

AIRWAY MANUAL

K.Shirazi

P.Shirazi



Module objectives

At the end of this module you will be able to Describe the **function of airway manual in aviation** based on standard ICAO regulations.



Module Plan

- **PART 1: Enroute section**
- **PART 2: Table & Code**
- **PART 3: Airport Directory**
- **PART 4: Instrument Approach Procedure**
- **PART 5: Chart Briefing**

PART 1

Enroute section

Time 04:00

ATS ROUTE

SSR
TRANSPONDER

E
N
R
O
U
T
E

Module objectives

At the end of this module you will be able to explain some **specification of ATS route in aviation** based on standard ICAO regulations.



Time 02:00

ATS route

A specified route designed for channelling the flow of traffic as necessary for the provision of air traffic services.

*The term “ATS route” is used to mean variously, **airway, advisory route, controlled or uncontrolled route, arrival or departure route, etc.***

An ATS route is defined by route specifications which include an **ATS route designator**, the **track** to or from significant points (waypoints), **distance** between significant points, **reporting** requirements and, as determined by the appropriate ATS authority, the **lowest safe altitude**.

ATS route designator

According to ICAO Annex 11 basic designators for ATS routes shall consist of *a maximum of five, in no case exceed six*, alpha/numeric characters in order to be usable by both ground and airborne automation systems. The designator shall indicate the type of the route.

COMPOSITION OF DESIGNATORS

a. The basic designator consists of one letter of the alphabet followed by a number from 1 to 999. The letters may be:

1. **A, B, G, R** — for routes which form part of the regional networks of ATS routes **and** are not area navigation routes;
2. **L, M, N, P** — for area navigation routes which form part of the regional networks of ATS routes;
3. **H, J, V, W** — for routes which do **not** form part of the regional networks of ATS routes **and** are not area navigation routes;
4. **Q, T, Y, Z** — for area navigation routes which do **not** form part of the regional networks of ATS routes.

b. Where applicable, one supplementary letter **shall** be added as a **prefix** to the basic designator as follows:

1. **K** — to indicate a low level route established for use primarily by **helicopters**;
2. **U** — to indicate that the route or portion thereof is established in the **upper airspace**;
3. **S** — to indicate a route established exclusively for use by **supersonic** aircraft during acceleration/deceleration and while in **supersonic flight**.

c. Where applicable, a supplementary letter **may** be added after the basic designator of the ATS route as a **suffix** as follows:

1. **F** — to indicate that on the route or portion thereof **advisory** service **only** is provided;
2. **G** — to indicate that on the route or portion thereof **flight** information service **only** is provided;
3. **Y** — for RNP1 routes at and above FL200 to indicate that all turns on the route between 30 and 90 degrees shall be made within the tolerance of a tangential arc between the straight leg segments defined with a radius of 22.5 NM;
4. **Z** — for RNP1 routes at and below FL190 to indicate that all turns on the route between 30 and 90 degrees shall be made within the tolerance of a tangential arc between the straight leg segments defined with a radius of 15 NM.

USE OF DESIGNATORS IN COMMUNICATIONS

In voice communications, the basic letter of a designator should be spoken in accordance with the ICAO spelling alphabet.

Where the prefixes **K**, **U** or **S**, specified above, are used in voice communications, they should be pronounced as:

K = “Kopter”

U = “Upper” and

S = “Supersonic”

as in the English language.

Where suffixes “**F**”, “**G**”, “**Y**” or “**Z**” specified above are used, the flight crew should not be required to use them in voice communications.

Example:

A11

will be spoken Alfa 11

UR5

will be spoken Upper Romeo 5

KB34

will be spoken Kopter Bravo 34

UW456 F

will be spoken Upper Whiskey 456

Direction

137°

VOR radial & route bearings (magnetic)

137°T

VOR Radial and route bearings (true)

ADF Bearings (inbound or outbound). Bearings are magnetic unless followed by a "T" indicating True.

←279°

←279°T

ADF Bearings include an arrow to indicate the direction of flight or, when used to designate Fixes, direction to the station. In remote or oceanic areas where ground based navigation aids are not available, the arrow indicates the direction of flight.

←266°T
086°T→

ADF bearings (True at track midpoint).

ENRT-A	Even and Odd Indicators Even and Odd altitudes are used in direction indicated < E E > < O O > < E&O E&O > E&O
ENRT-L	
ENRT-H	
ENRT-H/L	

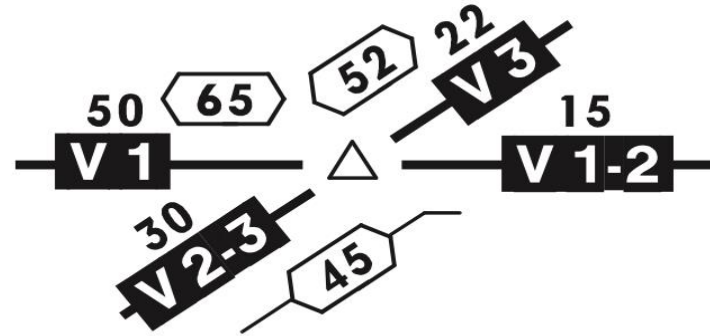


One Way Airway

Suffix 1 or 1, 2 or 1, 2, 3 gives the Conditional Route Category (Europe).

E
N
R
O
U
T
E

Distance



Mileages. Total mileage between nav aids  is positioned along respective airway centerline. Total mileage may have directional pointers  when there are multiple airway designators. The pointers parallel the airway centerlines along which the mileage applies.

Reporting point

FIXES

		Compulsory Reporting Point
		Non-Compulsory Reporting Point
		Low Altitude Compulsory Reporting Point
		Low Altitude Non-Compulsory Reporting Point.
X		Mileage Break/Turning Point
		RNAV Waypoint

COMPULSORY REPORTING POINTS

Reporting points which must be reported to ATC. They are designated on aeronautical charts by **solid triangles or filed in a flight plan as fixes selected to define direct routes**. These points are geographical location which are defined by navigation aids/fixes. Pilots should **discontinue position reporting** over compulsory reporting points when informed by ATC that their aircraft is in “radar contact.”

FLY-BY WAYPOINT

A fly-by waypoint requires the use of turn anticipation to avoid overshoot of the next flight segment.

FLY-OVER WAYPOINT

A fly-over waypoint precludes any turn until the waypoint is overflown and is followed by an intercept maneuver of the next flight segment.

WAYPOINT

specified geographical location used to define an area navigation route or the flight path of an aircraft employing area navigation.



PITCH POINT

A fix/waypoint that serves as a transition point from a departure procedure or the low altitude ground-based navigation structure into the high altitude waypoint system.

CATCH POINT

A fix/waypoint that serves as a transition point from the high altitude waypoint navigation structure to the low altitude structure or an arrival procedure (STAR).

Symbol Category: AIRSPACE FIXES

APCH-PL	<u>Non-Compulsory</u>
SID/STAR	
ENRT-A	
ENRT-L	
ENRT-H	
ENRT-H/L	
ENRT-H/L	
APCH-PL	<u>Compulsory</u>
SID/STAR	
ENRT-A	
ENRT-L	
ENRT-H	
ENRT-H/L	
ENRT-H/L	

APCH-PL	<u>RNAV Non-Compulsory</u>
SID/STAR	
ENRT-A	
ENRT-L	
ENRT-H	
ENRT-H/L	
APCH-PL	
SID/STAR	
ENRT-A	
ENRT-L	
ENRT-H	<u>RNAV Compulsory</u>
ENRT-H/L	
APCH-PL	
SID/STAR	
ENRT-A	
ENRT-L	
ENRT-H	
ENRT-H/L	
APCH-PL	
SID/STAR	
ENRT-A	<u>Mileage Break/CNF</u> Non-Compulsory Fix
ENRT-L	
ENRT-H	
ENRT-H/L	
APCH-PL	
SID/STAR	<u>Fly Over Fix</u> Indicated by circle around fix
ENRT-A	
ENRT-L	
ENRT-H	
ENRT-H/L	
APCH-PL	
SID/STAR	
ENRT-A	
ENRT-L	
ENRT-H	

E
N
R
O
U
T
E

Minimum/Maximum altitude

MINIMUM ENROUTE IFR ALTITUDE (MEA)

The lowest published altitude between radio fixes that meets obstacle clearance requirements between those fixes and in many countries assures acceptable navigational signal coverage. The MEA applies to the entire width of the airway, segment, or route between the radio fixes defining the airway, segment, or route.

MINIMUM VECTORING ALTITUDE (MVA)

The lowest MSL altitude at which an IFR aircraft will be vectored by a radar controller, except as otherwise authorized for radar approaches, departures and missed approaches. The altitude meets IFR obstacle clearance criteria. It may be lower than the published MEA along an airway of J-route segment. It may be utilized for radar vectoring only upon the controller's determination that an adequate radar return is being received from the aircraft being controlled.

MINIMUM OBSTRUCTION CLEARANCE ALTITUDE (MOCA)

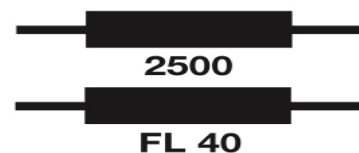
The lowest published altitude in effect between radio fixes on VOR airways, off airway routes, or route segments which meets obstacle clearance requirements for the entire route segment and in the USA assures acceptable navigational **signal coverage only within 22NM of a VOR.**

MINIMUM OFF-ROUTE ALTITUDE (MORA)

This is an altitude derived by Jeppesen. The MORA provides known **obstruction clearance 10NM either side of the route centerline including a 10NM radius beyond the radio fix reporting or mileage break defining the route segment.** For terrain and man-made structure clearance refer to Grid MORA.

MAXIMUM AUTHORIZED ALTITUDE (MAA)

A published altitude representing the maximum usable altitude or flight level for an airspace structure or route segment.



MEA (Minimum Enroute Altitude), shown as altitude or flight level.



MEA is established with a gap in nav-signal coverage.



Directional MEAs as indicated.

7500G

GPS MEA

1300T

MOCA (Minimum Obstruction Clearance Altitude).

1300a

Route MORA (Route Minimum Off-Route Altitude). See glossary.

MAA 25000
MAA FL 240

MAA (Maximum Authorized Altitude), shown as altitude or flight level.

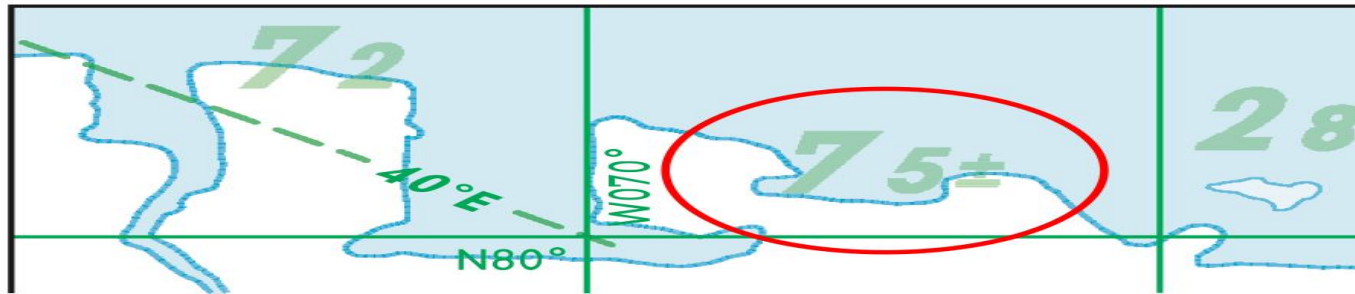
GRID MINIMUM OFF-ROUTE ALTITUDE (Grid MORA)

An altitude derived by Jeppesen or provided by State Authorities. The Grid MORA altitude provides terrain and *man-made structure clearance* within the section outlined by **latitude and longitude** lines. MORA does not provide for navaid signal coverage or communication coverage.

Grid MORA values derived by Jeppesen clear all terrain and man-made structures by *1000ft in areas where the highest elevations are 5000ft MSL or lower. MORA values clear all terrain and man-made structures by 2000ft in areas where the highest elevations are 5001ft MSL or higher.* Grid MORA values *followed by a +/- denote doubtful accuracy*, but are believed to provide sufficient reference point clearance.

Grid MORA (State) altitude supplied by the State Authority provides 2000ft clearance in mountainous areas and 1000ft in non-mountainous areas.

ORIENTATION



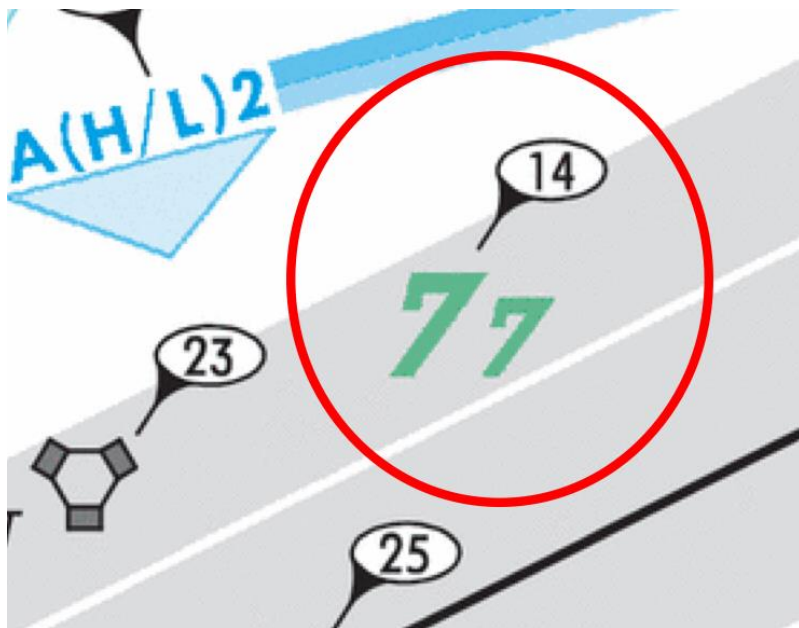
Grid shown at the intersection of units of latitude and longitude or by complete line.

Magnetic variation isogonic lines are indicated at the edge of the chart or are extended fully across the chart in a continuous dashed line.

Shorelines and large inland lakes are shown.

Grid Minimum Off-Route Altitude (Grid MORA) in hundreds of feet provides reference point clearance within the section outlined by latitude and longitude lines. Grid MORA values followed by a +/- denote doubtful accuracy, but are believed to provide sufficient reference point clearance.

ENRT-A	Grid MORA 90 157
ENRT-L	
ENRT-H	
ENRT-H/L	



13 — DME.

14 — Grid MORA. Values 10,000 feet and greater are maroon. Values less than 10,000 feet are green.
 Values are depicted in hundreds of feet.

NO # 4

Time = 00:04



Which of the following prefixes indicate an area navigation route which does not form part of the regional network of ATS routes?

- a) G
- b) M
- c) H
- d) Q



Which of the following prefixes indicate an area navigation route which does not form part of the regional network of ATS routes?

- a) G
- b) M
- c) H
- d) Q



Which suffixes of route designator does not use in voice communication?

- a) F, S, T
- b) R, Y, Z
- c) F, Y, Z
- d) Y, Z, U



Which suffixes of route designator does not use in voice communication?

- a) F, S, T
- b) R, Y, Z
- c) F, Y, Z
- d) Y, Z, U



What is the meaning of (F) as a suffix when added after the basic designator of an ATS route?

- a) ATC is provided.
- b) Advisory service is provided.
- c) Flight information is provided.
- d) All ATS services are provided.



What is the meaning of (F) as a suffix when added after the basic designator of an ATS route?

- a) ATC is provided.
- b) Advisory service is provided.
- c) Flight information is provided.
- d) All ATS services are provided.



How the route designator of ``UL426F`` shall be used in voice communication?

- a) Uniform Lima 426 foxtrot.
- b) Upper Lima 426.
- c) Uniform Lima 426.
- d) Upper Lima 426 foxtrot.

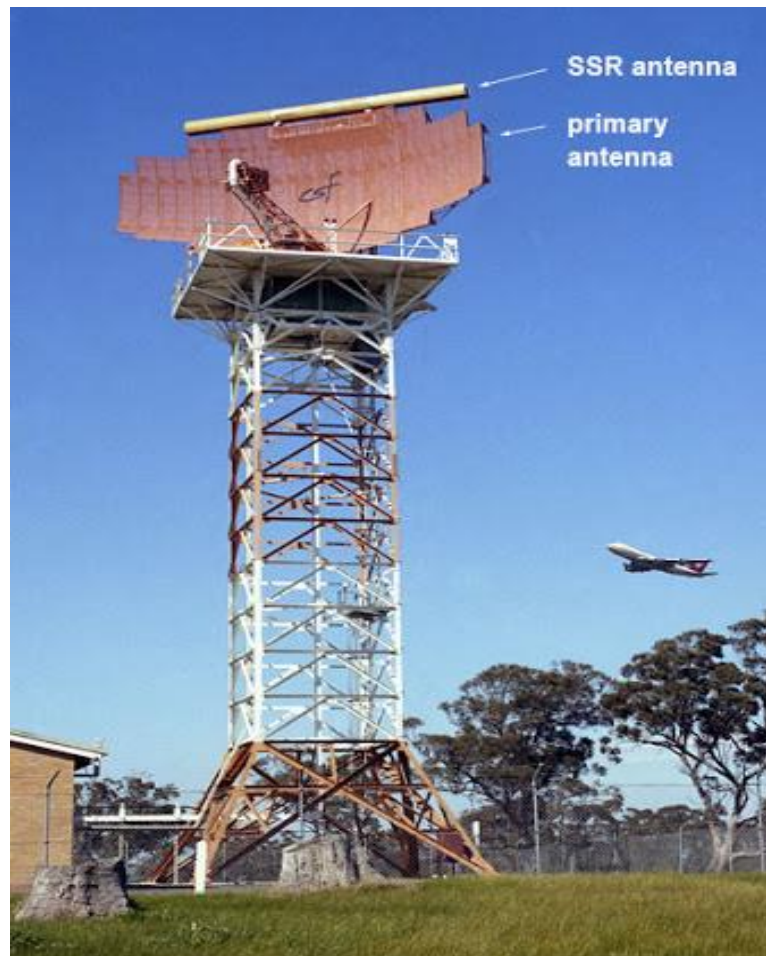


How the route designator of ``UL426F`` shall be used in voice communication?

- a) Uniform Lima 426 foxtrot.
- b) Upper Lima 426.
- c) Uniform Lima 426.
- d) Upper Lima 426 foxtrot.



Secondary Surveillance Radar



Module objectives

At the end of this module you will be able to explain the **SSR function in aviation** based on standard ICAO regulations.

Time 02:00



SSR and ACAS

Secondary Surveillance Radar (SSR)

The modern SSR systems have been developed from the equipment used in WWII as a means of identifying 'friend' from 'foe' (IFF). The basic system was rather crude effectively giving the ground station a response from the aircraft indicating that the aircraft was fitted with the then highly secret equipment. As only 'friendly' aircraft had the equipment the radar operator could easily distinguish a friendly aircraft radar response from an enemy response.

Carriage of Transponders

The airborne equipment is called a transponder (because it transmits a response to an interrogation). PANS OPS requires that where a serviceable transponder is carried in an aircraft, unless ATC instructs otherwise, it will be used at all times. Individual states may specify certain conditions where the carriage and operation of a transponder is mandatory. In either case, the operation of the equipment will be regardless of the provision of an ATC service.

Mode of Operation

The output codes of the SSR system consist of groups of 4 numbers in the range 0 - 7. The ground station (the interrogator) transmits a coded signal that prompts the aircraft transponder to reply. The overall SSR system has several different 'modes' of operation. *The response will be mode Alpha with addition of mode Charlie.* In addition, the military have other modes of operation of SSR which overlap with civilian usage. In order to correctly indicate the required response code, the mode as well as code should always be specified. The pilot is to respond with the mode and code.

Squawk Ident

The transponder has a facility to enable the radar controller to automatically identify the specific radar contact using SSR other than by reliance on the specific code transmission. This facility may be activated by selection of the 'Ident' feature on the transponder controller in response to a request to **“squawk Ident.”** Pilots are not to squawk Ident except on instruction from the radar controller.

Special Codes

Because the airborne equipment can transmit any of **4096 individual coded responses**, certain individual responses have been allocated specific meanings. The following special codes indicate:

- *Emergency* *A/7700*
- *Radio failure* *A/7600*
- *Unlawful interference* *A/7500*

In addition, the following reserved codes have the specific meanings:

- **A/7000** *Conspicuity. This is set when the aircraft is in an area where radar is used to provide ATS, but the pilot is not in receipt of a service (VFR outside CAS)*
- **A/2000** *In the absence of any ATC direction or regional air navigation agreement (or when outside of a radar control/service area). This code is set when eastbound in the NAT region.*
- **A/0000** *Unserviceable transponder. Set as directed by ATC.*

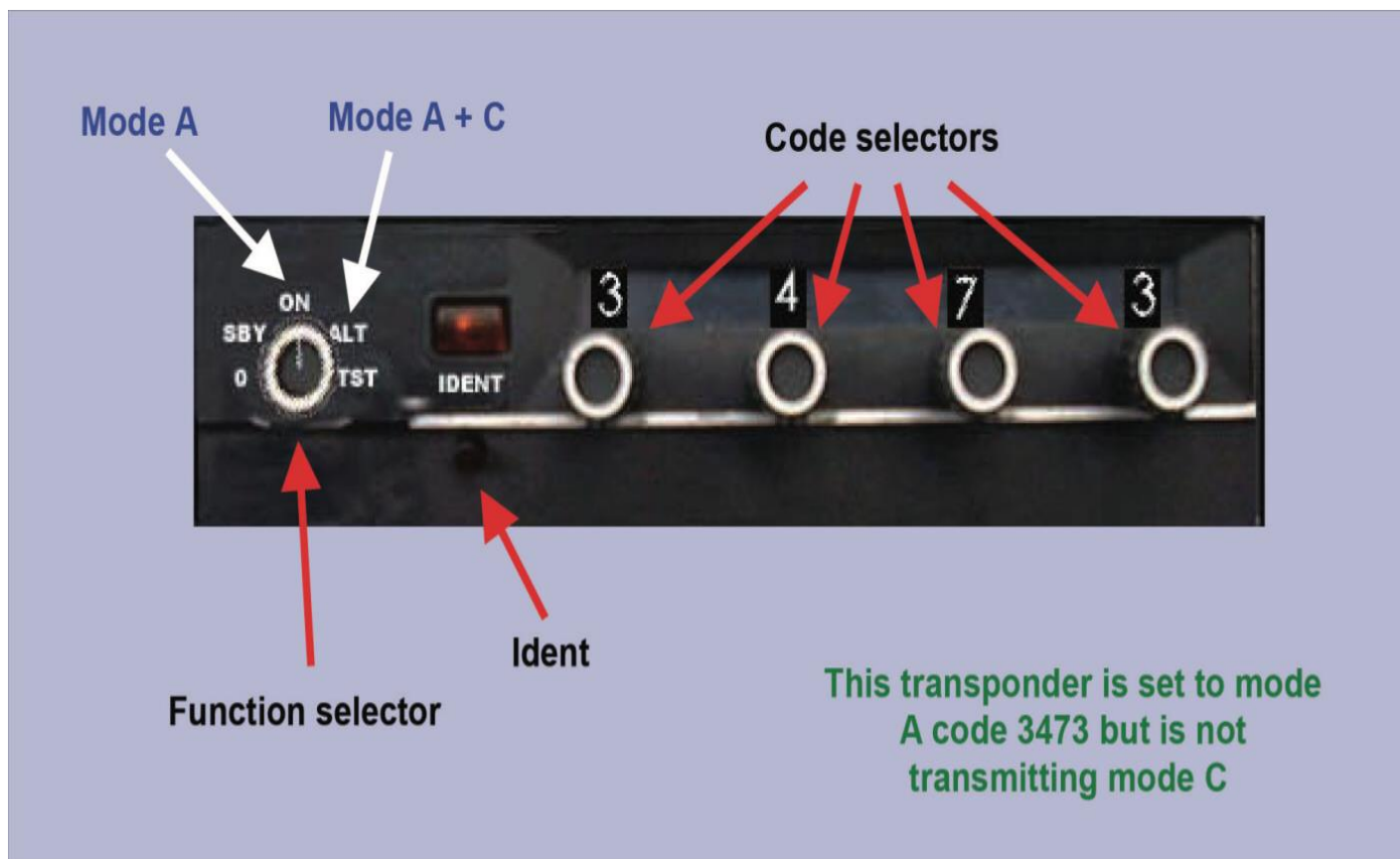
Altitude Reporting Function (Mode Charlie)

Mode Charlie encodes and transmits the aircraft altitude with reference to SPS (1013 hPa). Whenever the transponder is operating, mode Charlie should also be selected. At some point during the initial communications with ATC, the pilot will be requested to “say aircraft level for Charlie.” The pilot should report the aircraft level information accurate to the nearest full 100 ft. From this, the ATCO will determine the accuracy of mode Charlie data. If the mode Charlie data **is within +/-300 ft of the stated level, mode Charlie is deemed to be accurate.**

For aircraft to be visible to a TCAS equipped aircraft they must have a minimum of a Mode “A” Transponder. *If the transponder is switched off, or is unserviceable, the intruding aircraft are invisible to the TCAS equipment and a collision risk exists.* Mode A transponders transmit no height information and therefore the information available to the TCAS equipment is two dimensional only and therefore can only give TAs.

Mode “C” Transponder equipped intruders broadcast height information to the TCAS equipment and the system becomes three dimensional and can now give both TAs and RAs.

Mode “S” Transponder TCAS equipped intruders as well as broadcasting height information allow a discrete data link to be established between them. This data link will allow avoidance maneuvers to be mutually resolved.



Transponder Failure

The failure of a transponder in the air will adversely affect the quality of the ATC service provided. Whilst every effort will be made to permit the flight to continue to the destination in accordance with the filed FP, it may be that ATC clearances may be restricted. If a transponder fails before departure and it cannot be rectified, the pilot is to:

Inform ATS as soon as possible, preferably before the submission of the FP.

- *Put 'N' in item 10 for the FP form.*
- *Comply with the published procedures for seeking exemption from the requirements for the mandatory carriage of a transponders.*
- *If required by the ATS authority, proceed directly to the nearest suitable aerodrome where the transponder can be repaired.*

Airborne Collision Avoidance System (ACAS)

Basically, the system uses the redundant capacity of the SSR system to determine the proximity of another aircraft which is operating its SSR transponder. *In areas where RVSM is applied, the use of ACAS is mandatory and operators are required to ensure compliance with the requirement.*

ACAS is to be used by pilots in the avoidance of potential collisions, the enhancement of situational awareness, and the active search for (and visual acquisition of) conflicting traffic. It must be understood by pilots that the use of and the exploitation of ACAS alerts and the procedures applicable, do not relieve the pilot of the basic responsibility for the safety of the aeroplane. In all cases, the pilot will be expected to exercise his/her best judgment and full authority in choosing the best course of action to be taken.

Response to ACAS Alerts

ACAS generated alerts consist of *Traffic Advisories (TAs) and Resolution Advisories (RAs)*. A TA is intended to alert the pilot to the possibility of an RA being generated. As such, pilots are not to maneuver the aircraft in response to a TA only. *If an RA is generated, the pilot is to respond immediately unless in doing so the safety of the aeroplane would be jeopardized.*

In *any case, stall warning, wind shear and GPWS alerts will have priority over ACAS.* Pilots must be aware that visually acquired traffic may not be the cause of an RA and visual perception of an encounter may be misleading especially at night.

Conflict

Should there be a conflict of Resolution Advisories between the aircraft, *pilots must follow the RA and the equipment should offer a Reversal Advisory.*

As soon as would be permitted by the workload of the flight deck crew, **ATC** should be notified of the RA and the direction of any deviation from the current flight plan. Once the conflict is resolved, the aircraft should be promptly returned to the requirements of the current FP and again, ATC informed. Under some circumstance, it is possible that ATC issues instructions that are unknowingly contrary to ACAS RAs. *It is **vitally important that ATC is notified when an ATC instruction or clearance is not being followed because it conflicts with an ACAS RA.***

Disregarding RA

RAs may be disregarded only when the pilot visually identifies the potentially conflicting traffic and decides no deviation from the current flight path is needed. Nevertheless ATC must be informed in these circumstances.

Determination of Aircraft Level using Mode C

- *ICAO defines the standards for level determination using Mode C (altitude reporting function) as generally +/- 300 ft. However, most contracting states employ a higher standard, +/- 200 ft. The specific ICAO standards are:*

1 OPERATION OF TRANSPONDERS

1.1 GENERAL

1.1.1 When an aircraft carries a serviceable transponder, the pilot shall operate the transponder at all times during flight, regardless of whether the aircraft is within or outside airspace where secondary surveillance radar (SSR) is used for ATC purposes.

1.1.2 When the aircraft carries a serviceable Mode C equipped transponder, the pilot shall use the Mode C altitude information provided by ATC.

1.1.3 When requested by ATC to "SQUAWK IDENT", the pilot shall:

- a. verify the Mode A code setting on the transponder;
- b. insert the assigned code if necessary; and
- c. confirm to ATC the setting displayed on the controls of the transponder.

1.1.4 Pilots shall not SQUAWK "IDENT" unless requested by ATC.

1.2 USE OF MODE C

Whenever Mode C is operated, pilots shall, in a ground voice communication, when requested, give such information by stating that code to the nearest 100 feet indicated on the pilot's altimeter.

1.3 USE OF MODE S

Pilots of aircraft equipped with Mode S having an aircraft identification feature shall set the aircraft identification in the transponder. This setting shall correspond to the aircraft identification specified in item 7 of the ICAO flight plan, or, if no flight plan has been filed, the aircraft registration.

1.7 TRANSPONDER FAILURE PROCEDURES WHEN THE CARRIAGE OF A FUNCTIONING TRANSPONDER IS MANDATORY

1.7.1 In case of a transponder failure after departure, ATC units shall attempt to provide for continuation of the flight to the destination aerodrome in accordance with the flight plan. Pilots may, however, expect to comply with specific restrictions.

2 PHRASEOLOGY

2.2 PHRASEOLOGY USED BY PILOTS

Pilots shall read back the mode and code to be set when they acknowledge mode/code setting instructions.

Although ICAO named it ACAS, the principle manufacturer in the US referred to its system as Traffic alert and Collision Avoidance System (TCAS), and this name is now a widely accepted alternative. The system is designed to provide an additional margin of safety and keep commercial aircraft clear of conflict, independently of Air Traffic Control. An aircraft must carry a transponder and have the facility to interrogate other aircraft transponders. Presently there are four systems in use, I, II, III and IV, each with increasing levels of protection

TCAS I

is a first generation collision avoidance system and simply warns the crew of other traffic in the vicinity of their aircraft. It will detect and display range and approximate relative bearing. If the TCAS display aircraft and the intruder are carrying Mode C, relative altitude will also be displayed. It encourages flight crew to look for the conflicting traffic by **generating visual and aural warnings - TRAFFIC ADVISORIES (TAs)**:

“Traffic, Traffic”.

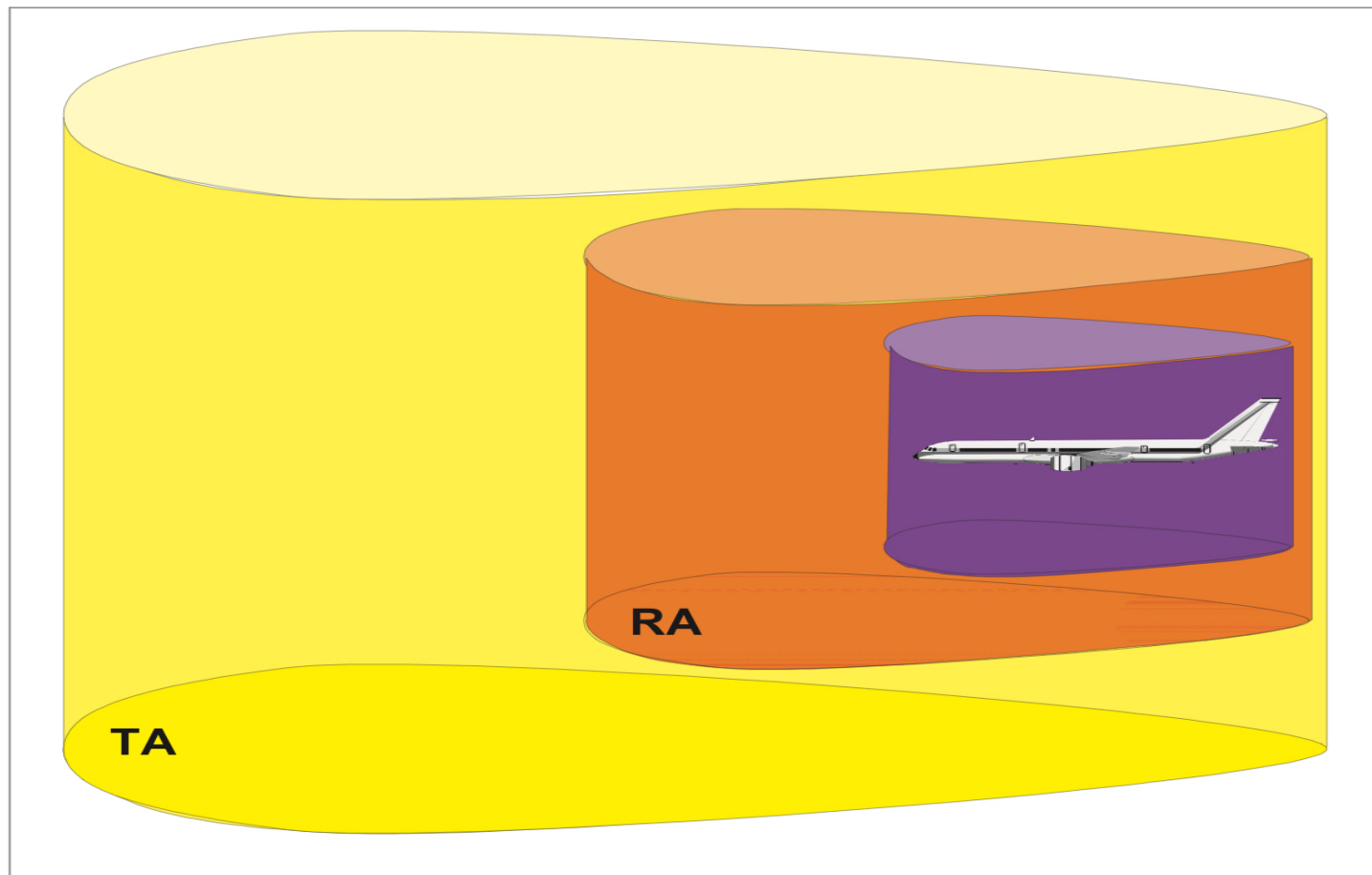
It does not give any resolution advisory information, i.e. a course of action to follow.

TCAS II

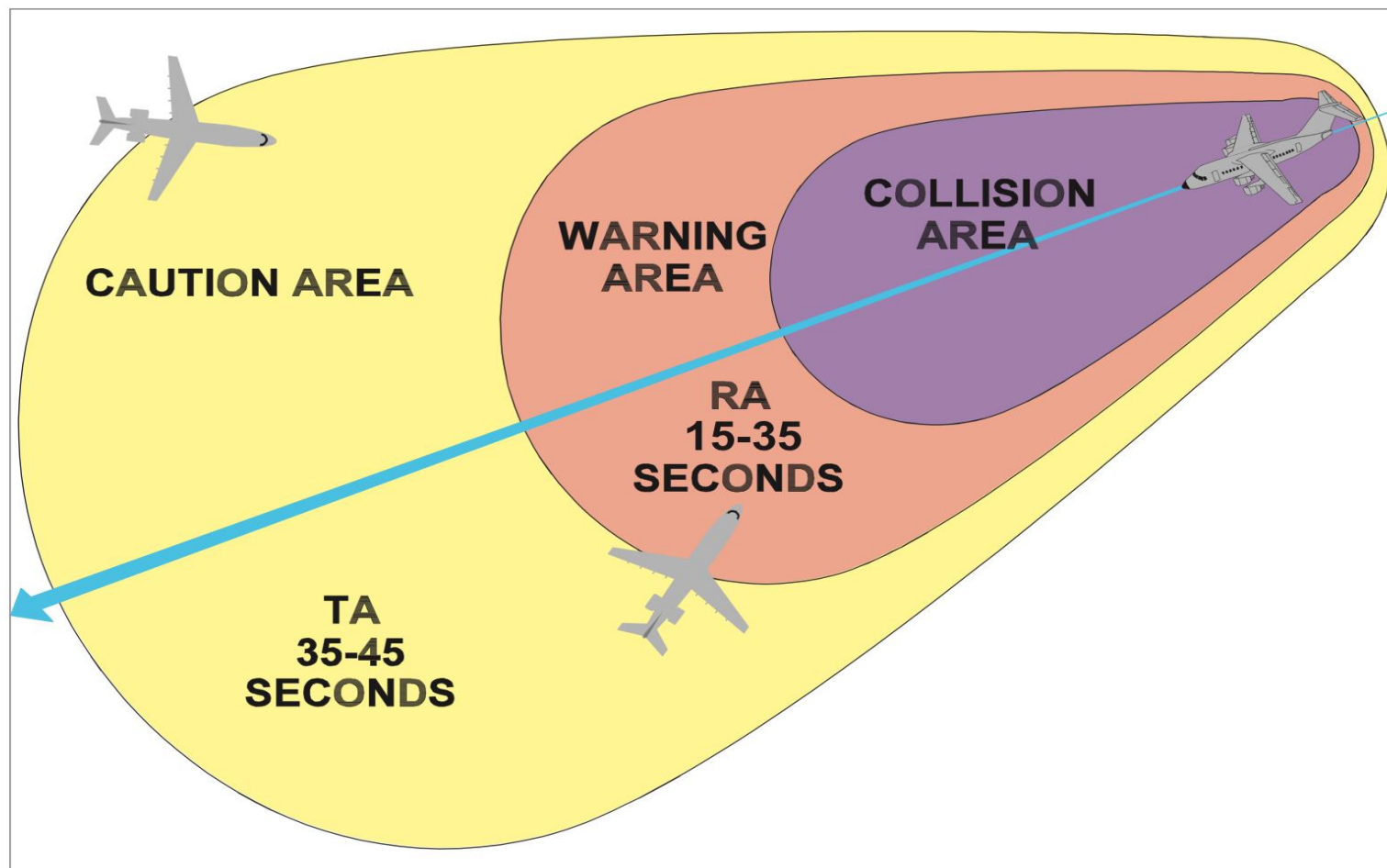
TCAS II detects intruders in the TCAS aircraft's vicinity, assesses the collision risk and presents warnings to the crew in the form of TAs and Resolution Advisories (RAs)

e.g. “Climb” “Increase Climb” “Descend” “Increase Descent” “Monitor Vertical Speed” “Decrease Climb” “Decrease Descent” Thus,

RAs offer maneuvering advice in the vertical plane to resolve conflict. If your aircraft and the intruder **both have Mode S data link transponders** the system will coordinate the RAs to provide complementary vertical avoidance instructions.



E
N
R
O
U
T
E



Synthetic Voice Prioritization

Modern aircraft use a synthetic voice to give warning advice to the crew. The voice is used for various systems including windshear detection, ground proximity warnings, including height call-outs, and TCAS. The synthetic voice is prioritized as follows:

- ***Stall*** Identification/Stall Prevention. (Stick-shake/Stick-push). The synthetic voice is inhibited during stick shake/stick push operation.
- ***Windshear*** ,The detection of performance decreasing windshear takes first priority with the synthetic voice, inhibiting both GPWS and TCAS warnings.
- ***Ground Proximity Warning System (GPWS)***, Detection of approach to terrain takes priority over TCAS announcements.

... after a flight crew starts to deviate from any ATC clearance or instruction to comply with an ACAS resolution advisory (pilot and controller interchange)

... after the response to an ACAS RA is completed and a return to the ATC clearance or instruction is initiated (pilot and controller interchange)

... after the response to an ACAS RA is completed and the assigned ATC clearance or instruction has been resumed (Pilot and controller interchange)

r. **TCAS RA**

s. ROGER;

t. **CLEAR OF CONFLICT, RETURNING TO** (*assigned clearance*);

u. ROGER (*or alternative instructions*);

v. **CLEAR OF CONFLICT** (*assigned clearance*), **RESUMED**;

w. ROGER (*or alternative instructions*);

NO # 4

Time = 00:04



Based on what facility the ACAS operate:

- a) NAVAIDS
- b) SSR
- c) SSR transponder
- d) Communication



Based on what facility the ACAS operate:

- a) NAVAIDS
- b) SSR
- c) SSR transponder
- d) Communication



What SSR code shall be selected by hijacked airplane?

- a) 7700
- b) 7600
- c) 7500
- d) 7400



What SSR code shall be selected by hijacked airplane?

- a) 7700
- b) 7600
- c) 7500
- d) 7400



When SSR must be switch on?

- a) Prior takeoff
- b) After takeoff.
- c) After landing
- d) Assign by ATSU.



When SSR must be switch on?

- a) Prior takeoff
- b) After takeoff.
- c) After landing
- d) Assign by ATSU.



Which of the following transponder codes is not a valid SSR mode A squawk?

- a) 0000
- b) 5678
- c) 7700
- d) 7777



Which of the following transponder codes is not a valid SSR mode A squawk?

- a) 0000
- b) 5678
- c) 7700
- d) 7777



PART 2

Table & code

Pressure definition
Temperature correction
Altimeter error

Morse Code
Conversion Table

Time 04:00

NOTAM

Module objectives

At the end of this module you will be able to explain some **information such as NOTAM, Temperature correction** based on standard ICAO regulations.

Version 8.2.1 for Windows

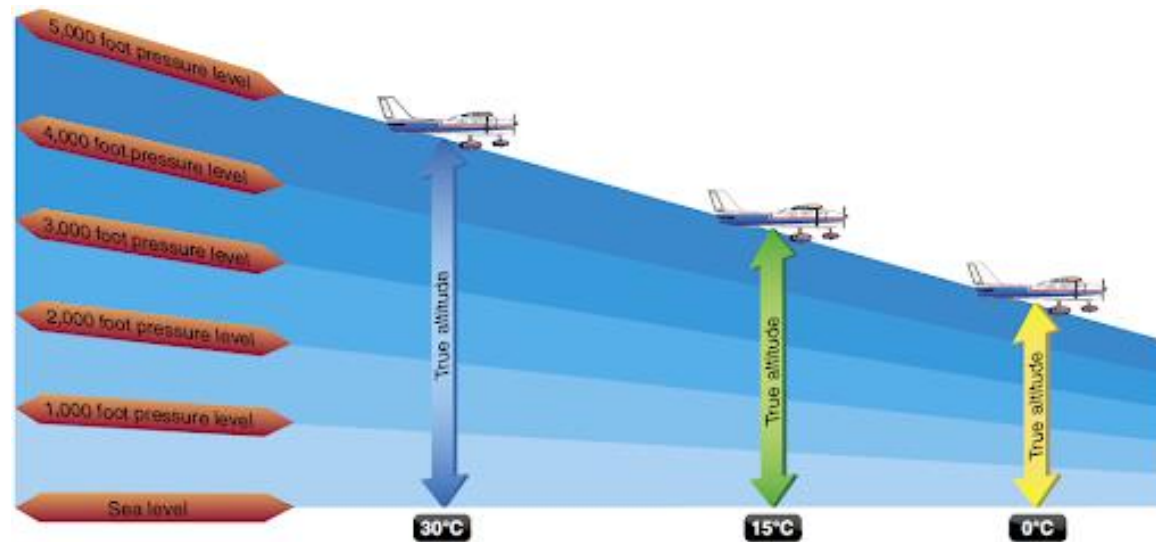


 **JEPPESEN**
A BOEING COMPANY


JEPPESEN[®]

Time 04:00

Altimeter Setting Procedures

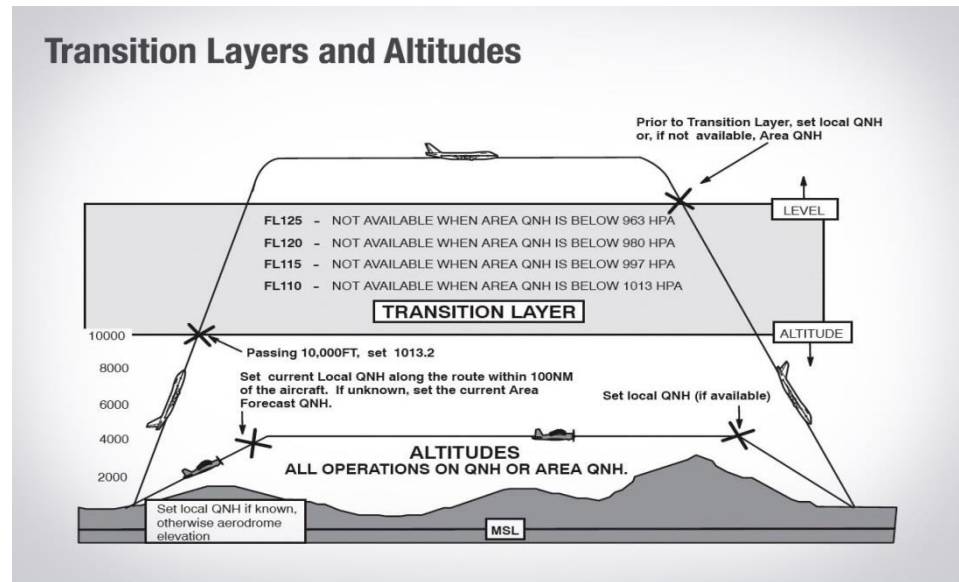


Module objectives

At the end of this module you will be able to explain the **definition and type of pressure and their functions in aviation** based on standard ICAO regulations.

T
A
N
D
C

Time 02:00



The *two* main objectives of altimeter setting procedures are to:

- *Provide adequate terrain clearance during all phases of flight especially departure and arrival.*
- *Provide adequate vertical separation between aircraft*
- **QNH**

This is the observed barometric pressure at an aerodrome adjusted in accordance with the ISA pressure lapse rate to indicate the pressure that would be observed if the observation was carried out at sea level. If QNH is set on the altimeter subscale, the altimeter would read aerodrome elevation at touchdown.

➤ *QFE*

This is the observed barometric pressure at an aerodrome which, if set on the altimeter subscale, would result in the altimeter reading zero at touchdown.

➤ *QNE*

A situation can occur where the QNH is below the lowest altimeter subscale setting. For instance, if the altimeter subscale will not read below 950 hPa and the QNH is 935 hPa it would appear that the altimeter is useless. If, however, the altimeter subscale is set to a standard setting (e.g. 1013 hPa) then it would be possible to calculate what the altimeter would read at touchdown where the QNH is 930 hPa and the altimeter subscale is set to 1013 hPa using the ICAO ISA. Assume that the aerodrome elevation is 100 ft AMSL. On touchdown the altimeter will read:

Transition Altitude

This is the altitude (with QNH set) above the aerodrome at which the altimeter subscale is reset to SPS and vertical position above that is then reported as a flight level. The transition altitude is specified for every aerodrome by the Authority of the State in which the aerodrome is located. The transition altitude shall be as low as possible but normally not less than 3000 ft. Transition altitudes are published in the AIP and shown on charts and instrument plates. A state may specify a general transition altitude (as in the USA, 18 000 ft).

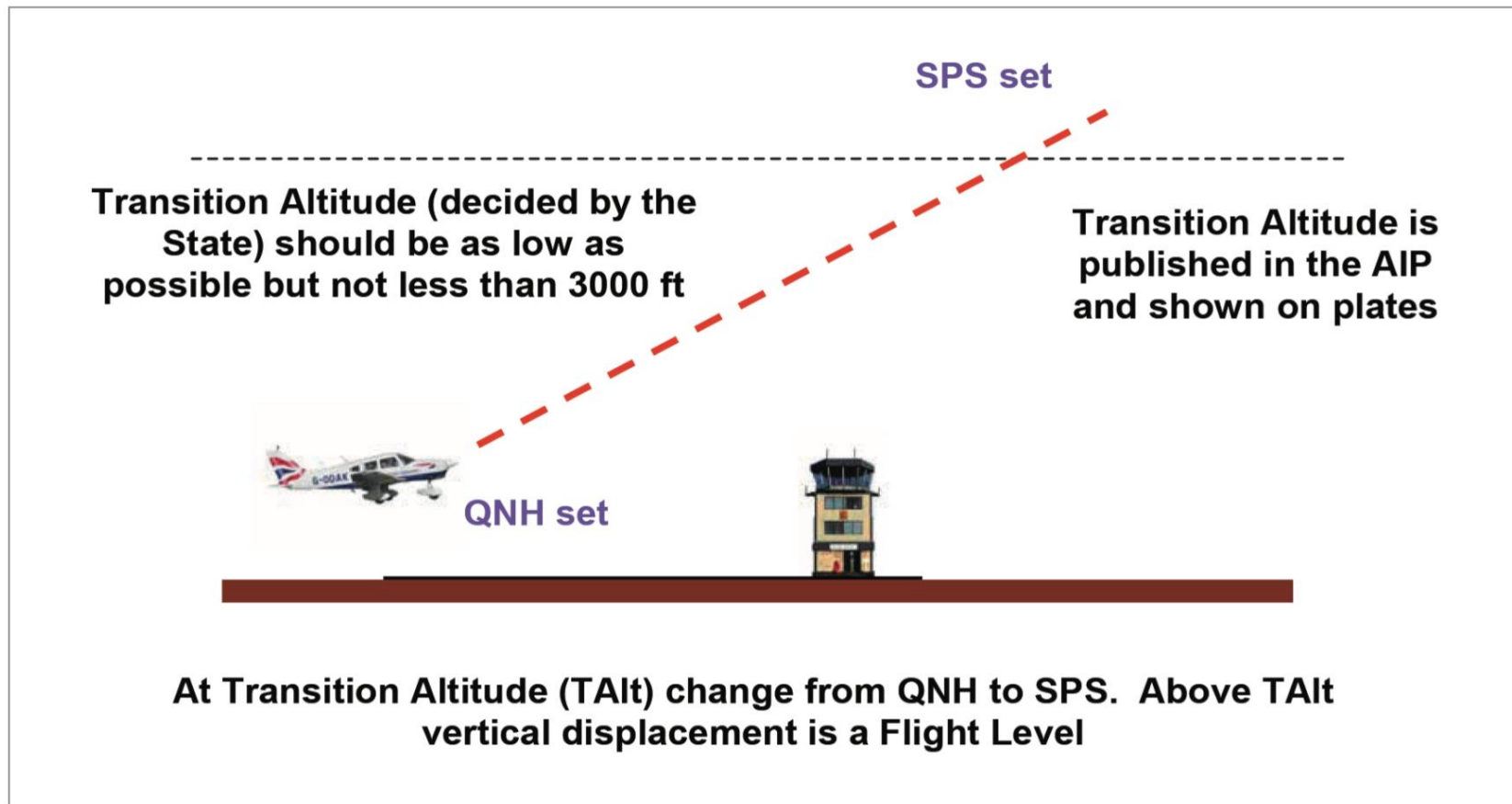


Figure 11.2 Transition altitude

Transition Level

The transition level is the flight level at which the altimeter is reset to the aerodrome QNH and subsequent flight is reported with reference to altitude. The transition level changes with the QNH. It is calculated by the Approach Controller at regular intervals and also when QNH changes. It is defined as the first available flight level above the transition altitude. This will be a 'rounding up' from what the altimeter is reading at the transition level with SPS set. Calculation of transition level is not required by the learning objectives.

