ATO ADRIANA AVIATION

INSTRUMENT RATING TRAINING STUDENTS HANDBOOK

FOR EXCLUSIVE USE OF

ATO ADRIANA AVIATION

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This Handbook was introduced for use in the ATO ADRIANA AVIATION by the order of Head of Training

Ordinance No. ………………………………….., dated ………………………….………..

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(HT Signature)

TABLE OF CONTENTS

I N T E N T I O N A L L Y

L E F T

B L A N K

1. INTOUDUCTION

Instrument flying allows you to fly in bad weather conditions. A pilot deprived of seeing of a natural horizon must determinate the position of his airplane by reference to instruments only. Instrument flight requires the following skills:

- distribution of attention in instrument tracking
- interpretation of instrument indications
- airplane control

REMEMBER : **During instrument flight, the pilot MUST TRUST what he sees on the instruments, what he reads from them, and NOT on his personal sensations.**

2. TRAINING STRUCTURE AND CONTAIN

IR training contain 2 modules:

- Module 1 – Basics of Instrument Flying
- Module 2 – IFR Procedures

In both modules, the first part of the training is conducted in a simulator (FNPT II), the second part on an airplane, according to training program. The information in this document applies to both simulator (FNPT II) and airplane training.

Module 1 consists of acquiring the knowledge and basic instrument flying skills listed below:

- scanning
- straight and level flight with power change for acceleration and deceleration
- straight climb and descent
- steep turns with bank angle 15°, 25° and 45°
- climbing and descending Rate 1 turns
- stall avoidance and upset recovery
- radial interceptions
- procedure turns
- base turns
- DME Arc

Module 2 consists of Instrument Flying Rules (IFR) procedures listed below:

- Standard Instrument Departure (SID)
- Altimeter Setting Procedures
- Holding Procedures
- En-RoutepProcedures
- Instrument Apprroaches
    - Standard Instrument Arrival (STAR)
    - Precision Approaches – 3D
    - Non-precision Approaches – 2D
    - Circling Approaches
    - Missed Approach Procedures

3. MODULE 1 – BASICS OF INSTRUMENT FLYING

3.1. Scanning

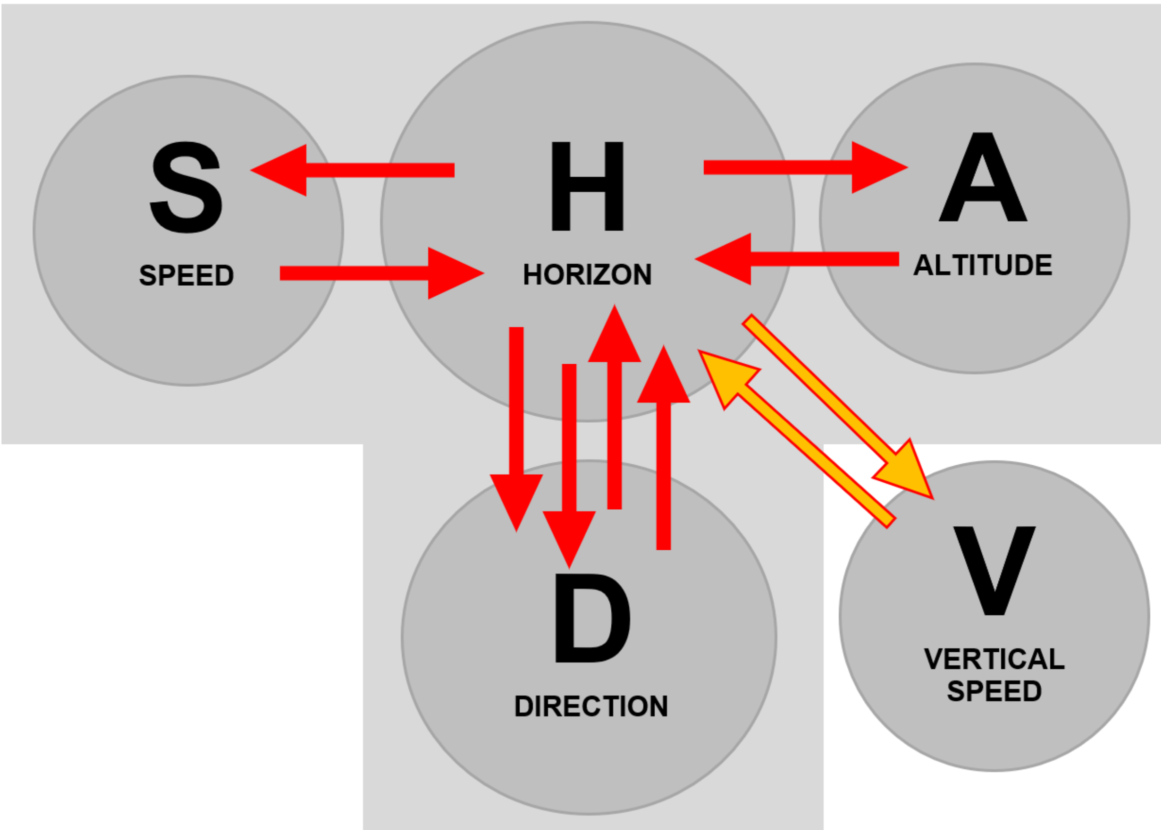
Correct scanning is the basis of instrument flights. Proper scanning sequences are shown below:

