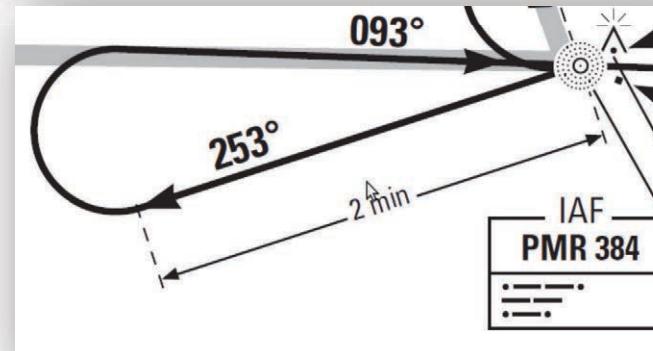
- Facilities



- Intersections

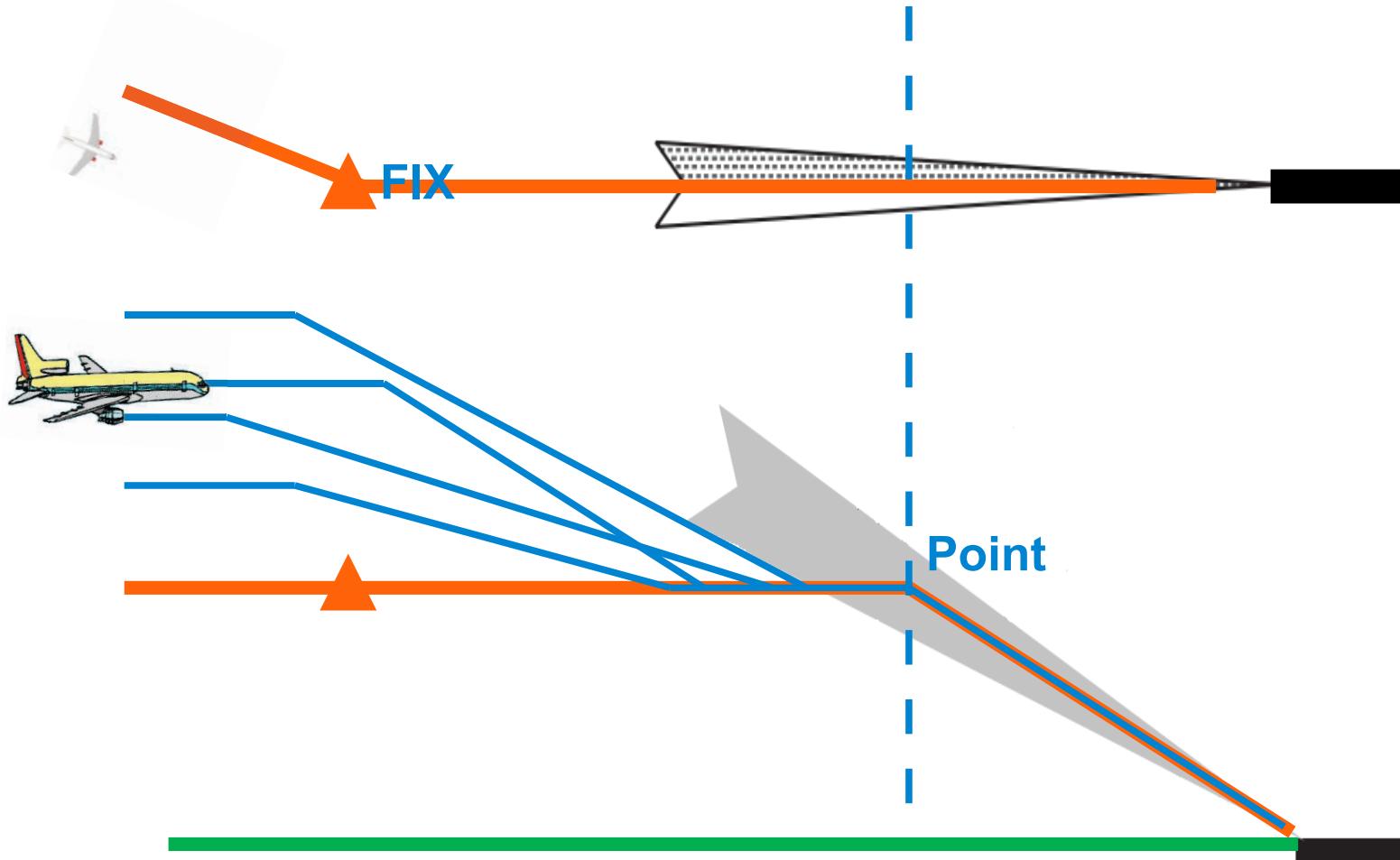


- Timing



# Conventional instrument procedures

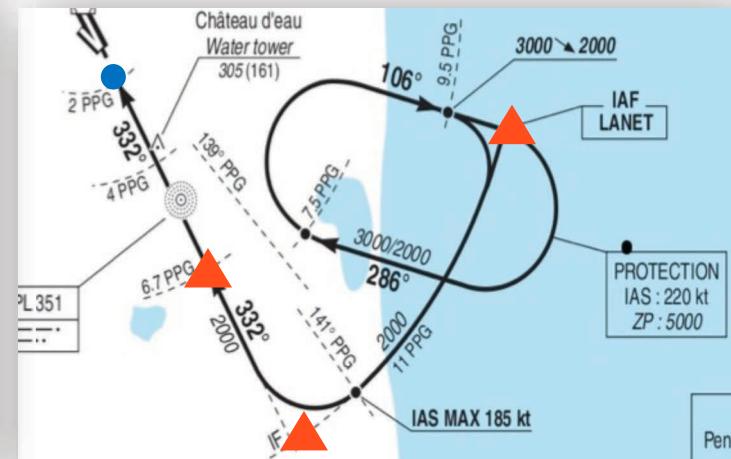
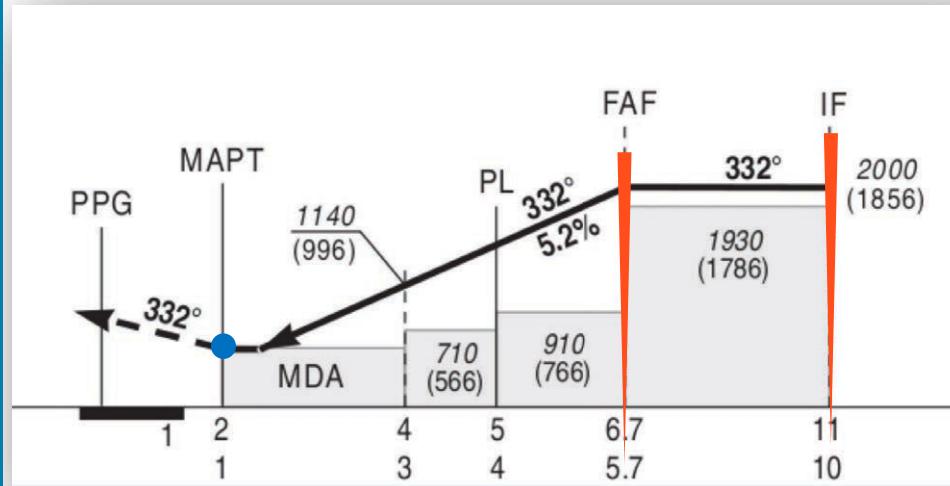
## FIXES vs. POINTS



# Conventional instrument procedures

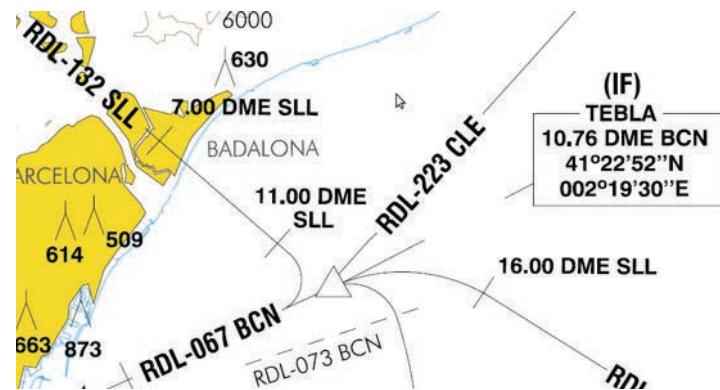
**Named points/fixes:**

IAF	→ Initial Approach Fix
IF	→ Intermediate Fix
FAF	→ Final Approach Fix
FAP	→ Final Approach Point
MAPt	→ Missed Approach Point