AIP

The flight crew shall be provided with the transition level :

- *prior to reaching the level during the descent*
- *in the approach clearance*
- *when requested by the pilot*

QNH	T.L
1050.4 – 1031.8	TA + 500
1031.7 – 1013.2	TA + 1000
1013.1 – 995.2	TA + 1500
995.1 – 977.1	TA + 2000
977.0 – 959.5	TA + 2500

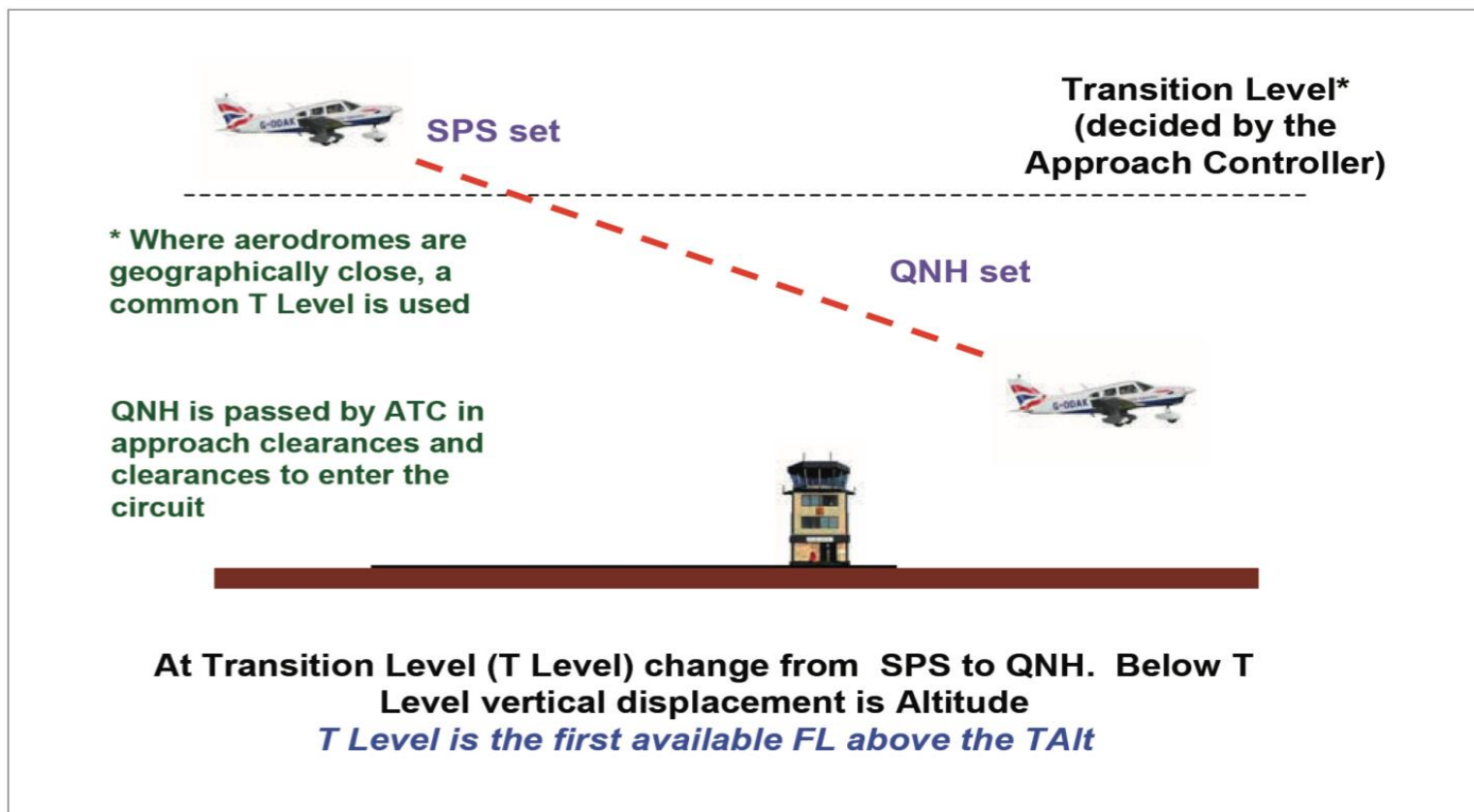


Figure 11.3 Transition level

Lowest Useable Flight Level.

This is the flight level that corresponds to or is immediately above the established minimum flight altitude.

Once above the 'safe in all cases' altitude, the problem ceases to be terrain avoidance and becomes avoidance of other air traffic. In this case it is essential that all aircraft have at least one altimeter referenced to the same subscale setting so that a standard separation can be applied regardless of the sea level pressure. According to ICAO ISA the average barometric pressure is 1013.25 hPa and this (when rounded down to 1013 hPa) is defined as the Standard Pressure Setting (SPS).

Transition Layer

This is the airspace between the transition altitude with SPS set and the transition level. It is usually insignificant but some states require a minimum depth to the transition layer. When ascending through the transition layer (with SPS set) vertical position is reported as a flight level and when descending through the layer with QNH set, as an altitude.

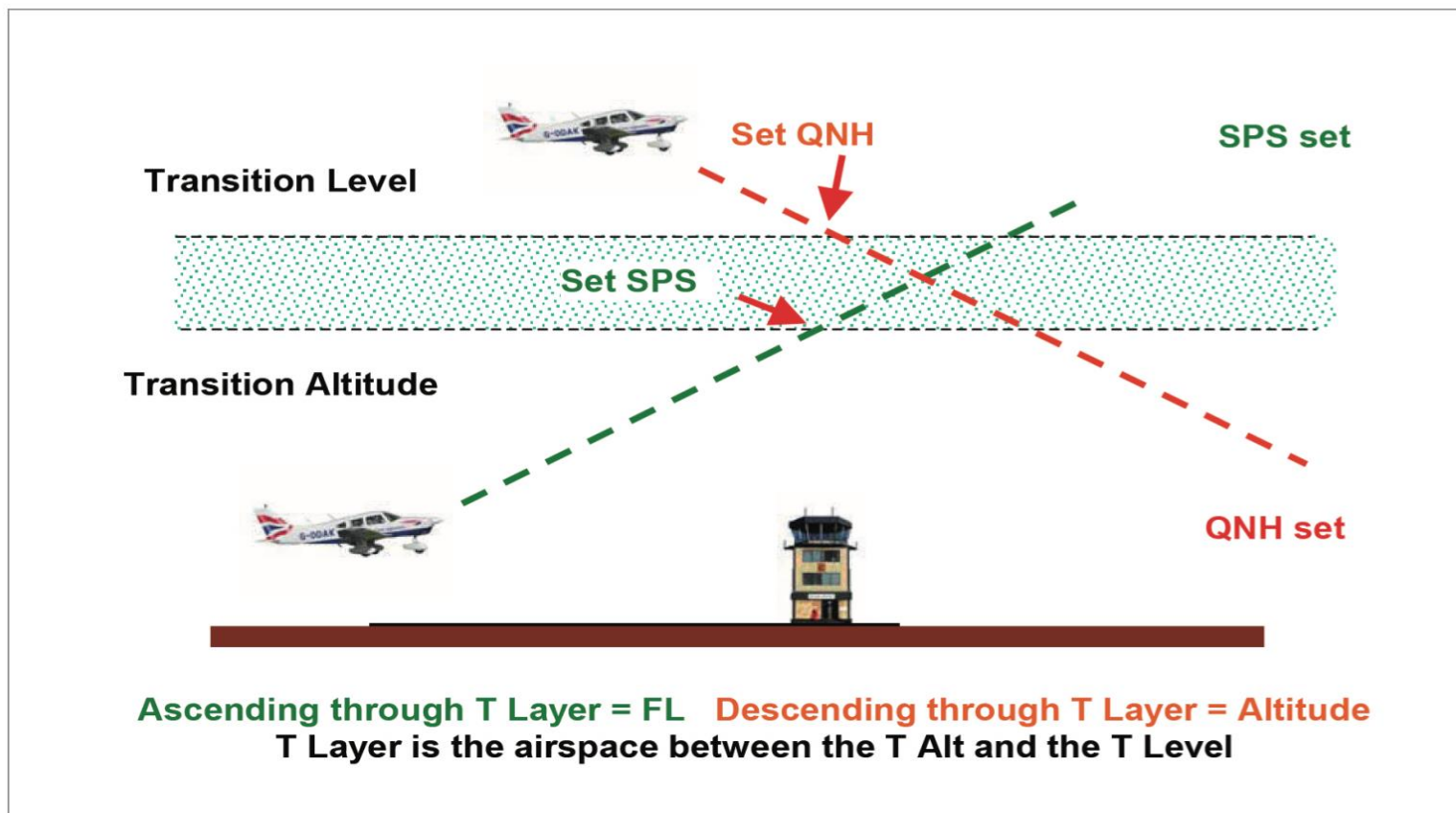


Figure 11.4 Transition layer

The cruising levels at which a flight or a portion of a flight is to be conducted shall be in terms of:

- *flight levels, for flights at or above the lowest usable flight level or, where applicable, above the transition altitude;*
- *altitudes, for flights below the lowest usable flight level or, where applicable, at or below the transition altitude.*

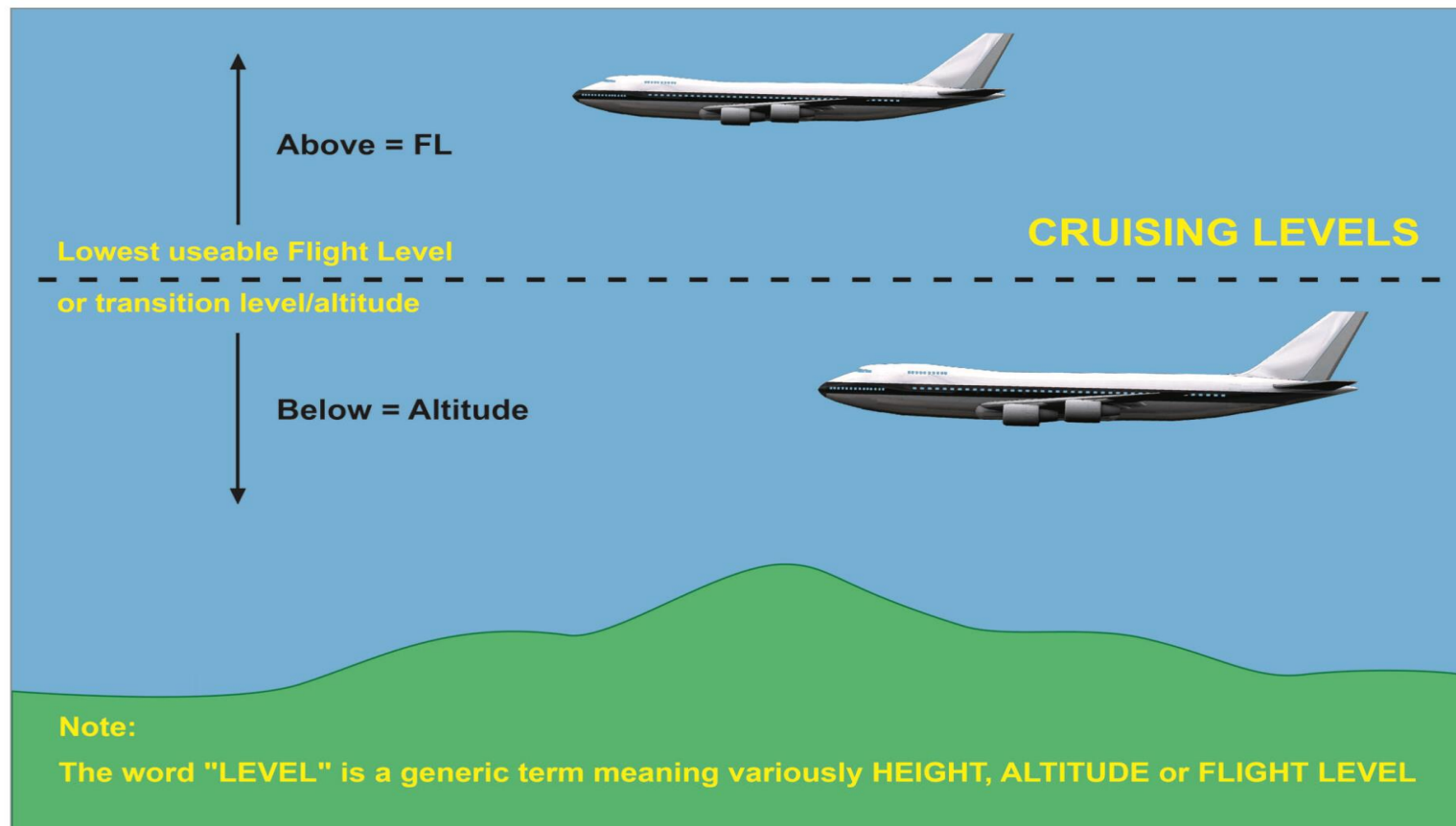


Figure 6.4

PRE-FLIGHT OPERATIONAL TEST

QNH Setting

- With the aircraft at a known elevation on the aerodrome, set the altimeter pressure scale to the current QNH setting
- Vibrate the instrument by tapping unless mechanical vibration is provided. A serviceable altimeter indicates the elevation of the point selected, plus the height of the altimeter above this point, within a tolerance of:
 - ± 20 m or 60 ft for altimeters with a test range of 0 to 9000 m (0 to 30000 ft); and
 - ± 25 m or 80 ft for altimeters with a test range of 0 to 15000 m (0 to 50000 ft).

Pilot's responsibility

The pilot-in-command is responsible for the safety of the operation and the safety of the aero-plane and of all persons on board during flight time (Annex 6, 4.5.1). This includes responsibility for obstacle clearance, except when an IFR flight is being vectored by radar.

Operator's responsibility

The operator is responsible for establishing minimum flight altitudes, which may not be less than those established by States that are flown over. The operator is responsible for specifying a method for determining these minimum altitudes (Annex 6, 4.2.6).

ALTIMETER CORRECTIONS

PRESSURE CORRECTION

Flight levels When flying at levels with the altimeter set to 1013.2 hPa, the minimum safe altitude must be corrected for deviations in pressure when the pressure is lower than the standard atmosphere (1013 hPa).

An appropriate correction is 10 m (30 ft) per hPa below 1013 hPa. Alternatively, the correction can be obtained from standard correction graphs or tables supplied by the operator.

When using the QNH or QFE altimeter setting (giving altitude or height above QFE datum respectively), a pressure correction is not required.

TEMPERATURE CORRECTION

Requirement for temperature correction

The calculated minimum safe altitudes/heights must be adjusted when the ambient temperature on the surface is much lower than that predicted by the standard atmosphere. In such conditions, an approximate *correction is 4 per cent height increase for every 10° C below standard temperature as measured at the altimeter setting source*. This is safe for all altimeter setting source altitudes for temperatures above -15°C.

Table III-1-4-1 b). Values to be added by the pilot to minimum promulgated heights/altitudes (ft)

Aerodrome tempera- ture (°C)	Height above the elevation of the altimeter setting source (feet)														
	200	300	400	500	600	700	800	900	100 0	150 0	200 0	300 0	400 0	500 0	
0	20	20	30	30	40	40	50	50	60	90	120	170	230	280	
−10	20	30	40	50	60	70	80	90	100	150	200	290	390	490	
−20	30	50	60	70	90	100	120	130	140	210	280	420	570	710	
−30	40	60	80	100	120	140	150	170	190	280	380	570	760	950	
−40	50	80	100	120	150	170	190	220	240	360	480	720	970	1210	
−50	60	90	120	150	180	210	240	270	300	450	590	890	1190	1500	

Table III-1-4-2/3. Margin in mountainous areas

Terrain variation	MOC
Between 3000 ft and 5000 ft (900 m and 1500 m)	1476 ft (450 m)
Greater than 5000 ft (1500 m)	1969 ft (600 m)

Table III-1-4-4/5. Altimeter error due to wind speed

Wind speed	Altimeter error
20 kt (37 km/h)	53 ft (17 m)
40 kt (74 km/h)	201 ft (62 m)
60 kt (111 km/h)	455 ft (139 m)
80 kt (148 km/h)	812 ft (247 m)

➤ Altitude

The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

➤ Height

The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

➤ Flight level.

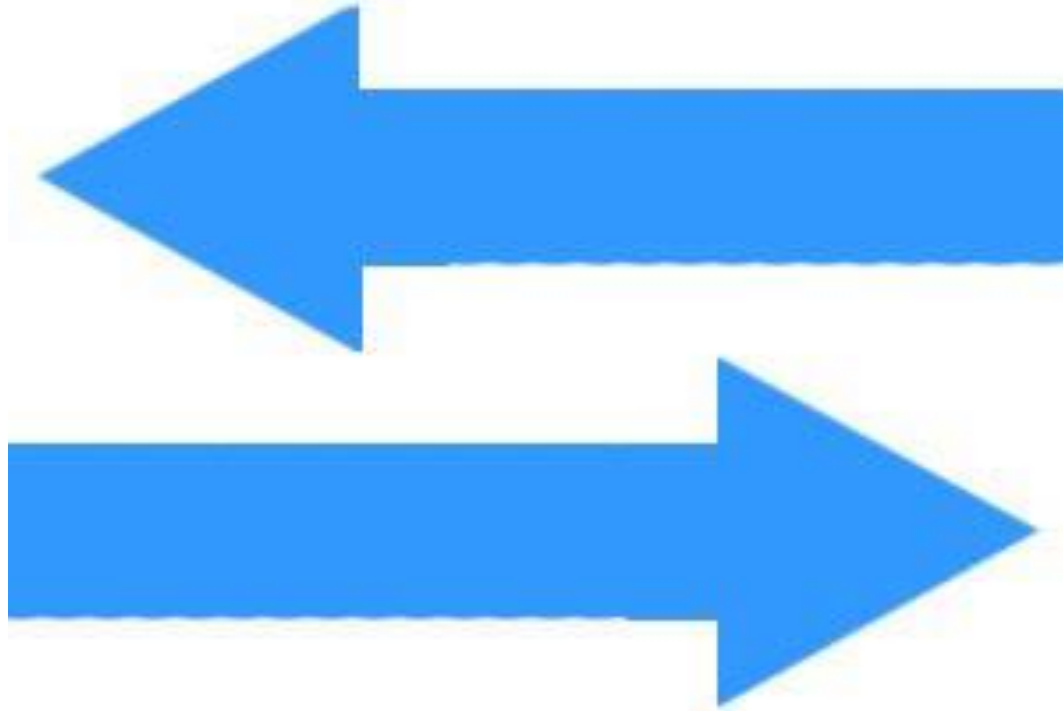
A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 (hPa), and is separated from other such surfaces by specific pressure intervals.

A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

- when set to a QNH altimeter setting, will indicate altitude;
- when set to a QFE altimeter setting, will indicate height above the QFE reference datum;
- when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Level

A generic term relating to the vertical position of an aircraft in **flight and meaning variously, height, altitude or flight level.**



CONVERSION

Time 01:00

PHONETIC ALPHABET AND MORSE CODE

LETTER	CODE	WORD	LATIN ALPHABET REPRESENTATION
A	•—	Alfa	<u>AL</u> FAH
B	—•••	Bravo	<u>BRAH</u> VOH
C	—•••	Charlie	<u>CHAR</u> LEE or <u>SHAR</u> LEE
D	—••	Delta	<u>DELL</u> TAH
E	•	Echo	<u>ECK</u> OH
F	••—•	Foxtrot	<u>FOKS</u> TROT
G	—••	Golf	GOLF
H	••••	Hotel	HOH <u>TELL</u>
I	••	India	<u>IN</u> DEE AH
J	•—•—	Juliett	<u>JEW</u> LEE <u>ETT</u>
K	—•—	Kilo	<u>KEY</u> LOH
L	••••	Lima	<u>LEE</u> MAH
M	—•—	Mike	MIKE
N	—•	November	NO VEM BER
O	—•—	Oscar	<u>OSS</u> CAH
P	••—•	Papa	PAH <u>PAH</u>
Q	—••—	Quebec	KEH <u>BECK</u>
R	•—•	Romeo	<u>ROW</u> ME OH
S	•••	Sierra	SEE <u>AIR</u> RAH
T	—	Tango	<u>TANG</u> GO
U	••—	Uniform	<u>YOU</u> NEE FORM or <u>OO</u> NEE FORM
V	•••—	Victor	<u>VIK</u> TAH
W	•—•—	Whiskey	<u>WISS</u> KEY
X	—••—	X-ray	<u>ECKS</u> RAY
Y	—••—	Yankee	<u>YANG</u> KEY
Z	—•••	Zulu	ZOO LOO

REFERENCE TABLES

NUMERAL OR NUMERAL EL- EMENT	CODE	PRONUNCIATION
1	•-----	WUN
2	••-----	TOO
3	•••-----	TREE
4	••••-	FOW-er
5	•••••	FIFE
6	-••••	SIX
7	--•••	SEV-en
8	----••	AIT
9	-----•	NIN-er
0	-----	ZE-RO
Decimal		DAY-SEE-MAL
Thousand		TOU-SAND

WIND COMPONENT TABLES

WIND SPEED KNOTS	ANGLE BETWEEN WIND DIRECTION AND HEADING (LEFT OR RIGHT)							
	10	20	30	40	50	60	70	80
	HEADWIND COMPONENT							
5	-5	-5	-4	-4	-3	-3	-2	-1
10	-10	-9	-9	-8	-6	-5	-3	-2
15	-15	-14	-13	-11	-10	-8	-5	-3
20	-20	-19	-17	-15	-13	-10	-7	-3
25	-25	-23	-22	-19	-16	-13	-9	-4
30	-29	-28	-26	-23	-19	-15	-10	-5
35	-34	-33	-30	-27	-22	-18	-12	-6
40	-39	-38	-35	-31	-26	-20	-14	-7
45	-44	-42	-39	-34	-29	-23	-15	-8
50	-49	-47	-43	-38	-32	-25	-17	-9
55	-54	-52	-48	-42	-35	-28	-19	-9
60	-59	-56	-52	-46	-39	-30	-21	-10
65	-64	-61	-56	-50	-42	-33	-22	-11
70	-69	-66	-61	-54	-45	-35	-24	-12

ANGLE BETWEEN WIND DIRECTION AND HEADING (LEFT OR RIGHT)								
WIND SPEED KNOTS	10	20	30	40	50	60	70	80
	CROSSWIND COMPONENT							
5	1	2	3	3	4	4	5	5
10	2	3	5	6	8	9	9	10
15	3	5	8	10	11	13	14	15
20	3	7	10	13	15	17	19	20
25	4	9	13	16	19	22	23	25
30	5	10	15	19	23	26	28	29
35	6	12	18	22	27	30	33	34
40	7	14	20	26	31	35	38	39

ANGLE BETWEEN WIND DIRECTION AND HEADING (LEFT OR RIGHT)								
WIND SPEED KNOTS	10	20	30	40	50	60	70	80
	CROSSWIND COMPONENT							
50	9	17	25	32	38	43	47	49
55	9	19	28	35	42	48	52	54
60	10	21	30	39	46	52	56	59
65	11	22	33	42	50	56	61	64
70	12	24	35	45	54	61	66	69

PRESSURE ALTITUDE

Inches of Mercury	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
21.00	9475	9462	9450	9438	9425	9413	9401	9388	9376	9364
21.10	9352	9339	9327	9315	9303	9290	9278	9266	9254	9241
21.20	9229	9217	9205	9192	9180	9168	9156	9144	9131	9119
21.30	9107	9095	9083	9071	9058	9046	9034	9022	9010	8998
21.40	8986	8973	8961	8949	8937	8925	8913	8901	8889	8877
21.50	8864	8852	8840	8828	8816	8804	8792	8780	8768	8756
21.60	8744	8732	8720	8708	8696	8684	8672	8660	8648	8636
21.70	8624	8612	8600	8588	8576	8564	8552	8540	8528	8516
21.80	8504	8492	8480	8468	8456	8444	8432	8420	8408	8397
21.90	8385	8373	8361	8349	8337	8325	8313	8301	8290	8278

(1 hectopascal = 1 millibar = 0.02953 inches of mercury)										
hPa or mb	0	1	2	3	4	5	6	7	8	9
	INCHES OF MERCURY									
900	26.58	26.61	26.64	26.67	26.70	26.72	26.75	26.78	26.81	26.84
910	26.87	26.90	26.93	26.96	26.99	27.02	27.05	27.08	27.11	27.14
920	27.17	27.20	27.23	27.26	27.29	27.32	27.34	27.37	27.40	27.43
930	27.46	27.49	27.52	27.55	27.58	27.61	27.64	27.67	27.70	27.73
940	27.76	27.79	27.82	27.85	27.88	27.91	27.94	27.96	27.99	28.02
950	28.05	28.08	28.11	28.14	28.17	28.20	28.23	28.26	28.29	28.32
960	28.35	28.38	28.41	28.44	28.47	28.50	28.53	28.56	28.58	28.61
970	28.64	28.67	28.70	28.73	28.76	28.79	28.82	28.85	28.88	28.91
980	28.94	28.97	29.00	29.03	29.06	29.09	29.12	29.15	29.18	29.21
990	29.23	29.26	29.29	29.32	29.35	29.38	29.41	29.44	29.47	29.50

CONVERSIONS

METERS PER SECOND TO FEET PER MINUTE

(mps = 196.85 fpm)			
MPS	FPM	MPS	FPM
1	197	1.5	295
2	394	2.5	492

REFERENCE TABLES

(mps = 196.85 fpm)			
MPS	FPM	MPS	FPM
3	591	3.5	689
4	787	4.5	885
5	984	5.5	1082
6	1181	6.5	1279
7	1378	7.5	1476
8	1575	8.5	1673
9	1772	9.5	1870
10	1969	10.5	2067
11	2165	11.5	2263
12	2362	12.5	2460

METERS PER SECOND TO KNOTS

(1 mps = 1.9438 knots)			
Meters p/sec.	Knots	Meters p/sec.	Knots
0	-	1	1.9
2	3.9	3	5.8
4	7.8	5	9.7
6	11.7	7	13.6
8	15.6	9	17.5
10	19.4	11	21.4
12	23.3	13	25.3

REFERENCE TABLES

(1 mps = 1.9438 knots)			
Meters p/sec.	Knots	Meters p/sec.	Knots
14	27.2	15	29.2
16	31.1	17	33.0
18	35.0	19	36.9
20	38.9	21	40.8

WEIGHT

Lbs	→	Kgs	Lbs	←	Kgs
2.2046		1		.45359	
4		2		1	
7		3		1	
9		4		2	
11		5		2	
13		6		3	
15		7		3	
18		8		4	
20		9		4	
22		10		4	

DISTANCES

KILOMETERS		
to SM		to NM
0.62137	1	0.53996
1.24	2	1.08
1.86	3	1.62
2.49	4	2.16
3.11	5	2.70
3.73	6	3.24
4.35	7	3.78
4.97	8	4.32
5.59	9	4.86
6.21	10	5.40

Time 01:00



universalweather.com/blog

Aeronautical Information services

Notices to Airmen (NOTAM)

Definition:

NOTAM are notices distributed by means of telecommunications containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Origination.

NOTAM are to be originated and issued promptly whenever the information to be distributed is of a ***temporary nature and of short duration, or when operationally significant permanent changes, or temporary changes of long duration***, are made at short notice (except when extensive text and/or graphics is essentially included, in which case, the information is published as an AIP supplement). NOTAM are required whenever information is of direct operational significance.

Aeronautical Information services

Notice and Validity.

NOTAM should ***remain in force as a reminder in the pre-flight information bulletin until the next checklist/summary is issued.*** Whenever possible, ***at least 24 hours' advance notice is desirable,*** to permit timely completion of the notification process and to facilitate airspace utilization planning. NOTAM notifying the unserviceability of aids to air navigation, facilities or communication services should give an estimate of the period of unserviceability or the time at which restoration of service is expected.

Aeronautical Information services

Excluded Matter.

NOTAM should ***not include*** information of non-operational importance including partial failures of lighting or ground systems, routine maintenance, any work in progress on runways not in use or if the equipment can be rapidly removed from the duty runway, temporary obstructions, local area parachuting, and the lack of apron marshaling services and road traffic control.

NOTAM Checklists.

A checklist of current NOTAM is issued at intervals of ***not more than one month***. The checklist is to refer to the latest AIP amendment, AIP supplement and the internationally distributed AICs.

Errors.

When errors occur in a NOTAM, a NOTAM with a new number to replace the erroneous NOTAM will be issued or the erroneous NOTAM cancelled and a new NOTAM issued.

Aeronautical Information services

NOTAM contain the information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely

knowledge of which is essential for personnel concerned with flight operations. The text of each NOTAM contains the information in the order shown in the ICAO NOTAM Format and is composed of the significations / uniform abbreviated phraseology assigned to the ICAO NOTAM Code complemented by ICAO abbreviations, indicators, identifiers, designators, call signs, frequencies, figures and plain language. NOTAM are originated and issued for Tehran FIR and are distributed in three ***series identified by the letters A, B and S*** and also different types ***C,R,N***

Aeronautical Information services

Series A.

General rules, en-route navigation and communication facilities, airspace restrictions and activities and information concerning international aerodromes and significant information on national aerodromes which affect the international traffic.

Series B.

Information on airspace restrictions, activities and information on national aerodromes and those subjects which does not affects the international traffic.

Aeronautical Information services

Series S (SNOWTAM).

Information concerning snow, slush, ice or standing water associated with snow and slush and ice in the movement areas. SNOWTAM are prepared in accordance with ICAO Annex 15, Appendix 2, and are issued by the Tehran NOTAM Office (NOF), with consecutive serial numbers based on the calendar year.

**GC EDZZNAEG
020610 EGGNYNYX**



(A0623/91 NOTAMN

Q) EGXX/QRDCA/IV/NBO/W/000/400/5510N00520W050

A) EGTG/EGPX

B) 9104030730

C) 9104281500

D) APR 03 07 12 21 24 AND 28 0730 TO 1500

E) DANGER AREA DXX IS ACTIVE

F) GND

G) 12200M (40000 FT.) MSL.)



¹JEPPesen®

NOTAMN — New NOTAM

NOTAMR — Replaces a previous NOTAM

NOTAMC — Cancels a NOTAM

NOTAMS — SNOWTAM

NOTAM format item Q is divided into eight separate qualifier fields.

- a. FIR — ICAO location indicator plus “XX” if applicable to more than one FIR.
- b. NOTAM CODE — If the subject of the NOTAM (second and third letter of NOTAM code) is not in the NOTAM Code , the following letters should be used to reference the subject category.

QAGXX = AGA

QCOXX = COM

QRCXX = RAC

QXXX = Other

c. **TRAFFIC** — I = IFR

V = VFR

IV = IFR/VFR

d. **PURPOSE** — N = Selected for the immediate attention of aircraft operators.

—

B = Selected for preflight information bulletins.

O = Operationally significant for IFR flights.

M = Miscellaneous.

- e. SCOPE — A = Aerodrome
 E = Enroute
 W = Navigational warning
- f. LOWER — Used when applicable to indicate lower limits of the affected area. Default value of 000 is used when limit is not defined.
- g. UPPER — Used when applicable to indicate upper limit of the affected area. Default value of 999 is used when limit is not defined.
- h. COORDINATES RADIUS — Latitude and longitude present approximate center of a circle whose radius encompasses the whole area of influence.

- A) EGT/EGPX**
- B) 9104030730**
- C) 9104281500**
- D) APR 03 07 12 21 24 AND 28 0730 TO 1500**
- E) DANGER AREA DXX IS ACTIVE**
- F) GND**
- G) 12200M (40000 FT.) MSL.)**

Aeronautical Information services

NOTAM format items A thru G provide information on location, times, changes and limits.

- A) ICAO location indicator of aerodrome or FIR.
- B) Ten figure date-time group indicating when the NOTAM comes into force.
- C) Ten figure date-time group or PERM indicating the duration of the NOTAM. If the duration of the NOTAM is uncertain, the approximate duration must be indicated using the date-time group followed by EST.

Aeronautical Information services

5) ...	7) ...
6) ...	8) ...
9) ...	10) ...
11) ...	12) ...
13) ...	14) ...
15) ...	16) ...
17) ...	18) ...
19) ...	20) ...
21) ...	22) ...
23) ...	24) ...
25) ...	26) ...
27) ...	28) ...
29) ...	30) ...
31) ...	32) ...
33) ...	34) ...
35) ...	36) ...
37) ...	38) ...
39) ...	40) ...
41) ...	42) ...
43) ...	44) ...
45) ...	46) ...
47) ...	48) ...
49) ...	50) ...
51) ...	52) ...
53) ...	54) ...
55) ...	56) ...
57) ...	58) ...
59) ...	60) ...
61) ...	62) ...
63) ...	64) ...
65) ...	66) ...
67) ...	68) ...
69) ...	70) ...
71) ...	72) ...
73) ...	74) ...
75) ...	76) ...
77) ...	78) ...
79) ...	80) ...
81) ...	82) ...
83) ...	84) ...
85) ...	86) ...
87) ...	88) ...
89) ...	90) ...
91) ...	92) ...
93) ...	94) ...
95) ...	96) ...
97) ...	98) ...
99) ...	100) ...

SECOND AND THIRD LETTERS

SECOND AND THIRD LETTERS (Q__ __)		
CODE	SIGNIFICATION	UNIFORM ABBREVIATED PHRASEOLOGY
AGA		
Lighting facilities (L)		
LA	Approach light system (<i>specify runway and type</i>)	als
LB	Aerodrome beacon	abn
LC	Runway centerline lights (<i>specify runway</i>)	rcll
LD	Landing direction indicator lights	ldi lgt
LE	Runway edge lights (<i>specify runway</i>)	redl
LF	Sequenced flashing lights (<i>specify runway</i>)	sequenced flg lgt
LG	Pilot-controlled lighting	pcl
LH	High intensity runway lights (<i>specify runway</i>)	high intst rwy lgt
LI	Runway end identifier lights (<i>specify runway</i>)	rwy end id lgt
LJ	Runway alignment indicator lights (<i>specify runway</i>)	rai lgt
LK	Category II components of approach lighting system (<i>specify runway</i>)	cat II components als

Aeronautical Information services

Movement and landing area (M)

MA	Movement area	mov area
MB	Bearing strength <i>(specify part of landing area or movement area)</i>	bearing strength
MC	Clearway <i>(specify runway)</i>	cwy
MD	Declared distances <i>(specify runway)</i>	declared dist
MG	Taxiing guidance system	tgs
MH	Runway arresting gear <i>(specify runway)</i>	rag
MK	Parking area	prkg area
MM	Daylight markings <i>(specify threshold, centerline, etc.)</i>	day markings
MN	Apron	apron
MO	Stopbar <i>(specify taxiway)</i>	stopbar
MP	Aircraft stands <i>(specify)</i>	acft stand
MR	Runway <i>(specify runway)</i>	rwy
MS	Stopway <i>(specify runway)</i>	swy
MT	Threshold <i>(specify runway)</i>	thr

Aeronautical Information services

CNS

Instrument and microwave landing systems (I)

IC	Instrument landing system (<i>specify runway</i>)	ils
ID	DME associated with ILS	ils dme
IG	Glide path (ILS) (<i>specify runway</i>)	ils gp
II	Inner marker (ILS) (<i>specify runway</i>)	ils im
IL	Localizer (ILS) (<i>specify runway</i>)	ils llz
IM	Middle marker (ILS)(<i>specify runway</i>)	ils mm
IN	Localizer (<i>not associated with ILS</i>)	llz
IO	Outer marker (ILS) (<i>specify runway</i>)	ils om
IS	ILS Category I (<i>specify runway</i>)	ils cat I
IT	ILS Category II (<i>specify runway</i>)	ils cat II
IU	ILS Category III (<i>specify runway</i>)	ils cat III
IW	Microwave landing system (<i>specify runway</i>)	mls
IX	Locator, outer (ILS) (<i>specify runway</i>)	ils lo
IY	Locator, middle (ILS) (<i>specify runway</i>)	ils lm

Aeronautical Information services

SECOND AND THIRD LETTERS (Q__ __)		
CODE	SIGNIFICATION	UNIFORM ABBREVIATED PHRASEOLOGY
NC	DECCA	decca
ND	Distance measuring equipment	dme
NF	Fan marker	fan mkr
NL	Locator <i>(specify identification)</i>	I
NM	VOR/DME	vor/dme
NN	TACAN	tacan
NO	OMEGA	omega
NT	VORTAC	vortac
NV	VOR	vor
NX	Direction finding station <i>(specify type and frequency)</i>	df

Aeronautical Information services

FOURTH AND FIFTH LETTERS		
CODE	SIGNIFICATION	UNIFORM ABBREVIATED PHRASEOLOGY
AG	Operating but ground checked only, awaiting flight check	opr but gnd ck only, awaiting flt ck
AH	Hours of service are now . . . (<i>specify</i>)	hr ser
AK	Resumed normal operation	okay
AL	Operative (or reoperative) subject to previously published limitations/conditions	opr subj previous cond
AM	Military operations only	mil ops only
AN	Available for night operation	avbl ngt ops
AO	Operational	opr
AP	Available, prior permission required	avbl ppr
AR	Available on request	avbl o/r
AS	Unserviceable	u/s
AU	Not available (<i>specify reason if appropriate</i>)	not avbl
AW	Completely withdrawn	withdrawn
AX	Previously promulgated shutdown has been cancelled	promulgated shutdown cnl

Aeronautical Information services

Limitations (L)

LA	Operating on auxiliary power supply	opr aux pwr
LB	Reserved for aircraft based therein	reserved for acft based therein
LC	Closed	clsd
LD	Unsafe	unsafe
LE	Operating without auxiliary power supply	opr aux wo pwr
LF	Interference from	interference fm
LG	Operating without identification	opr wo ident
LH	Unserviceable for aircraft heavier than	u/s acft heavier than
LI	Closed to IFR operations	clsd ifr ops
LK	Operating a a fixed light	opr as f lgt. . .

Aeronautical Information services

FLT NO: IZG

Date & Time: 03 Sep 2019 22:04

NOTAM

1 OF 12

DEPARTURE: OIBK

(A2309/19 NOTAMR A1234/19

A)OIBK B)1907040755 C)1910021200EST

E)A LIGHTED GAS MAST ERECTED AT PSN 263147N 0535605E WITH
HGT 187FT)

(A2310/19 NOTAMR A1246/19

A)OIBK B)1907040758 C)1910021200EST

E)A LIGHTED GAS MAST ERECTED AT PSN 263226N 0535746E
AT NW OF AD WITH HGT 187FT.)

(A2311/19 NOTAMR A1276/19

A)OIBK B)1907040836 C)1910021200EST

E)RWY 09R/27L CLSD DUE TO RESURFACING)

(B0500/19 NOTAMR B0264/19

A)OIBK B)1906250950 C)1909232359EST

E)TACAN KIH CH 112X FLTCK EXPIRED.)

T
A
N
D
C

NO # 4

Time = 00:04



The cruising level of an aircraft shall be in the term of flight level.....

- a) At lowest usable flight level
- b) Above lowest usable flight level
- c) At or above lowest usable flight level



The cruising level of an aircraft shall be in the term of flight level.....

- a) At lowest usable flight level
- b) Above lowest usable flight level
- c) At or above lowest usable flight level *



The cruising level of an aircraft shall be in the term of altitude:

- a) At lowest usable flight level
- b) Below the lowest usable flight level
- c) At or below transition altitude
- d) b and c are correct



The cruising level of an aircraft shall be in the term of altitude:

- a) At lowest usable flight level
- b) Below the lowest usable flight level
- c) At or below transition altitude
- d) b and c are correct *



The position of an aircraft during descent within transition layer is:

- a) Altitude.
- b) Height.
- c) Flight level.
- d) Elevation.



The position of an aircraft during descent within transition layer is:

- a) Altitude.
- b) Height.
- c) Flight level.
- d) Elevation.



The cruising level of an aircraft below lowest usable flight level is called:

- a) Flight level.
- b) Altitude.
- c) Elevation.
- d) None.



The cruising level of an aircraft below lowest usable flight level is called:

- a) Flight level.
- b) Altitude.
- c) Elevation.
- d) None.



PART 3

Airport Directory

**Airport Data
Technical
Information**

**Airport
Data
Briefing**

Time 04:00

Module objectives

At the end of this module you will be able to analyze airport data information based on standard ICAO regulations.



Time 04:00

Bandar Abbas (Bandar Abbas Intl) Apt of
Entry

22' OIKB BND +03:30* N27 13.1 E056 22.7

Apt Administration 76-33611000-1, 33611025;
Fax 76-33611002, 33611026; Bandarab-
bas.info@airport.ir.

03L/21R 11345' ASPHALT. PCN 55/F/A/X/T.
TODA 03L 11821'. TODA 21R 12841'. ASDA
03L 11821'. ASDA 21R 12841'. RL.

03R/21L 12011' ASPHALT. PCN 65/F/A/X/T.
TODA 03R 13199'. TODA 21L 13205'. ASDA
03R 13199'. ASDA 21L 13205'. HIRL. HIALS
21L.

H24. 12hr PPR for non-skd flights before EOBT
from dep AD. Customs.

Jet A-1.

ABN. Fire 7 , Cat 8 avbl PPN least 24hr before
EOBT.

1. **LOCATION (AIRPORT), APT OF ENTRY (IF APPLICABLE)** Airports are listed alphabetically by location name, with airport name in parentheses when different than location name. A cross index by airport name is provided.
2. **ELEVATION, JEPPESEN NAVDATA (ICAO) IDENTIFIER, IATA IDENTIFIER (IF APPLICABLE), TIME ZONE, COORDINATES** – Time Zone in numeric format, observed by the airport as stated in the source and indicating the standard difference of each zone from Universal Time Coordinated (UTC). * – indicated that the airport observes Daylight Savings or Summer Time.
3. **TELEPHONE/TELEFAX NUMBERS** Telephone/Telefax numbers are provided for contact with the airport, where available.

4. RUNWAY DATA AND RUNWAY/APPROACH LIGHTS

All usable runways are listed indicating the following items:

- a) Runway designators.
- b) Total runway length, excluding stopways, overruns or clearways.
- c) TORA and LDA if not identical with total runway length. TODA and ASDA when longer than take-off run (TORA) and provided by controlling authority. For explanation see below.
- d) Type of runway surface.
- e) Runway bearing strength.

f) Runway edge and approach lights are indicated as the best available system from the following sequence.

HIRL	– high intensity runway lights
MIRL	– medium intensity runway lights
RL	– low intensity runway lights
PORT-RL	– portable electric runway lights
FLARES	– flare pots or goosenecks
HIALS	– high intensity approach lights
MIALS	– medium intensity approach lights
ALS	– low intensity approach lights
LDIN	– sequenced flashing lead-in lights
RAIL	– runway alignment indicator lights (sequenced flashing)

5. HOURS & RESTRICTIONS

Airport hours of operation, restrictions for certain types of users or aircraft. All times are UTC unless otherwise indicated. Abbreviations used for airport hours and restrictions have the following meaning:

SR — Sunrise
SS — Sunset
H24 — Continuous operation
HX — Irregular times
O/R — On Request

O/T — Other times
PNR — Prior Notice Required
PPO — Prior Permission Only
PPR — Prior Permission Required
PTO — Part Time Operation
ATND/SKD — Attended Schedule

6. CUSTOMS

“Customs” without further explanation indicates that Customs are available during airport hours. Other Customs conditions are explained, as appropriate. NOTE: Availability at destination should be checked before departure.

7. FUEL

U — Fuel Services/Type unknown

F-7 — 100 octane F-3 — 100LL octane, low lead (equal to MIL F-18)

Jet A — Kerosene without FS-II*, FP** minus 40°C

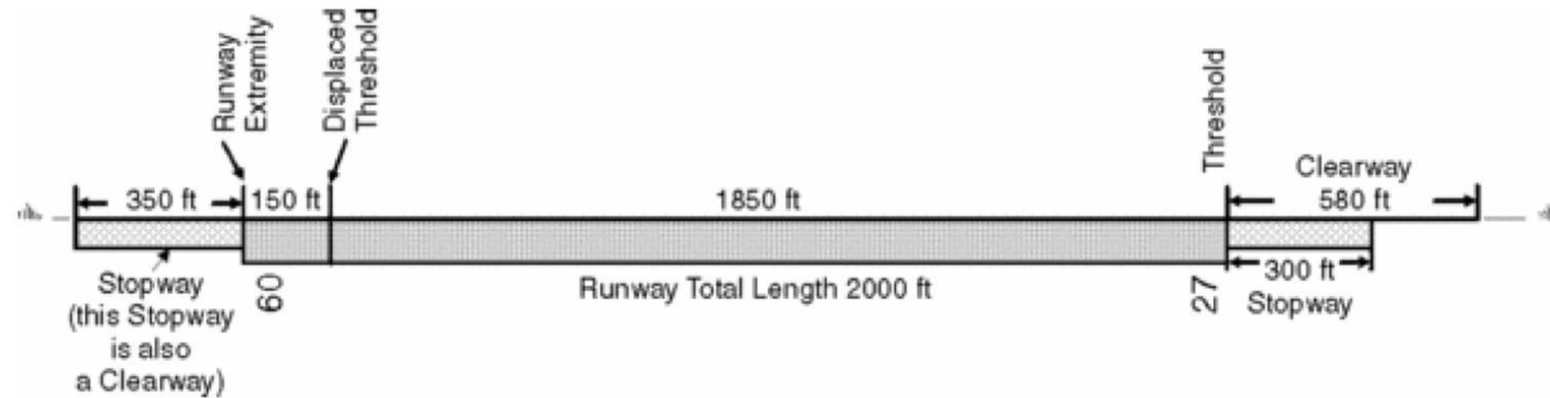
Jet A+ — Kerosene with FS-II*, FP** minus 40°C

Jet A-1 — Kerosene without FS-II*, FP** minus 47°C (equal to MIL F-35/JP-1***)

8. **BEACON** The abbreviations “ABN” and “IBN” indicate the availability of an aerodrome light beacon or aerodrome identification beacon.
9. **DECLARED RUNWAY DISTANCES AS SPECIFIED BY ICAO**
- Take-off Run Available (TORA), that is, the length of runway which is declared available and suitable for the ground run of an aeroplane taking off.
 - Accelerate Stop Distance Available (ASDA), that is, the length of the take-off run available plus the length of stopway available (if stopway is provided).

- **Take-off Distance Available (TODA)**, that is, the length of the take-off run available plus the length of clearway available (if clearway is provided).
- **Landing Distance Available (LDA)**, that is, the length of runway which is declared available and suitable for the ground run of an aeroplane landing. The landing distance available commences at the threshold and extends for the length of runway after the threshold. However, the threshold may be displaced from the extremity of the runway when it is considered necessary to make a corresponding displacement of the approach surface by reason of obstacles in the approach path to the runway.

RUNWAY	TORA	ASDA	TODA	LDA
	ft	ft	ft	ft
09	2000	2300	2580	1850
27	2000	2350	2350	2000



10. RESCUE AND FIRE FIGHTING SYSTEM Airport categories for rescue and fire fighting are based on the over-all length of the longest aeroplane normally using the airport and its maximum fuselage width as detailed in table 1.1. Table 1.2. shows the minimum usable amounts of extinguishing agents related to the airport categories. They will be shown in the airport listings as “Fire” followed by the category number (e.g. Fire 5). Where fire fighting equipment is available but the category is not defined, the letter U (Uncategorized) will be published (e.g. Fire U). Where fire fighting equipment is not available, the letter N will be published.

10 RESCUE AND FIRE FIGHTING SYSTEM

Airport categories for rescue and fire fighting are based on the over-all length of the longest aeroplane normally using the airport and its maximum fuselage width as detailed in table 1.1.

Table 1.2. shows the minimum usable amounts of extinguishing agents related to the airport categories. They will be shown in the airport listings as “Fire” followed by the category number (e.g. Fire 5).

Where fire fighting equipment is available but the category is not defined, the letter U (Uncategorized) will be published (e.g. Fire U).

Where fire fighting equipment is not available, the letter N will be published.

If different category numbers are published for one airport, the lowest category number will be shown. The higher category number with the relevant note (e.g. Fire 7 PTO, Fire 7 PPR ... etc.) can be found within the airport information block.