- Level flight

  H ↓ D ↑ H ↓ D ↑ H → A ← H ↓ D ↑ H ← S → H

- Climbing and descending

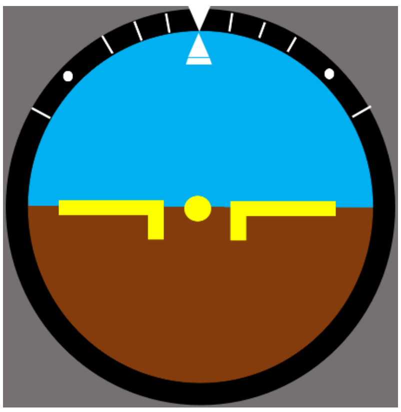
  H ↓ D ↑ H ↙ V ↖ H ↓ D ↑ H → A ← H ↓ D ↑ H → S ← H



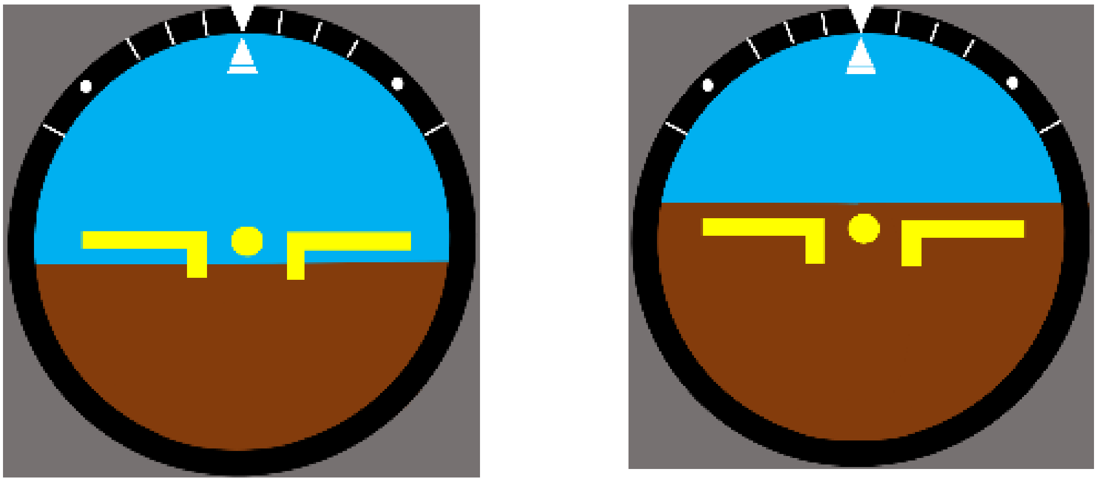
3.2. Straight and level flight with power change for acceleration and deceleration

For straight and level flight scan instruments and maintain aircraft symbol in central position, on the horizon line.

REMEMBER: **Each power change involves attitude change, so pilot's input to controls is needed. Move power lever gently, it will be easier to keep required parameters.**