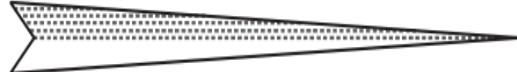


# Conventional instrument procedures

## LEGS

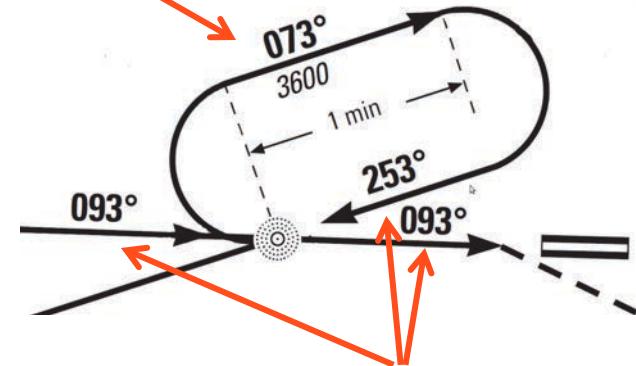


VOR radial

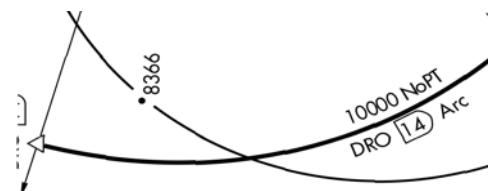


ILS Localizer / MLS azimuth

Dead reckoning

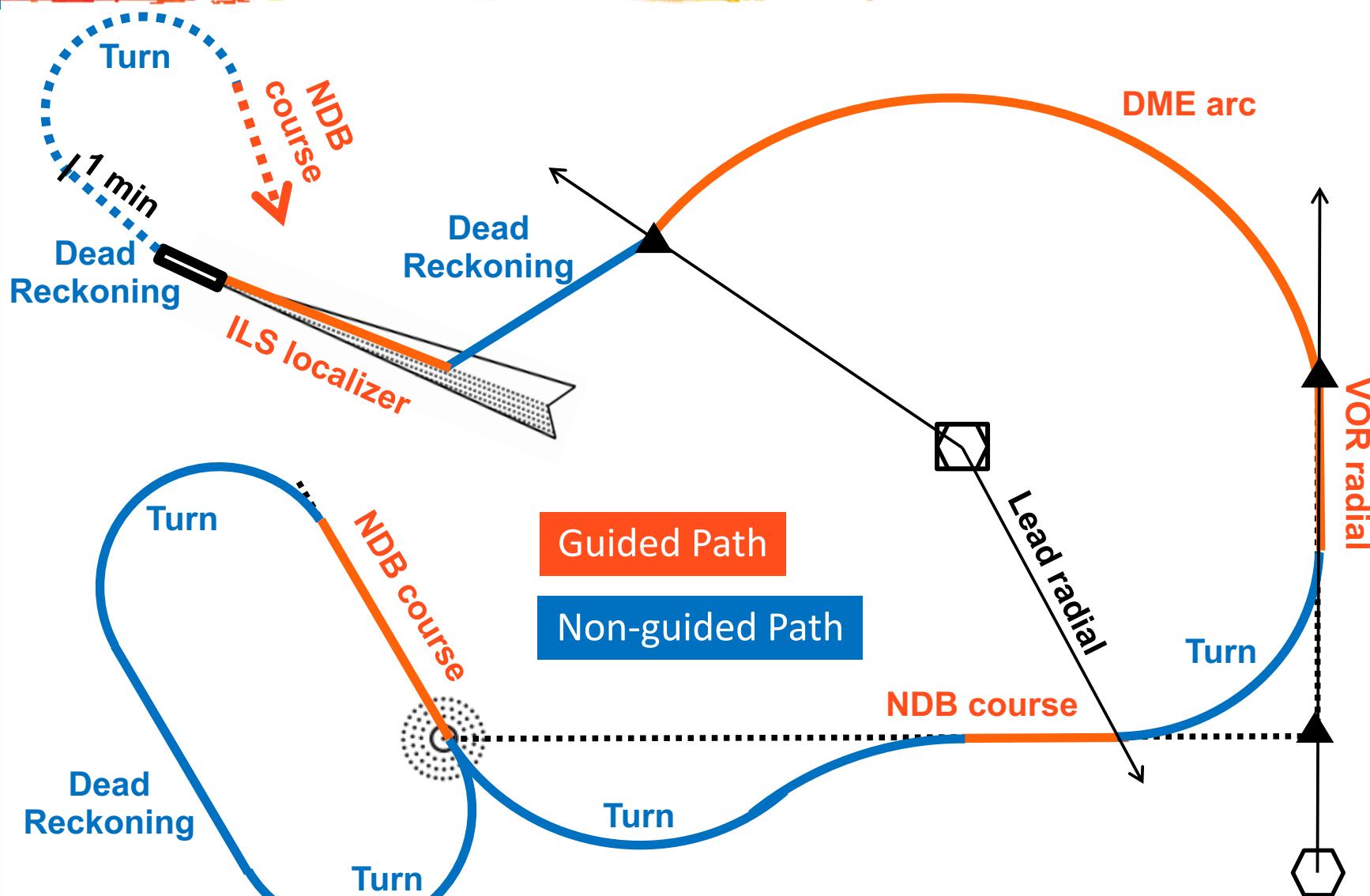


NDB course



DME arc

# Conventional instrument procedures





# Thank you!!

# Gràcies!!