Table 1.1. Airport Category for Rescue and Fire Fighting

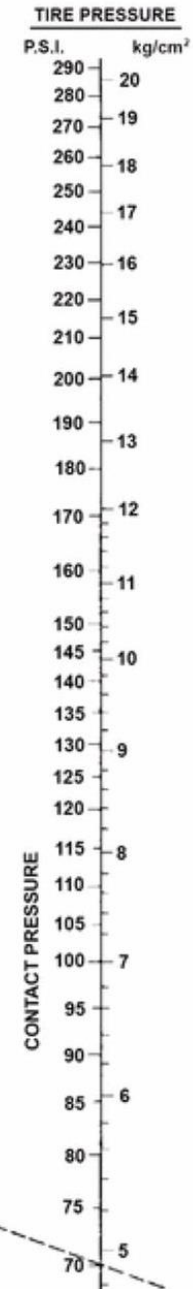
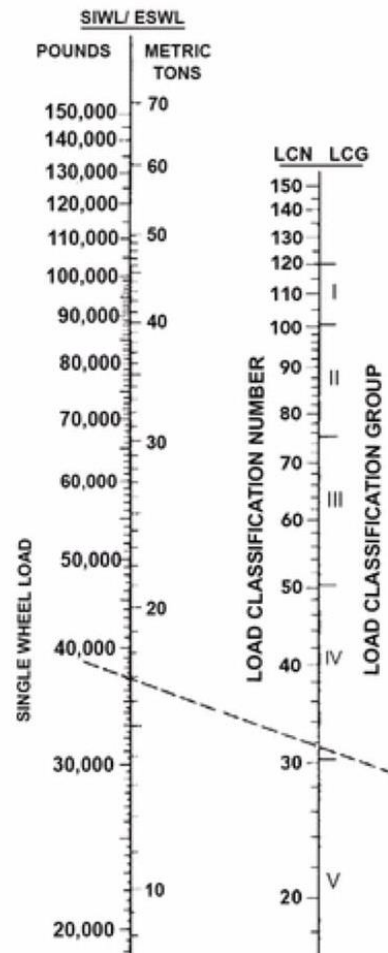
Airport Cat. ¹			
ICAO	FAA	Aeroplane Over-all Length (ft/m)	Maximum Fuselage Width (ft/m)
1	A	0 up to but not including 30/9	7/2
2		30/9 up to but not including 39/12	7/2
3		39/12 up to but not including 59/18	10/3
4		59/18 up to but not including 79/24	13/4
5		79/24 up to but not including 92/28	13/4

Table 1.1. Airport Category for Rescue and Fire Fighting (continued)

Airport Cat. ¹			
ICAO	FAA	Aeroplane Over-all Length (ft/m)	Maximum Fuselage Width (ft/m)
6	B	92/28 up to but not including 128/39	16/5
7	C	128/39 up to but not including 161/49	16/5
8	D	161/49 up to but not including 200/61	23/7
9	E	200/61 up to but not including 249/76	23/7
10		249/76 up to but not including 295/90	26/8

11. LOAD CLASSIFICATION OF RUNWAYS AND AIRCRAFT ALIGNMENT CHART

At some airports the bearing strength of runway pavement is defined by Load Classification Number (LCN)/Load Classification Group (LCG). The LCN/LCG has to be determined for a given aircraft and compared with the specific runway LCN/LCG. Normally the LCN/LCG of an aircraft should not be above that of the runway on which a landing is contemplated. Pre-arranged exceptions may be allowed by airport authorities. The aircraft LCN/LCG can be determined as



12. ACN/PCN SYSTEM

- a. The ICAO introduced the ACN/PCN System as a method to classify pavement bearing strength for aircraft with an All-up Mass of more than 12500lbs (5700kg). For lighter aircraft see item e.

DEFINITIONS:

ACN (Aircraft Classification Number) – A number expressing the relative effect of an aircraft on a pavement for a specified standard subgrade category.

NOTE: The aircraft classification number is calculated with respect to the center of gravity (CG) position which yields the critical loading on the critical gear. Normally the aft most CG appropriate to the maximum gross apron (ramp) mass is used to calculate the ACN. In exceptional cases the forward most CG position may result in the nose gear loading being more critical

CBR (California Bearing Ratio) – The bearing ratio of soil determined by comparing the penetration load of the soil to that of a standard material. The method covers evaluation of the relative quality of subgrade soils but is applicable to sub-base and some base course materials.

PCN (Pavement Classification Number) – A number expressing the bearing strength of a pavement for unrestricted operations.

b. ACN for selected aircraft types currently in use have been provided by aircraft manufacturers or ICAO and the results are presented in tables shown on the following pages.

c. PCN will be determined and reported by the appropriate authority. PCN will be qualified by type of pavement, subgrade strength, tire pressure and calculation method information, using the following codes:

1. The Pavement Classification Number: The reported PCN indicates that an aircraft with **an ACN equal to or less than the reported PCN** can operate on the pavement subject to any limitation on the tire pressure.

2. The **type** of pavement:

R — Rigid

F — Flexible

3. The subgrade **strength** category:

A — High

B — Medium

C — Low

D — Ultra-low

4. The tire pressure category:

W – Unlimited, no pressure limit

X – High, limited to 1.75MPa (254psi)

Y – Medium, limited to 1.25MPa (181psi)

Z – Low, limited to 0.50MPa (73psi)

5. Pavement calculation method:

T – Technical evaluation

U – Using aircraft experience

EXAMPLE: Coding - PCN 80/R/B/W/T

The bearing strength of a pavement for aircraft with an All-up **Mass EQUAL TO OR LESS than 12500lbs (5700kg)** shall be made available by reporting the following information in plain language:

1. **Maximum allowable aircraft mass, and**
2. **Maximum allowable tire pressure.**

EXAMPLE: 4000kg (8800lbs)/0.50MPa (73psi)

.Occasional minor overloading operations are acceptable for:

1. flexible pavements by aircraft with ACN **not exceeding 10 per cent** above the PCN;
2. rigid or composite pavements by aircraft **with ACN not exceeding 5 per cent** above the PCN;
3. unknown pavement structure, **a 5 per cent limitation** above the PCN should apply.

ACN TABLES

Aircraft Type	All-up Mass ¹ (Maximum Apron Mass) (Operating Mass Empty)		Load on one main gear leg (%)	Standard Aircraft Tire Pressure			ACN relative to							
							Rigid Pavement Subgrades				Flexible Pavement Subgrades			
							High K = 150 MN/m ³	Medium K = 80 MN/m ³	Low K = 40 MN/m ³	Ultra-low K = 20 MN/m ³	High CBR = 15%	Medium CBR = 10%	Low CBR = 6%	Very low CBR = 3%
	lbs	kgs		psi	kg/c m ²	mPa	A	B	C	D	A	B	C	D
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Airbus A300-B4	349209	15840	47.0	177	12.4	1.22	42	51	60	69	43	48	58	75
	200848	0					20	23	28	33	21	23	26	35
		91104												
Airbus A300-B4	349209	15840	47.0	160	11.2	1.10	40	49	59	68	42	47	58	75
	200848	0					19	23	27	32	21	22	26	35
		91104												
Airbus A300-B4	365743	16590	47.0	212	14.9	1.46	48	57	67	75	46	51	63	80
	200667	0					22	25	29	34	22	23	26	35
		91022												
Airbus A300-B4	365743	16590	47.0	186	13.1	1.28	46	55	65	74	45	51	63	80
	200667	0					21	24	28	33	21	23	26	35
		91022												
Airbus A300-B4	365743	16590	47.0	168	11.8	1.16	44	53	64	73	45	51	62	79
	200667	0					20	23	27	32	21	22	26	35
		91022												

Esfahan (Shahid Beheshti Intl) Apt of Entry
5059' OIFM IFN +03:30* N32 45.0 E051
51.8

Apt Administration 31 35275060-1; Fax 31
35275062. ARO Fax 31 35275042.

07L/25R 14426' ASPHALT. PCN 65/F/C/X/T.
TODA 07L 15610'. TODA 25R 15617'. ASDA
07L 15610'. ASDA 25R 15617'. HIRL. HIALS
25R.

07R/25L 14426' ASPHALT. PCN 65/F/C/X/T.
TODA 07R 15607'. TODA 25L 15610'. ASDA
07R 15607'. ASDA 25L 15610'. HIRL. HIALS
25L.

H24. PPR for non-schedule flights at least 48hr.
Customs: H24.

F-3, Jet A-1.

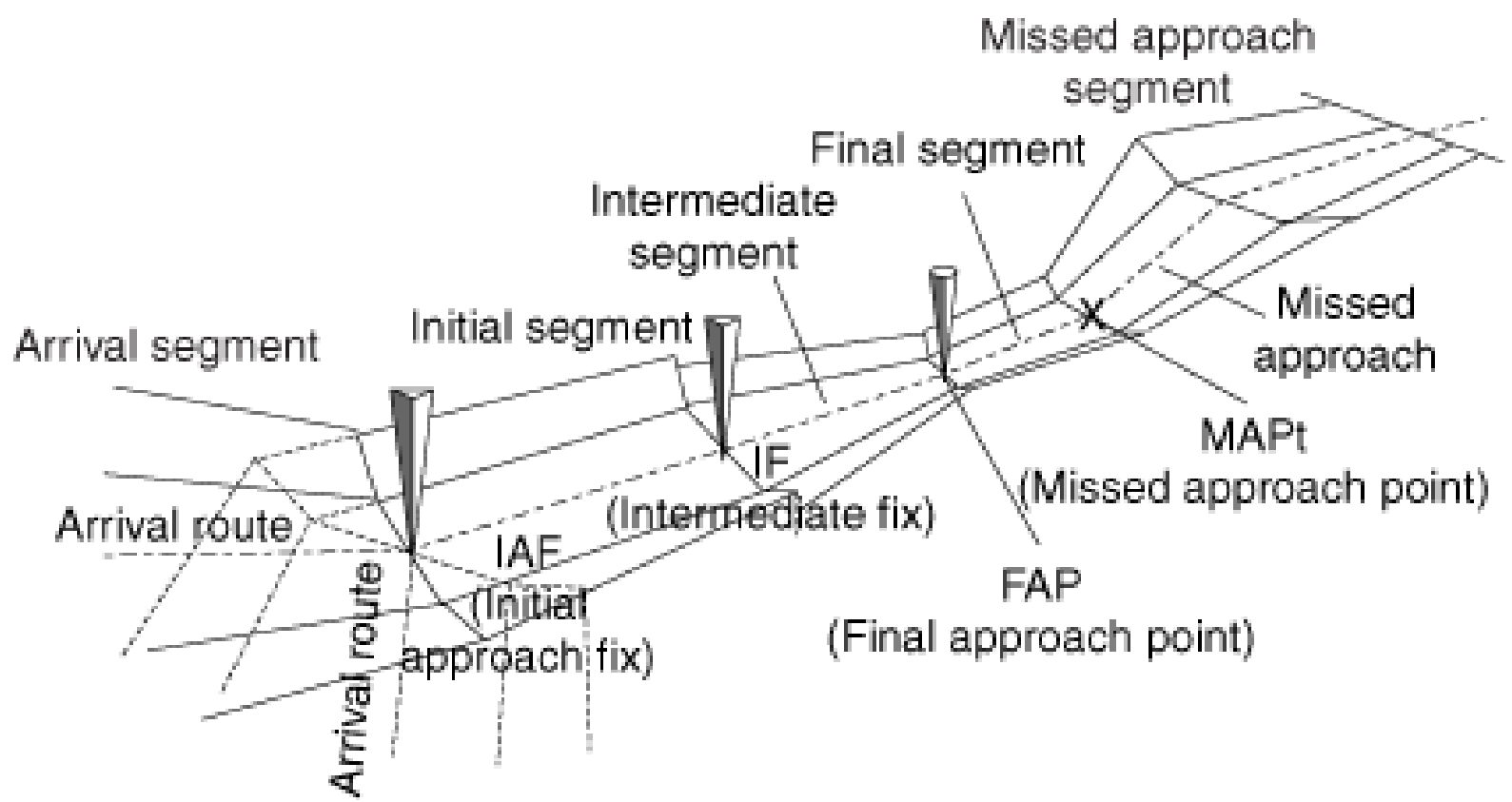
ABN. Fire 8.

Instrument approach procedure & Standard instrument departure

Time 08:00



Instrument approach procedure



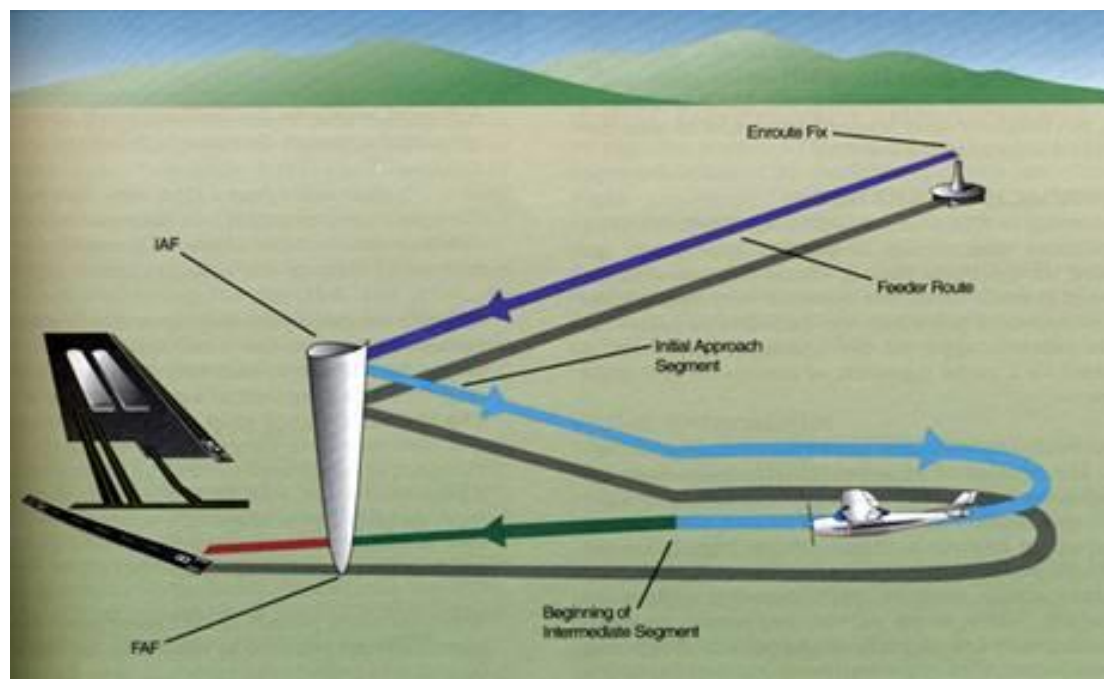
**D
O
C

8
1
6
8**



Module objectives

At the end of this module you will be able to Describe the **roll of DOC 8168 to analyze instrument approach chart** based on standard ICAO regulations.



Instrument approach procedure:

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 land-ing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply.

7.2 Abbreviations

C/L	Centre line	MSA	Minimum Sector Altitude
DA/H	Decision Altitude/Height	NOZ	Normal Operating Zone
DER	Departure End of Runway	NTZ	No Transgression Zone
DME	Distance Measuring Equipment	OIS	Obstacle Identification Surface
DR	Dead Reckoning	PDG	Procedure Design Gradient
FAF	Final Approach Fix	RTR	Radar Termination Range
FAP	Final Approach Point	SDF	Step Down Fix
FAT	Final Approach Track	SID	Standard Instrument Departure
IAF	Initial Approach Fix	STAR	Standard Arrival Route
IF	Intermediate Fix	TAA	Terminal Approach Altitude
LHA	Lowest Holding Altitude	TP	Turning point
MAPt	Missed Approach Point	VM(C)	Visual Manoeuvring Circling
MDA/H	Minimum Descent Altitude/Height	VM(C)A	Visual Manoeuvring Circling Area

The design of an instrument approach procedure is, in general, dictated by the ***terrain surrounding*** the aerodrome, the type of operations contemplated and the aircraft to be accommodated. These factors in turn influence the type and siting of navigation aids in relation to the runway or aerodrome. ***Airspace*** restrictions ***may*** also affect the siting of navigation aids.

An instrument approach procedure may have **five** separate segments. They are the ***arrival, initial, intermediate, final and missed approach segments***.

The approach segments begin and end at designated fixes. However, under some circumstance certain of the segments may begin at specified points where no fixes are available.

For example, the final approach segment of a precision approach may start where the intermediate flight altitude intersects the nominal glide path (the final approach point).

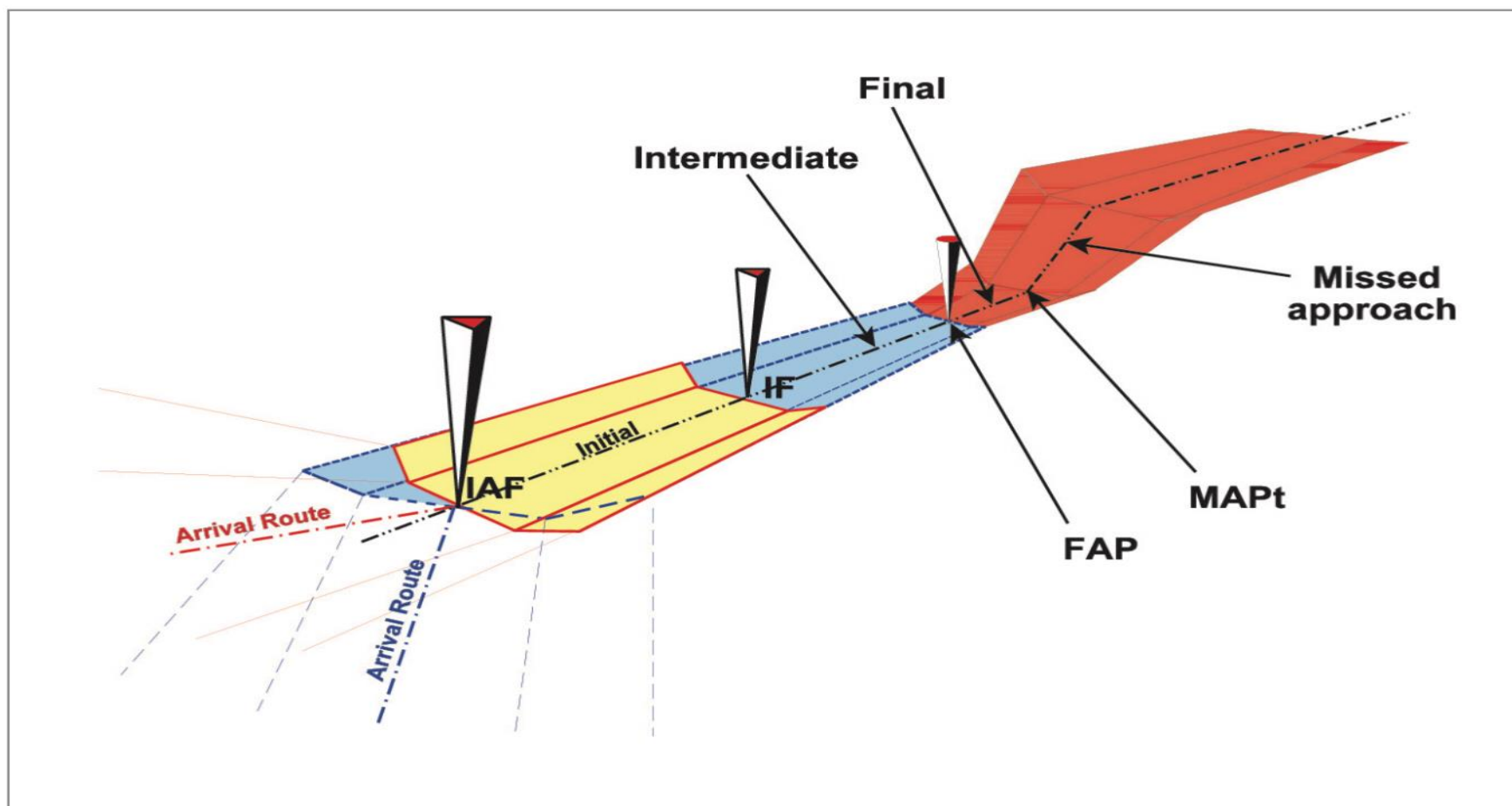
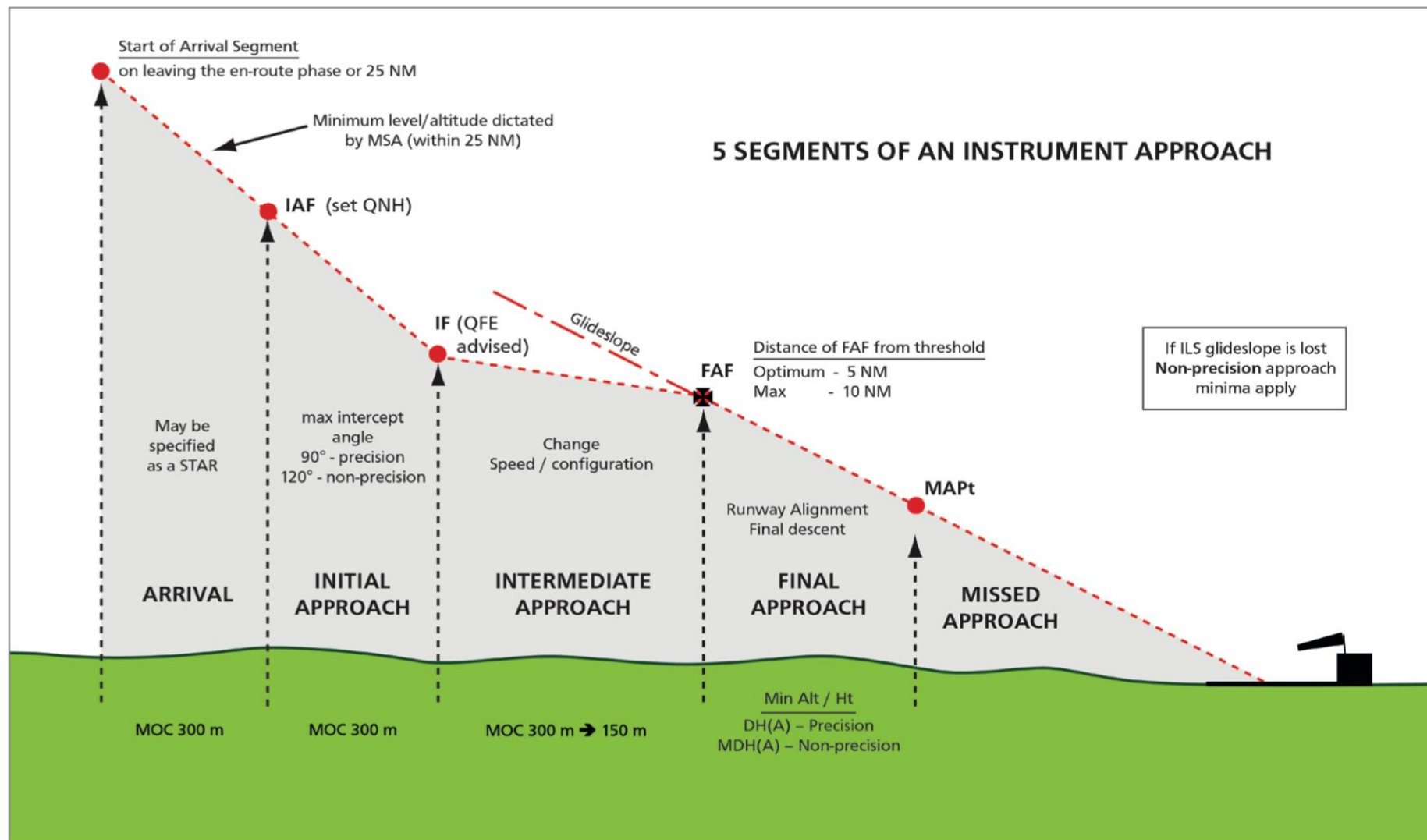


Figure 8.3 Procedure segments



Physical Characteristics of Segments

The vertical cross section of each segment is divided into **primary** and **secondary** MOC areas. Full obstacle clearance is applied over the primary area, reducing to zero at the outer edges of the secondary areas.

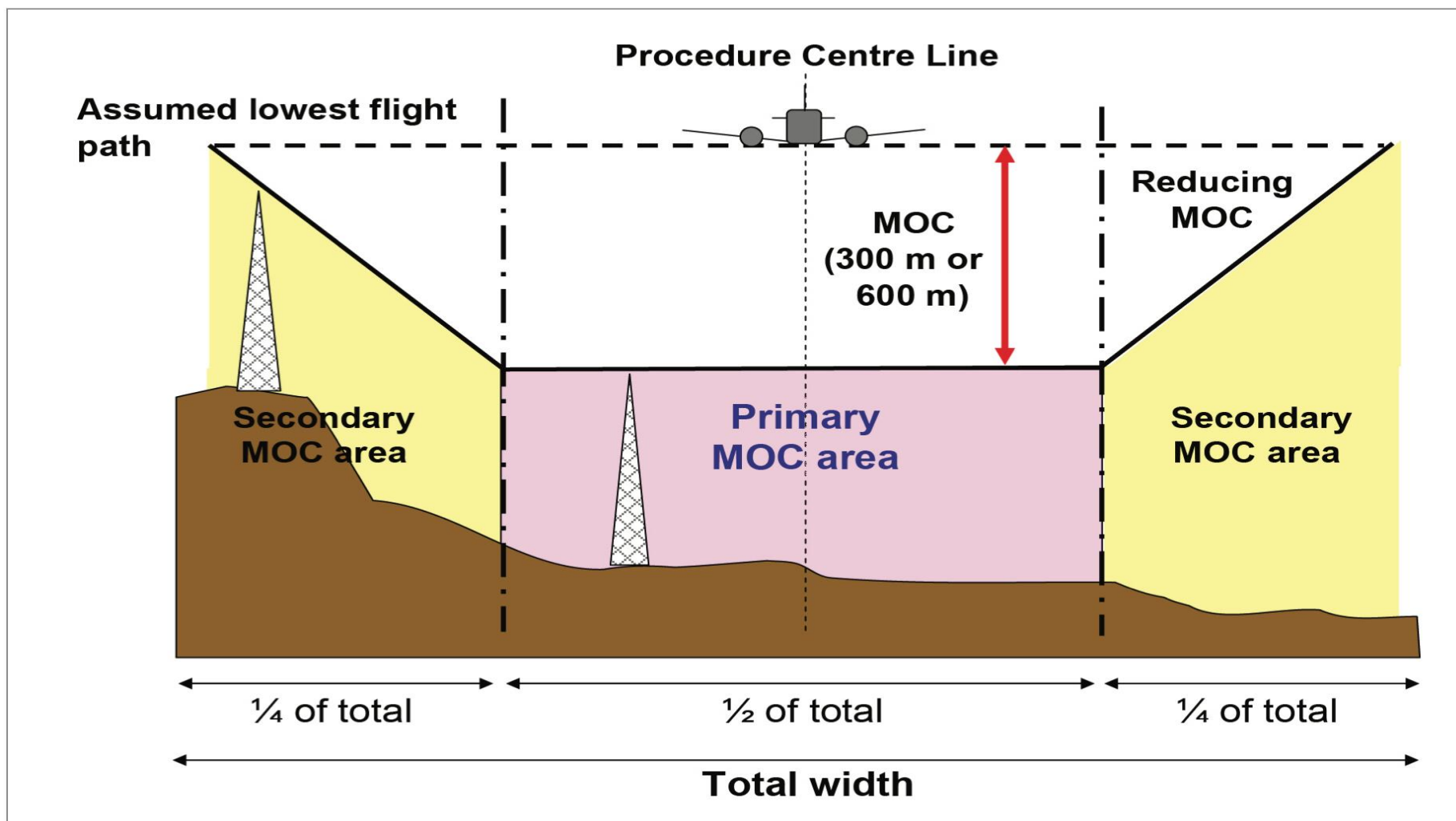
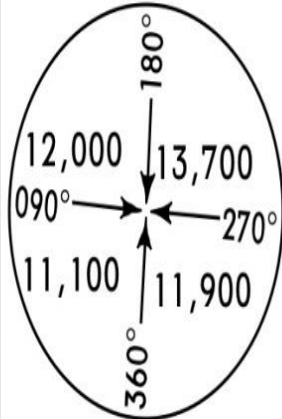


Figure 8.4 Characteristics of segments

Types of approach

*There are two types of approach: **straight-in** and **circling**.*

- ***Straight-in approach*** Whenever possible, a straight-in approach will be specified which is aligned with the runway centre line. In the case of non-precision approaches, a straight-in approach is considered acceptable if the angle between the final approach track and the runway centre line is 30° or less.
- ***Circling approach*** A circling approach will be specified in those cases where terrain or other constraints cause the final approach track alignment or descent gradient to fall outside the criteria for a straight-in approach. The final approach track of a circling approach procedure is in most cases aligned to pass over some portion of the usable landing surface of the aerodrome.

n	*Ground		
	121.9		
GS D3.7 IKRD 5207' (1414')	ILS DA(H) 4050' (257')	Apt Elev 3793' Rwy 3793'	
Lead VOR, then climb on R-274 KRD to 6000', Lead VOR and intercept R-109 KRD to NDB. Holding at 10800'.			MSA KRD VOR
ev: 131 hPa		Trans level: FL 135	Trans alt: 11500'

The **straight in approach** is identified by **runway designator** in head of instrument approach charts.

PP ESEN

KHORAM ABAD, IRAN

13-3

CAT A & B

① CIRCLING VOR DME

*Ground

121.9

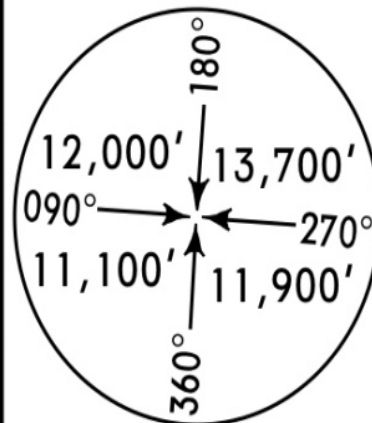
Alt

MDA(H)

Apt Elev 3793'

(207')

5850' (2057')



MSA
KRD VOR

on R-117 KRD to reach 7100'
overhead VOR at or above 8500',
/R-285 KRD and climb to 10500'.

Trans level: FL 135

Trans alt: 11500'

The **circling approach** is identified *without runway designator* in head of instrument approach charts.

Responsibility of ATC

Should a pilot report, or it is clear to ATC that the pilot is unfamiliar with an instrument approach procedure, the ATCU is responsible for describing the procedure to the pilot unless the aircraft is cleared for a straight-in approach.

Speed/Categories of Aircraft

Aircraft performance has a direct effect on the airspace and visibility required for the various maneuvers associated with the conduct of instrument approach procedures. The most significant performance factor is ***aircraft speed***.

Table I-4-1-2. Speeds for procedure calculations in knots (kt)

Aircraft Category	V _{at}	Initial Approach Speeds	Final Approach Speeds	Maximum Speeds for Visual Manoeuvring (Circling)	Maximum Speeds for Missed Approach	
					Intermediate	Final
A	<91	90/150 (110*)	70/100	100	100	110
B	91/120	120/180 (140*)	85/130	135	130	150
C	121/140	160/240	115/160	180	160	240
D	141/165	185/250	130/185	205	185	265
E	166/210	185/250	155/230	240	230	275
H	N/A	70/120**	60/90***	N/A	90	90

V_{at} : Speed at threshold based on 1.3 times stall speed V_{so} or 1.23 times stall speed V_{s1g} in the landing configuration at maximum certificated landing mass. (Not applicable to helicopters.)

- Maximum speed for reversal and racetrack procedures.
- ** Maximum speed for reversal and racetrack procedures up to and including 6000 ft is 100 kt, and maximum speed for reversal and racetrack procedures above 6000 ft is 110 kt.



NO # 2

Time = 00:02

If the stall speed of an airplane with maximum mass and landing configuration over threshold is 126 kts what will be its category?

- A) A
- B) B
- C) C
- D) D

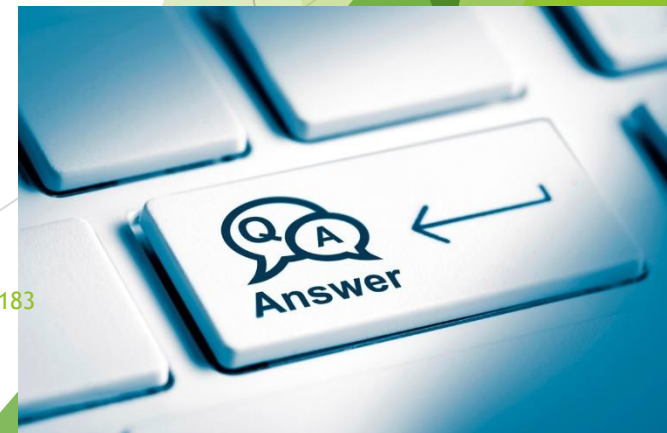


D
O
C

8
1
6
8

If the stall speed of an airplane with maximum mass and landing configuration over threshold is 126 kts what will be its category?

- a) A
- b) B
- c) C
- d) D



How many separate segments may have an instrument approach procedure?

- A) 3
- B) 4
- C) 5
- D) 6



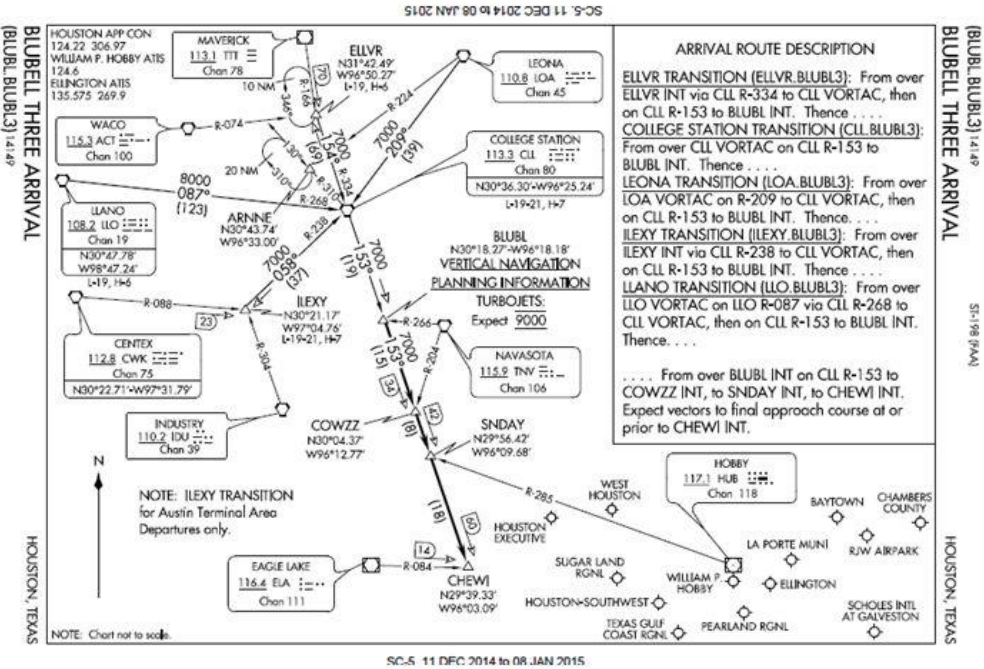
How many separate segments may have an instrument approach procedure?

- A) 3
- B) 4
- C) 5
- D) 6



Arrival Route/Segment

Standard Terminal Arrival Routes STARs



Arrival Route/Segment

The arrival segment begins at the point the aircraft departs from the en route airways system to begin the instrument arrival. This will normally be a radio navigation facility.

- If this is 25 NM or more from the aerodrome, a standard arrival route (STAR) will be specified.
- If the distance is less than 25 NM then the aircraft will route directly from the point of leaving the airway to the facility serving as the IAF for the procedure.

In either case, the en route MOC is applied and the altitude specified for the aircraft to be over the IAF is not below the highest MSA for the aerodrome. It is usual for aircraft to be radar vectored from a convenient point, to the final approach track.

A standard instrument arrival (STAR) route permits *transition* from the en-route phase to the approach phase.

The arrival route normally *ends at the IAF*. Omnidirectional or sector arrivals can be provided taking into account minimum sector altitudes (MSA).

MINIMUM SECTOR ALTITUDES (MSA)/TERMINAL ARRIVAL ALTITUDES (TAA)

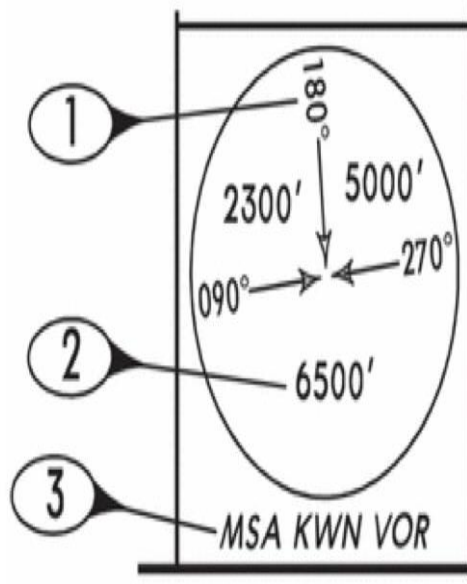
Minimum sector altitudes or terminal arrival altitudes are established for each aerodrome and provide ***at least 300 m (1000 ft) obstacle clearance within 46 km (25 NM)*** of the significant point, the aerodrome reference point (ARP) associated with the approach procedure for that aerodrome.

MSA/TAA is shown on all instrument plates and will be the lowest altitude permitted at the appropriate fix (normally the altitude at which the procedure begins).

*An arriving aircraft is permitted to **descend below MSA only when:***

- the aerodrome and underlying terrain are **visible** and will remain so,
- the aircraft is under **radar** control being radar vectored,
- the aircraft is flying a **published approach procedure**.

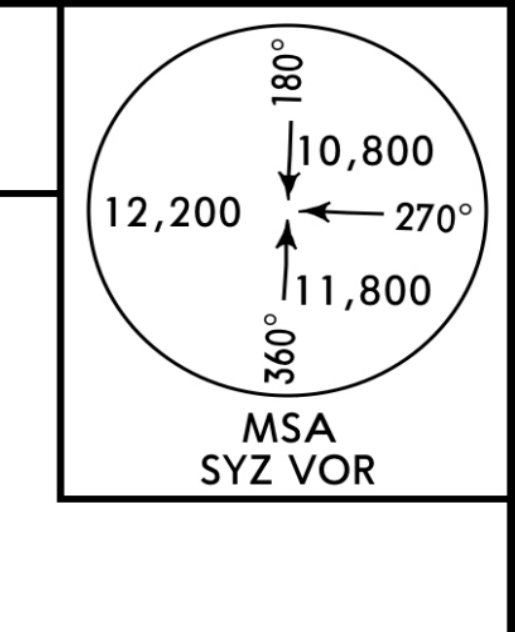
MINIMUM SAFE or SECTOR ALTITUDE (MSA)



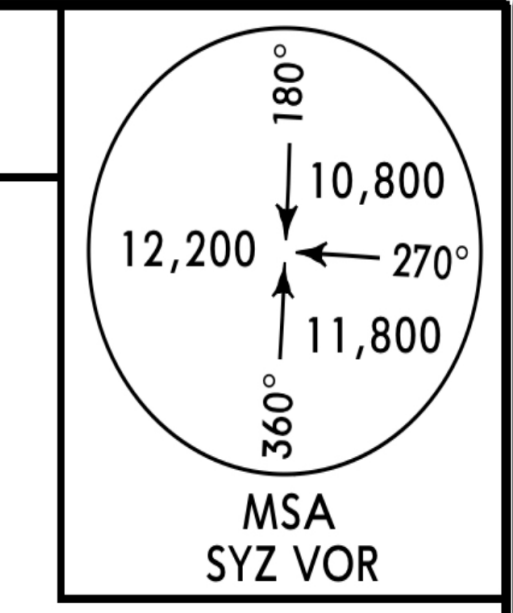
- 1 — Sector defining Radial/Bearing, always depicted inbound for the Navaid, Fix or Airport Reference Point (ARP).
- 2 — Minimum safe/sector altitude.
- 3 — Navaid/Fix/ARP the MSA is predicated on.

NOTE: Normal coverage is a 25 NM radius from the forming facility/fix. If the protected coverage is other than 25 NM, that radius is depicted below the forming facility/fix. MSA is provided when specified by the governing authority for any procedure serving the airport.

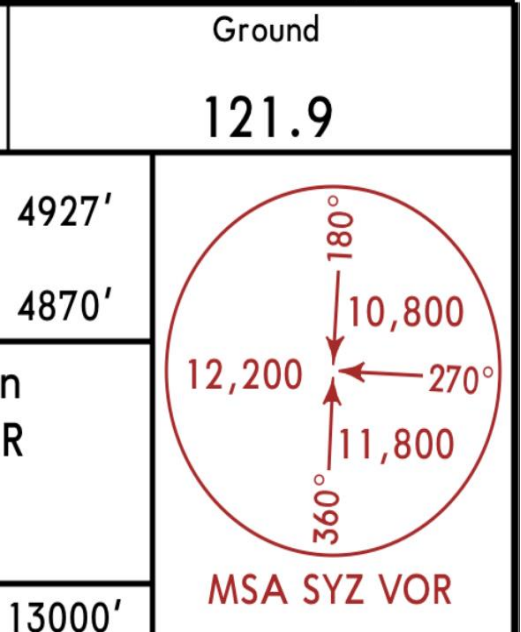
SHIRAZ, IRAN
STAR



SHIRAZ, IRAN
SID



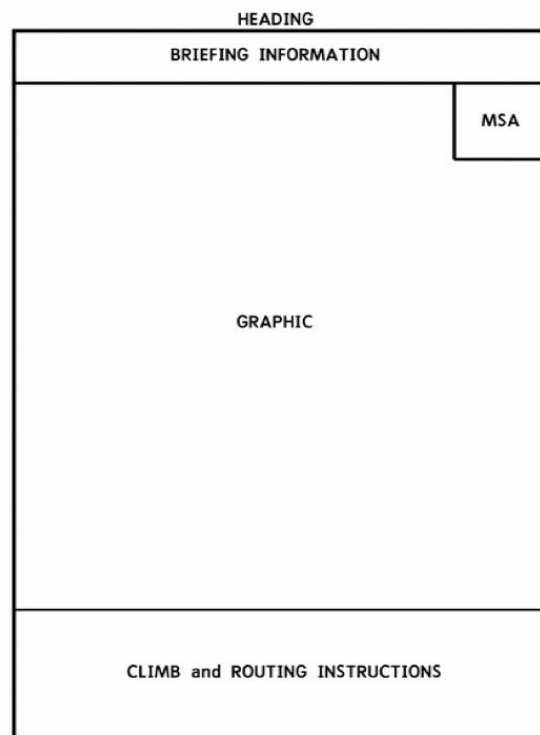
SHIRAZ, IRAN
ILS 1 Rwy 29L



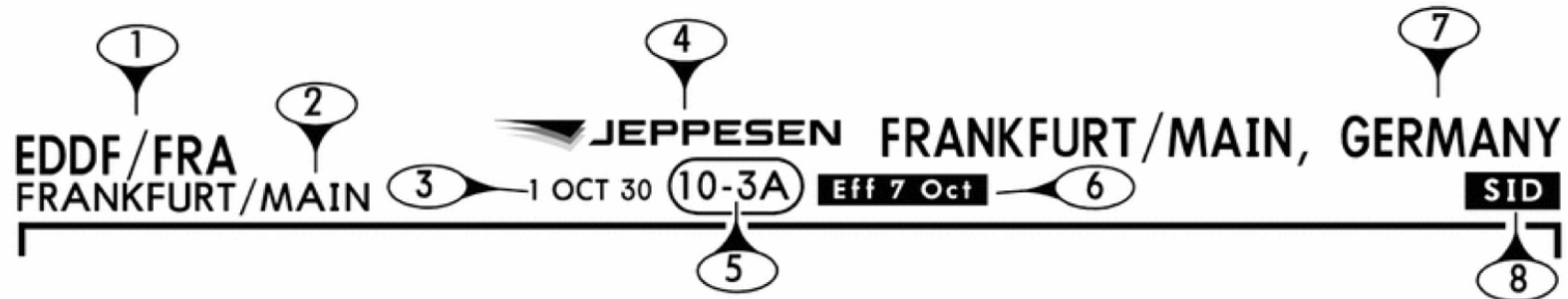
SID/STAR SID/DP AND STAR LEGEND

SID/DP AND STAR

The SID & STAR section of the Jeppesen legend provides a general overview and depiction of Standard Instrument Departure (SID), Departure (DP), Standard Terminal Arrival Route/Standard Instrument Arrival (STAR), and Arrival charts. These charts are graphic illustrations of the procedures prescribed by the governing authority. A text description may be provided, in addition to the graphic, when it is supplied by the governing authority. All altitudes shown on SID/DP and STAR charts are MSL unless otherwise specified. All mileages are nautical, all radials and bearings are magnetic unless otherwise specified.



HEADING



1 — ICAO indicators and IATA identifiers.

2 — Airport name.

3 — Chart revision date.

4 — Jeppesen company logo.

5 — Index number.

6 — Chart effective date.

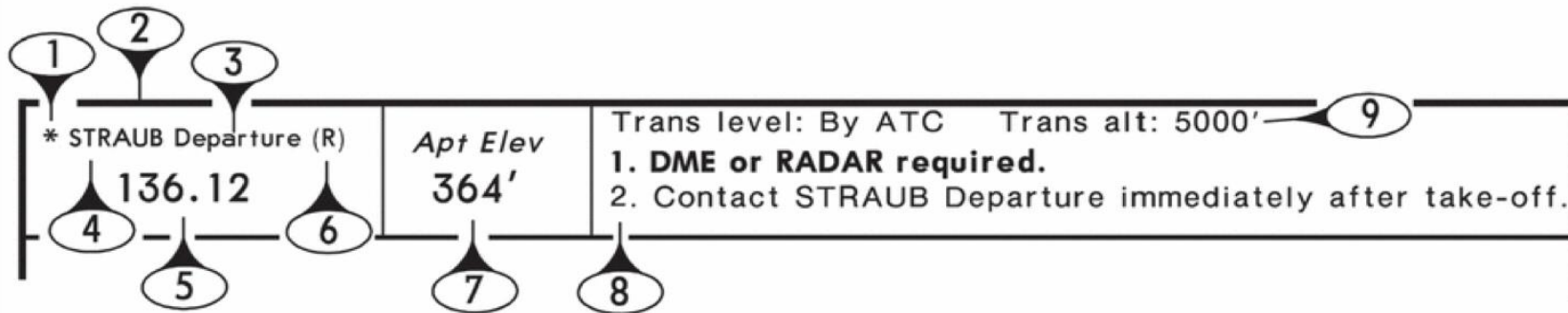
7 — Geographical location name.

8 — Chart type identifier.

Charts are sequenced alphabetical or by runway number within similar type arrivals or departures.

SID/STAR SID/DP AND STAR LEGEND

BRIEFING INFORMATION



- | | |
|--|--|
| 1 — Indicates the service is part time. | 5 — All available primary frequencies are depicted. |
| 2 — SID/DP Initial Departure Control Services or STAR Weather Services (e.g. ATIS) are depicted. | 6 — Indicates that radar services are available. |
| 3 — Function of the service is shown when applicable. | 7 — Airport elevation is provided for Arrival/Departure airport. |
| 4 — Service call sign is shown when transmit and receive, or transmit only ops are available. The call sign is omitted when the service is broadcast only or has a secondary function. | 8 — Procedure restrictions and instructions. Required equipment notes are prominently displayed. |
| | 9 — Transition Level and Altitude. |

CLIMB and ROUTING INSTRUCTIONS TABULATED TEXT BOX

Text description might be provided, in addition to the graphic, when it is supplied by the governing authority. Text should be used in conjunction with the graphic to fully understand the procedure to be flown. Neither the text nor the graphic is a stand alone representation of all instructions, speed, and altitude restrictions, but are a combined representation of the procedure.

1	2	3	4
RWY	INITIAL CLIMB		ALTITUDE
6	Fly runway heading or as assigned for vectors to join filed route.		All aircraft MAINTAIN 4000' or assigned lower altitude
24	(SOUTHBOUND) Fly runway heading or as assigned for vectors to join filed route.		
2 ROUTING 3			
EXPECT further clearance to filed altitude within 10 minutes after departure.			

Tabulated Text boxes, which include a wide variety of actions, instructions, or restrictions for the pilot, have certain common elements of design for SID, DP and STAR procedures.

- | | |
|---|--|
| <p>1 — General identification applying to certain sections of the procedure, such as Runway, Arrival or SID identification.</p> <p>2 — Segment of flight, such as Initial Climb, Routing, or Landing may be identified.</p> | <p>3 — Textual description, which compliments the graphic-based depictions or unique instructions, that cannot be graphically represented.</p> <p>4 — General restriction that cannot be incorporated in the graphic or that would enhance understanding of procedure.</p> |
|---|--|

SID/STAR

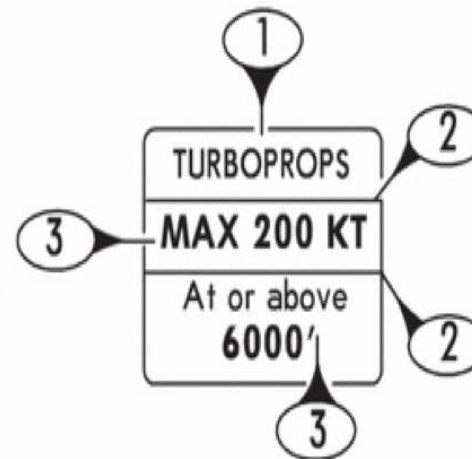
SID/DP AND STAR LEGEND

GRAPHIC — INFORMATION BOXES

Information boxes are generally tied to the track, fix, or navaid to which the information applies. The content is associated with the graphic depiction on SID, DP, and STAR charts. Information boxes include a wide variety of actions, instructions, or restrictions.

Though information boxes vary widely based on the complexity of procedures, they do have certain common elements of design.

- 1 — Heading, if included, represent the who, what, where, or why of the information box.
- 2 — Instruction lines are used to separate instructions and conditions for improved clarity.
- 3 — Instructions or conditional statements associated with track, fix, navaid, or procedure.



GRAPHIC — LOST COMMUNICATIONS PROCEDURE

LOST COMMS ▼ LOST COMMS ▼ LOST COMMS ▼ LOST COMMS ▼ LOST COMMS ▼ LOST COMMS

Unique lost communication instructions, provided by the governing authority for a procedure, are placed within the graphic and are outlined by the lost communication boundary.