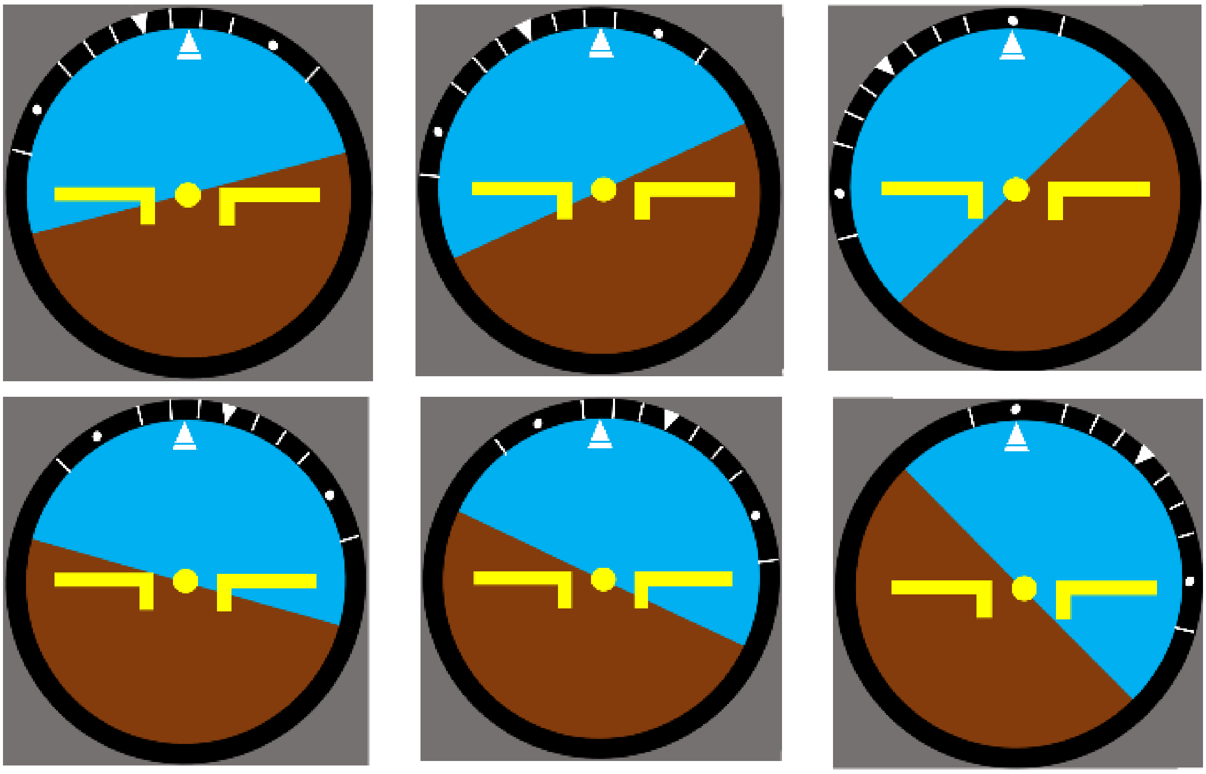
3.3. Straight climb and descent



Climb and descent need pitch changes. Each change in pitch results in speed change. To maintain constant speed during climbing and descending, power setting changes are required. In this case, as presented before, scanning must be expanded to include vertical speed indications.

NOTE : Standard ROC (rate of climb) and ROD (rate of descent) for instrument training is 500 ft per minute.

3.4. Steep turns with bank angle 15°, 25° and 45°, roll-out onto predetermined headings



Steep turns are 360° left or right turns at a desired altitude, with constant speed, angular speed and constant bank angle e .g. 15°, 25° and 45°.

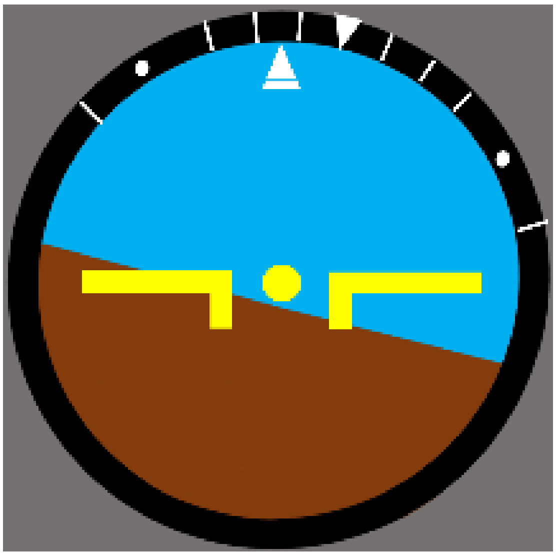
How to do it properly?:

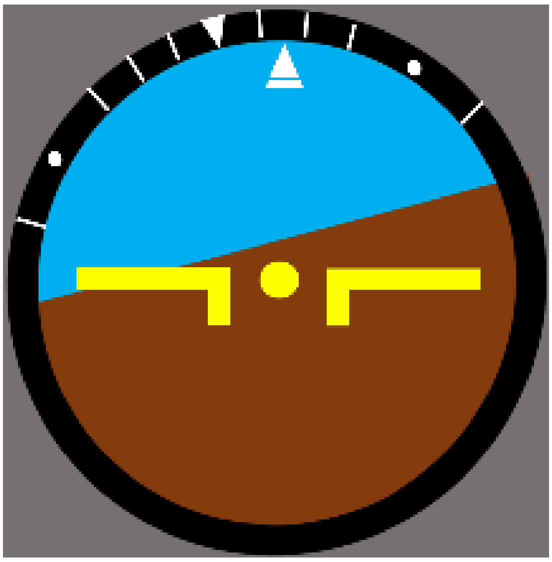
- establish straight and level flight with cruise power on a desired heading;
- start turn left or right;
- maintain constant altitude, constant angular speed and constant bank angle;
- if the desired bank is grater then 30°, add more power, when crossing bank value of 30°;
- when approaching the desired heading, begin to reduce the bank angle;
- reduce power, when crossing 30° bank;
- establish straight and level flight with cruise power and on a desired heading.