GRAPHIC — SPEED RESTRICTIONS

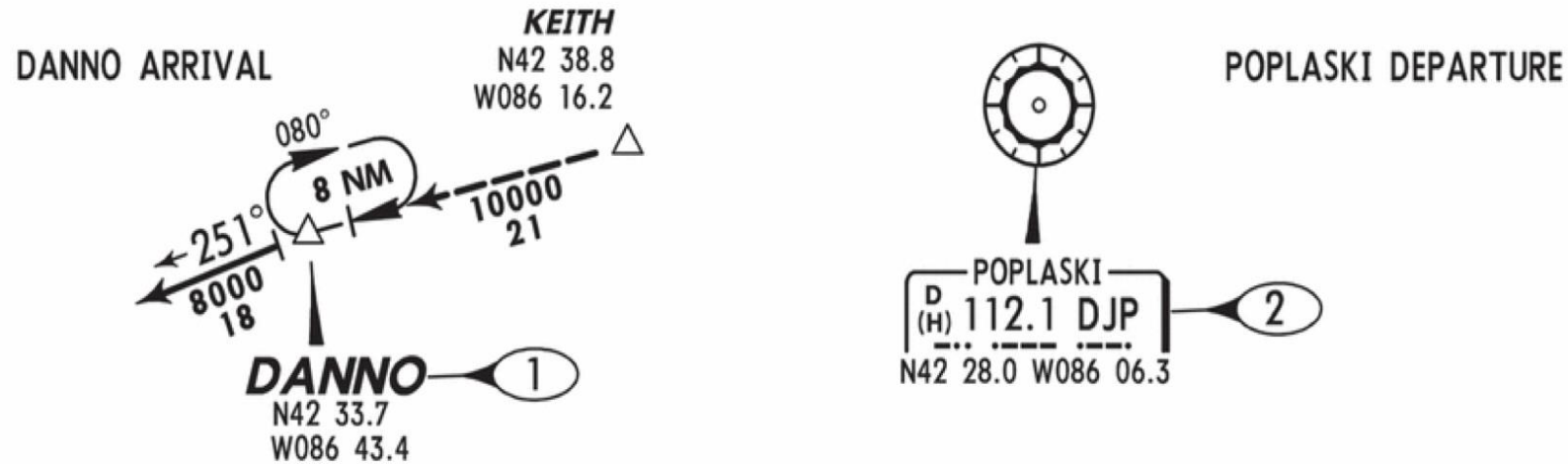
Speed restrictions that apply to the entire procedure are shown below the procedure title.

SPEED: DO NOT EXCEED 230 KT UNTIL ADVISED BY ATC

Speed restrictions vary widely within individual procedures. They can be in the tabulated text, boxed, and/or placed in information boxes at the associated track, fix or phase of flight.

GRAPHIC — STARTING POINT AND END POINT OF STAR, DP, AND SID PROCEDURES

Nav aids, intersections, or waypoints identified in the procedure title are shown prominently for easy identification of the starting points on STARs, and the ending points on SID or DP procedures.

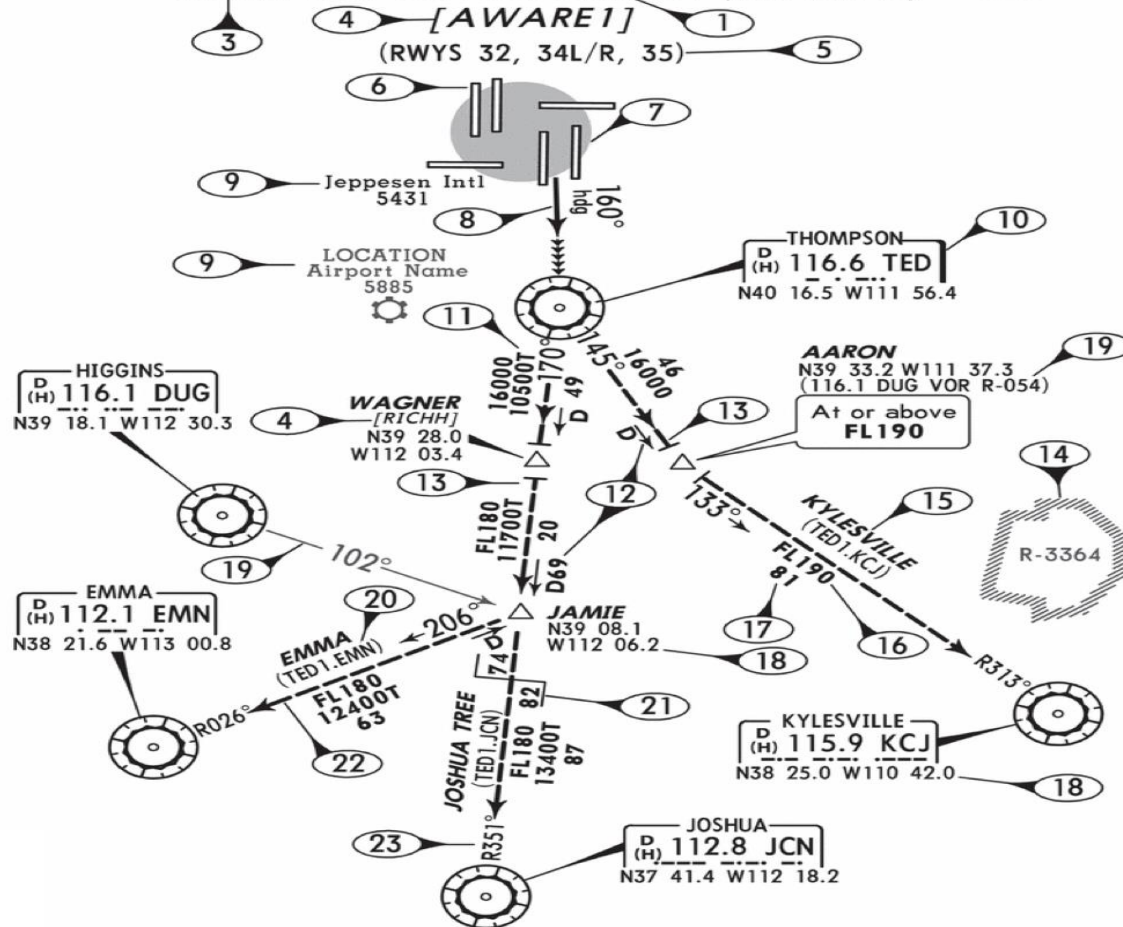


- 1 — Intersection or waypoint names are shown in larger text.
- 2 — Nav aid boxes include a shadowed outline.

SID/STAR SID/DP AND STAR LEGEND

GRAPHIC

THOMPSON ONE DEPARTURE (TED1.TED) — 2



- 1 — Type of procedure.
- 2 — Arrival/Departure code.
- 3 — Arrival/Departure name.
- 4 — Database identifiers are included when different than the Arrival/Departure code or name.
- 5 — Specified qualifying statements, such as runways, navigational requirements, or aircraft type.
- 6 — Runway layout is provided for all hard surface runways.
- 7 — Arrival/Departure airport is highlighted with circular screen.
- 8 — Arrival/Departure track of procedure represents a common course used by multiple transitions.
- 9 — Airport is listed only when SID, DP, or STAR also serves multiple airports, which are screened.
- 10 — Starting Point of STAR and end point of SID/DP procedures are shown prominently.
- 11 — T placed after altitude denotes a Minimum Obstruction Clearance Altitude (MOCA).
- 12 — Radial and DME forms the fix. The DME, if not displayed is the segment distance, if shown it is the total distance from the forming Navaid.
- 13 — Altitude T is placed when the altitude changes along a track at other than a Navaid.
- 14 — Certain Special Use Airspace Areas are charted when referenced in procedure source.

SID/STAR SID/DP AND STAR LEGEND

- 15 — Transition name placed on the last segment of the SID/DP and the first segment of STAR procedures.
- 16 — Minimum Enroute Altitude (MEA) unless otherwise designated.
- 17 — Segment distance.
- 18 — Coordinates of fix or Navaids.
- 19 — Formation radials are presented in many ways based on Navaid position & compositional space.
- 20 — Route identification code.
- 21 — At the Changeover point, the pilot changes primary navigation to the next Navaid.
- 22 — Transition track.
- 23 — VOR radial on which aircraft is flying inbound towards the Navaid.



A MSA provides at least:

- A) 300 m obstacle clearance within 46 km of the homing facility associated with the approach procedure for aerodrome.
- B) 300 ft obstacle clearance within 20 NM of the homing facility associated with the approach procedure for that aerodrome.
- C) 300 ft obstacle clearance within 25 NM of the homing facility associated with the approach procedure for that aerodrome.
- D) 300 m obstacle clearance within 20 km of the homing facility associated with the approach procedure for that aerodrome.



A MSA provides at least:

- A) **300 m obstacle clearance within 46 km of the homing facility associated with the approach procedure for aerodrome.**
- B) 300 ft obstacle clearance within 20 NM of the homing facility associated with the approach procedure for that aerodrome.
- C) 300 ft obstacle clearance within 25 NM of the homing facility associated with the approach procedure for that aerodrome.
- D) 300 m obstacle clearance within 20 km of the homing facility associated with the approach procedure for that aerodrome.



Normally a procedure will be designed to provide protected airspace and obstacle clearance for aircraft up to and including:

- A) Category A.
- B) Category B.
- C) Category C.
- D) Category D.



D
O
C

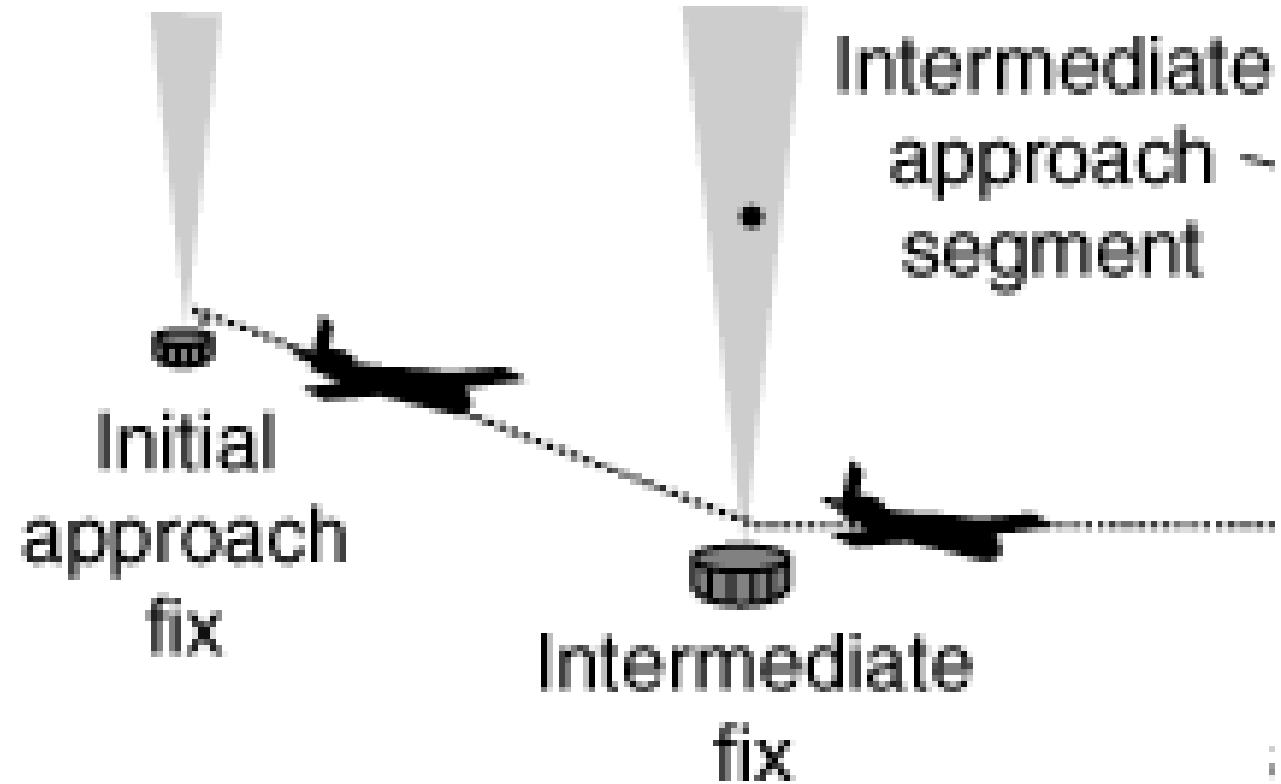
8
1
6
8

Normally a procedure will be designed to provide protected airspace and obstacle clearance for aircraft up to and including:

- A) Category A.
- B) Category B.
- C) Category C.
- D) **Category D.**



INITIAL APPROACH SEGMENT



INITIAL APPROACH SEGMENT

- The initial approach segment **begins at the initial approach fix (IAF) and ends at the intermediate fix (IF).**
- In the initial approach, the aircraft has **left** the en-route structure and is maneuvering to **enter** the intermediate approach segment.
- Aircraft **speed** and configuration will depend on the distance from the aerodrome, and the descent required.
- In the initial segment, the aircraft is **directed** to a point at which the **intermediate segment can be intercepted.**
- MOC in the initial segment is **300 m (984 ft)**

INITIAL APPROACH FIX (IAF)

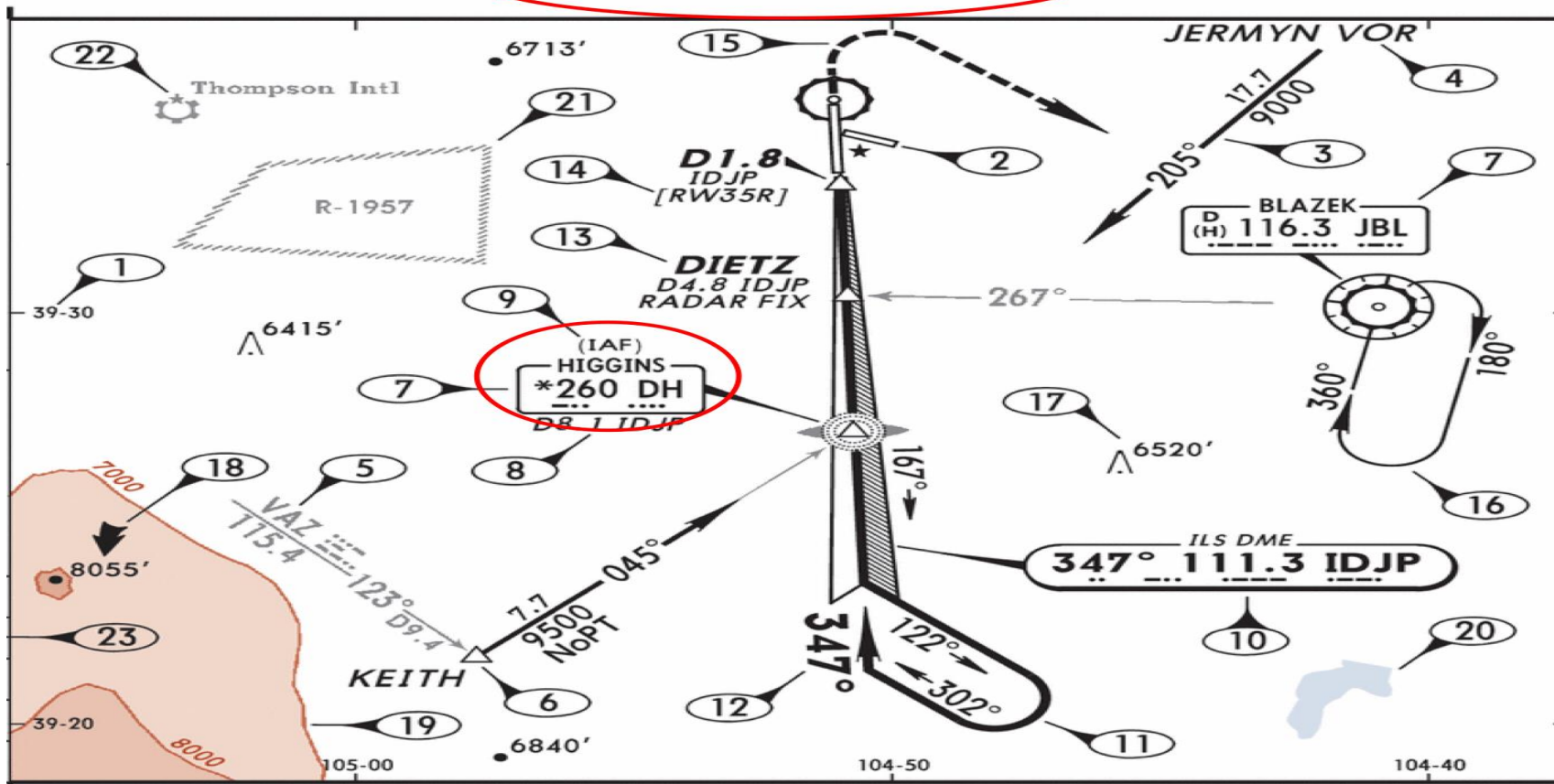
A fix that marks the beginning of the initial segment and the end of the arrival segment, if applicable. In RNAV applications this fix is normally defined by a fly-by waypoint.

INTERMEDIATE FIX (IF)

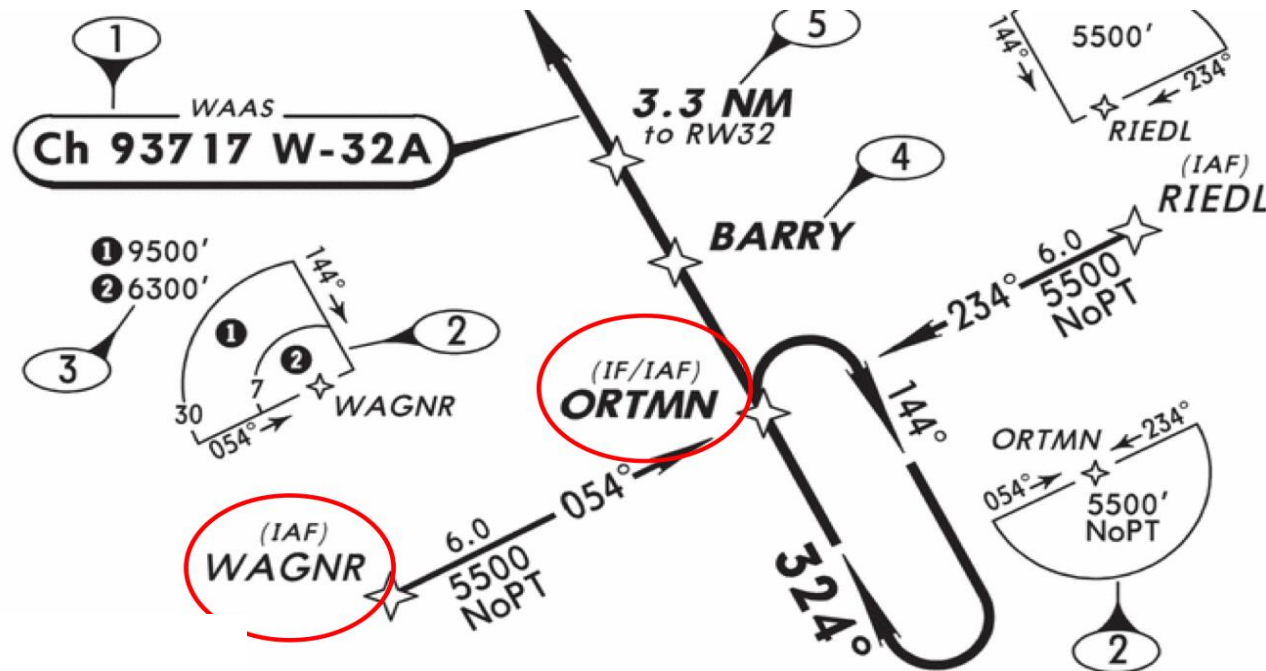
A fix that marks the end of an initial segment and the beginning of the intermediate segment. In RNAV applications this fix is normally defined by a fly-by waypoint.

APPROACH APPROACH CHART LEGEND

APPROACH PLANVIEW



- 8 — Substitute fix identification information located below facility box when applicable.
- 9 — Initial Approach Fixes and Intermediate Fixes are labeled as (IAF) and (IF) respectively.
- 10 — A shadowed navaid box indicates the primary navaid upon which lateral course guidance for the final approach segment is predicated.
- 11 — The final/intermediate approach course is indicated with a heavy weight line.

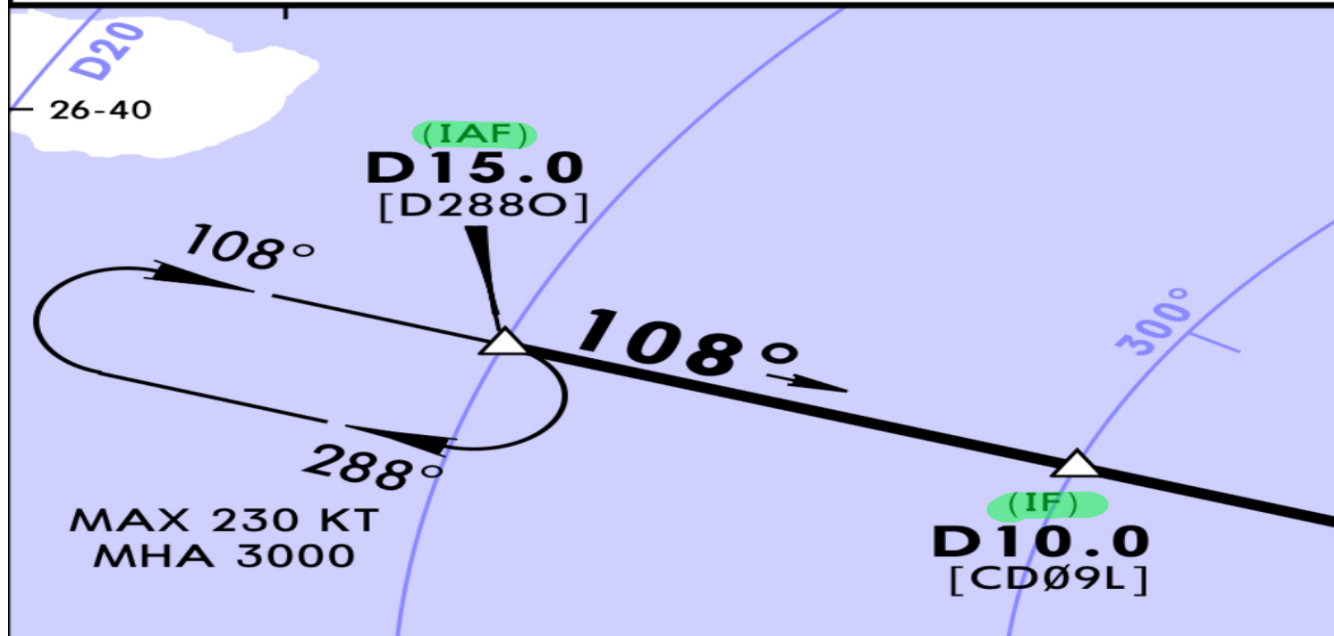


MISSED APCH: Climb on track 108° to V_h and rejoin holding at 3000'.

Alt Set: hPa

Apt Elev: 4 hPa

Trans



INITIAL APPROACH SEGMENT

The initial approach segment **begins** at the **initial approach fix (IAF)** and **ends** at the **intermediate fix (IF)**.

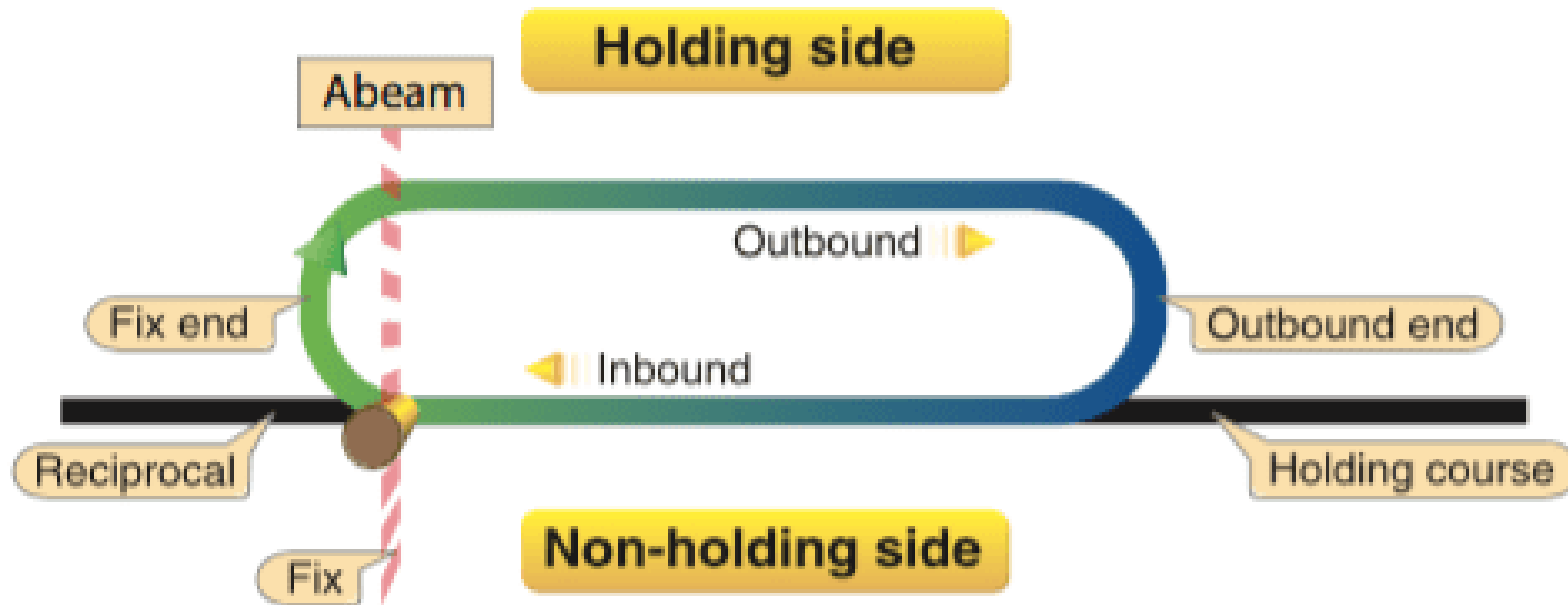


INITIAL APPROACH SEGMENT

Aircraft speed and configuration will depend on the distance from the aerodrome, and the descent required.

Aircraft Category	V _{at}	Initial Approach Speeds
A	<91	90/150 (110*)
B	91/120	120/180 (140*)
C	121/140	160/240
D	141/165	185/250
E	166/210	185/250
H	N/A	70/120**

Holding procedure



Holding procedure

Holding is the equivalent to temporary parking areas for aeroplanes. Clearly (unless you are flying a rotorcraft) you cannot stop, but you can remain (hold) in the vicinity of a radio navigation facility for as long as is required (fuel permitting!). Providing you can fly the aeroplane accurately and navigate with reference to a radio navigation aid (VOR, NDB) or a fix position, holding is a feasible option for losing time. ***Indeed, in bad weather or at times of peak traffic flow, you will be lucky to get a 'straight-in' approach.*** All instrument arrivals start from a holding pattern established at the IAF. In a holding pattern, aircraft are 'stacked' up, one on top of another with the necessary vertical separation applied (1000 ft). As the bottom aircraft departs the holding pattern to fly the approach procedure, the others above are 'shuttled' (descended in the stack) to a lower level one at a time.

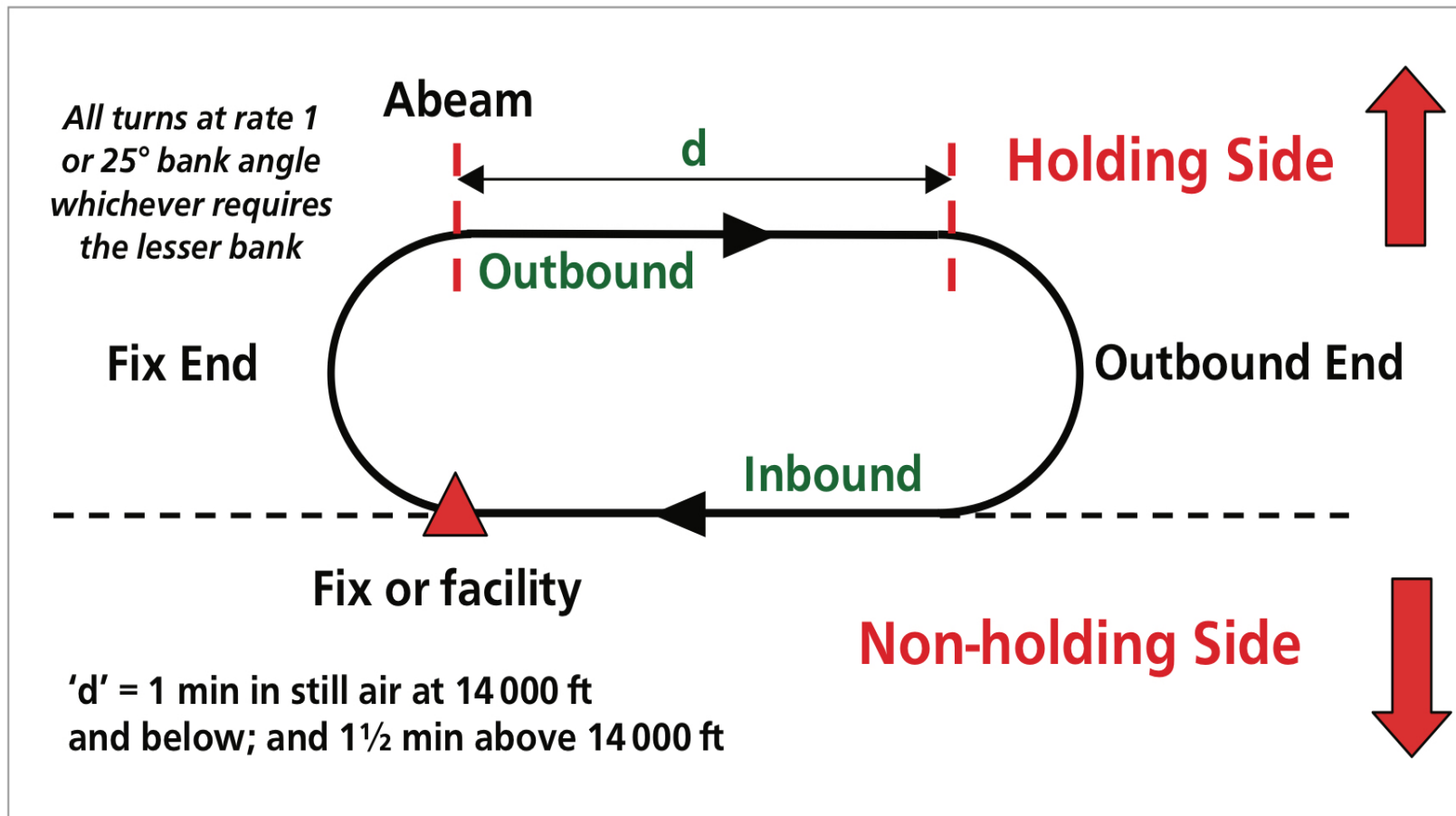


Figure 10.1 Holding pattern terminology

Bank angle/rate of turn

All turns are to be made at a **bank angle of 25° or at a rate of 3° per second**, whichever requires the lesser bank.

Allowance for known wind All procedures depict tracks

Pilots should attempt to maintain the track by **making allowance for known wind by applying corrections both to heading and timing**. This should be done during entry and while flying in the holding pattern.

Start of outbound timing

Outbound timing begins over or abeam the fix, whichever occurs later. If the abeam position cannot be determined, start timing when turn to outbound is completed

Outbound leg length based on a DME distance

If the outbound leg length is based on a DME distance, then the outbound leg terminates as soon as the limiting DME distance is reached.

Limiting radials

In the case of holding away from the station, where the distance from the holding fix to the VOR/DME station is short, a limiting radial may be specified. A limiting radial may also be specified where airspace conservation is essential.

If the limiting radial is reached before the limiting DME distance, this radial should be followed until a turn inbound is initiated. The turn should be initiated at the latest where the limiting DME distance is reached.

Speeds

Holding patterns shall be entered and flown at or below the airspeeds given in Table I-6-1-1.

The speeds in given in Table I-6-1-1 are rounded to the nearest multiple of five for operational reasons. From the standpoint of operational safety, these speeds are considered to be equivalent to the unrounded originals.

Table IV-1-1 (or I-6-1-1 in PANS-OPS). Holding speeds - Categories A through E

Levels ¹	Normal conditions	Turbulence conditions
Up to 4250 m (14000 ft) inclusive	425 km/h (230 kt) ²	520 km/h (280 kt) ³
	315 km/h (170 kt) ⁴	315 km/h (170 kt) ⁴
Above 4250 m (14000 ft) to 6100 m (20000 ft) inclusive	445 km/h (240 kt) ⁵	520 km/h (280 kt) or 0.8 Mach, whichever is less ³
Above 6100 m (20000 ft) to 10350 m (34000 ft) inclusive	490 km/h (265 kt) ⁵	
Above 10350 m (34000 ft)	0.83 Mach	0.83 Mach

1. The levels shown represent *altitudes* or corresponding *flight levels* depending upon the altimeter setting in use.
2. When the holding procedure is followed by the initial segment of an instrument approach procedure promulgated at a speed higher than 425 km/h (230 kt), the holding should also be promulgated at this higher speed wherever possible.
3. The speed of 520 km/h (280 kt) (0.8 Mach) reserved for turbulence conditions shall be used for holding only after prior clearance with ATC, unless the relevant publications indicate that the holding area can accommodate aircraft flight at these high holding speeds.
4. For holdings limited to CAT A and B aircraft only.
5. Wherever possible, 520 km/h (280 kt) should be used for holding procedures associated with airway route structures.

Table IV-1-2. PANS-OPS Second Edition Holding Speeds Applicable to Many of the Presently Published Holdings

Levels ¹	Propeller ² aircraft	Jet aircraft	
		Normal conditions	Turbulence conditions
up to 1850 m inclusive 6000 ft	315 km/h (170 kt)	390 km/h (210 kt)	520 km/h (280 kt) or 0.8 Mach whichever is less ³
above 1850 m to 4250 m inclusive 6000 ft to 14000 ft	315 km/h (170 kt)	405 km/h (220 kt)	
above 4250 m 14000 ft	325 km/h (175 kt)	445 km/h (240 kt)	

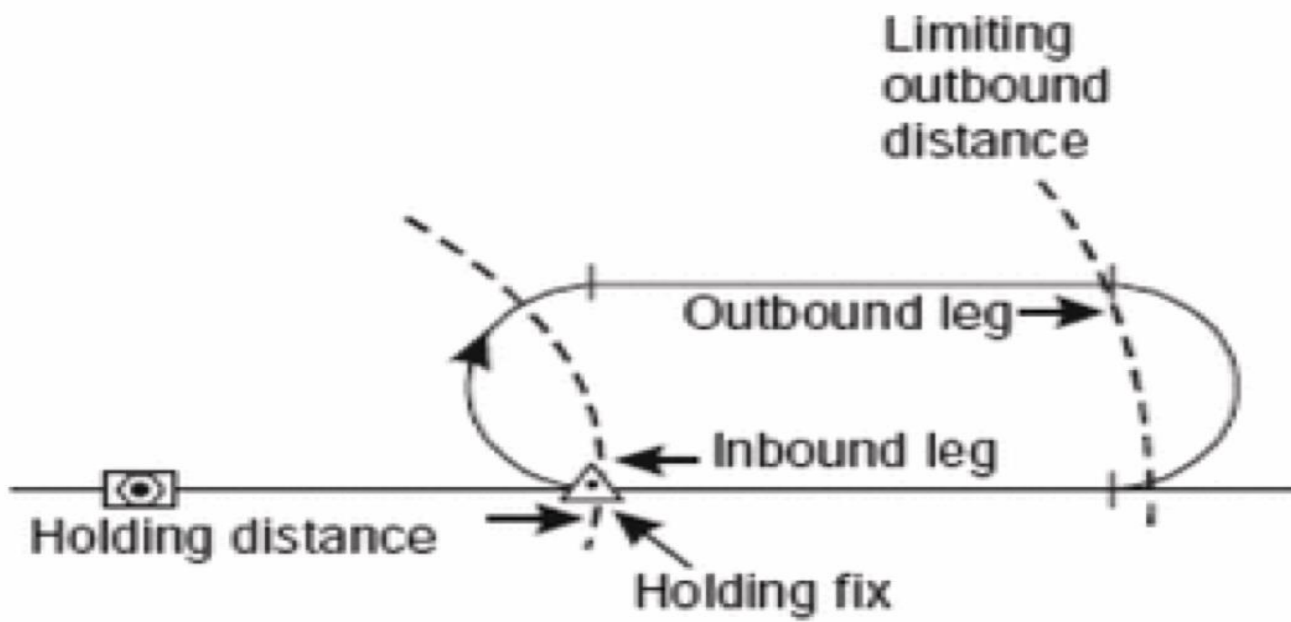
Time/distance outbound The *still air time* for flying the outbound entry heading should not exceed:

- *one minute if at or below 4250 m (14000 ft); or*
- *one and one-half minutes if above 4250 m (14000 ft). Where DME is available, the length of the outbound leg may be specified in terms of distance instead of time.*

Corrections for wind

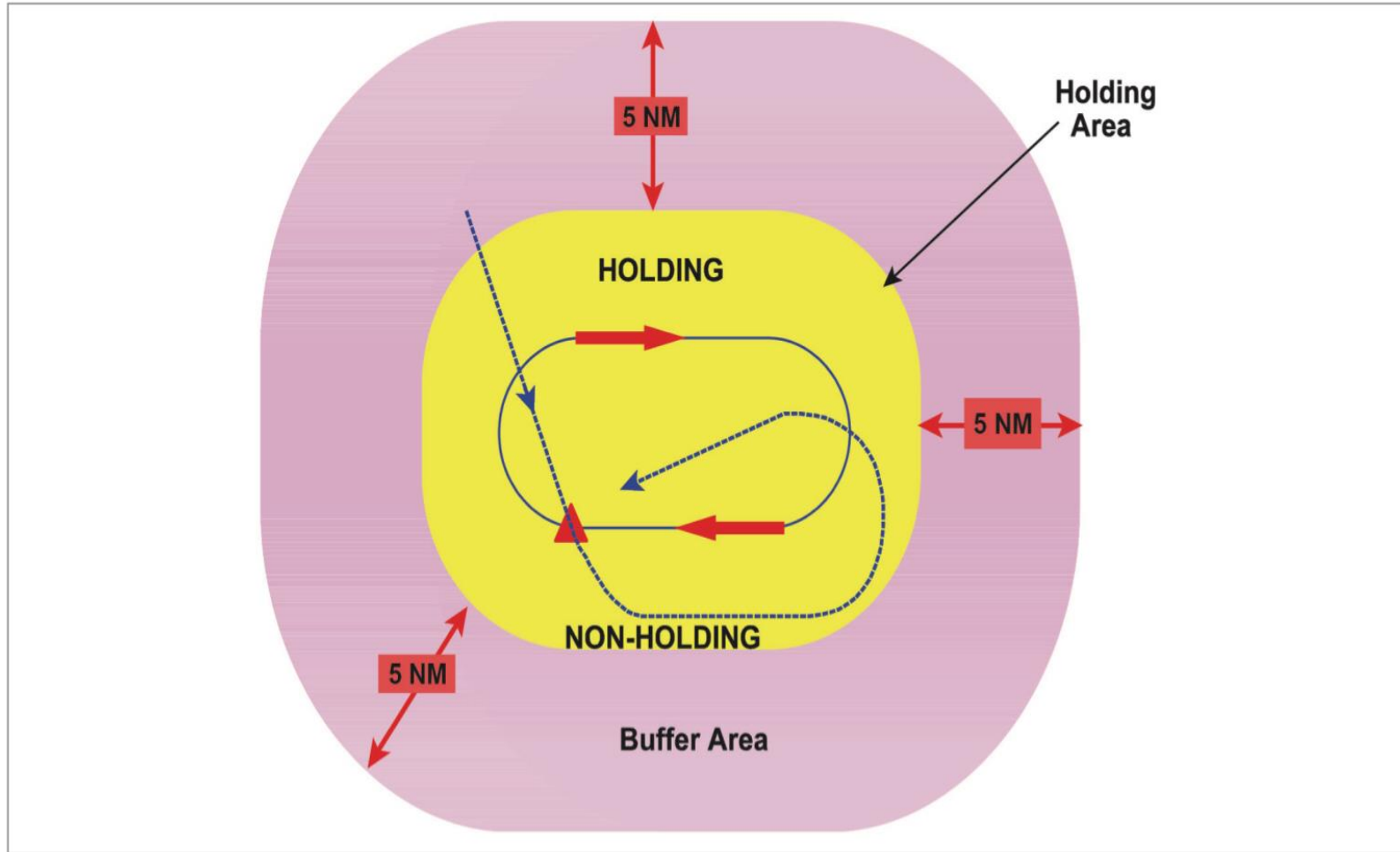
effect Due allowance should be made in **both heading and timing** to compensate for the effects of wind to **ensure the inbound track** is regained before passing the holding fix inbound. In making these corrections, full use should be made of the indications available from the nav aid and estimated or known wind.

B. VOR/DME-holding towards the station



Holding Area

The instrument procedure designer will ensure that the **MOC (300 m or 600 m in mountainous terrain)**, is applied throughout the holding area. This will include the holding pattern and any necessary adjacent airspace that would be used during a joining procedure. The size of the holding area will depend upon the nature of the pattern, the type of aircraft using the hold, adjacent airspace requirements and maximum holding altitude. ***Surrounding the holding area a buffer zone, 5 NM wide***, is established within which decreasing MOC is applied from full MOC at the boundary with the holding area, to zero at the extremity.



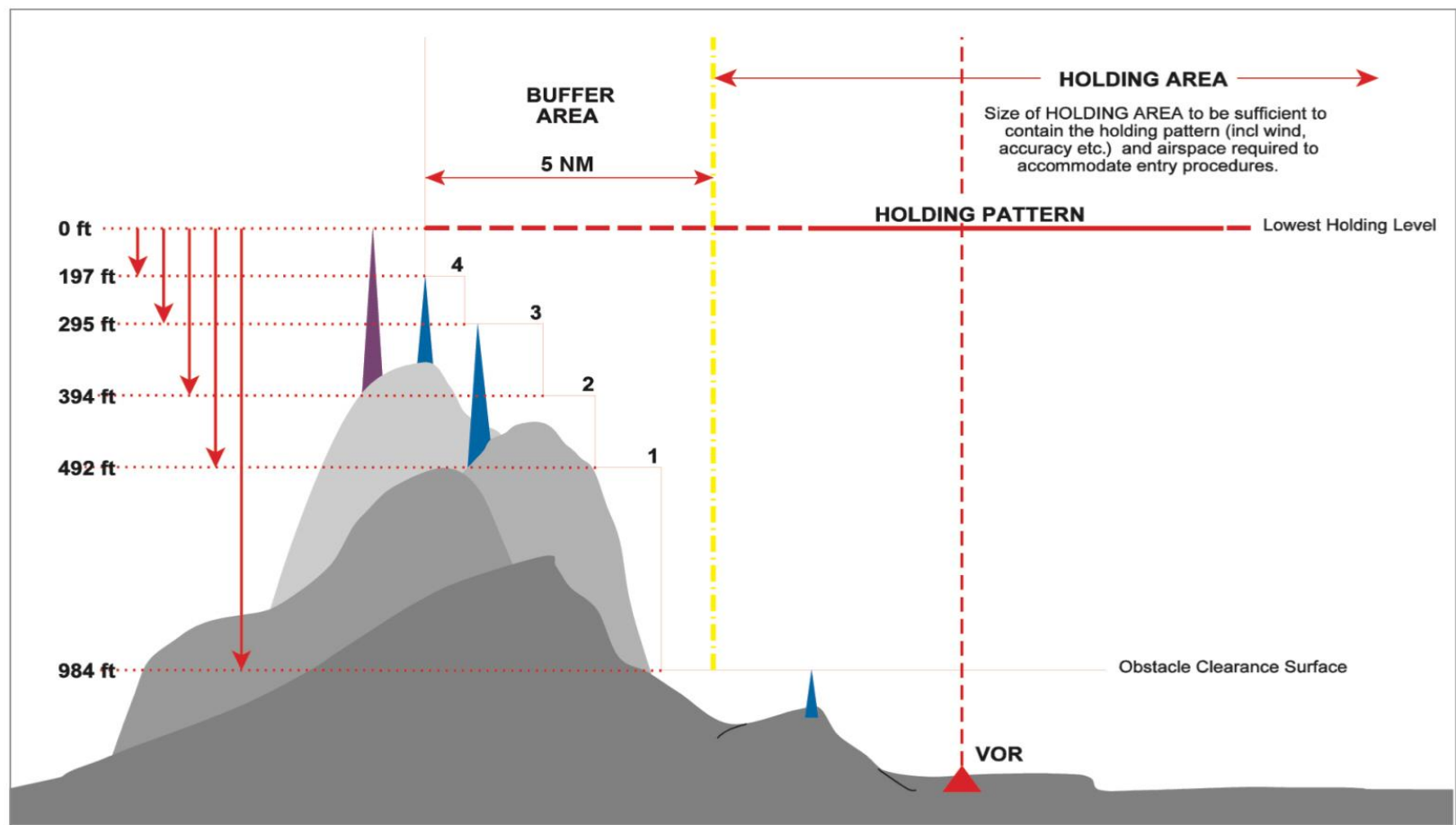
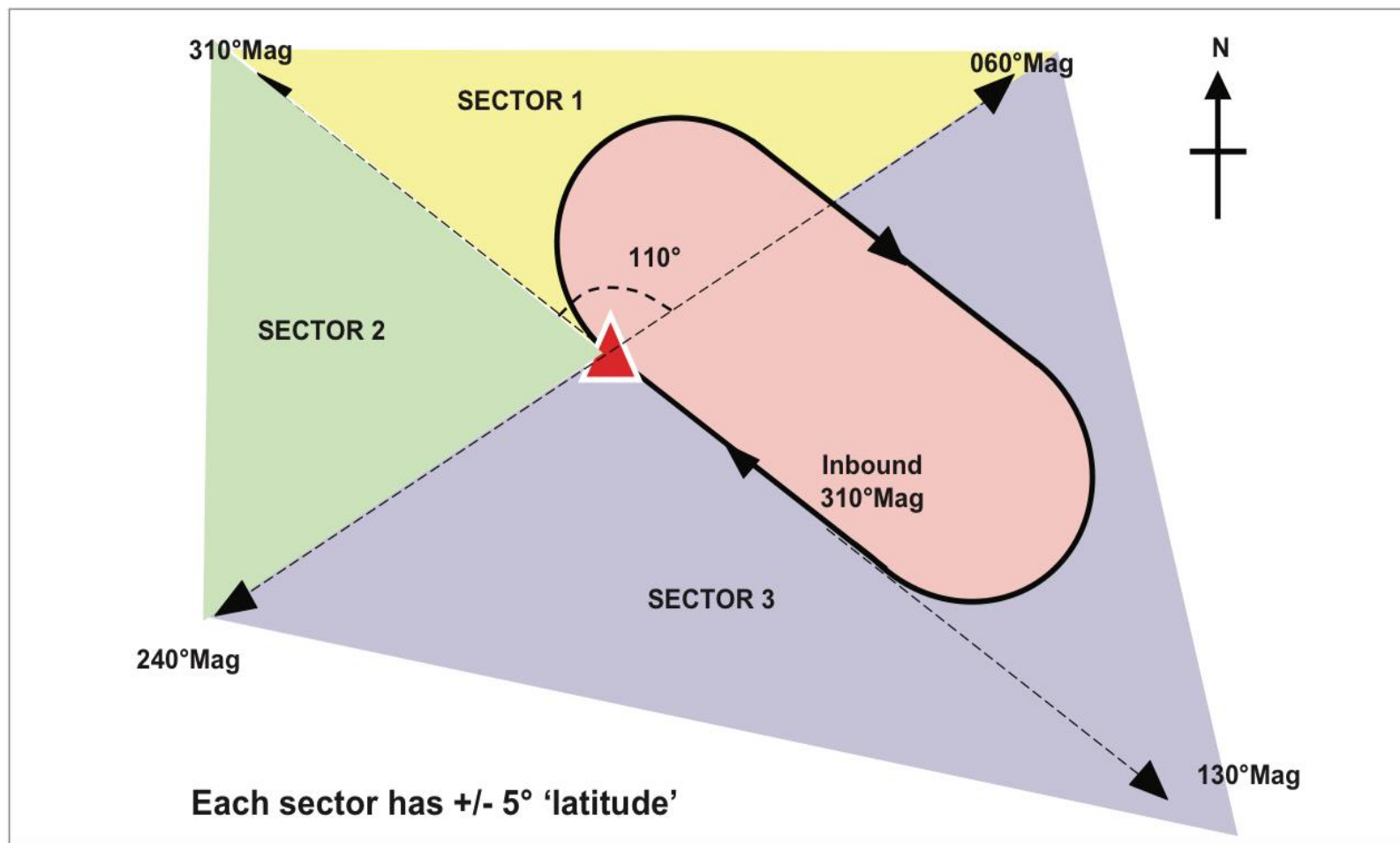


Figure 10.8

Entry Sectors

There are three methods of joining a holding pattern based on the heading of the aircraft as it approaches the holding fix. Based upon this heading, three sectors are defined with specific procedures appropriate to each. Between each **sector there is a 5° 'flexibility' area** either side of the defining heading within which the pilot has the choice of applicable joining procedure. The three sectors are illustrated below. For ease of definition the entry procedures below relate to a standard (right hand) pattern.



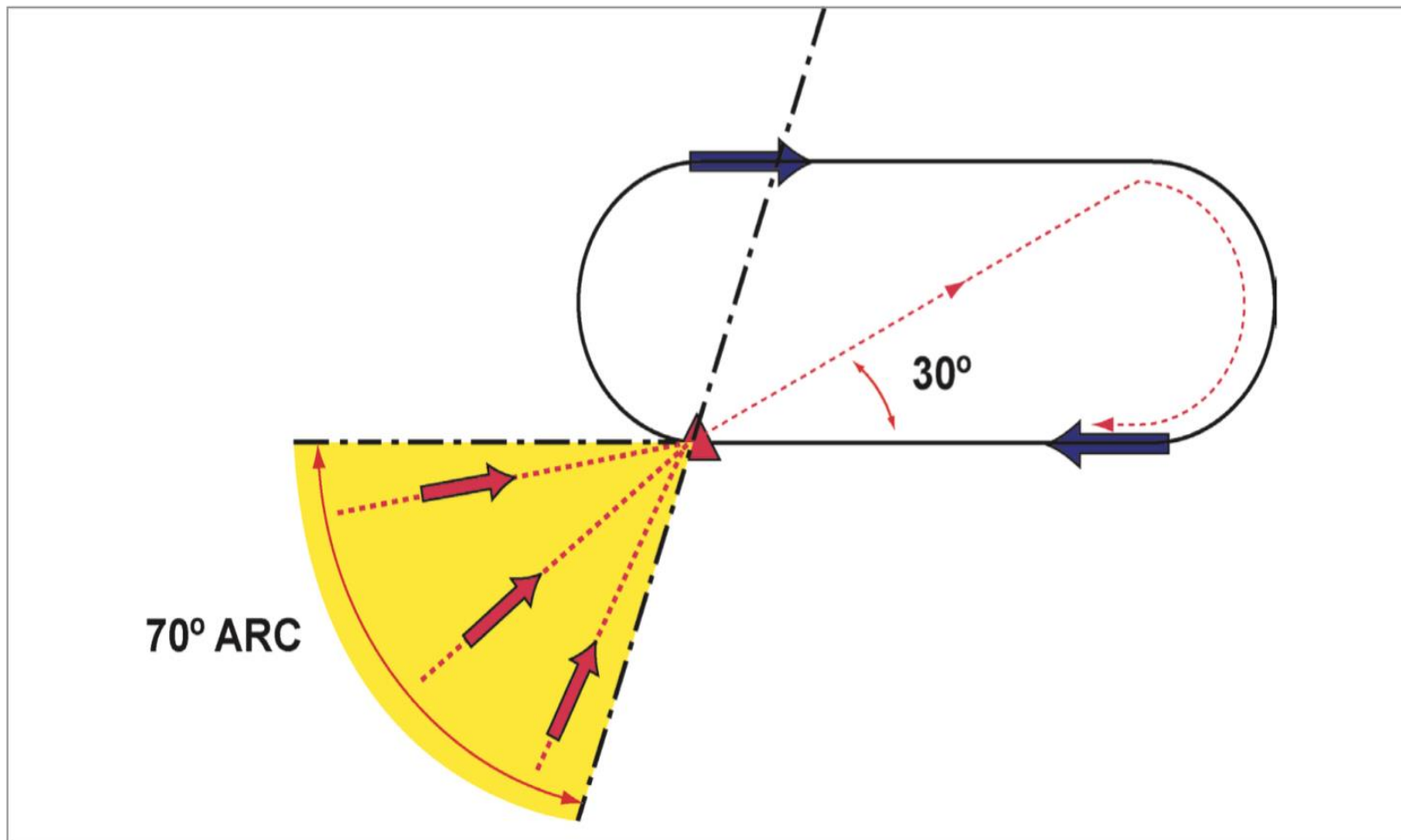
Sector 1 (Parallel Entry) Procedure

Having reached the fix, the aircraft is turned left onto an outbound heading to make good a track reciprocal to the stated inbound holding track. This is maintained for the appropriate period of time relating to the altitude of the aircraft, and then the aircraft is turned left to return to the fix. On the second time over the fix, the aircraft is turned right to follow the holding pattern.



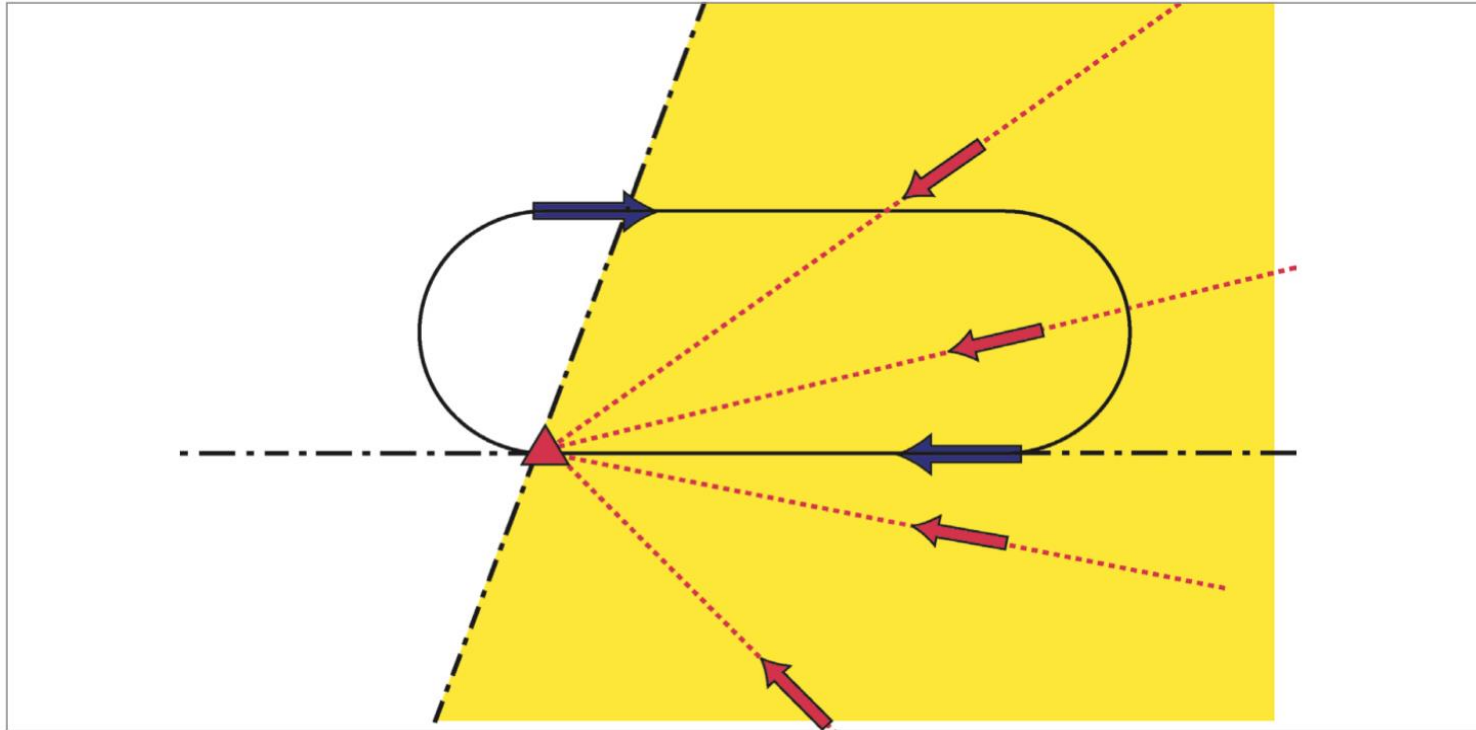
Sector 2 (Offset Entry) Procedure

Having reached the fix, the aircraft is turned onto the heading to make good the track ***diverging 30° left of the reciprocal of the inbound holding track***. This is maintained for the appropriate period of time relating to the altitude of the aircraft, and then the aircraft is turned right onto the holding track to return to the fix. On the second time over the fix, the aircraft is turned right to follow the holding pattern.



Sector 3 (Direct Entry) Procedure

Having reached the fix, the aircraft is turned right to follow the holding pattern.



ATC Considerations

Clearance to Join

As the holding pattern will be in controlled airspace and used for controlled flights, ATC (usually the approach controller) will pass an ATC clearance to the pilot with instructions to take up the holding pattern. The clearance will specify the location of the hold to be used, details of the holding pattern (unless routinely published), the holding level and any special requirements.

"G-CD hold at OX FL50 expected approach time 1020"

"Hold OX FL50 1020 G-CD"

Followed by:

"Oxford Approach G-CD is established in the hold at FL50"

The pilot is required to ensure that the aircraft is level at the holding ***level at least 5 NM before reaching the holding fix***. The clearance will be acknowledged and the ATCO will not expect to hear from the pilot again until the aircraft has completed the joining procedure and is established in the holding pattern.

Descending in the Hold

When the level below is vacant, the ATCO will re-clear the pilot to the lower level. The pilot will acknowledge the clearance and immediately commence descent.

Shuttle is a climbing or descending maneuver in a holding pattern.

"G-CD shuttle in the hold to FL40"

"Leaving FL50 descending to FL40 G-CD"

Followed by:

"G-CD level FL40"

Departing the Hold

At the appropriate time, the ATCO will instruct the pilot to commence the instrument procedure. It is usual to leave a holding pattern at the fix, but where radar is used the Approach Radar controller may vector the aircraft from any position in the holding pattern. Typically a clearance would be as follows:

"G-CD advise when ready to commence the procedure"

"Ready to commence the procedure G-CD"

"G-CD set the Oxford QNH 1003, clear NDB/DME approach runway 01, report turning inbound at 2000 ft"

"1003 set clear NDB/DME runway 01 wilco G-CD"

Under certain circumstances (timed approaches) the ATCO will clear the aircraft to depart the holding pattern at a specific time to commence the procedure. In this case, the pilot should adjust the holding pattern leg lengths to depart the pattern from overhead the holding fix as close as possible to the stated clearance time.



NO # 4

Time = 00:04

243

*D
O
C*

*8
1
6
8*

How many entry procedures may be applied for an Omni-directional holding?

- a) 1
- b) 3
- c) 2
- d) 4



How many entry procedures may be applied for an Omni-directional holding?

- a) 1
- b) 3**
- c) 2
- d) 4



What is the distance of buffer area of a holding?

- a) 5 km
- b) 3 km
- c) 3 NM
- d) 5 NM



What is the distance of buffer area of a holding?

- a) 5 km
- b) 3 km
- c) 3 NM
- d) 5 NM



In an approach procedure, a descent or climb conducted in a holding pattern is called:

- a) Base turn.
- b) Racetrack pattern.
- c) Procedure turn.
- d) Shuttle.



In an approach procedure, a descent or climb conducted in a holding pattern is called:

- a) Base turn.
- b) Racetrack pattern.
- c) Procedure turn.
- d) Shuttle.**



Standard airway holding pattern (FAA) below 14000 ft?

- a) Left hand turns /1 minute outbound.
- b) Right hand turns /1.5 minutes outbound.
- c) Right hand turns /1 minute outbound.
- d) Left hand turns /1.5 minutes outbound.



Standard airway holding pattern (FAA) below 14000 ft?

- a) Left hand turns /1 minute outbound.
- b) Right hand turns /1.5 minutes outbound.
- c) Right hand turns /1 minute outbound.**
- d) Left hand turns /1.5 minutes outbound.



Maximum angle of interception of initial approach segment

Normally track guidance is provided along the initial approach segment to the **IF**, with a maximum angle of interception of:

- 90° for a precision approach;
- 120° for a non-precision approach.

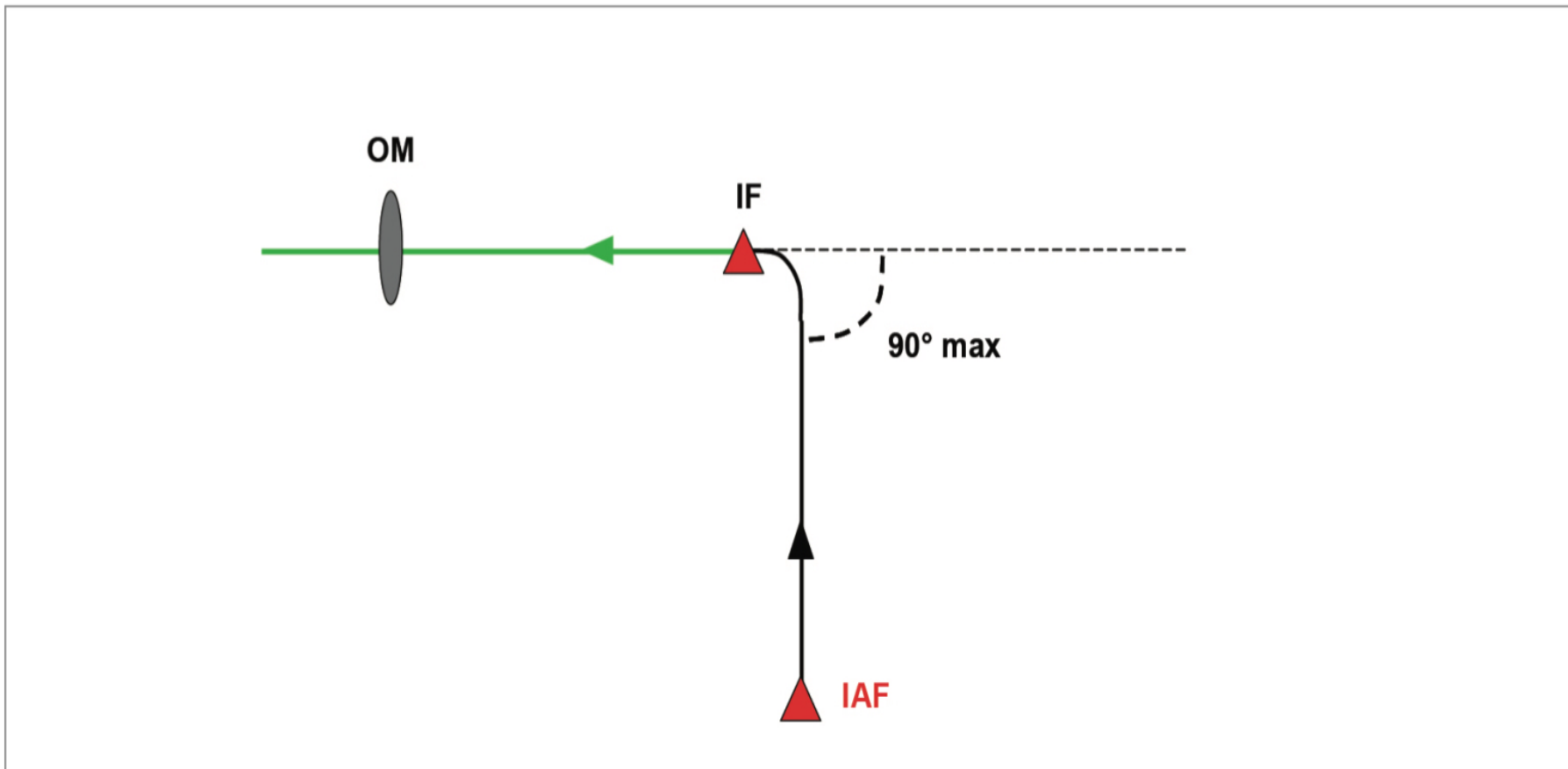


Figure 8.8 IAF to IF (precision approach)



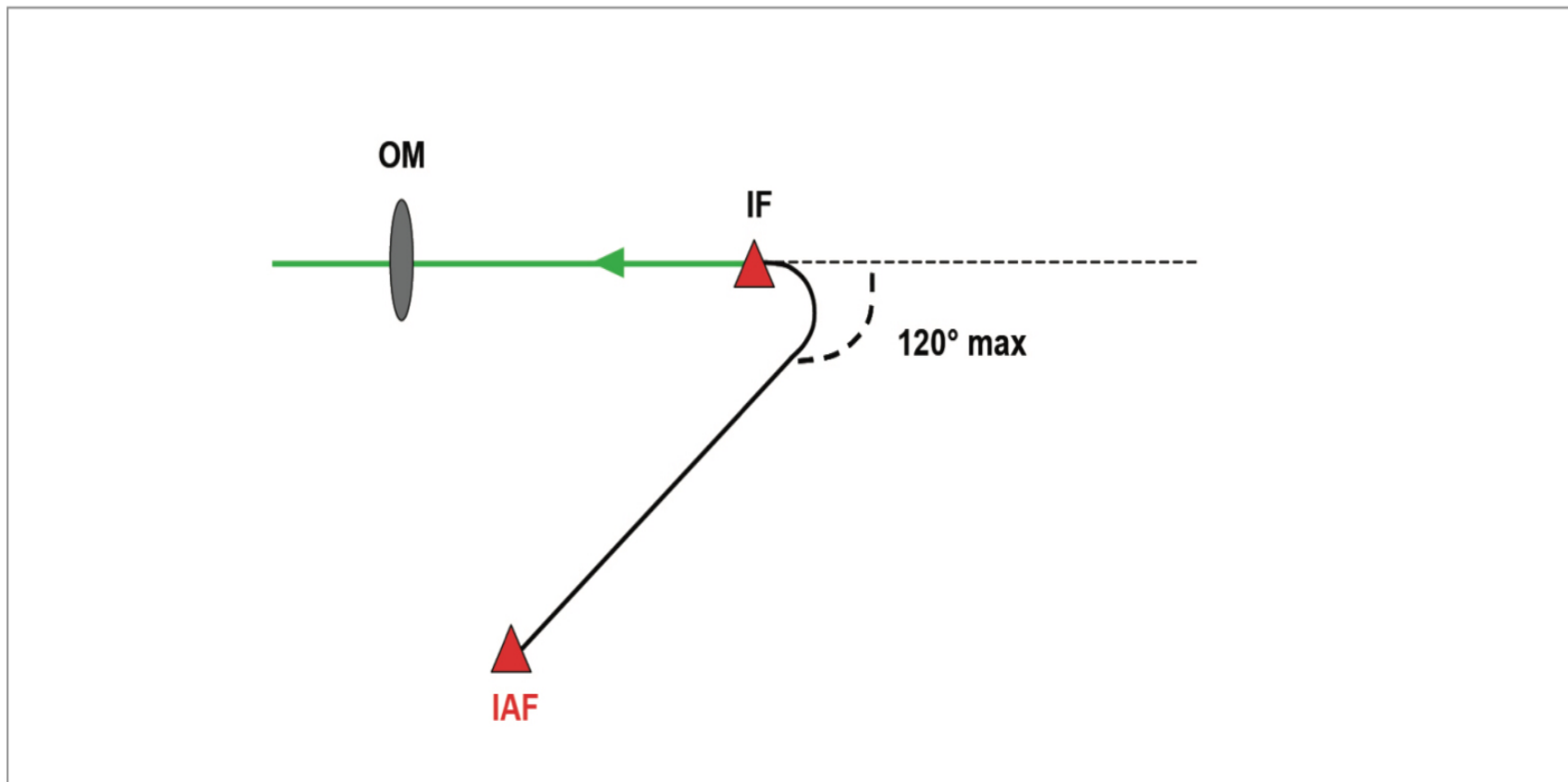


Figure 8.9 IAF to IF (non-precision approach)

Where a straight-in approach is not feasible or *there is no suitable remote IAF or IF, a track reversal, racetrack or holding pattern is required.*

REVERSAL PROCEDURE A procedure designed to enable aircraft to reverse direction during the initial approach segment of an instrument approach procedure. The sequence may include *procedure turns or base turns.*

PROCEDURE TURN A maneuver in which a turn is made away from a designated track followed by a turn in the opposite direction to permit the aircraft to intercept and proceed along the reciprocal of the designated track.

NOTE 1: Procedure turns are designated “left” or “right” according to the direction of the initial turn.

NOTE 2: Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual procedure.

PROCEDURE TURN

A maneuver in which a turn is made away from a designated track followed by a turn in the ***opposite direction to permit the aircraft to intercept and proceed along the reciprocal of the designated track.***

NOTE 1: Procedure turns are designated “left” or “right” according to the direction of the initial turn.

NOTE 2: Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual procedure.

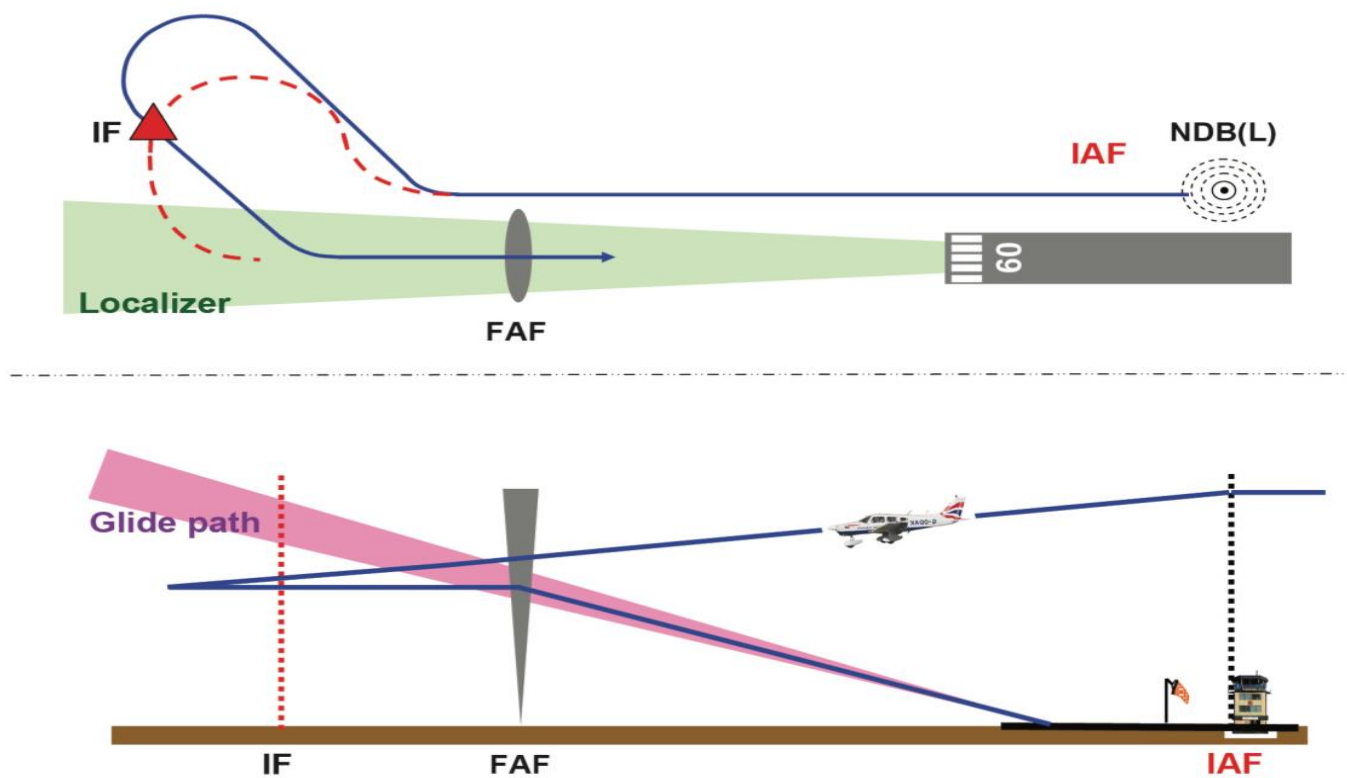


Figure 8.17 Track reversal - procedure turn

Where a straight-in approach is not feasible or *there is no suitable remote IAF or IF, a track reversal, racetrack or holding pattern is required.*

REVERSAL PROCEDURE

A procedure designed to enable aircraft to reverse direction during the initial approach segment of an instrument approach procedure. The sequence may include procedure turns or base turns.

8.43 45°/180° Procedure Turn. This requires track guidance to a point (timed or DME) where a 45° turn is made followed by a straight leg of either 1 minute (category A or B aircraft) or 1 minute and 15 seconds (category C, D and E). At the end of the timed leg a rate 1 turn is made through 180° to bring the aircraft into a position to intercept the reciprocal of the outbound track at an interception angle of 45°.

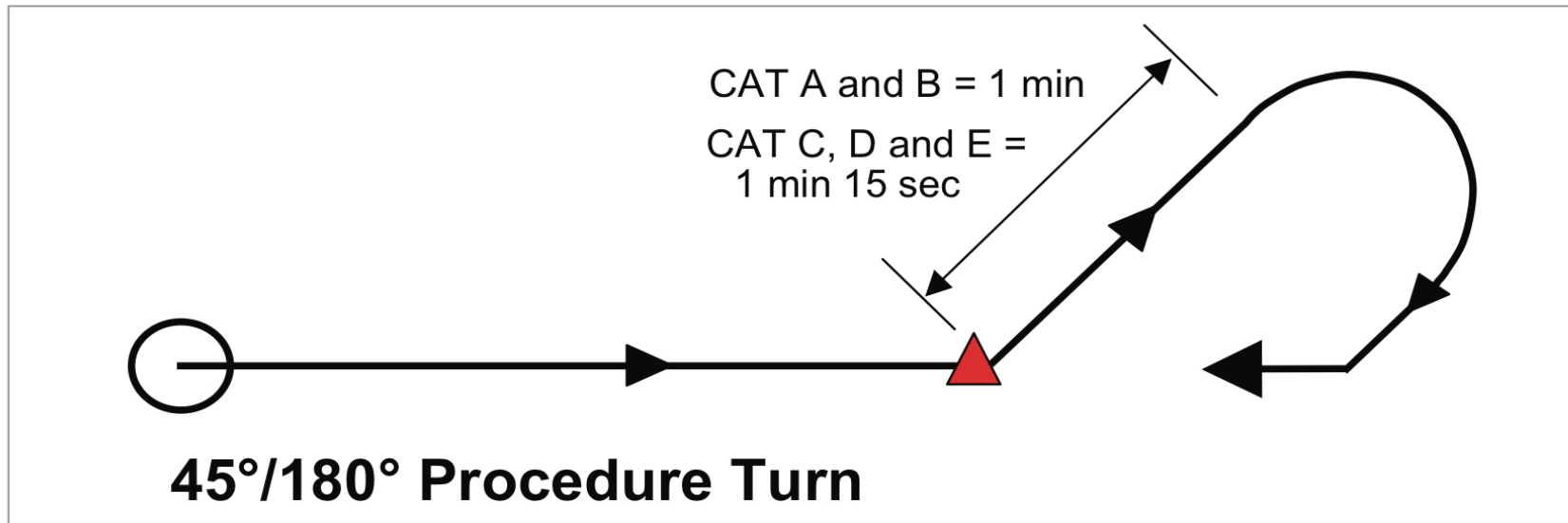


Figure 8.18 45°/180° - procedure turn

8.44 80°/260° Procedure Turn. This requires track guidance to a point (timed or DME) where an 80° rate 1 turn is made followed immediately by an opposite direction 260° rate 1 turn. In still air, this should bring the aircraft on to the reciprocal of the outbound track. Also in still air, the procedure should take exactly 2 minutes.

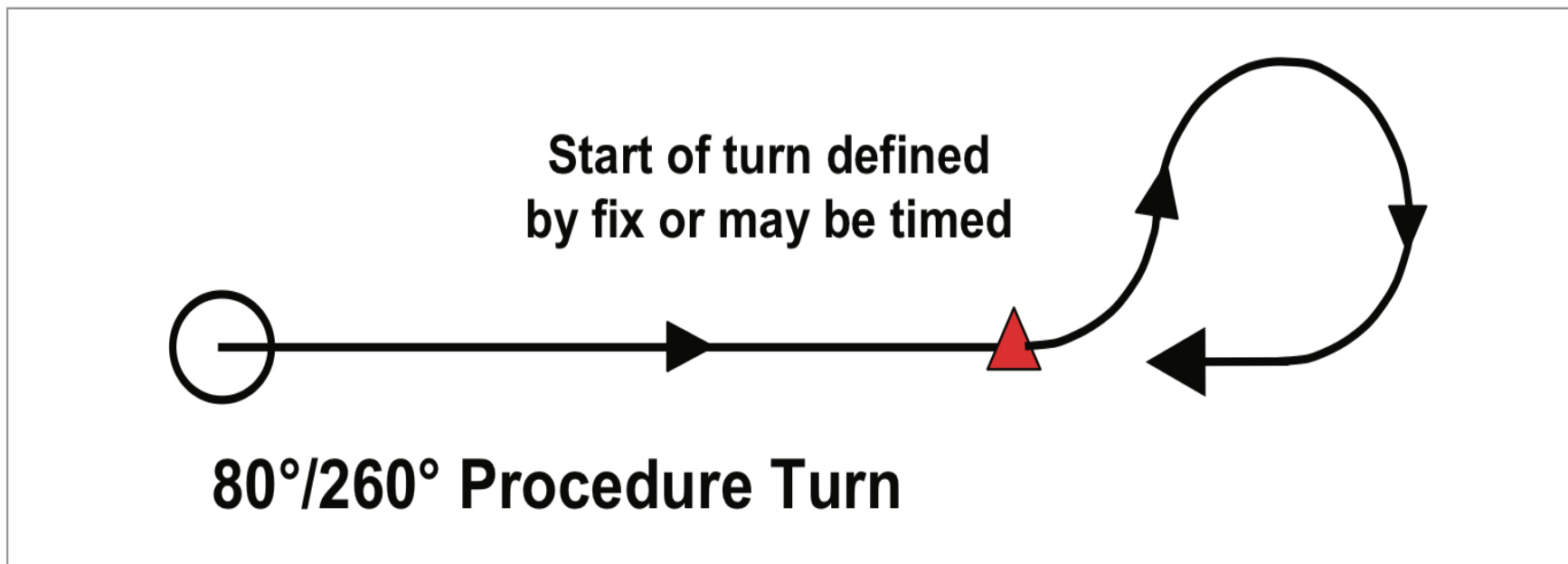


Figure 8.19 80°/260° - procedure turn

8.45 Base Turn. Where accurate outbound track guidance can be provided by an NDB or VOR, a base turn can be specified where the inbound track is not the reciprocal of the outbound track. The specified outbound track is followed to a predetermined point at which a rate 1 turn is made so that the aircraft rolls out on the required inbound track.

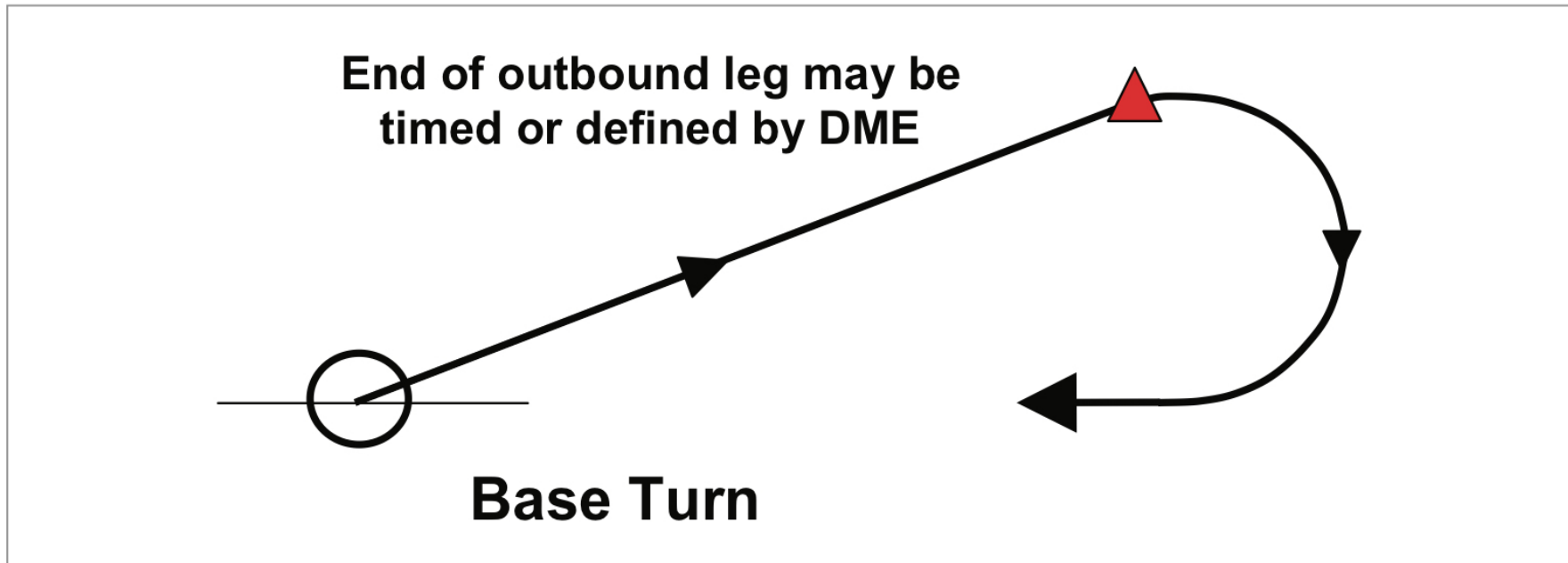


Figure 8.21 Base turn

8.46 Racetrack Procedure. A racetrack consists of a turn from the inbound track through 180° at the facility or a fix after which, the outbound leg is flown to a point defined by time or a fix at which another turn through 180° is made to bring the aircraft back on to the inbound track. It is used where aircraft are required to enter a holding pattern prior to commencing the instrument procedure, and where the orientation of the holding pattern does not permit either a procedure turn or a base turn to be used. It will normally be specified as an 'alternate procedure' and specific instructions will be included on the plate.

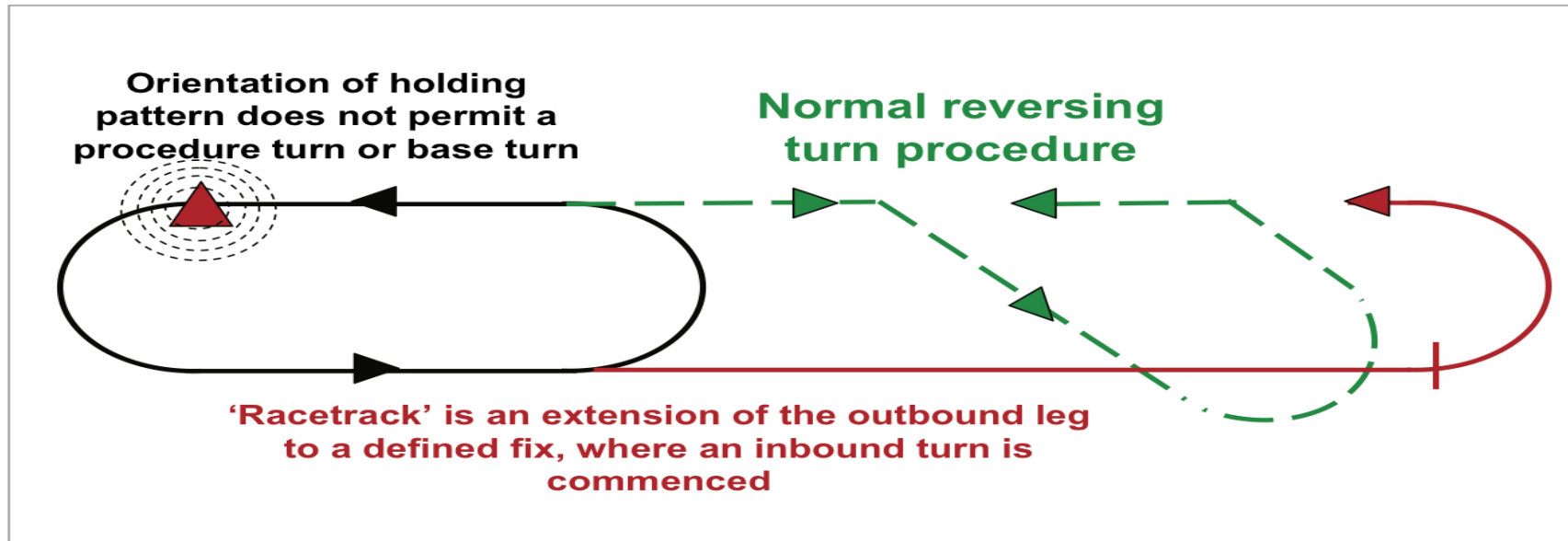
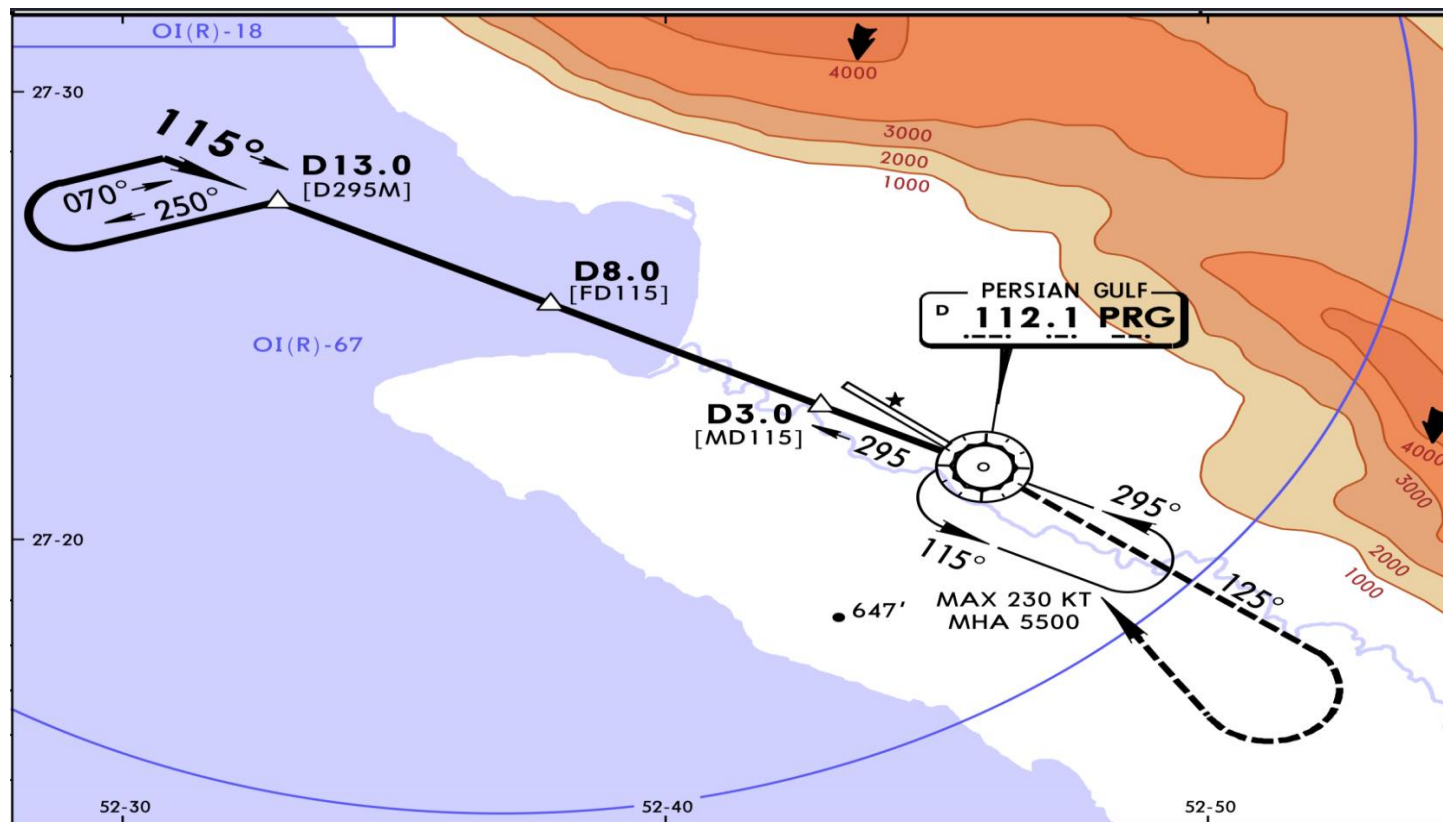
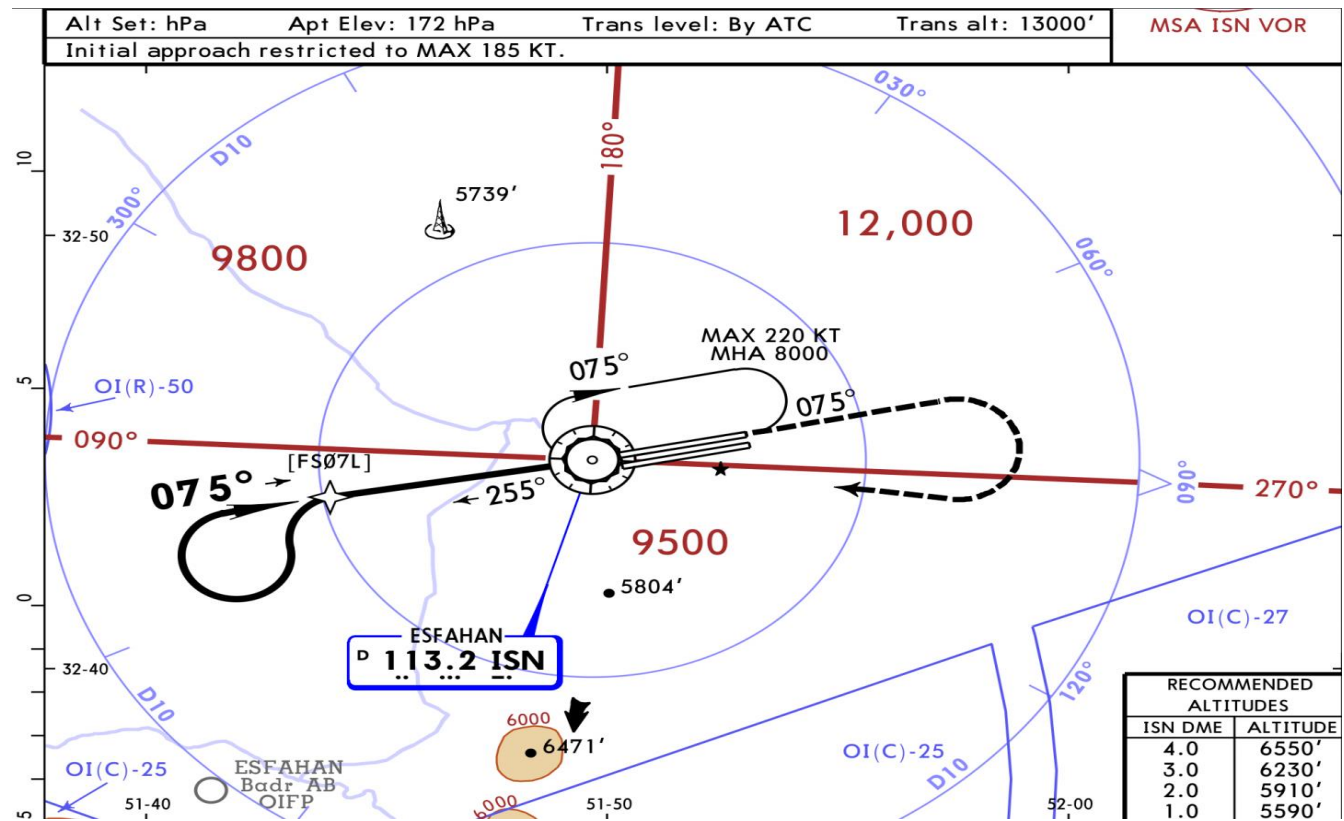


Figure 8.23 Racetrack procedure

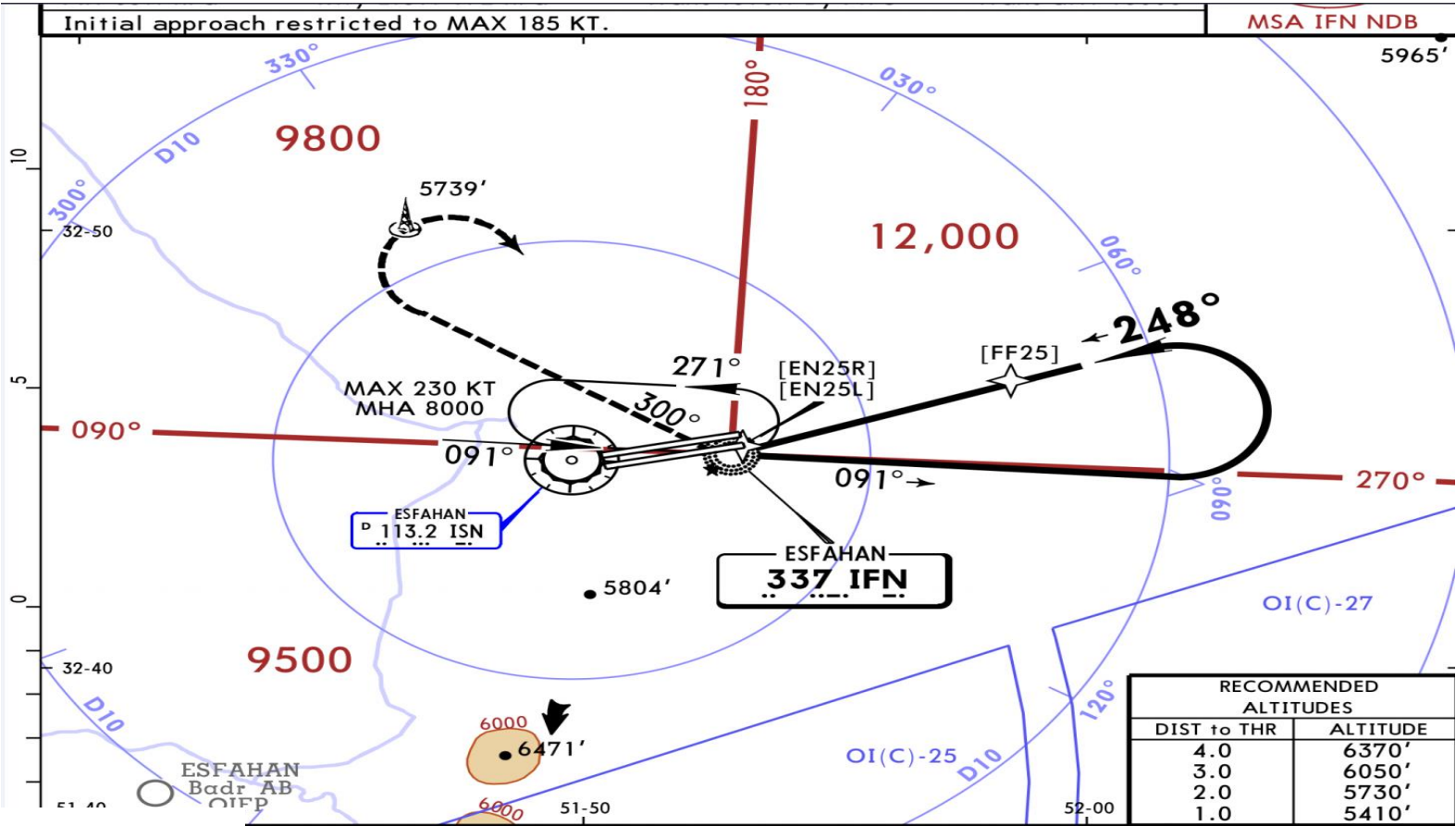
45°/180° procedure turn



80°/260° procedure turn



Base turn



DOC 8168



DOC 8168

Shuttle

A shuttle is normally prescribed where the descent required between the end of initial approach and the beginning of final approach exceeds the values shown in ***Table I-4-3-1***.

NOTE: A shuttle is descent or climb conducted in a holding pattern.

Table I-4-3-1. Maximum/minimum descent rate to be specified on a reversal or racetrack procedure

Outbound track	Maximum*	Minimum*
Category A/B	245 m/min (804 ft/min)	N/A
Category C/D/E/H	365 m/min (1197 ft/min)	N/A
Inbound track	Maximum*	Minimum*
Category A/B	200 m/min (655 ft/min)	120 m/min (394 ft/min)
Category H	230 m/min (755 ft/min)	N/A
Category C/D/E	305 m/min (1000 ft/min)	180 m/min (590 ft/min)

* Maximum/minimum descent for 1 minute nominal outbound time in m (ft).

Bank angle

Procedures are based on average achieved **bank angle of 25° , or the bank angle giving a rate of turn of 3° /second, whichever is less.**

Wind effect

To achieve a stabilized approach, due allowance should be made in both **heading and timing** to compensate for the effects of wind so that the aircraft regains the inbound track as accurately and expeditiously as possible.

In making these corrections, full use should be made of the indications available from the aid and from estimated or known winds. This is particularly important for slow aircraft in high wind conditions, when failure to compensate may render the procedure unflyable (i.e. the aircraft may pass the fix before establishing on the inbound track) and it could depart outside the protected area).

Descent

The aircraft shall cross the fix or facility and fly outbound on the specified track, descending as necessary to the procedure altitude/height but no lower than the minimum crossing altitude/height associated with that segment. If a further descent is specified after the inbound turn, this descent shall not be started until the aircraft is established on the inbound track.

*An aircraft is considered **established** when it is:*

- within half full scale deflection for the ILS and VOR;
- within $\pm 5^\circ$ of the required bearing for the NDB.

12.4.2.2 ***Vectoring for ILS and Other Pilot-Interpreted Aids***

. . . when a pilot wishes to be positioned a specific distance from touchdown

. . . instructions and information

In most cases ATC and/or pilot use a wrong response such as:

Full established
Established on GS
Established on ILS
Established on LOC

- a. POSITION (*number*) KILOMETRES (*or* MILES) from (*fix*). TURN LEFT (*or* RIGHT) HEADING (*three digits*);
- b. YOU WILL INTERCEPT (*radio aid or track*) (*distance*) FROM (*significant point or TOUCHDOWN*);
- c. **REQUEST (*distance*) FINAL;**
- d. CLEARED FOR (*type of approach*) APPROACH RUNWAY (*number*); .
- e. **REPORT ESTABLISHED ON [ILS]** LOCALIZER (*or* ON GBAS/SBAS/MLS APPROACH COURSE);
- f. CLOSING FROM LEFT (*or* RIGHT) [REPORT ESTABLISHED];
- g. TURN LEFT (*or* RIGHT) HEADING (*three digits*) [TO INTERCEPT] *or* [REPORT ESTABLISHED];



NO # 2

Time = 00:02

273

D
O
C

8
1
6
8

What is the maximum interception angle from initial approach segment to IF for precision approach?

- A) 120°
- B) 110°
- C) 100°
- D) 90°



What is the maximum interception angle from initial approach segment to IF for precision approach?

- A) 120°
- B) 110°
- C) 100°
- D) 90°



How long the straight leg without track guidance shall take place by CAT C airplane on 45°/180° of procedure turn?

- A) 30 Sec
- B) 45 Sec
- C) 60 Sec
- D) 75 Sec

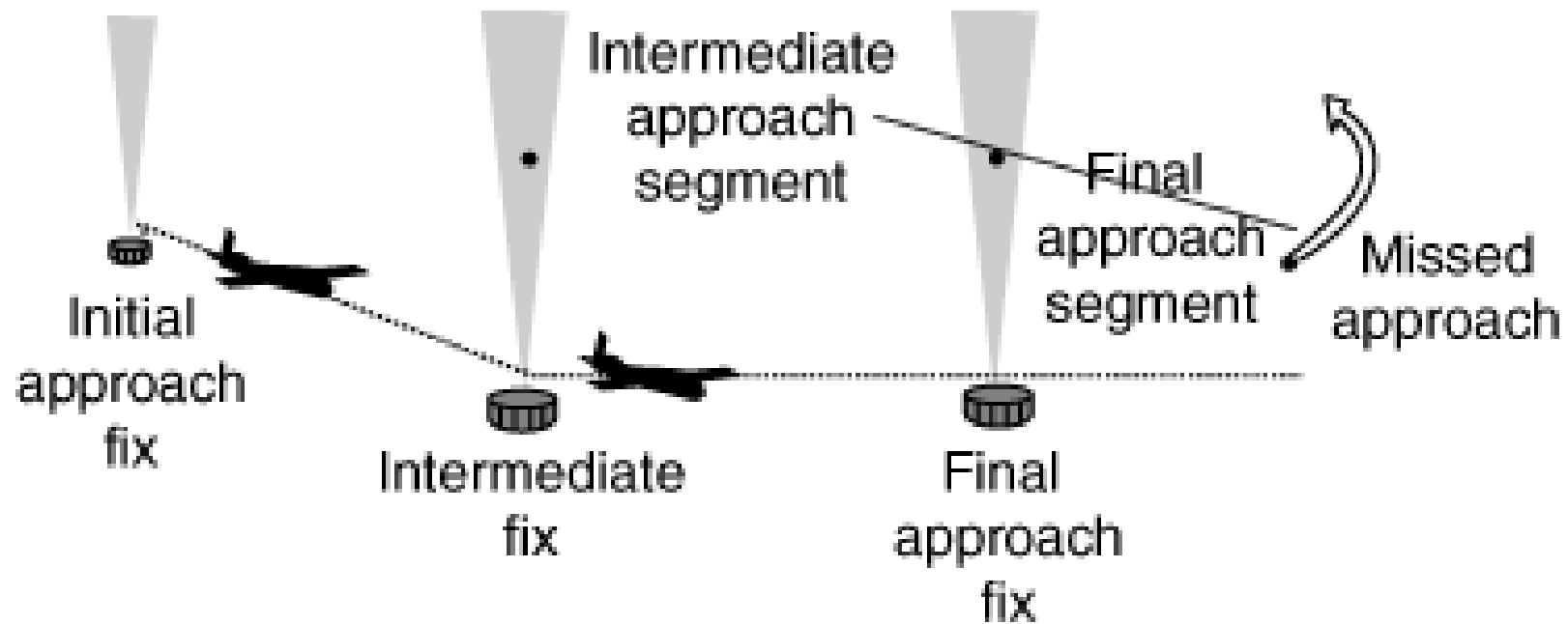


How long the straight leg without track guidance shall take place by CAT C airplane on 45°/180° of procedure turn?

- A) 30 Sec
- B) 45 Sec
- C) 60 Sec
- D) **75 Sec**



INTERMEDIATE APPROACH SEGMENT



INTERMEDIATE APPROACH SEGMENT

This is the segment during which the aircraft **speed** and **configuration** should be adjusted to prepare the aircraft for **final approach**. For this reason, the designed descent gradient is kept as **shallow as possible**. To fly an efficient descent profile, the pilot may elect to configure the aircraft whilst in a continuous descent along this segment.

Minimum obstacle clearance

During the intermediate approach, the obstacle clearance requirement reduces **from 300 m (984 ft) to 150 m (492 ft) in the primary area**, reducing laterally **to zero at the outer edge of the secondary area**.

INTERMEDIATE APPROACH SEGMENT

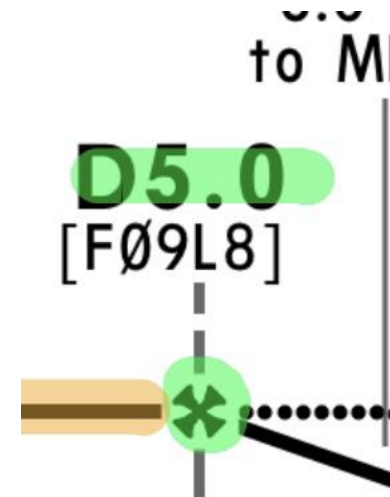
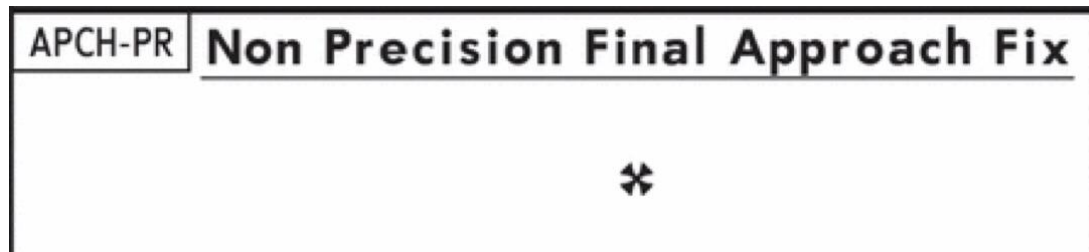
That segment of an instrument approach procedure between either the intermediate approach fix and the final approach fix or point, or between the end of a reversal, racetrack or dead reckoning track procedure and the final approach fix or point, as appropriate.

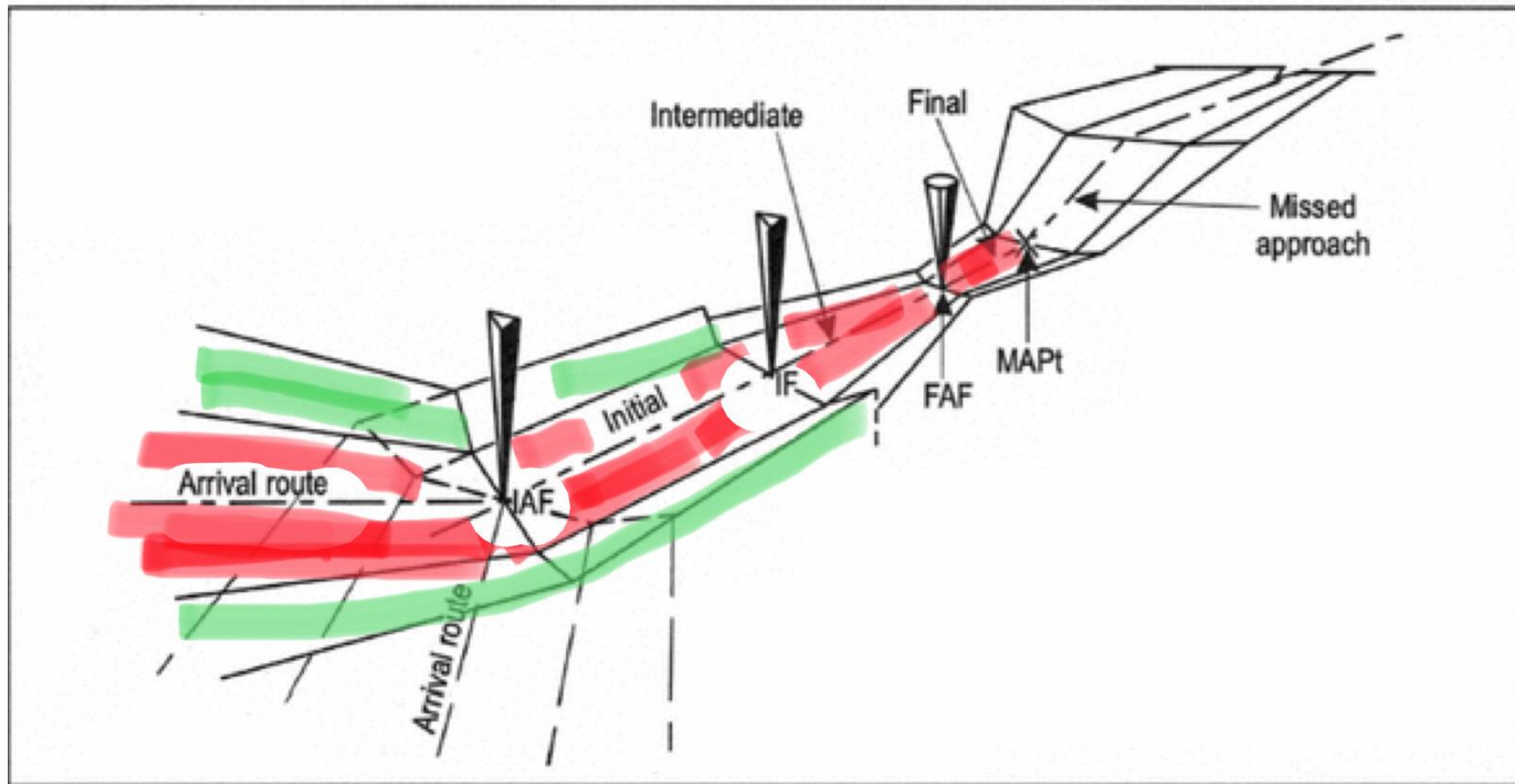
INTERMEDIATE FIX (IF)

A fix that marks the end of an initial segment and the beginning of the intermediate segment. In RNAV applications this fix is normally defined by a fly-by waypoint.

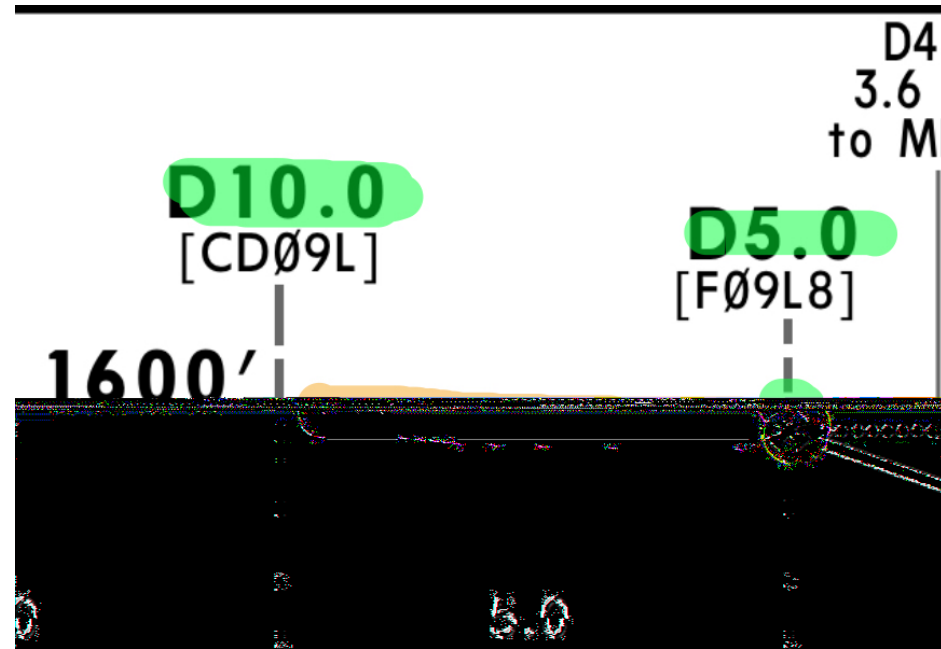
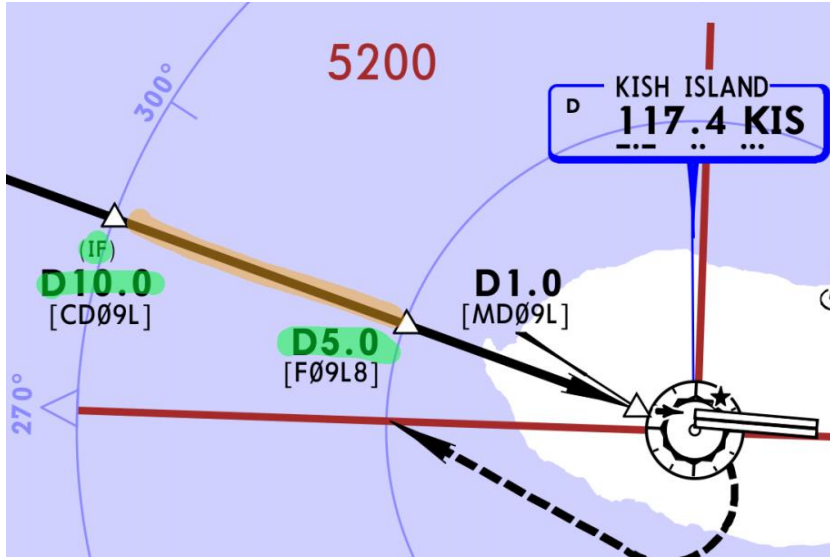
FINAL APPROACH FIX (FAF)

The fix from which the final approach (IFR) to an airport is executed and which identifies the beginning of the final approach segment. It is designated in the pro-file view of Jeppesen Terminal charts by the **Maltese Cross symbol** for non-precision approaches and by the glide slope/path intercept point on precision approaches. The glide slope/path symbol starts at the FAF. When ATC directs a lower-than-published Glide Slope/Path Intercept Altitude, it is the resultant actual point of the glide slope/path intercept.

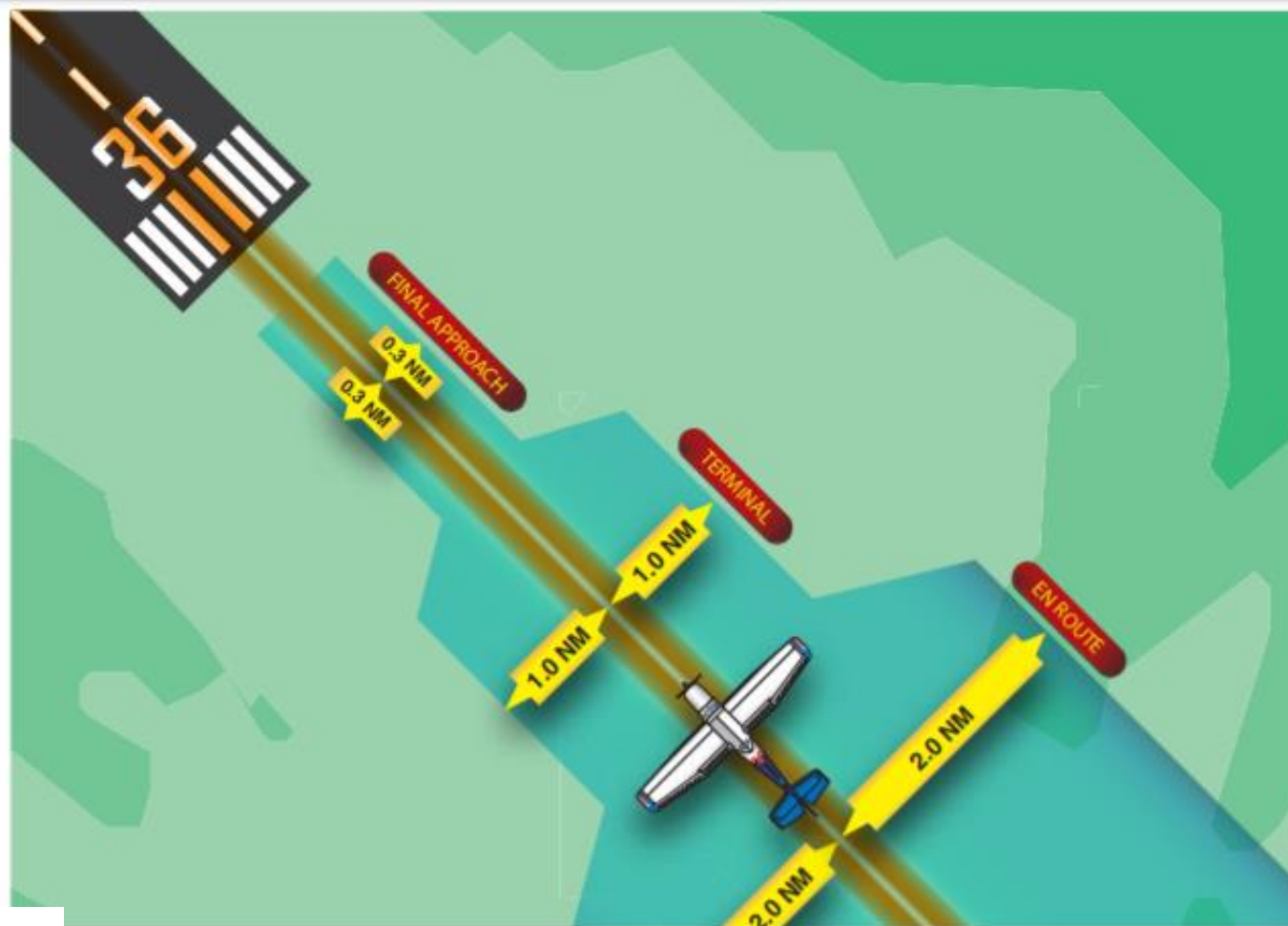




Where a final approach fix (FAF) is available, the intermediate approach segment begins when the aircraft is on the inbound track of the procedure turn, base turn or final inbound leg of the racetrack procedure. It ***ends at the FAF or final approach point (FAP), as applicable.***



FINAL APPROACH SEGMENT



FINAL APPROACH SEGMENT

This is the segment in which ***alignment and descent for landing are made***. Final approach may be made to a runway for a straight-in landing ***or*** to an aerodrome for a visual maneuver.

FINAL APPROACH FIX (FAF) OR POINT (FAP) (ICAO)

That fix or point of an instrument approach procedure where the final approach segment commences.

MISSED APPROACH POINT (MAP) (ICAO)

That point in an instrument approach procedure at or before which the prescribed missed approach procedure must be initiated in order to ensure that the minimum obstacle clearance is not infringed.

Aircraft Category	V _{at}	Initial Approach Speeds	Final Approach Speeds
A	<91	90/150 (110*)	70/100
B	91/120	120/180 (140*)	85/130
C	121/140	160/240	115/160
D	141/165	185/250	130/185
E	166/210	185/250	155/230
H	N/A	70/120**	60/90***

FINAL APPROACH SEGMENT

The *stabilization* height is defined as one of the following:

- *1 000 ft above airfield elevation (AAL) in Instrument Meteorological Conditions (IMC),*

or

- *500 ft above airfield elevation (AAL) in Visual Meteorological Conditions (VMC), and other cases*

or

- *Any other height defined in Operator policies or regulations.*

In order for the approach to be ***stabilized***, all of the following conditions must be satisfied before, or at the stabilization height:

- ***The aircraft is on the correct lateral and vertical flight path***
- ***The aircraft is in the desired landing configuration***
- ***The thrust is stabilized, usually above idle, and the aircraft is at target speed for approach***

In **IMC**, a later speed and thrust stabilization can be ***acceptable*** provided that:

- ***It is in accordance with Operator policies and regulations.***
- ***The aircraft is in deceleration toward the target approach speed.***
- ***The flight crew stabilizes speed and thrust as soon as possible and not later than 500 ft AAL.***
- ***The flight crew does not detect any excessive flight parameter deviation.***

Types of final approach

The criteria for final approach vary according to the type.

These types are:

- *Non-precision approach (NPA) with final approach fix (FAF);*
- *NPA without FAF;*
- *Approach with vertical guidance (APV);*
- *Precision approach (PA).*

Instrument approach procedures are classified as follows:

- **Non-precision approach (NPA)** procedure. An instrument approach procedure designed for 2D instrument approach operations Type A.
- **Precision approach (PA)** procedure. An instrument approach procedure based on navigation systems (ILS, MLS, GLS and SBAS Cat I) designed for 3D instrument approach operations Type A or B.
- **Approach procedure with vertical guidance (APV)**. A performance-based navigation (PBN) instrument approach procedure designed for 3D instrument approach operations Type A.

INSTRUMENT APPROACH OPERATIONS

An approach and landing using instruments for navigation guidance based on an instrument approach procedure.

There are ***two*** methods for executing instrument approach operations:

- a **two-dimensional (2D)** instrument approach operation, using lateral navigation guidance only;

And

- a **three-dimensional (3D)** instrument approach operation, using both lateral and vertical navigation guidance.

➤ **NPA WITH FAF**

This segment begins at a facility or fix, called the ***final approach fix (FAF)*** and ***ends at the missed approach point (MAPt)***. The FAF is sited on the final approach track at a distance that permits selection of final approach configuration, and descent from intermediate approach altitude/height to the appropriate MDA/H either for a straight-in approach or for a visual circling.

The *optimum* distance for locating the FAF relative to the **threshold is 9.3 km (5.0 NM)**. The *maximum* length should **not normally be greater than 19 km (10 NM)**. The minimum length is equal **to 5.6 km (3.0 NM)** and this value may be *increased* if required in case of a turn at the FAF for *category D, DL and E aircraft*.

Optimum descent gradient/Maximum descent gradient

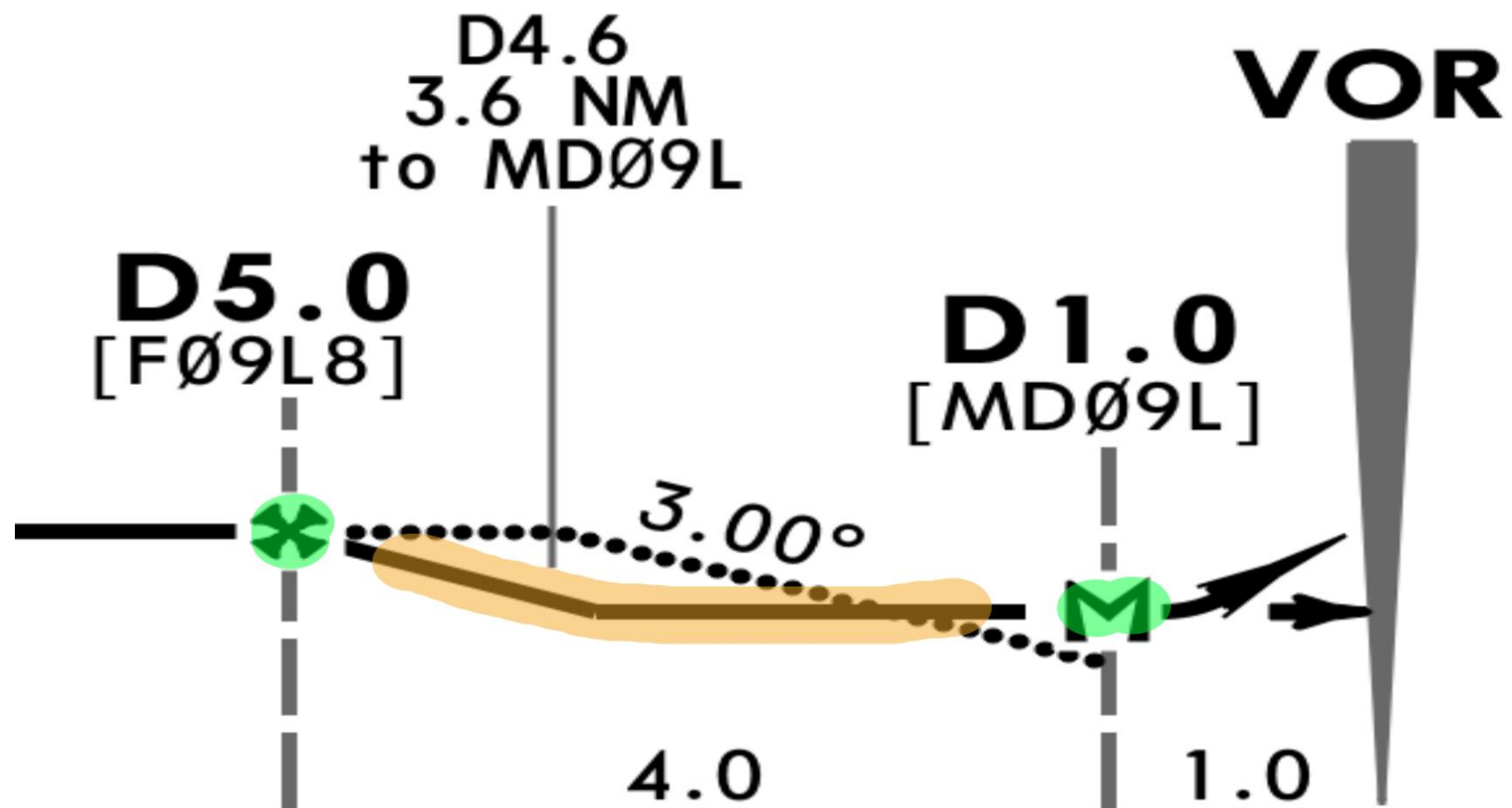
Compatible with the primary safety consideration of obstacle clearance, a non-precision approach provides the optimum final approach descent gradient of **5.2 per cent, or 3° , providing a rate of descent of 52 m per km (318 ft per NM).**

Information provided in approach charts displays the optimum constant approach slope.

The maximum descent gradient for non-precision procedures with FAF is:

- **6.5 percent (3.7°) for Cat A and B aircraft (Cat H: 10 per cent);**
- **6.1 percent (3.5°) for Cat C, D and E aircraft**

APCH-PR	<u>Non Precision Final Approach Fix</u>
	✖
APCH-PR	<u>Non Precision Missed Approach Fix</u>
	M



APPROACH BRIEFING INFORMATION

1	2	3	4	5
LOC IDJP 111.1	Final Apch Crs 270°	GS DP LOM 2500' (931')	ILS DA(H) 1769' (200')	Apt Elev 1575' TDZE 1569'
MISSED APCH: Climb to 2500', then climbing LEFT turn to 4500' direct DP LOM and hold.				
7 — Alt Set: hPa TDZ Elev: 1 hPa Trans level: FL 180 Trans alt: 18000'				
1. RADAR or DME required. 2. Simultaneous approaches authorized rwys 34L and 34R.				

1 — Approach primary Navaid.

LOC ← Navaid Type
IDJP ← Navaid Identifier
111.1 ← Navaid Frequency

WAAS ← RNAV with ground based Augmentation System
Ch 93717 ← Facility Channel Number
W-32A ← System Approach ID

2 — Final approach course bearing.

3 — Crossing altitude at the FAF. Glide slope crossing altitude for precision approaches. Procedure altitude (Vertical Descent Altitude or Minimum Crossing Altitude) for non-precision approaches.

GS ← Altitude Type
DP LOM ← Final Approach Fix
2500' (931') ← Altitude and Height

4 — Lowest DA(H) or MDA(H).

KIH



21 JUN 19

13-2

K

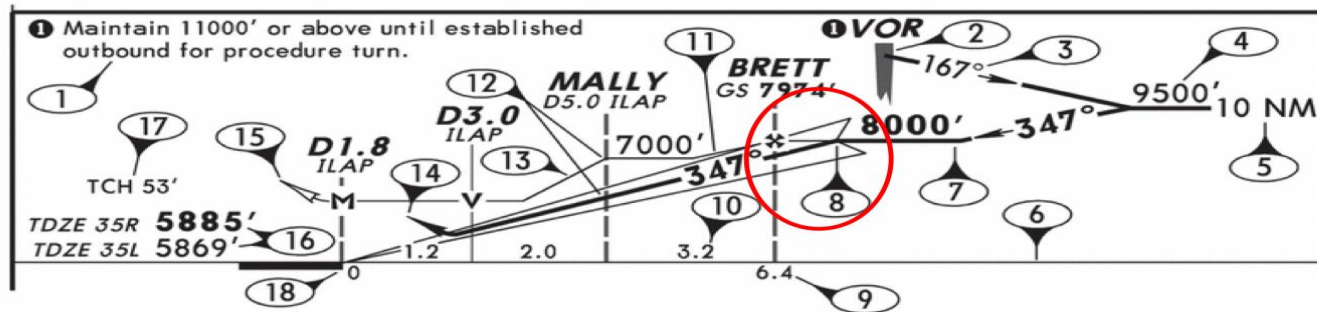
VOF

*ATIS			*K	
128.0			118.450 1	
OR IS 7.4	Final Apch Crs 108°	Minimum Alt D5.0 1600'(1501')	MDA(H) 450'(351')	Apt E

APCH: Climb on track 108° to VOR, then turn RIGHT
holding at 3000'.

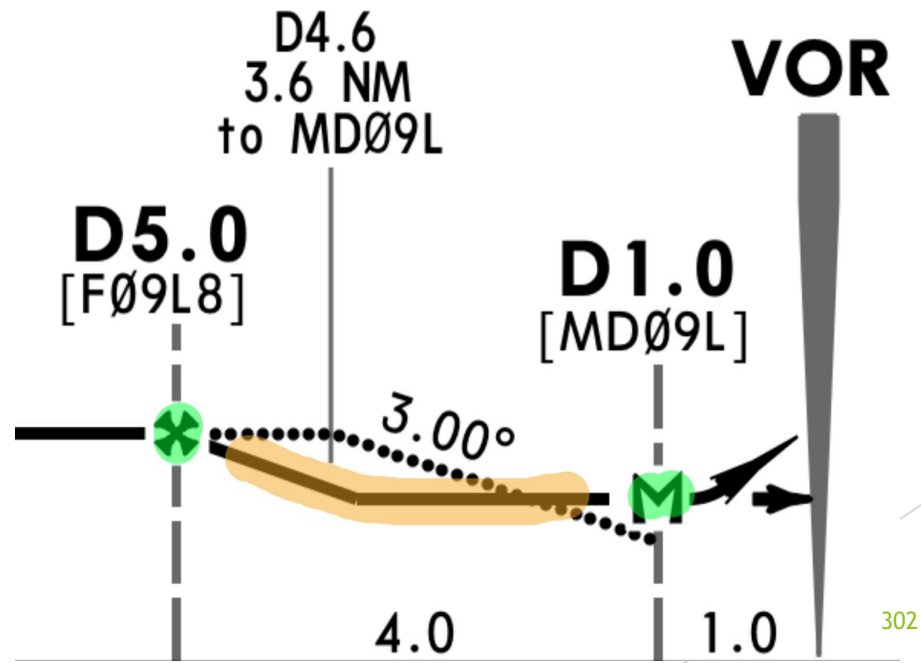
hPa	Apt Elev: 4 hPa	Trans level: By ATC	Trans
-----	-----------------	---------------------	-------





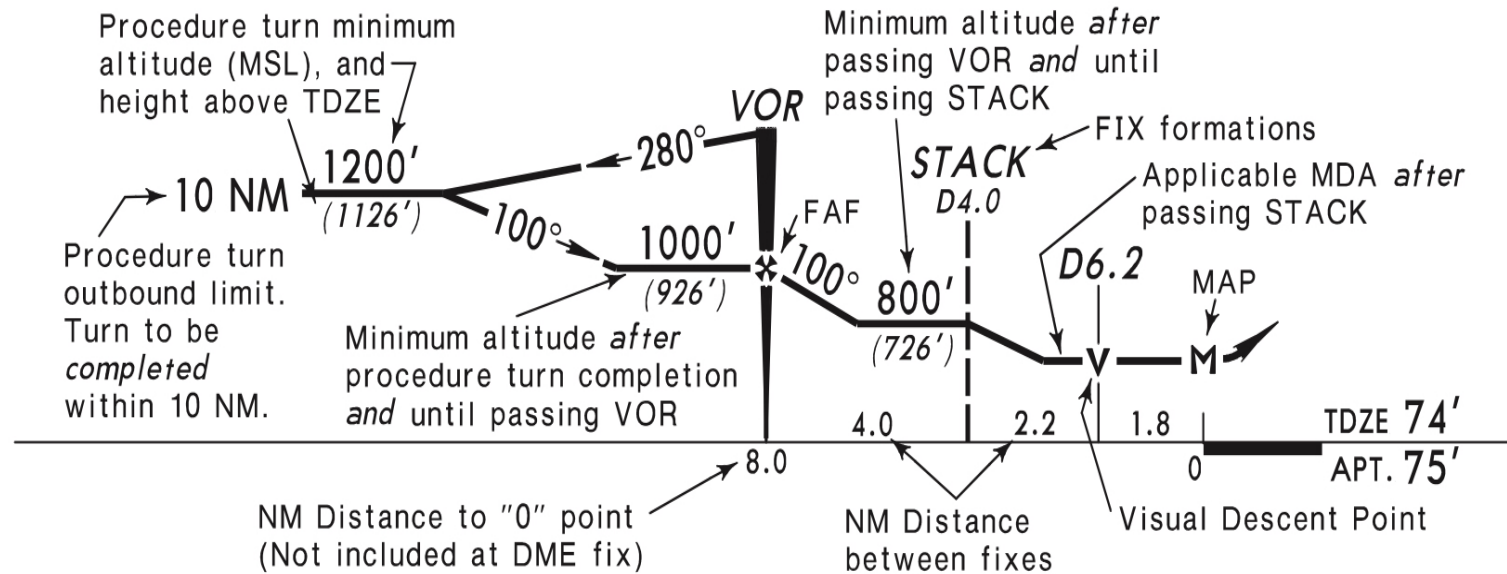
- 1 — Procedure notes that relate directly to information portrayed in the profile view are charted within the profile view, normally placed in the upper right or left corners.
- 2 — A "broken" navaid or fix symbol indicates that it does not fall directly in line with the final approach track.
- 3 — Outbound bearings associated with procedure turns are included for situational awareness.
- 4 — Minimum altitude while executing the procedure turn.
- 5 — The distance to remain within while executing the procedure turn. Distance is measured from the initiating navaid/fix unless otherwise indicated.
- 6 — Profile view "ground line". Represents an imaginary straight line originating from the runway threshold. No terrain high points or man-made structures are represented in the profile view.
- 7 — Procedure flight tracks are portrayed using a thick solid line. Multiple separate procedures using the same altitudes are represented by a single line.
- 8 — Final Approach Point (FAP). Beginning of the final approach segment for precision approaches.
- 9 — Nautical Mile (NM) distance to the "0" point. Not included at DME fixes.
- 10 — Nautical Mile (NM) distance between two nav aids and or fixes.

/KIH		JEPPESSEN		K	
21 JUN 19		13-2		VOF	
*ATIS			*K		
128.0			118.450 1		
DR	Final	Minimum Alt	MDA(H)	Apt E	
IS	Apch Crs	D5.0			
7.4	108°	1600' (1501')	450' (351')		
APCH: Climb on track 108° to VOR, then turn RIGHT holding at 3000'.					
hPa	Apt Elev: 4 hPa	Trans level: By ATC		Trans	
					

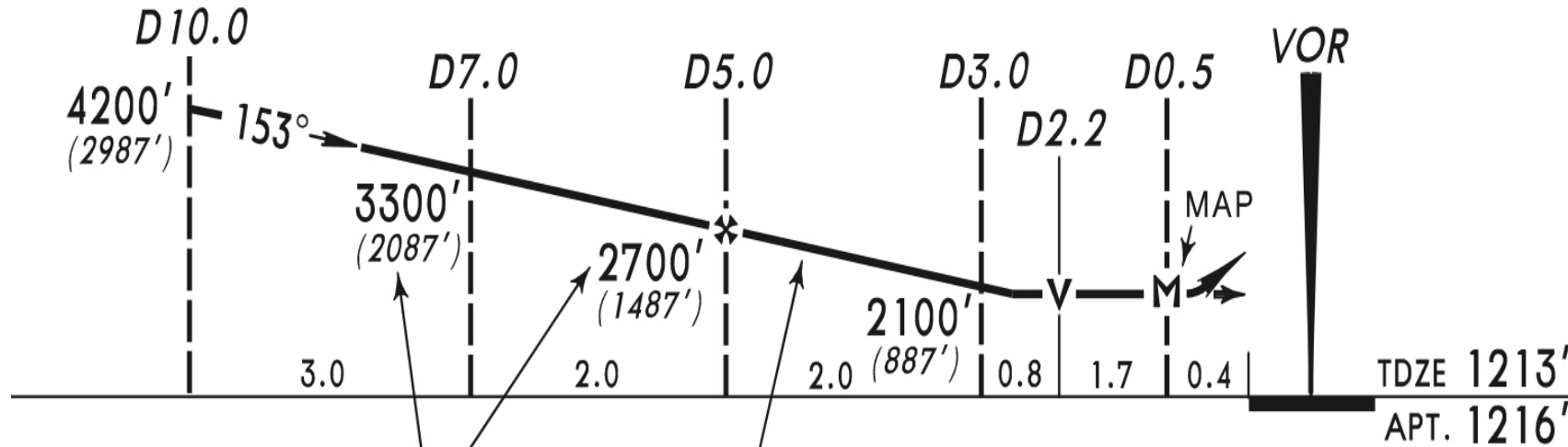


NON-PRECISION APPROACH PROFILE (LOC, VOR, VORTAC, NDB, etc.)

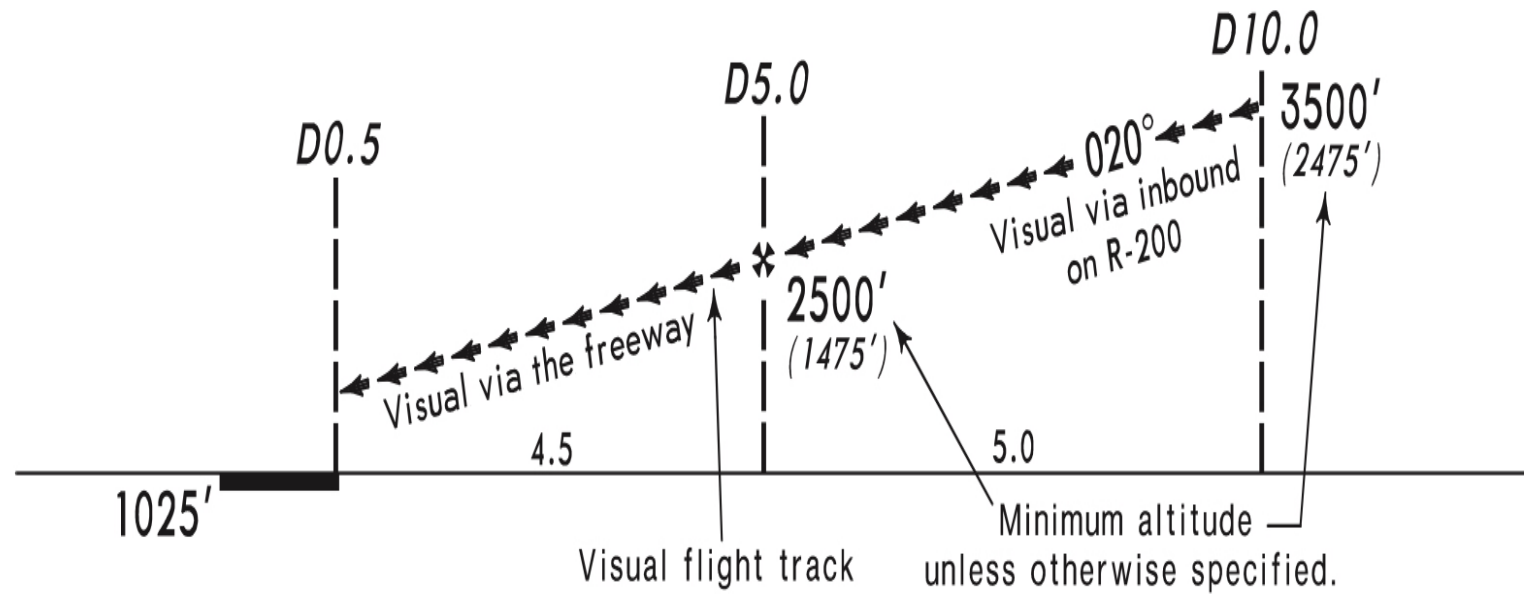
M symbol representing the non-precision missed approach point (MAP), as shown below, is used on charts dated on or after 5 FEB 93. This symbol is omitted when more than one non-precision approach track is depicted.



NON-PRECISION APPROACH PROFILE (LOC, VOR, VORTAC, NDB, etc.)
with constant rate of descent



NON-PRECISION APPROACH PROFILE (VISUAL APPROACH)



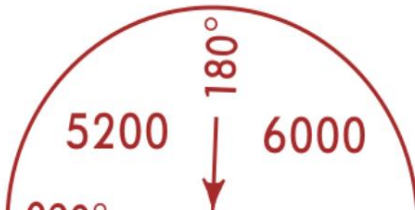
➤ **NPA WITHOUT FAF**

Sometimes an aerodrome is served by a *single* facility located on or near the aerodrome, and *no other facility is suitably situated to form a FAF*. In this case, a procedure may be designed *where the facility is both the IAF and the MAPt*.

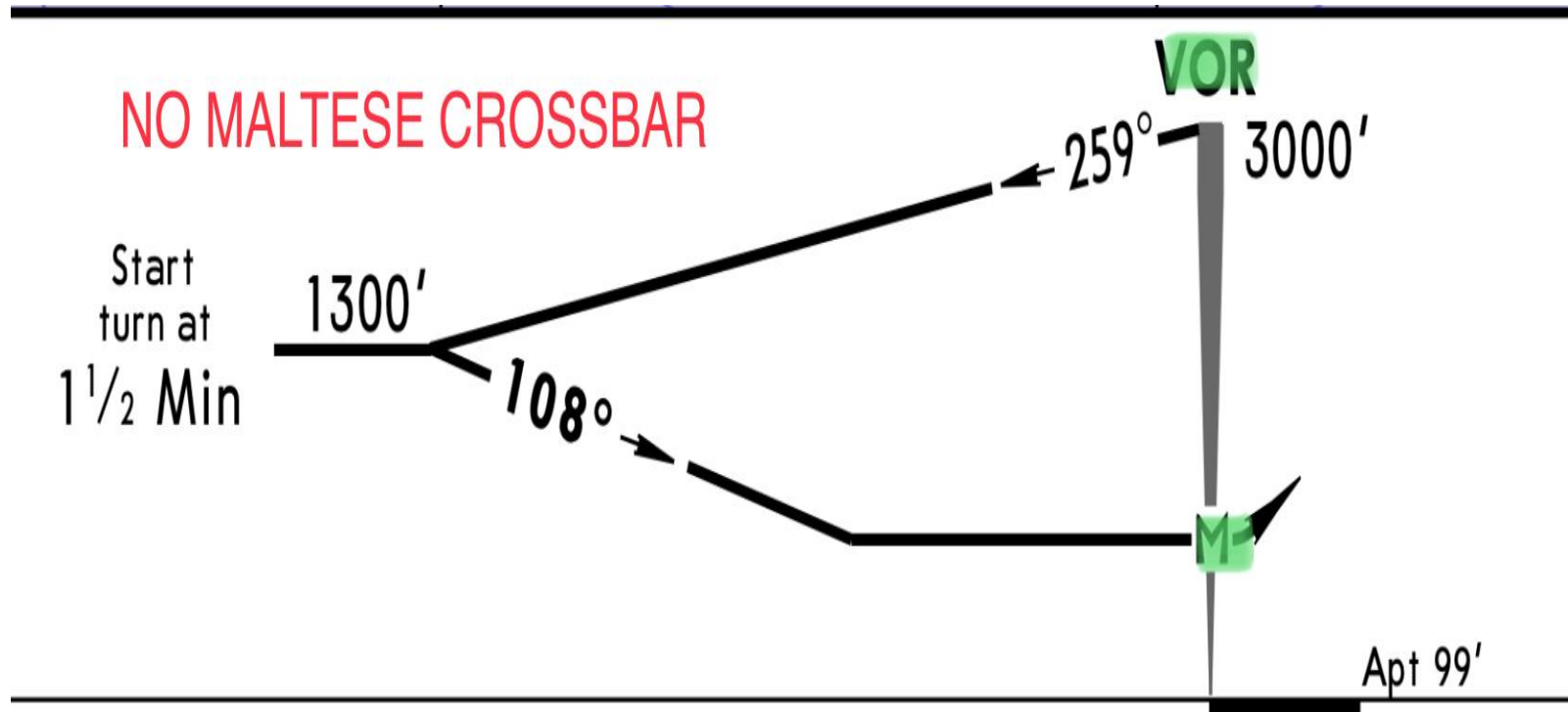
In the absence of a FAF, descent to MDA/H is made once the aircraft is established inbound on the final approach track. Procedure altitudes/heights will not be developed for non-precision approach procedures without a FAF.

Where no FAF is specified, the inbound track is the final approach segment.

Sometimes an aerodrome is served by a *single* facility

		KISH ISLAND, IRAN		
21 JUN 19		VOR Rwy 09		
		*KISH Tower		
		118.450	119.6	121.675
No FAF	MDA(H) 500' (401')	Apt Elev 99'		

In this case, a procedure may be designed where the facility is both the IAF and the MAPt.



Where no FAF is specified, the inbound track is the final approach segment.

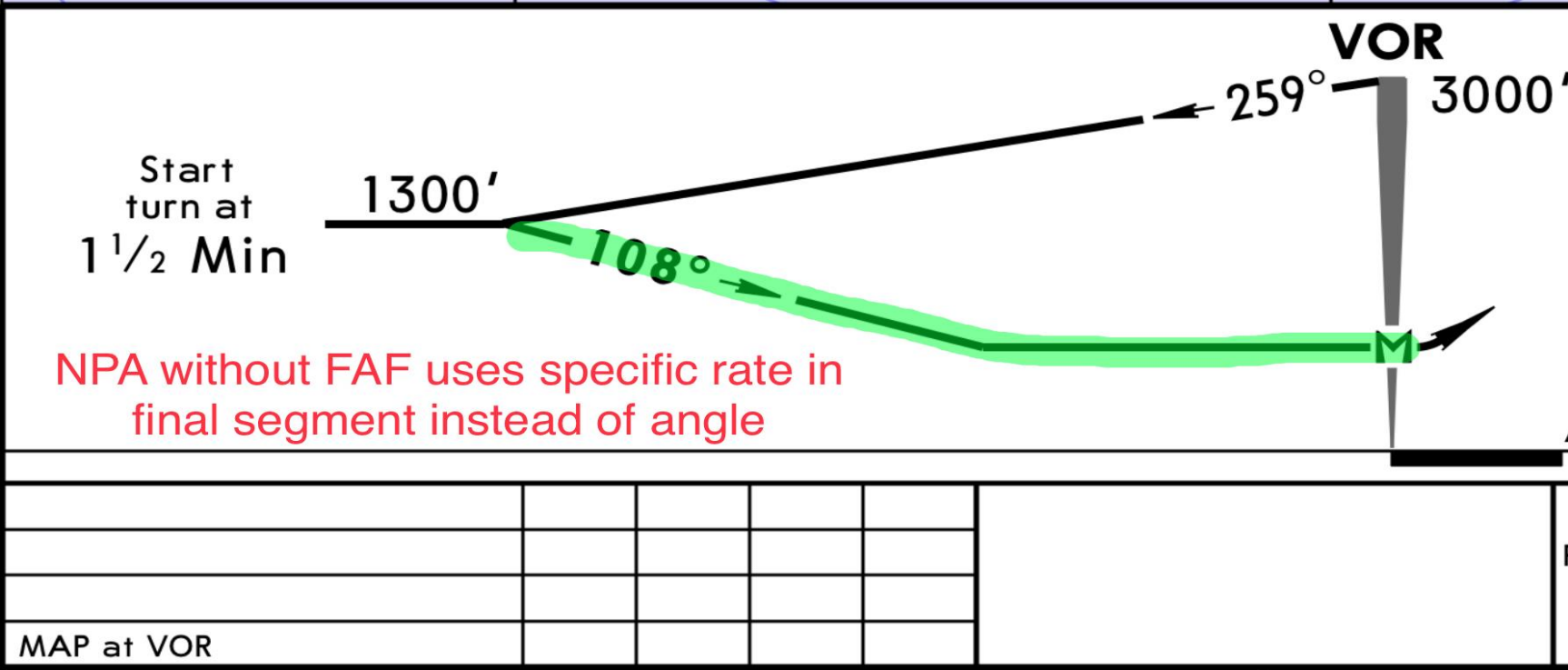


Table I-4-1-3. Rate of descent in the **final approach** segment of a procedure **with no FAF**

Aircraft categories	Rate of descent	
	Minimum	Maximum
A, B	120 m/min (394 ft/min)	200 m/min (655 ft/min)
C , D, E	180 m/min (590 ft/min)	305 m/min (1000 ft/min)

➤ *Approach with vertical guidance (APV);*

VERTICAL NAVIGATION (VNAV)

Vertical Navigation (VNAV) descent information will appear in the profile view of selected non-precision approaches beginning with charts dated 3 Dec 1999. The VNAV information appearing in the profile illustrates the geometric descent path with a descent angle from the Final Approach Fix (FAF) to the Threshold Crossing Height (TCH) at the approach end of the runway.

The VNAV descent path, depicted with a screened line, is based on the same descent angle coded into the Jeppesen NavData database. Use of this descent angle by certified VNAV-capable avionics equipment will ensure a stable, constant rate of descent that will clear all intervening altitude restrictions. Some approach procedures may require a delay of the start of descent beyond the FAF, until the VNAV descent path is intercepted. The profile view will depict this level segment of flight as required.

The VNAV descent angle appears in brackets along the VNAV descent path and is repeated in the conversion table. Additionally, the conversion table provides a recommended rate of descent relative to the VNAV angle and groundspeed.

The inclusion of the VNAV descent angle does not change or modify existing non-precision approach requirements. Usage of the Minimum Descent Altitude (MDA), as well as the Missed Approach Point (MAP), remains unchanged. In accordance with Federal Aviation Regulations (FARs) and ICAO PANS OPS criteria, do not descend below the MDA until attaining the required visual reference. Additionally, do not initiate the prescribed missed approach procedure prior to reaching the published missed approach point. Note: Operators may obtain permission from their controlling authority to use Decision Altitude (DA) operational techniques when making a VNAV descent. This approval is specific to the operator and to the approach.

VNAV descent is optional. Use of any VNAV approach technique is dependent on operator approval, certified VNAV-capable equipment availability, and crew training.

↖ See INTRODUCTION page NEW FORMAT-5
for VERTICAL NAVIGATION (VNAV)
explanation.

[3.00°]
.....

geometric descent path and
descent angle

[3.00°]

geometric descent path and
descent angle to Decision
Altitude (DA) for approved
operators.

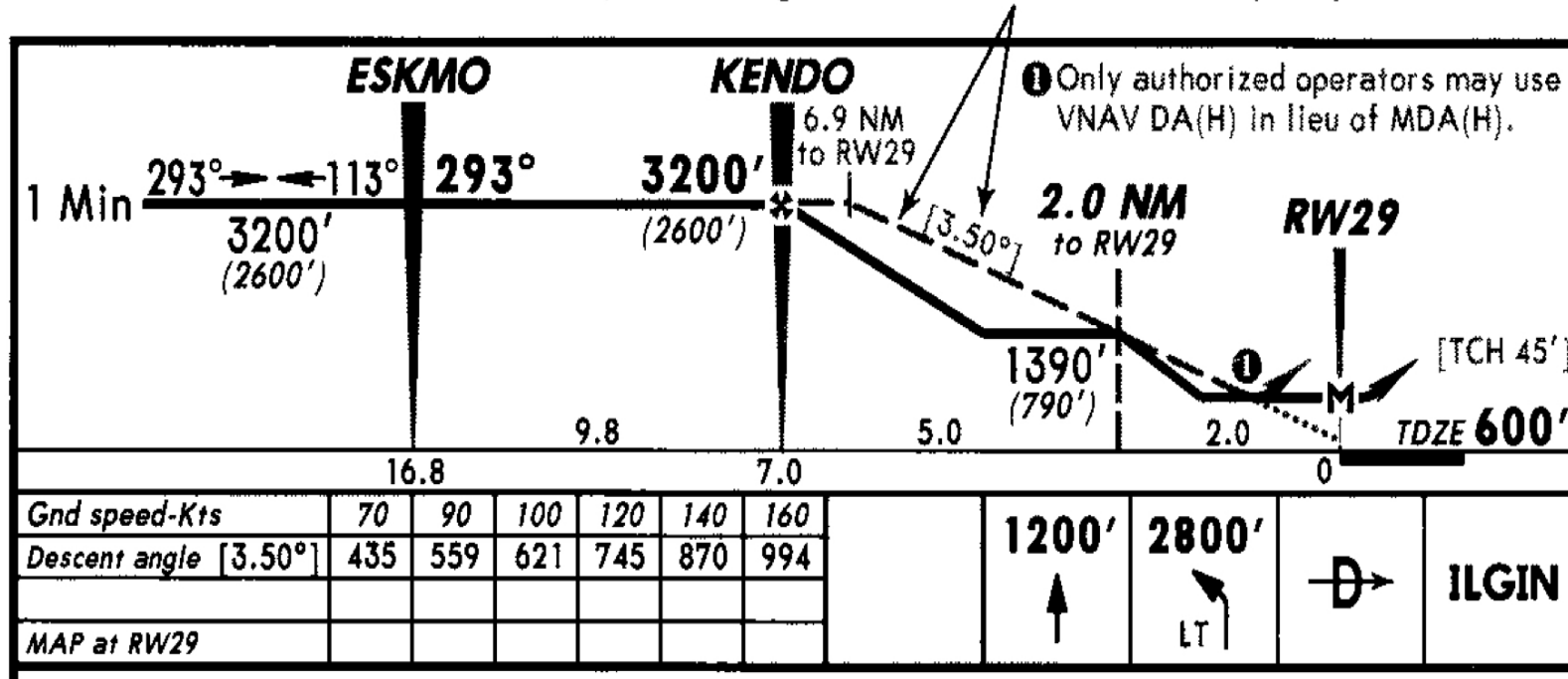


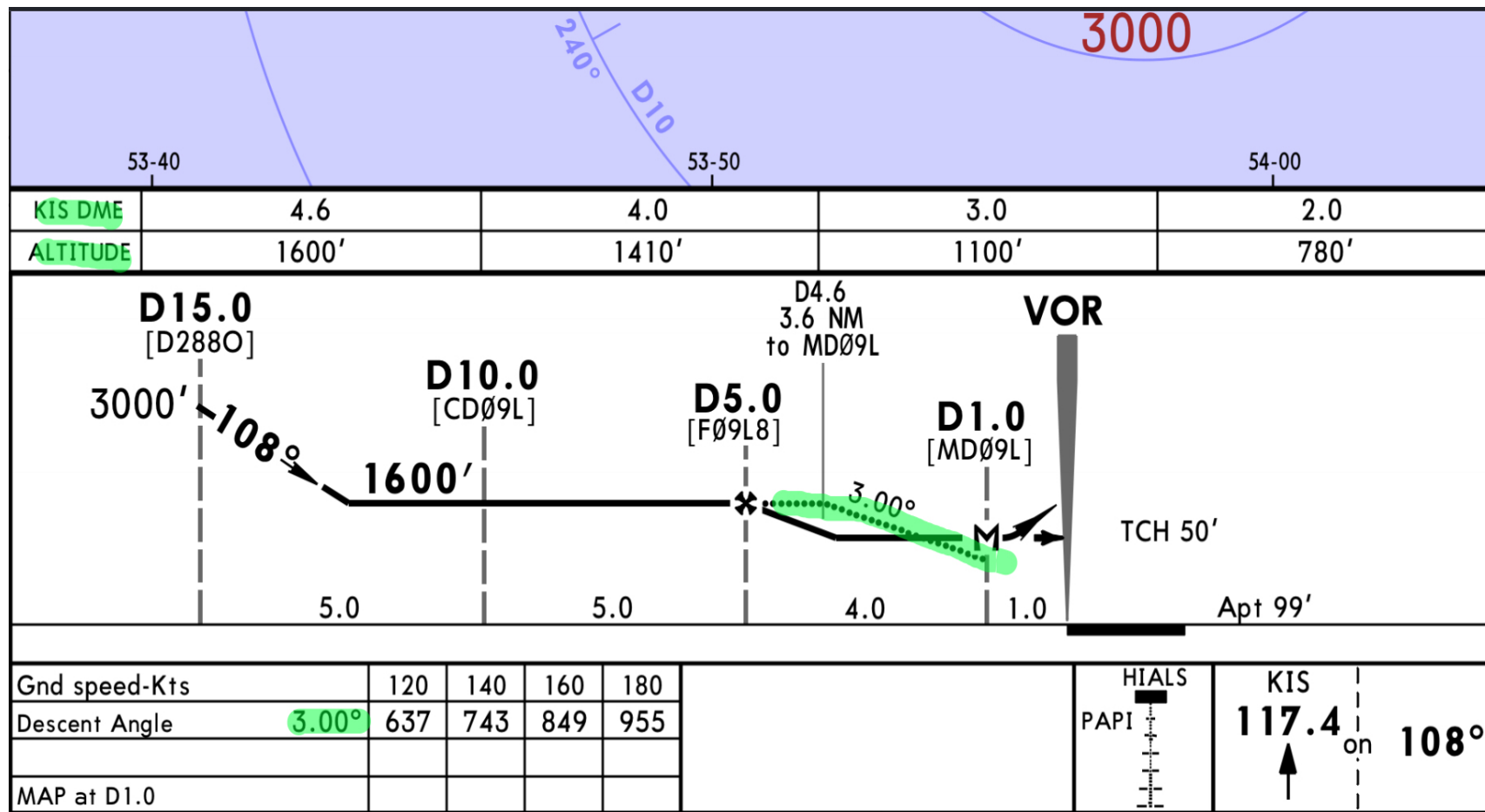
DOC 8168



DOC 8168

(VNAV angle and database descent path)





Instrument approach procedure:

➤ *Precision approach (PA)*

For ILS/MLS the *final segment begins* at the *Final Approach Point (FAP)*. This is defined as the point in space *on localizer* centre line (or the specified MLS azimuth) where the *intermediate approach altitude intercepts the nominal glide path. This can occur at heights between 300 m (1000 ft) and 900 m (3000 ft) which in the case of a 3° (300 ft/NM) glide path, will be between 3 NM and 10 NM from touchdown.*

MOC is included in the calculation for DA/H but requires the pilot to fly the aircraft with no more than half scale deflection of the CDI. At some point during the final segment, a fix will be specified where glide path information can be verified.

In the event of *loss of glide path* elevation angle guidance during the approach, the procedure becomes a *non-precision approach*. The OCA/H and associated procedure published for the glide path elevation angle inoperative case will then apply.

Non-standard procedures are those involving glide paths *greater than 3.5° or any angle when the nominal rate of descent exceeds 5 m/sec (1000 ft/min)*.

ILS:

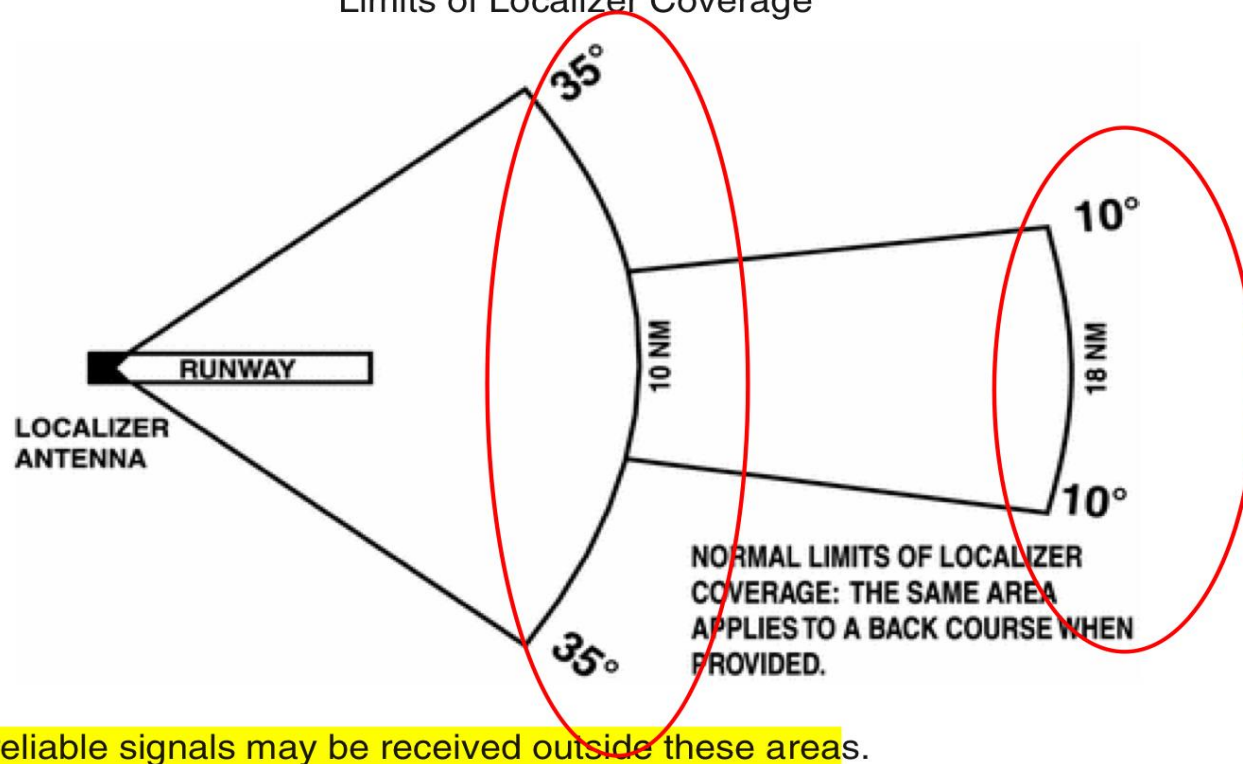
- Category I flown with pressure altimeter;
- Category II flown with radio altimeter and flight director;
- missed approach climb gradient is ***2.5 per cent***;
- glide path angle:
 - ❖ ***minimum: 2.5°***
 - ❖ ***optimum: 3.0°***
 - ❖ ***maximum: 3.5° (3° for Category II/III operations).***

1-1-9 INSTRUMENT LANDING SYSTEM (ILS)

a. General

1. The ILS is designed to provide an approach path for exact alignment and descent of an aircraft on final approach to a runway.
2. The ground equipment consists of two highly directional transmitting systems and, along the approach, three (or fewer) marker beacons. The directional transmitters are known as the localizer and glide slope transmitters.
3. The system may be divided functionally into three parts:
 - (a) **Guidance information:** localizer, glide slope;
 - (b) **Range information:** marker beacon, DME; and
 - (c) **Visual information:** approach lights, touchdown and centerline lights, runway lights.

FIGURE 1-1-6
Limits of Localizer Coverage



6. Unreliable signals may be received outside these areas.

d. **Glide Slope/Glide Path**

1. The UHF glide slope transmitter, operating on one of the 40 ILS channels within the frequency range 329.15 MHz, to 335.00 MHz radiates its signals in the direction of the

localizer front course. The term “glide path” means that portion of the glide slope that intersects the localizer.

CAUTION: False glide slope signals may exist in the area of the localizer back course approach which can cause the glide slope flag alarm to disappear and present unreliable glide slope information. Disregard all glide slope signal indications when making a localizer back course approach unless a glide slope is specified on the approach and landing chart.

3. The glide path projection angle is normally adjusted to 3 degrees above horizontal so that it intersects the MM at about 200 feet and the OM at about 1,400 feet above the runway elevation. The glide slope is normally usable to the distance of 10 NM. However, at some locations, the glide slope has been certified for an extended service volume which exceeds 10 NM.
4. Pilots must be alert when approaching the glidepath interception. False courses and reverse sensing will occur at angles considerably greater than the published path.

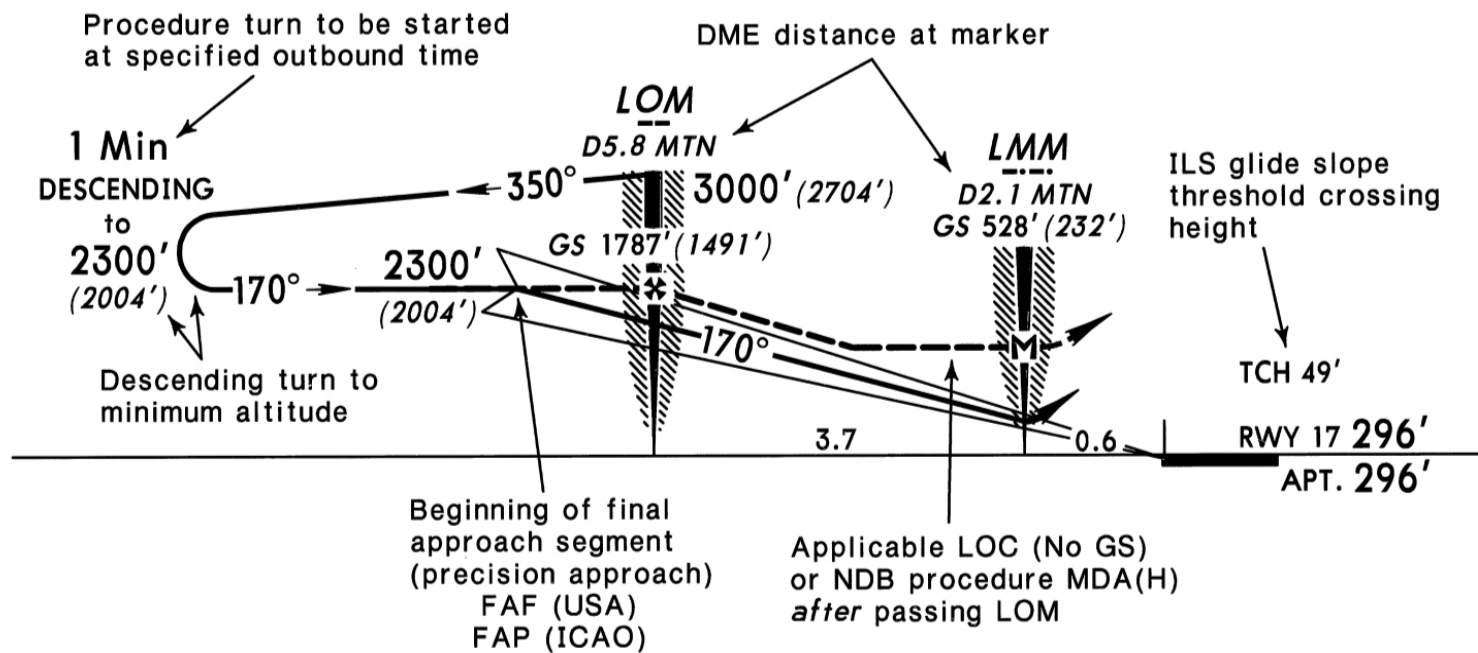
j. Inoperative ILS Components

1. **Inoperative localizer.** When the localizer fails, an ILS approach is not authorized.
2. **Inoperative glide slope.** When the glide slope fails, the ILS reverts to a non-precision localizer approach.

REFERENCE—*Jeppesen approach charts include adjustments to minimums due to inoperative airborne or ground system equipment.*

ILS CATEGORIES (ICAO) —

- a. ILS Category I — An ILS approach procedure which provides for an approach to a **decision height not lower than 60m (200ft)** and a **visibility not less than 800m (2400ft)** or a **runway visual range not less than 550m (1800ft)**.
- b. ILS Category II (Special authorization required) — An ILS approach procedure which provides for an approach to a **decision height lower than 60m (200ft) but not lower than 30m (100ft)** and a **runway visual range not less than 300m (1000ft)** for aircraft categories A, B, C (D with auto landing), and not less than 350m (1200ft) for aircraft category D without auto landing.
- c. ILS Category III (Special authorization required) —
 - 1. **IIIA** — An ILS approach procedure which provides for approach with either a decision height lower than 30m (100ft) or with no decision height and with a runway visual range of not less than 175m (574ft).
 - 2. **IIIB** — An ILS approach procedure which provides for approach with either a decision height lower than 15m (50ft) or with no decision height and with a runway visual range of less than 175m (574ft) but not less than 50m (150ft).
 - 3. **IIIC** — An ILS approach procedure which provides for approach with no decision height and no runway visual range limitations.



OIFM/IFN
SHAHID BEHESHTI INTL



JEPPESSEN

ESFAHAN, IRAN

6 SEP 19

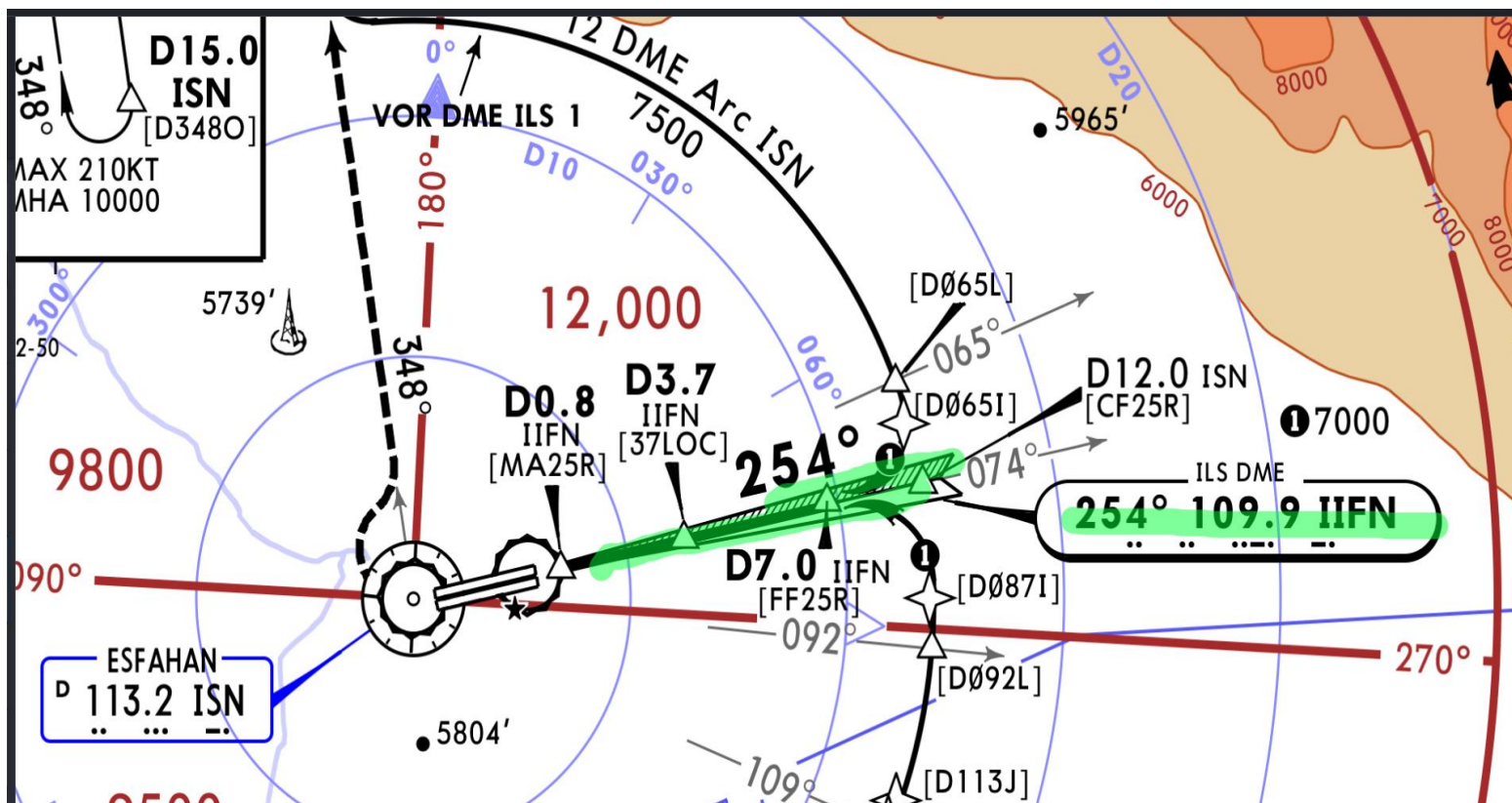
Eff 12 Sep

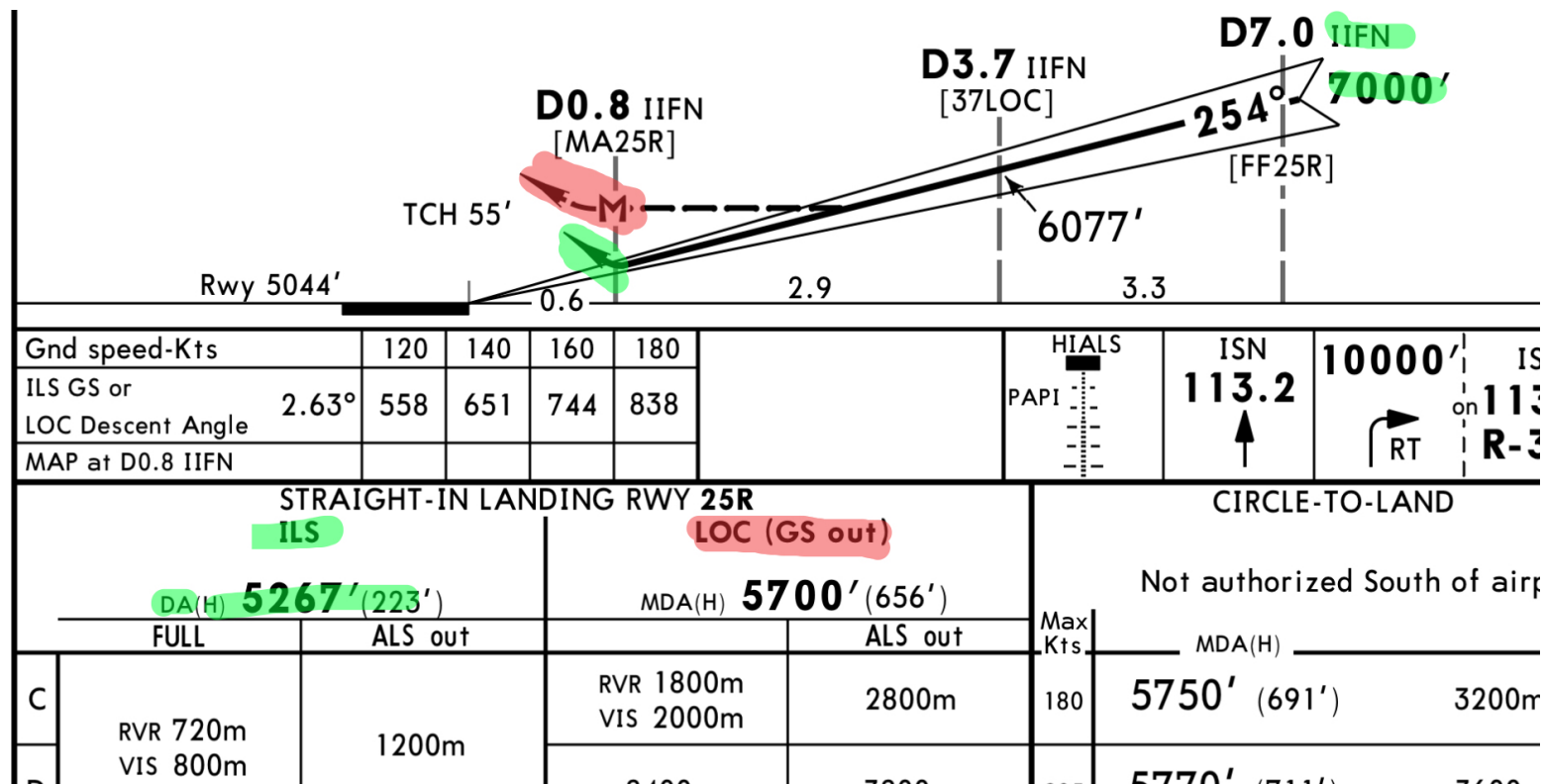
11-1

VOR DME ILS 1, 2 & 3 Rwy 25R

BRIEFING STRIP™

*ATIS 128.250		ESFAHAN Approach/Radar 124.6		ESFAHAN Tower 118.3		Ground 121.9		MSA ISN VOR		
LOC IIFN 109.9		Final Apch Crs 254°		GS D3.7 IIFN 6077' (1033')		ILS DA(H) 5267' (223')			Apt Elev 5059'	
Rwy 5044'										
MISSED APCH: Climb STRAIGHT AHEAD to VOR, then turn RIGHT and climb on R-348 to rejoin NORTH holding at 10000'.										
Alt Set: hPa		Rwy Elev: 172 hPa		Trans level: By ATC		Trans alt: 13000'				
NORTH HOLDING		33-00 (IAF) D15.0 ISN [D3480]		LOC (GS out)		IIFN DME	3.0	4.0	5.0	6.0
						ALTITUDE	5880'	6160'	6440'	6720'





approaches only.

ALS out___Approach lights out of service

CAT I ILS___CAT I ILS approach

CAT II ILS___CAT II ILS approach

CAT IIIA ILS___CAT IIIA ILS approach

CEILING REQUIRED___Indicates that a ceiling is required for landing.

CIRCLE-TO-LAND___Circling landing minimums applicable for all runways

*DA___Decision Altitude - MSL altitude

→ *DA(H)___Decision Altitude (Height)

*DH___Decision Height - MSL Altitude

→ FULL___All components of ILS are operating

HIRL out___High Intensity Runway Lights out of service

ILS___ILS approach

→ LOC (GS out)___Localizer approach (ILS without GS)



NO # 2

Time = 00:02

³³¹

D
O
C

8
1
6
8

What will be the maximum distance of FAF (non-precision)
from threshold?

- A) 12 NM
- B) 11 NM
- C) 10 NM
- D) 9 NM



What will be the maximum distance of FAF (non-precision) from threshold?

- A) 12 NM
- B) 11 NM
- C) 10 NM
- D) 9 NM



What will be the optimum descent gradient during final approach?

- A) 2.5°
- B) 3°
- C) 3.3°
- D) 3.5°

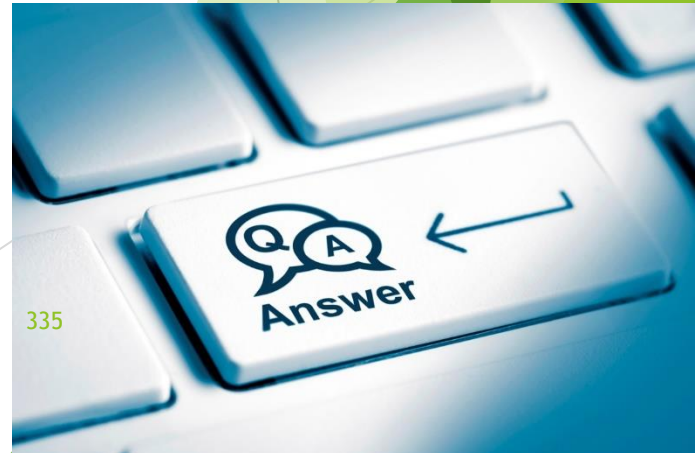


D
O
C

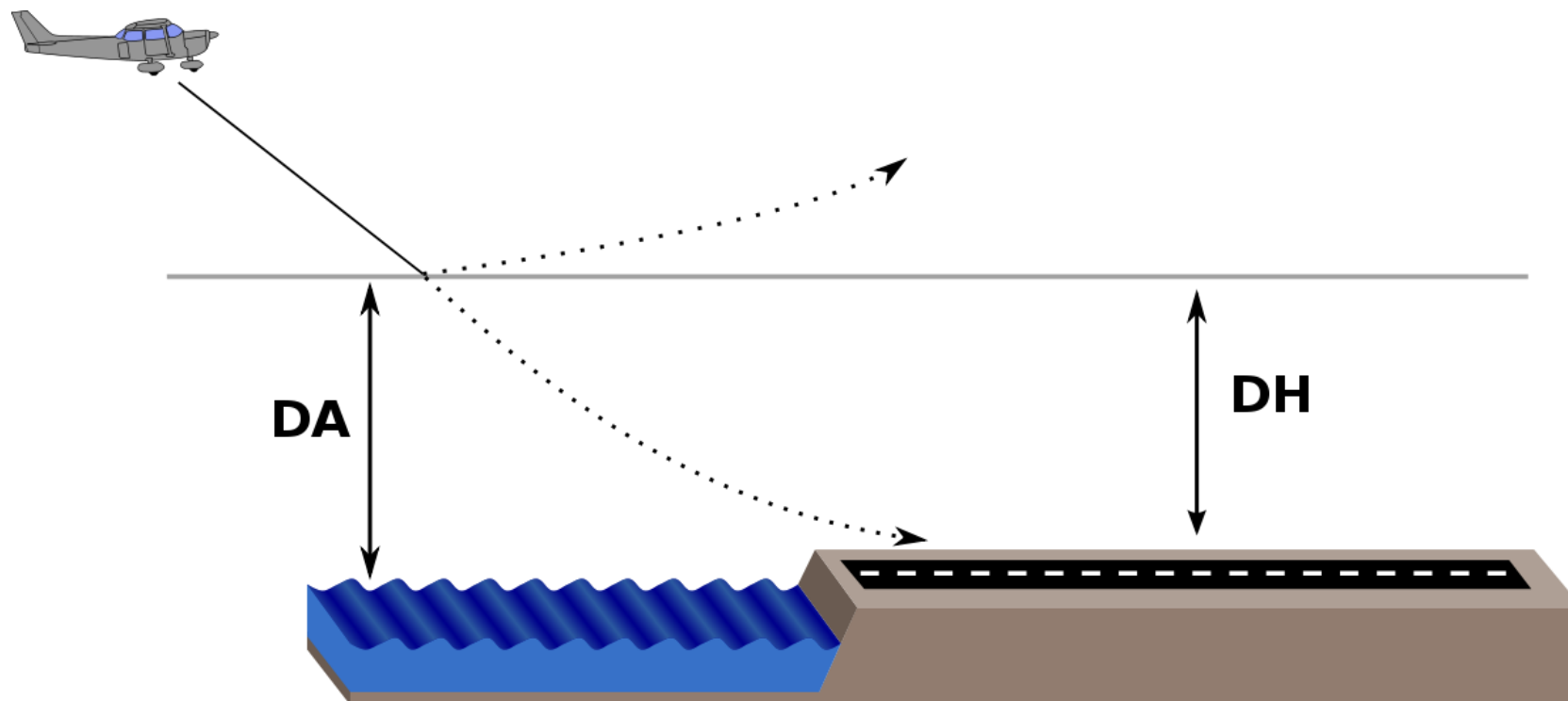
8
1
6
8

What will be the optimum descent gradient during final approach?

- A) 2.5°
- B) 3°
- C) 3.3°
- D) 3.5°



MISSED APPROACH SEGMENT



MISSED APPROACH SEGMENT

During the missed approach phase of the instrument approach procedure, the pilot is faced with the demanding task of changing the aircraft configuration, attitude and altitude. For this reason, the design of the missed approach has been kept as simple as possible and consists of ***three phases (initial, intermediate and final)***

Only one missed approach procedure is established for each instrument approach procedure. It is designed to provide protection from obstacle throughout the missed approach maneuver.

The missed approach should be *initiated not lower than the decision altitude/height (DA/H) in precision approach procedures, or at a specified point in non-precision approach procedures not lower than the minimum descent altitude/height (MDA/H).*

It is expected that the pilot will fly the missed approach procedure as published. If a missed approach is initiated before arriving at the missed approach point (MAPt), the pilot will normally proceed to the MAPt (or to the middle marker fix or specified DME distance for precision approach procedures) and then follow the missed approach procedure in order to remain within the protected airspace.

Missed approach gradient

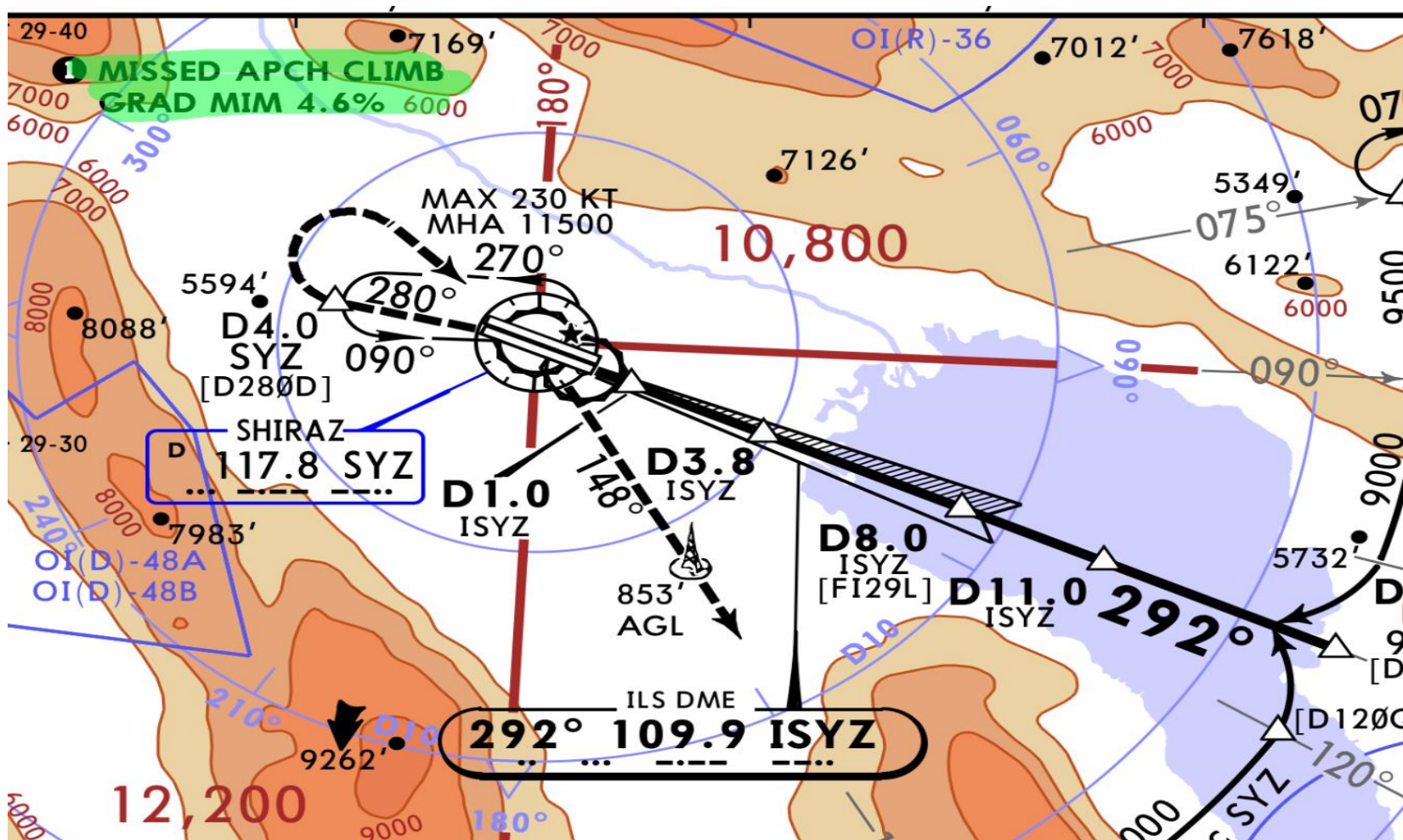
Normally procedures are based on a ***minimum missed approach climb gradient of 2.5 per cent***. A ***gradient of 2 per cent may be used in the procedure construction if the necessary survey and safeguarding have been provided. With the approval of the appropriate authority***, gradients of 3, 4 or 5 per cent may be used for aircraft whose climb performance permits an operational advantage to be thus obtained.

When a gradient ***other*** than 2.5 per cent is used, this is ***indicated*** on the instrument approach chart.

DECISION MAKING

The flight crew must consider to perform a go-around if:

- There is a loss or a doubt about situation awareness, or
- There is a malfunction which jeopardizes the safe completion of the approach e.g. major navigation problem, or
- ATC changes the final approach clearance resulting in rushed action from the crew or potentially unstable approach, or
- The approach is unstable in speed, altitude, or flight path in such a way that stability is not obtained by 1 000 ft AAL in IMC or (500 ft AAL in VMC), or is not maintained until landing, or
- Any of the following alerts occur:
 - GPWS, or
 - TCAS, or
 - Windshear, or
 - ROW  alerts for the relevant runway condition. Refer to AS-ROWROP Operating Techniques.
- Adequate visual references are not obtained at minima or lost below minima.



U.0				
Gnd speed-Kts	120	140	160	180
ILS GS or LOC Descent Angle 3.00°	637	743	849	956
MAP at D1.0 ISYZ				
STRAIGHT-IN LANDING RWY 29L				
Missed apch climb gradient mim 4.6%				
ILS			LOC (GS out)	
DA(H) 5174'(304')			MDA(H) 5400'(530')	
FULL		ALS out		ALS out
C	900m	1400m	RVR 1500m VIS 1600m	2400m
D			RVR 1800m VIS 2000m	2800m

CHANGES: Reversal proc and waypoint D13.0 SYZ withdrawn. RVR values added. © JEPPI

INITIAL PHASE

The initial phase ***begins at the MAPt and ends at the start of climb (SOC)***. This phase requires the concentrated attention of the pilot on establishing the climb and the changes in aeroplane configuration. It is assumed that guidance equipment is not extensively utilized during these maneuvers, and for this reason, no turns are specified in this phase.

INTERMEDIATE PHASE

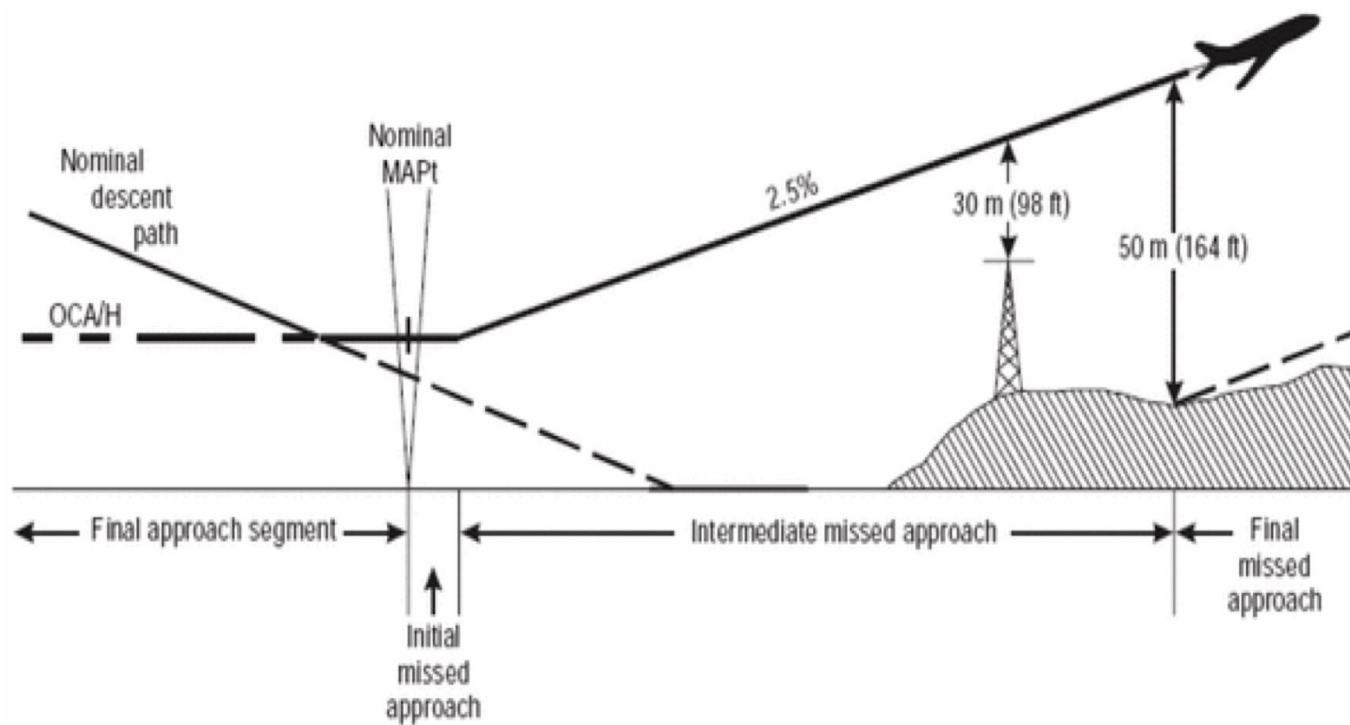
The *intermediate phase begins at the SOC, The climb is continued, normally straight ahead. It extends to the first point where 50 m (164 ft) obstacle clearance is obtained and can be maintained.*

The intermediate missed approach track may be changed by a *maximum of 15° from that of the initial missed approach phase.* During this phase, it is assumed that the aircraft begins track corrections.

FINAL PHASE

The final phase ***begins at the point where 50m (164 ft)*** obstacle clearance is first obtained and can be maintained. It extends to the point where a new approach, holding or a return to en-route flight is initiated. Turns may be prescribed in this phase.

Figure I-4-6-1. Missed approach phases



- Initial missed approach
- Intermediate missed approach
- Final missed approach

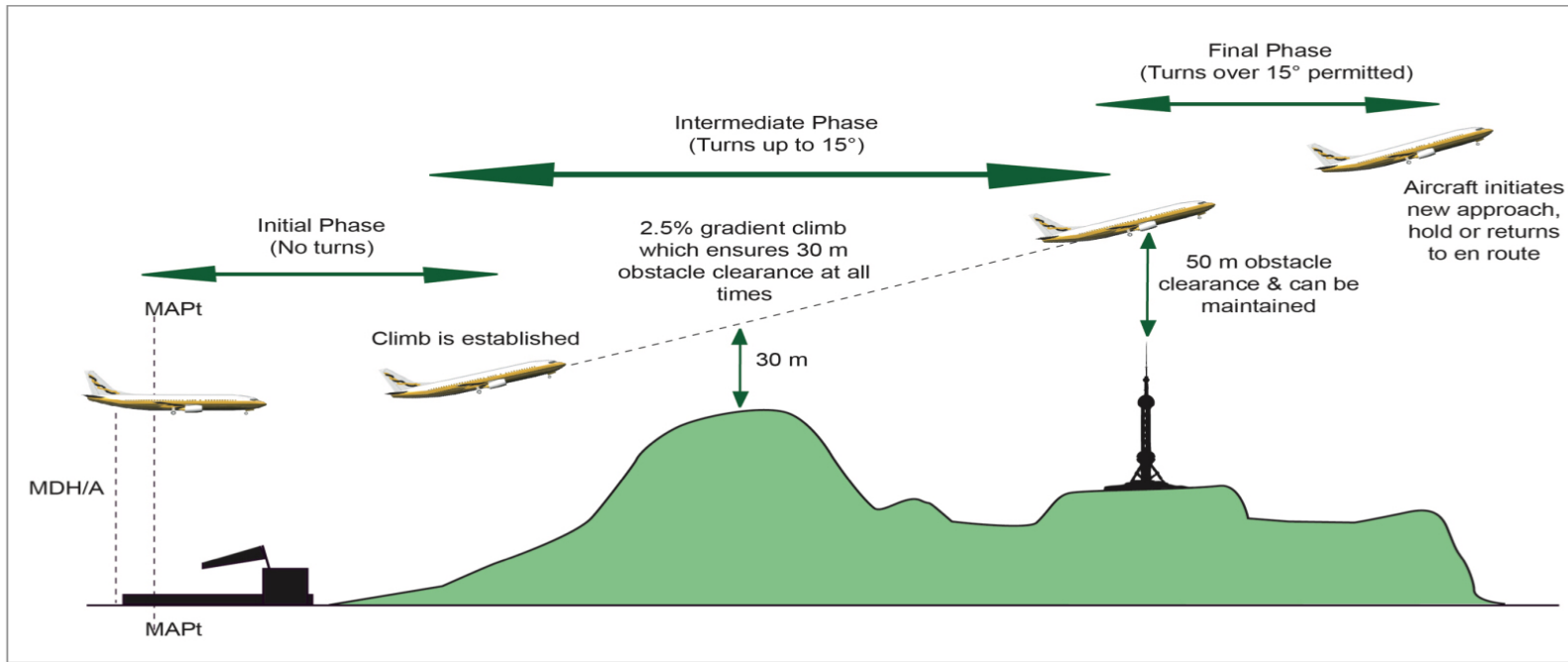


Figure 8.25 Three phases of the missed approach

Table I-4-1-2. Speeds for procedure calculations in knots (kt)

Aircraft Category	V _{at}	Initial Approach Speeds	Final Approach Speeds	Maximum Speeds for Visual Manoeuvring (Circling)	Maximum Speeds for Missed Approach	
					Intermediate	Final
A	<91	90/150 (110*)	70/100	100	100	110
B	91/120	120/180 (140*)	85/130	135	130	150
C	121/140	160/240	115/160	180	160	240
D	141/165	185/250	130/185	205	185	265
E	166/210	185/250	155/230	240	230	275

Obstacle Clearance Altitude/Height

OBSTACLE CLEARANCE ALTITUDE (OCA) OR OBSTACLE CLEARANCE HEIGHT (OCH)

The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of ***non-precision approaches to the aerodrome elevation or the threshold elevation if that is more than 2m (7 ft) below the aerodrome elevation.*** An obstacle clearance height for a ***circling approach is referenced to the aerodrome elevation.***

For convenience when both expressions are used they may be written in the form “obstacle clearance altitude/height” and abbreviated “OCA/H.”

MINIMUM DESCENT ALTITUDE (MDA) OR MINIMUM DESCENT HEIGHT (MDH)

A specified altitude or height in a 2D instrument approach operation or circling approach below which descent must not be made without the required visual reference.

Minimum descent altitude (MDA) is referenced to mean sea level and minimum descent height (MDH) is referenced to the aerodrome elevation or to the threshold elevation if that is more than 2m (7 ft) below the aerodrome elevation. A minimum descent height for a circling approach is referenced to the aerodrome elevation.

The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In the case of a circling approach the required visual reference is the runway environment.

DECISION ALTITUDE (DA) OR DECISION HEIGHT (DH)

A specified altitude, or height, in a 3D instrument approach operation at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.

The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path.

In Category III operations with a decision height the required visual reference is that specified for the particular procedure and operation.

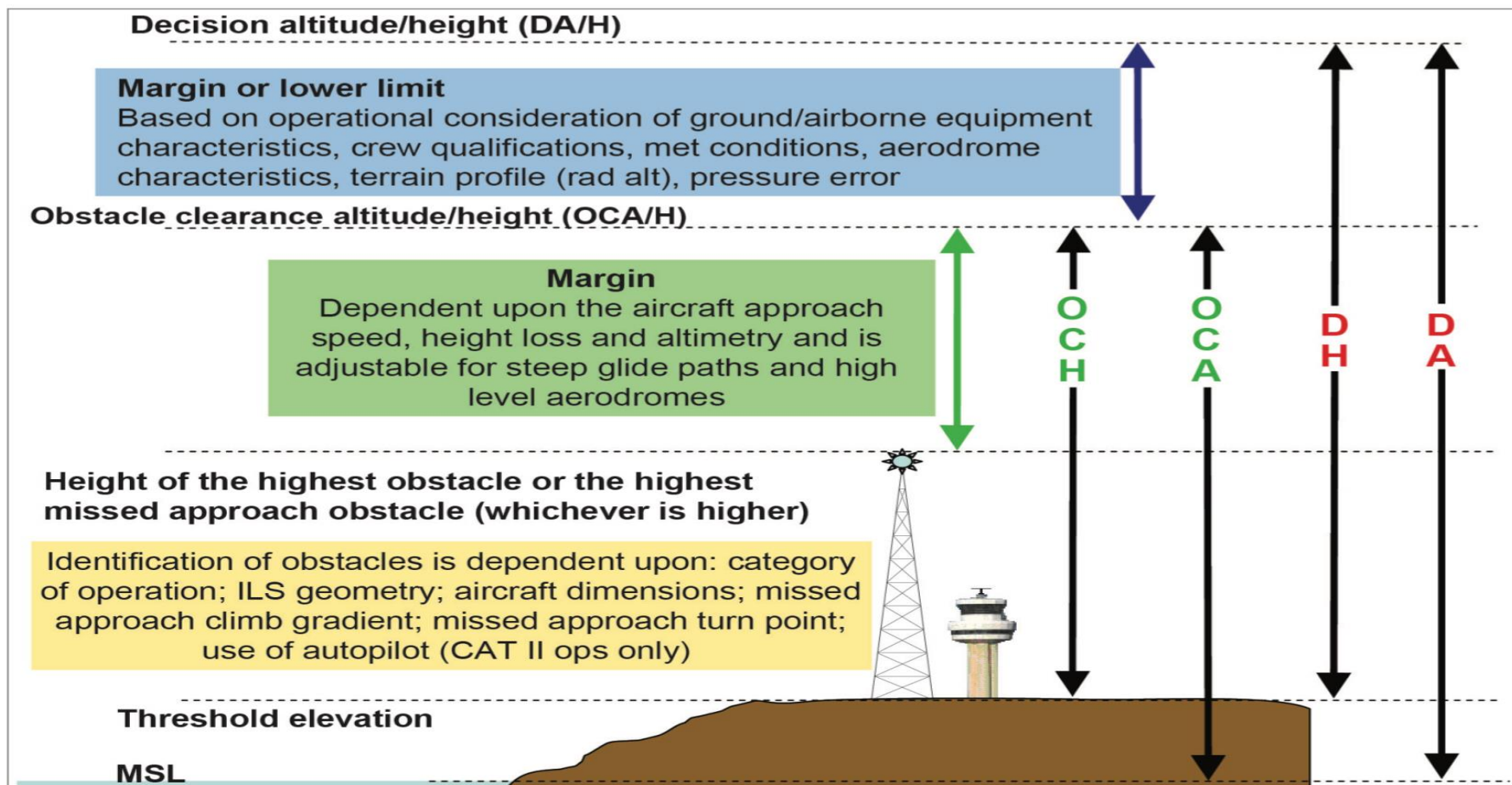


Figure 8.13 Method of determining DA/H for precision approaches

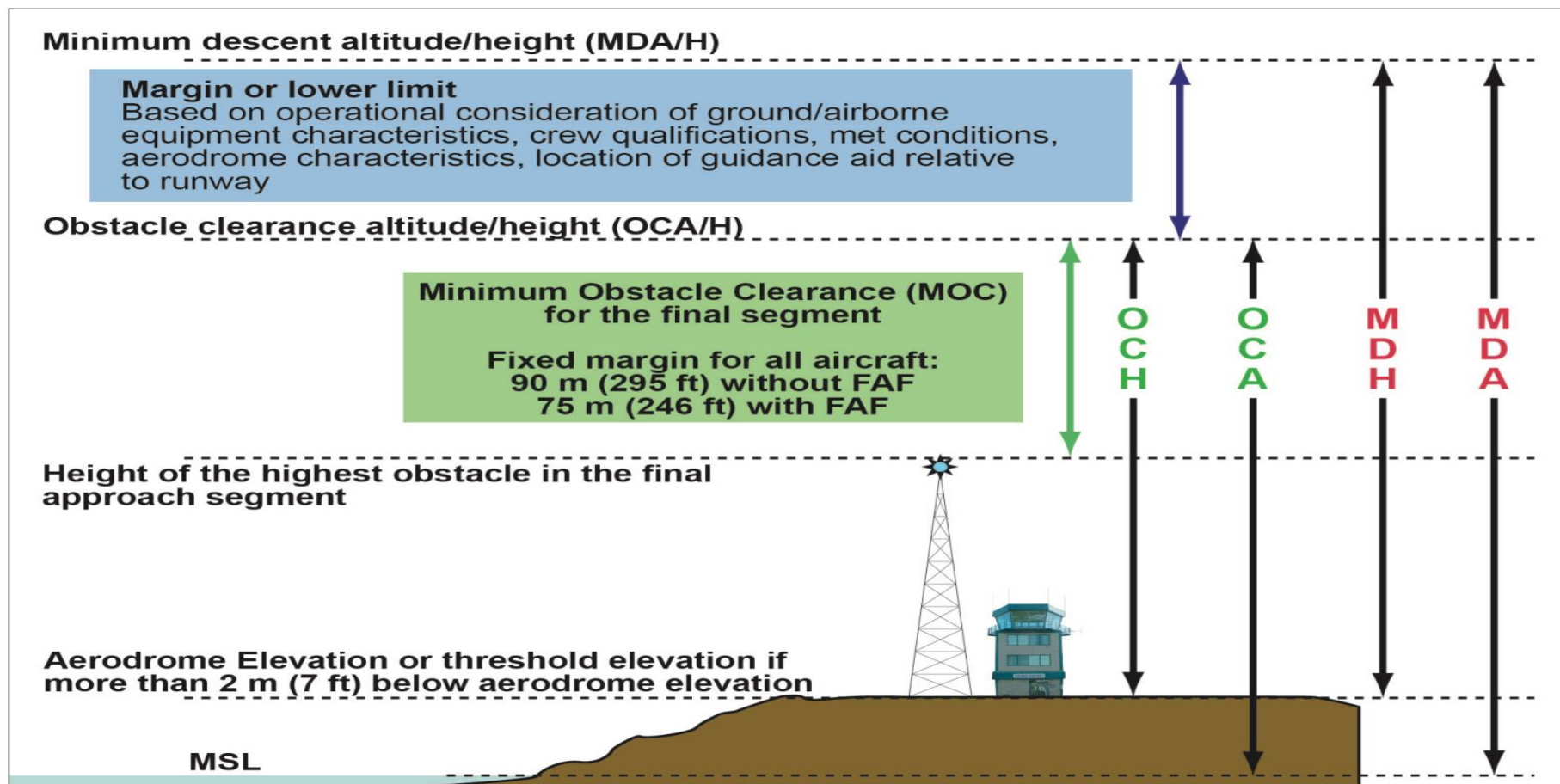


Figure 8.15 Method of determining MDA/MDH for non-precision approaches

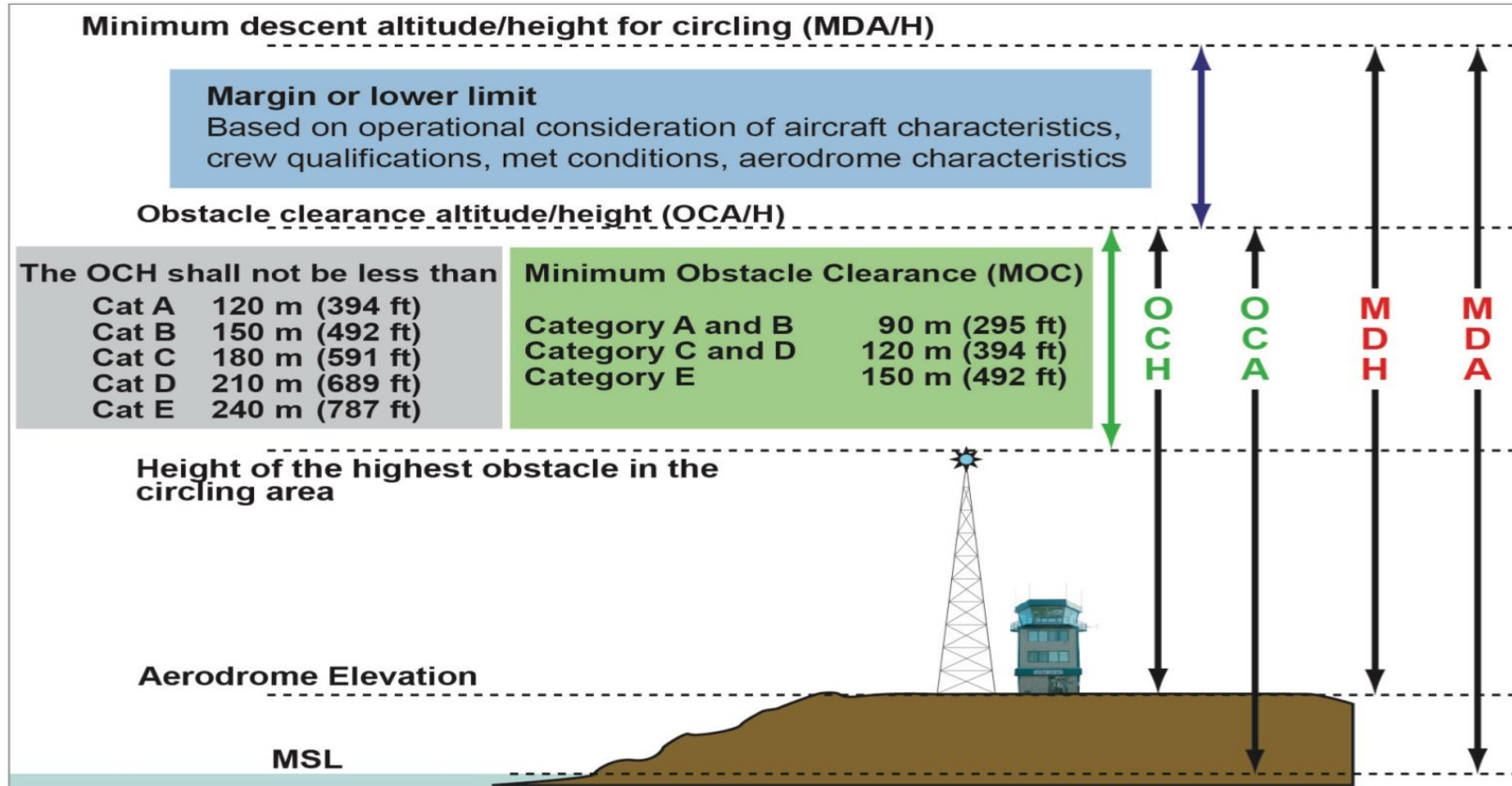


Figure 8.16 Method of determining MDA/MDH for circling approaches

Missed approach note & altitude in heading section of chart

OIBK/KIH
KISH

A

21 JUN 19

13-2

JEPPESSEN

KISH ISLAND, IRAN
VOR DME 8 Rwy 09L

*ATIS

128.0

*KISH Tower

118.450 119.6 121.675

VOR
KIS
117.4

Final
Apch Crs
108°

Minimum Alt
D5.0
1600'(1501')

MDA(H)
450'(351')

Apt Elev 99'

MISSED APCH: Climb on track 108° to VOR, then turn RIGHT to rejoin holding at 3000'.

Alt Set: hPa

Apt Elev: 4 hPa

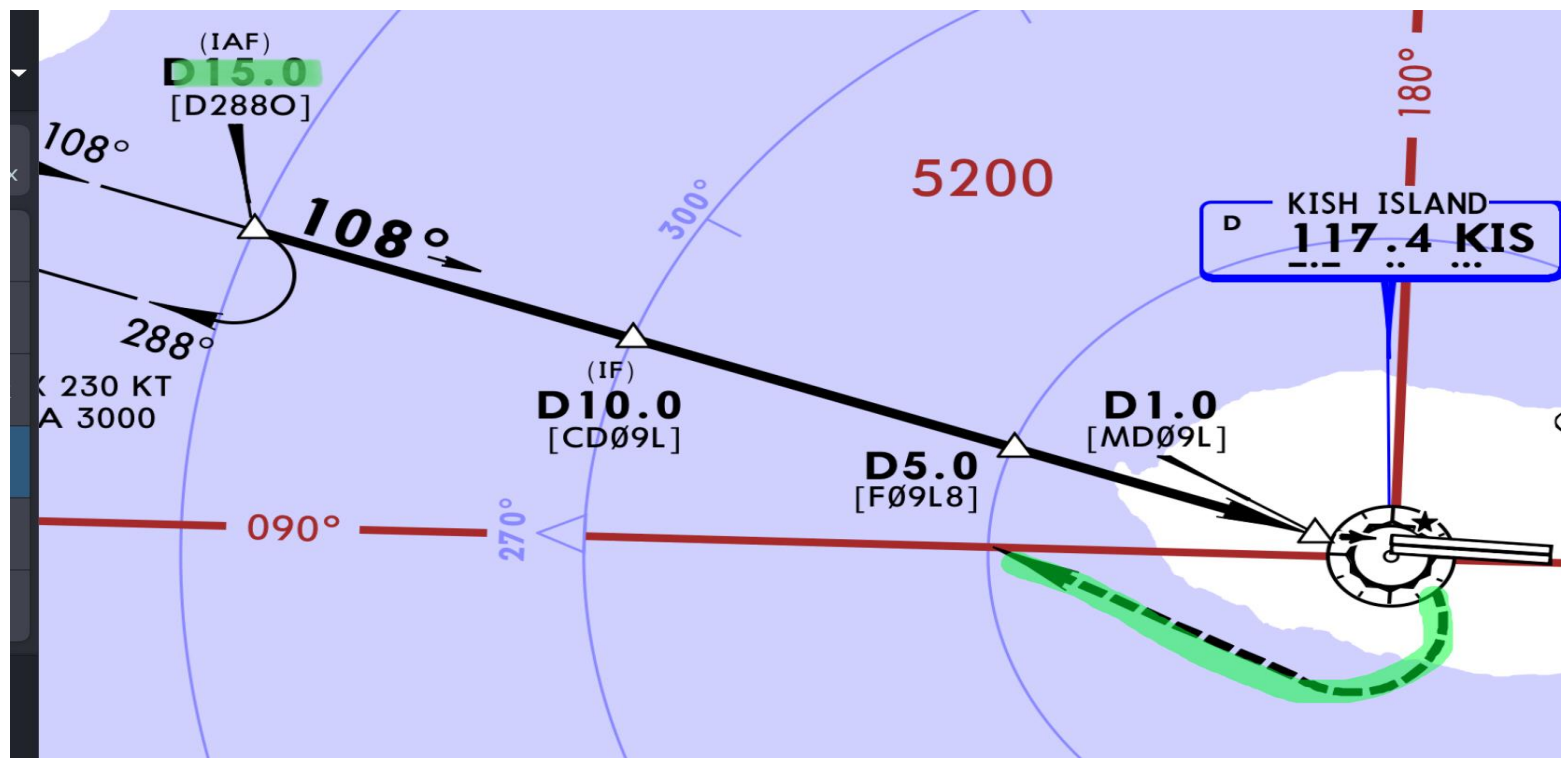
Trans level: By ATC

Trans alt: 3000'

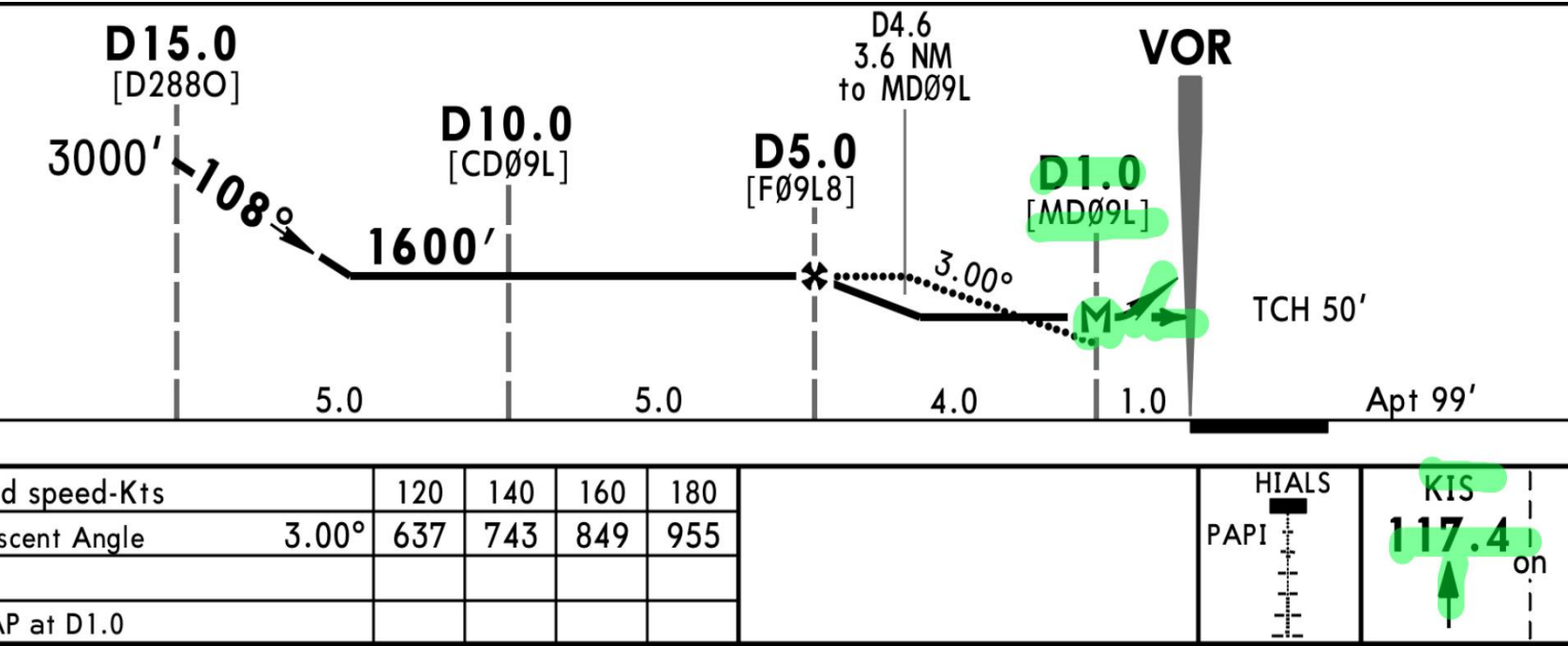
MSA KIS VOR

BRIEFING STRIP™

Missed approach track in plan view of chart



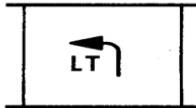
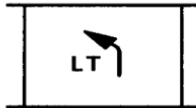
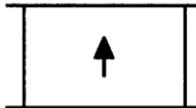
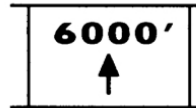
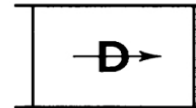
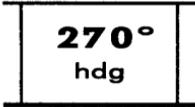
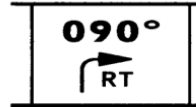
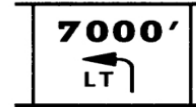
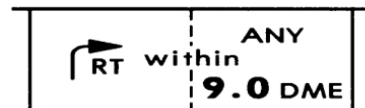
Missed approach symbol & icon in profile view of chart



Missed approach symbol & icon in profile view of chart

MISSED APPROACH ICONS

Missed Approach Icons include a wide variety of initial action instructions. A representative sample of Icons are shown below;

					
Right Turn (greater than 45°)	Left Turn (greater than 45°)	Left Turn (less than 45°)	Climb	Climb to altitude	Direct
					
Fly Heading	Track Radial	To specified Fix	To specified Navaid	Turn to specified Course	Turn to specified Altitude
					
Airspeed limit	Right turn with Limit				

NOTE: Missed Approach Icons provide for initial actions only. Always refer to the Missed Approach instructions in the PRE-APPROACH BRIEFING section and the plan view for complete instructions.

Missed approach altitude in landing minima section of chart

STRAIGHT-IN LANDING RWY 09L			CIRCLE-TO-LAND		
MDA(H) 450' (351')			Max Kts.	MDA(H) —	
		ALS out			
C	1000m	1600m	180	880' (781')	3600m
D	1600m	2000m	205	880' (781')	4000m
CHANGES: VOR name.					
© JEPPESEN, 2008, 2019. ALL RIGHTS RESERVED.					



NO # 2

Time = 00:02

³⁶¹

*D
O
C*

*8
1
6
8*

How many phases has a missed approach procedure?

- A) 1
- B) 2
- C) 3
- D) 4



How many phases has a missed approach procedure?

- A) 1
- B) 2
- C) 3
- D) 4



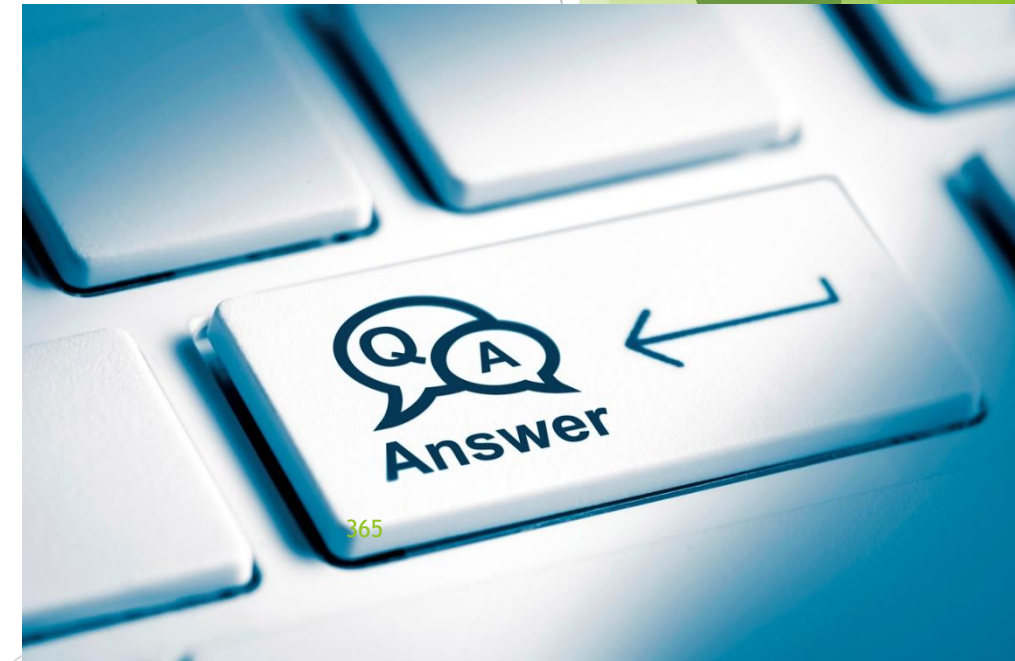
What is the minimum missed approach climb gradient?

- A) 2.5 %
- B) 2.6 %
- C) 2.7 %
- D) 2.8 %



What is the minimum missed approach climb gradient?

- A) 2.5 %
- B) 2.6 %
- C) 2.7 %
- D) 2.8 %



VISUAL MANEUVERING (CIRCLING) AREA

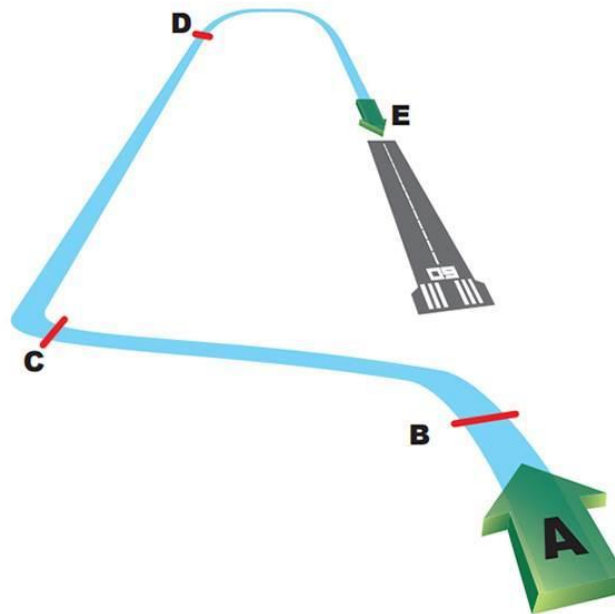


Figure 7-45. *Circling approach pattern I (imaginary runway).*

VISUAL MANEUVERING (CIRCLING) AREA

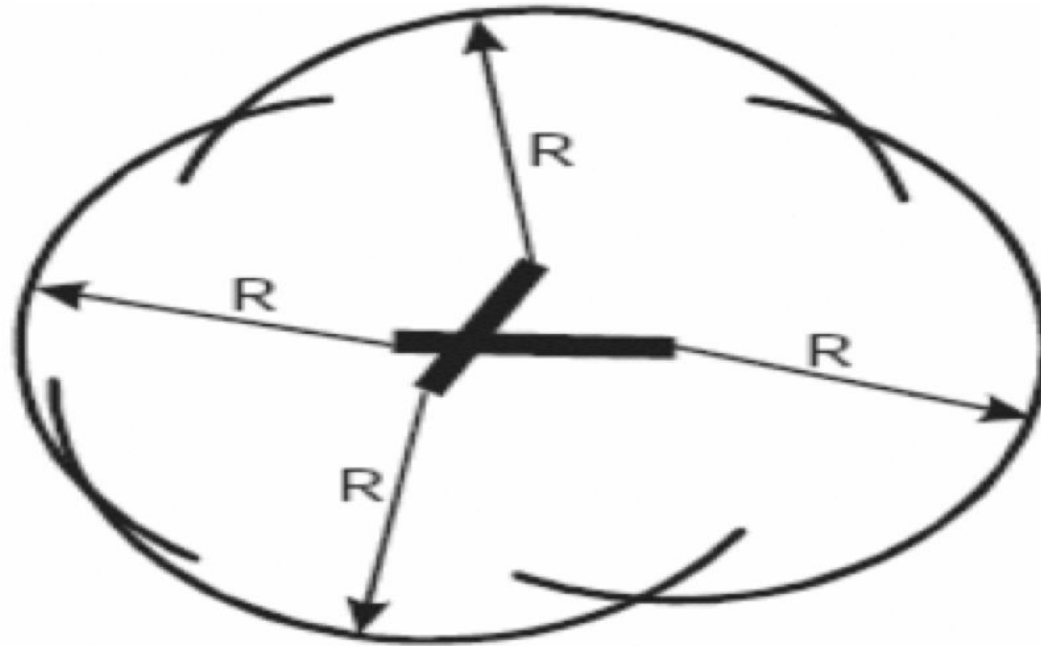
Visual maneuvering (circling) is the term used to describe the phase of flight after an instrument approach has been completed. It brings the aircraft into position for landing on a runway which is not suitably located for straight-in approach, i.e. one where the criteria for alignment or descent gradient cannot be met.

Table I-4-7-2. Example of determining radii for visual manoeuvring (circling) area for aerodromes at 1000 ft MSL (non-SI units)

Category of aircraft/IAS (km/h)	A/100	B/135	C/180	D/205	E/240
TAS at 2000 ft MSL + 25 kt wind factor (kt)	131	168	215	242	279
Radius (r) of turn (NM)	0.69	1.13	1.85	2.34	3.12
Straight segment (NM) (this is a constant value)	0.30	0.40	0.5	0.60	0.70
Radius (R) from threshold (NM)	1.68	2.66	4.20	5.28	6.94

NOTE: Radius from threshold (R) = 2r + straight segment.

Figure I-4-7-1. Visual manoeuvring (circling approach) area



Radius of the arcs (R) varies with
the aircraft category

VISUAL FLIGHT MANEUVER

A circling approach is a visual flight maneuver. Each circling situation is different because of variables such as runway layout, final approach track, wind velocity and meteorological condition. Therefore, there can be no single procedure designed that will cater for conducting a circling approach in every situation.

After initial visual contact, the basic assumption is that the runway environment should be kept in sight while at minimum descent altitude/height (MDA/H) for circling. The runway environment includes features such as the runway threshold or approach lighting aids or other markings identifiable with the runway.

Aircraft Category	V _{at}	Initial Approach Speeds	Final Approach Speeds	Maximum Speeds for Visual Manoeuvring (Circling)
A	<91	90/150 (110*)	70/100	100
B	91/120	120/180 (140*)	85/130	135
C	121/140	160/240	115/160	180
D	141/165	185/250	130/185	205
E	166/210	185/250	155/230	240
H	N/A	70/120**	60/90***	N/A

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

Aircraft category	Obstacle clearance m (ft)	Lowest 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)

MISSED APPROACH PROCEDURE WHILE CIRCLING

If visual reference is lost while circling to land from an instrument approach, the missed approach specified for that particular procedure shall be followed. The transition from the visual (circling) maneuver to the missed approach should be ***initiated by a climbing turn, within the circling area, towards the landing runway***, to return to the circling altitude or higher, immediately followed by interception and execution of the missed approach procedure. The indicated airspeed during these maneuvers shall not exceed the maximum indicated airspeed associated with visual maneuvering.

CIRCLE-TO-LAND

Max Kts	MDA(H)	
180	880' (781')	3600m
205	880' (781')	4000m



NO # 2

Time = 00:02

³⁷⁵

*D
O
C*

*8
1
6
8*

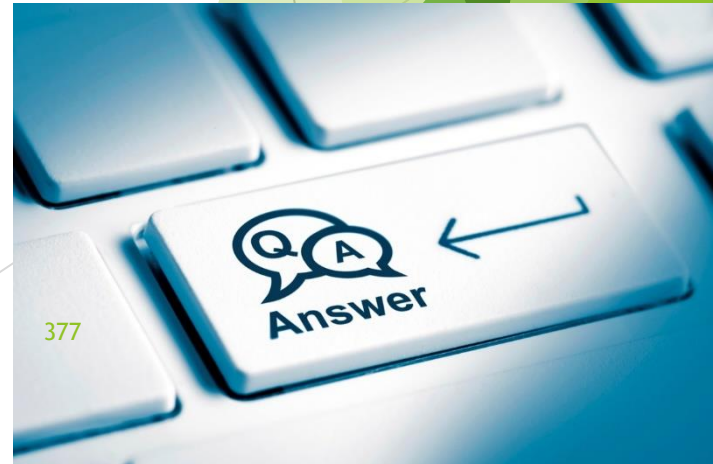
For a non-precision or circling approach, the Minimum Descent Height (MDH) cannot be lower than:

- A) 200 ft.
- B) The Obstacle Clearance Height (OCH).
- C) 350 ft.
- D) 400 ft.



For a non-precision or circling approach, the Minimum Descent Height (MDH) cannot be lower than:

- A) 200 ft.
- B) The Obstacle Clearance Height (OCH).
- C) 350 ft.
- D) 400 ft.



What is the minimum MOC for circling for CAT B?

- A) 320 ft
- B) 246 ft
- C) 295 ft
- D) 350 ft



What is the minimum MOC for circling for CAT B?

- A) 320 ft
- B) 246 ft
- C) **295 ft**
- D) 350 ft



Visual Approach

VisualApproach

Visual Approach

clearance for an *IFR* flight to execute a visual approach ***may be requested by a flight crew or initiated by the controller.*** In the latter case, the concurrence of the flight crew shall be required.

An IFR flight may be cleared to execute a visual approach provided that the pilot can maintain ***visual reference to the terrain and;***

- *the reported ceiling is at or above the level of the beginning of the initial approach segment for the aircraft so cleared; or*
- *the pilot reports at the level of the beginning of the initial approach segment or at any time during the instrument approach procedure that the meteorological conditions are such that with reasonable assurance a visual approach and landing can be completed.*

For successive visual approaches, ***separation shall be maintained by the controller until the pilot of a succeeding aircraft reports having the preceding aircraft in sight.*** The aircraft shall then be instructed to follow and maintain own separation from the preceding aircraft. When both aircraft are of a heavy wake turbulence category, or the preceding aircraft is of a heavier wake turbulence category than the following, and the distance between the aircraft is less than the appropriate wake turbulence minimum, the controller shall issue a caution of possible wake turbulence.

The pilot-in-command of the aircraft concerned shall be responsible for ensuring that the spacing from a preceding aircraft of a heavier wake turbulence category is acceptable. If it is determined that additional spacing is required, the flight crew shall inform the ATC unit accordingly, stating their requirements.

| 2.2 Visual approach within controlled airspaces

Visual approach is an approach by an IFR flight when either part or all of an instrument approach procedure is not completed and the approach is executed in visual reference to terrain.

Recommendation- This type of approach may be hazardous and careful consideration should be given by pilots before flying a visual approach in preference to an instrument approach.

2.2.1 A Controlled IFR flight may be cleared to execute a visual approach after commencing the instrument approach procedure (from the initial approach fix or where applicable, from the beginning of a defined arrival route (STAR)), provided that:

- a) The reported weather at aerodrome has a ceiling above the level of the beginning of the initial approach segment for the aircraft so cleared;
- b) The reported ground visibility is 3000 meters or more and;
- c) The pilot can maintain visual reference to the terrain and ensures that the meteorological conditions are such that with reasonable assurance a visual approach and landing can be completed.

Note1- A request for Visual Approach implies that the pilot can maintain visual reference to the terrain and landing can be completed so it is not necessary for the controller to verify it.

Note2- Execution of a visual approach to uncontrolled aerodrome which is located within a CTR is under the condition of controlled flights.

2.2.3 Controller should take into consideration the weather condition when it is expected that the ground visibility may become less than 3000 meters, before clearing or initiating a visual approach.

2.2.4 Controllers shall exercise caution in initiating a visual approach when there is reason to believe that the flight crew concerned is not familiar with the aerodrome and its surrounding terrain. Controllers should also take into consideration the prevailing traffic when initiating visual approaches.

2.2.5 Separation shall be provided between an aircraft cleared to execute a visual approach and other IFR and /or Special VFR aircraft.

2.2.7 A visual approach is not an IAP and therefore has no missed approach segment, If a go around is necessary for any reason under the reported ground visibility condition of less than 5 KM, aircraft operating at controlled airports will be issued an appropriate clearance/instruction by the air traffic controller to join the initial approach fix of the approach procedure which had already been cleared or any other fixes as appropriate.

2.2.8 In case of a go-around of a flight executing a visual approach under the reported ground visibility condition of 5 KM or more, it may be cleared by air traffic controller to join the aerodrome traffic circuit or may receive the ATC clearance/ instructions to join the initial approach fix of the approach procedure which had already been cleared or any other fixes as appropriate.

3.5 Visual Approach in Class G Airspace (visual arrival)

Note. Execution of Visual Approach in class G airspace is actually a Visual Arrival maneuver by an IFR flight under the specified conditions and shall not be considered as the same as the Visual Approach procedures in controlled airspaces.

3.5.1 Outside controlled airspace, IFR flights in receipt of any of the FIS is authorized to conduct a Visual Approach under the following conditions:

- a. Requested by pilot;
- b. The pilot reports at any time after commencing the instrument approach procedure that the visibility will permit a

visual approach and landing, and reasonable assurance exists that this can be accomplished.

- C. For the purpose of providing traffic information and alerting services, the pilot of the aircraft that are intended to execute a visual approach shall inform the aerodrome flight information service officers (AFISo) of the intention, the position of the flight, and the flight path to be followed, before commencing the Visual Approach.
- d. The AFIS unit is not an air traffic control unit therefore no separation shall be provided by that unit; (so) it is the responsibility of pilots using the service provided by this unit to maintain proper separation in conformity with the rules of the air.

Standard instrument departure



These procedures assume that all engines are operating. The design of an instrument departure procedure is, in general, dictated by the terrain surrounding the aerodrome, but may also be required to cater for ATC requirements (adjacent ATS routes, restricted, prohibited or danger areas and the proximity of other aerodromes). These factors in turn influence the type and position of navigation aids required to provide track guidance for the departure route.

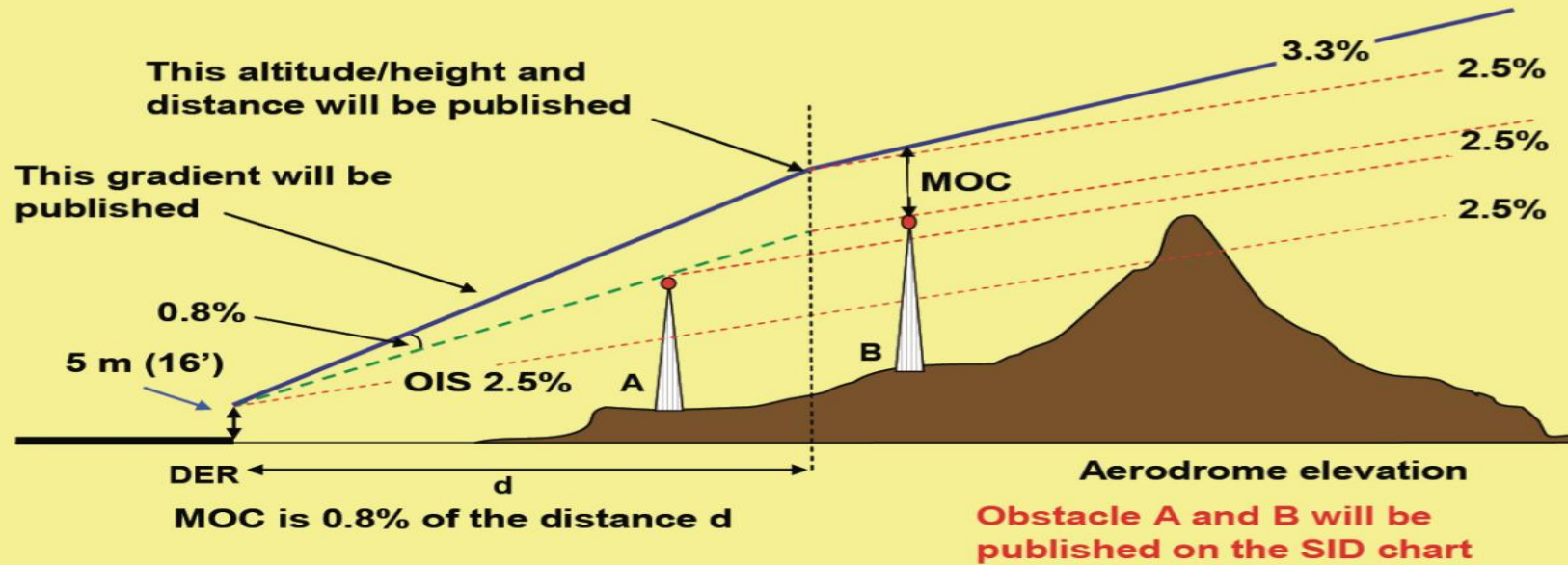
Airspace restrictions may also affect the position of navigation aids. From the pilot and operator point of view, the use of automatic take-off thrust control systems (ATTCS) and noise abatement procedures will need to be taken into account as well. Where no suitable navigation aid is available to provide specific track guidance, the criteria for omnidirectional (any direction) departures is applied. Wherever possible a straight departure will be specified, which is aligned with the runway. Where a departure route requires a turn of more than 15° to avoid an obstacle, a turning departure is constructed.

Where instrument departures are required, a departure procedure will be established for each runway to be used, and will define the procedure for the various categories of aircraft based on an all engines running PDG of 3.3%, or an increased PDG if required to achieve minimum obstacle clearance. The procedures assume that pilots will compensate for wind effects (known or estimated) when flying departure routes which are expressed as tracks to be made good. If radar vectoring is applied, pilots are required to fly the vector headings and not make allowance for the wind.

As already stated, obstacle clearance is a primary safety consideration in instrument departure procedures. Unless otherwise stated a PDG of 3.3% is assumed. The PDG is made up of 2.5% gradient of obstacle identification surfaces or the gradient based on the most critical obstacle penetrating these surfaces (whichever is higher), and 0.8% increasing obstacle clearance. Gradients published will be specified to an altitude/ height after which the minimum gradient of 3.3% is considered to exist.

The final PDG continues until obstacle clearance is ensured for the next phase of flight (en route, holding or approach). At this point the departure procedure ends and is marked by a significant point. The minimum obstacle clearance equals zero at the departure end of the runway (DER) and thereafter increases by 0.8% of the horizontal distance in the direction of flight, assuming maximum divergence of 15° . In the turn initiation area for a turning departure a minimum obstacle clearance of 90 m (295 ft) is provided. Increased obstacle clearance will be provided in mountainous terrain. If DME is available, additional height/distance information is made available.

Because of obstacle B the gradient cannot be reduced to 3.3% just after passing obstacle A. The altitude/height or fix at which the gradient in excess of 3.3% is no longer required will be published.



Procedure Design Gradient

Figure 7.3

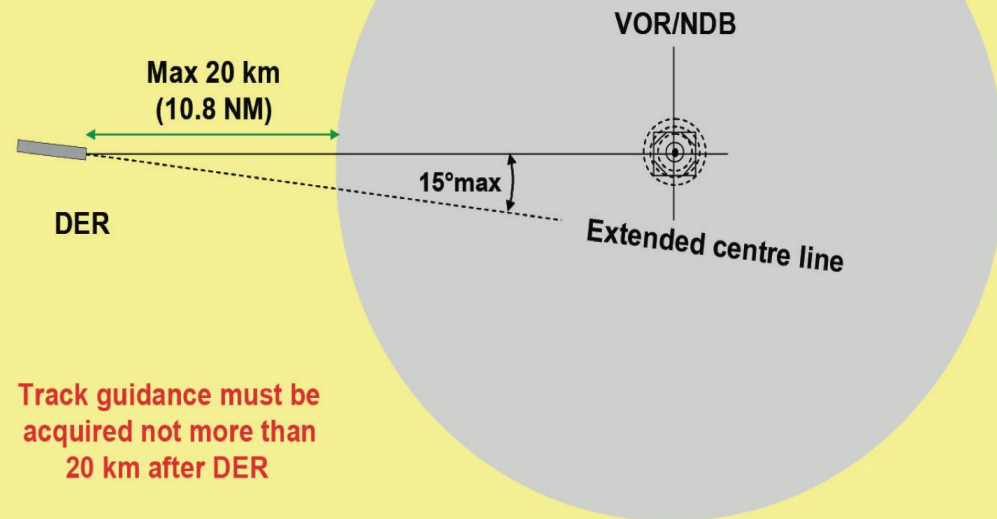
There are *two* basic types of departure route, *straight, or turning*.

Departure routes are based on track guidance acquired within 20 km (10.8 NM) from the end of the runway (DER) for straight departures, and within 10 km (5.4 NM) after completion of turns for turning departures.

When flying the route, the pilot is expected to correct for known wind and to remain within the protected airspace.

'Straight' Departure

No turns permitted more than 15° deviation from c/l



Track guidance must be acquired not more than 20 km after DER

Figure 7.5

Straight Departure

A straight departure is one in which the initial departure track is within 15° of the alignment of the runway. Track guidance may be provided by VOR, NDB or RNAV.

'Turning' Departure

Track guidance must be acquired not more than 10 km after the completion of the turn

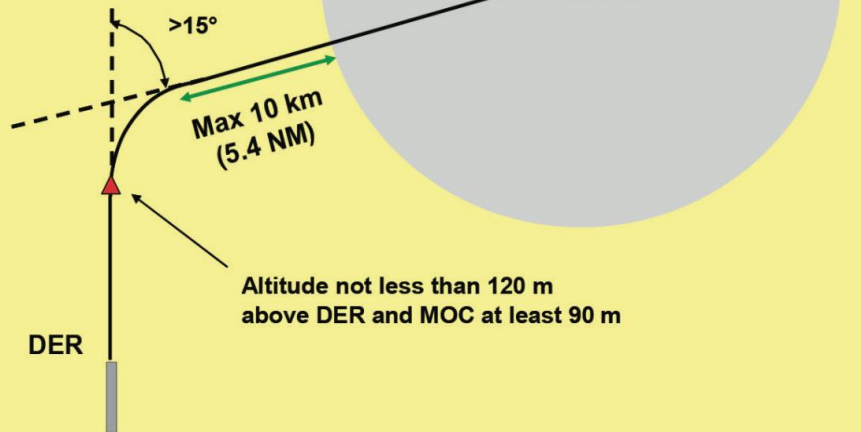


Figure 7.6

Turning Departure

If the departure track requires a **turn of more than 15°** , a turning area is constructed and the turn required is commenced upon reaching a specified altitude/height, or at a fix or at a facility (VOR, NDB etc...). ***Straight flight is assumed until reaching an altitude not less than 120 m (394 ft) above the elevation of the DER.***

Aeroplane Categories for Departure Procedures

Aeroplane Category	Max Speed km/h (kt)
A	225 (120)
B	305 (165)
C	490 (265)
D	540 (290)
E	560 (300)

Maximum speed for turning departures

Figure 7.7

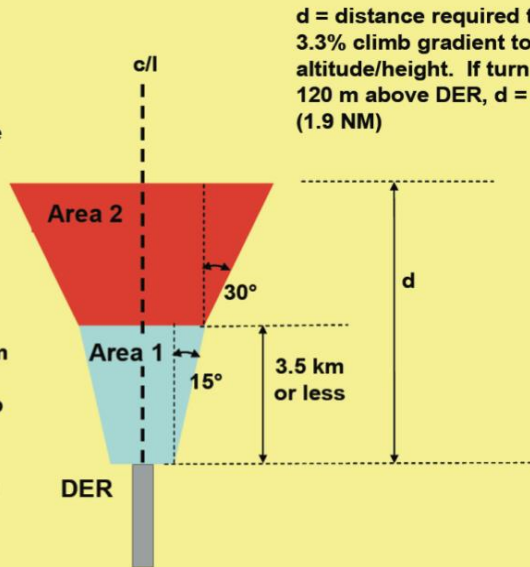
Omni-directional Departures

Where no track guidance is provided in the design of a departure procedure, the omni-directional method is used which basically provides for initial departure tracks to be undefined. In other words, once off the end of the runway and at a safe height, the aircraft can be navigated in any direction required to achieve the initial en route point. It may be that some sectors of the departure area may contain obstacles which preclude departures in that direction, in which case the published procedures will be annotated to show the restricted sectors. The basic procedure is that the aircraft will climb on the extended runway centre line to 120 m (394 ft) above aerodrome elevation before turns can be specified, and at least 90 m (295 ft) of obstacle clearance will be provided before turns greater than 15° can be specified.

Omni-directional Departure

Area 2 – where obstacles preclude turns at 120 m (394') a climb at 3.3% is required to the necessary OCA/H before turns can be made.

Area 1 – if no obstacles penetrate the OIS and 90 m (295') of obstacle clearance prevails, a climb to 120 m (394') will satisfy obstacle clearance requirements for any turn.



d = distance required to climb at 3.3% climb gradient to reach turn altitude/height. If turn height is 120 m above DER, $d = 3.5$ km (1.9 NM)

Figure 7.9

Turns will not commence within 600 m of the beginning of the runway. Where obstacles do not permit the development of omni-directional procedures, it is necessary to fly a departure route (straight or turning), or ensure that ceiling and visibility will permit obstacles to be avoided by visual means.



NO # 2

Time = 00:02

405

**D
O
C**

**8
1
6
8**

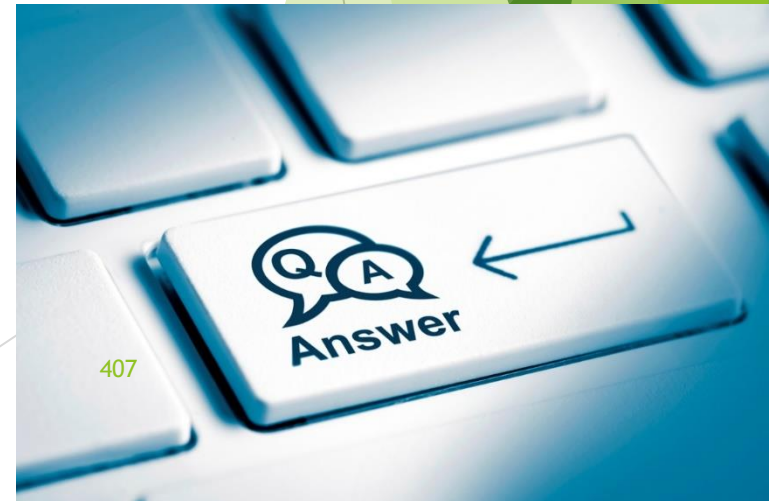
What is the maximum speed for CAT B during turning departure?

- A) 120 kts
- B) 290 kts
- C) 165 kts
- D) 300 kts



What is the maximum speed for CAT B during turning departure?

- A) 120 kts
- B) 290 kts
- C) **165 kts**
- D) 300 kts



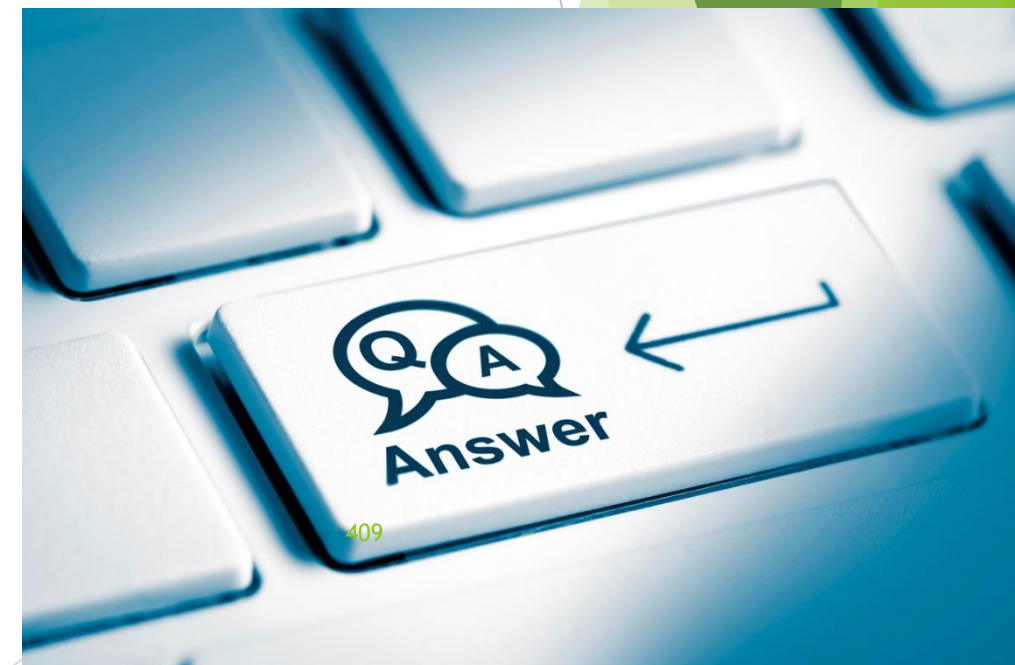
What is the minimum ROC during departure?

- A) 152 ft/NM
- B) 200 ft/NM
- C) 295 ft/NM
- D) 398 ft/NM



What is the minimum ROC during departure?

- A) 152 ft/NM
- B) 200 ft/NM
- C) 295 ft/NM
- D) 398 ft/NM





Good luck

***K.SHIRAZI
P.SHIRAZI
March 2020***