During turns, check carefully the „ball” or slip / skid indicator position for good turn coordination.

REMEMBER: **Improper position of this indicator will involve attitude deviation soon.**

3.5. Climb and descent Rate 1 turns





Rate 1 turn is a turn with direction change of 3° per one second, so one full orbit takes 2 minutes, 180° turn – 1 minute, 90° turn - 30 sec etc.

During climb and descent Rate 1 turns, one 360° turn with ROC or ROD 500 ft/min changing altitude by 1000 ft, 180° - 500 ft, 90° - 250 ft etc.

Rate 1 turn bank angle depends on airspeed, according to formula;

Bank angle = IAS [kt] / 10 + 7

For IAS = 80 kt it is 15°, for IAS = 100 kt it is 17° etc.

3.6. Upset recovery:

Upset is an event that unintentionally exceeds the parameters normally experienced in flight or flight training. These parameters are:

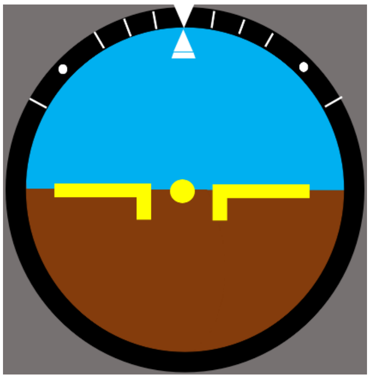
- pitch attitude greater than 25° nose up;
- pitch attitude greater than 10° nose down;
- bank angle greater than 45°;
- within the above parameters, but flying at airspeeds inappropriate for the given conditions.

Doing this exercise, the instructor first takes control of the airplane and places it an abnormal attitude, On the instructor's signal, the student takes over the control of the airplane and brings it to its normal position, according to the rules presented below.

UPSET REOVERY			
When Nose is **UP, Airspeed Low**		When Nose is **DOWN, Airspeed High**	
	Apply full power Keep banking, let the nose drop to the horizon		Reduce power to idle Roll wings level
	Roll wings level		Raise nose to level flight
	Adjust power		Adjust Power

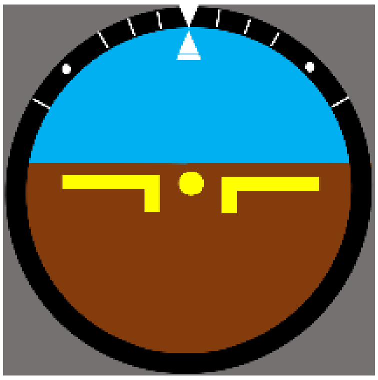
3.7. Recognition of, and recovery from, incipient and full stalls

Before starting the stall practice remind the pitch in different configurations as below:



Power ON,

Straight and level flight



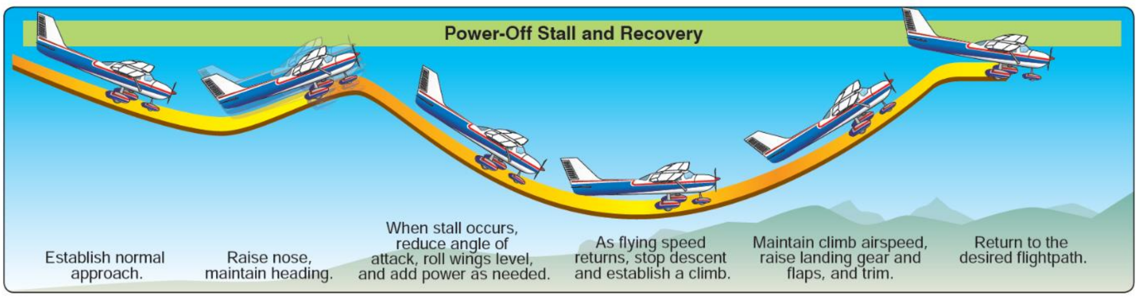
Power OFF, Constant Hdg,
Speed = Vy

Stalls occur when the airplane increases angle of attack beyond the critical angle of attack, then lift starts to decrease, and aircraft's nose drops down.

Perform the exercises as described below. In IFR flight, your reference point are the airplane's instruments, especially the artificial horizon.

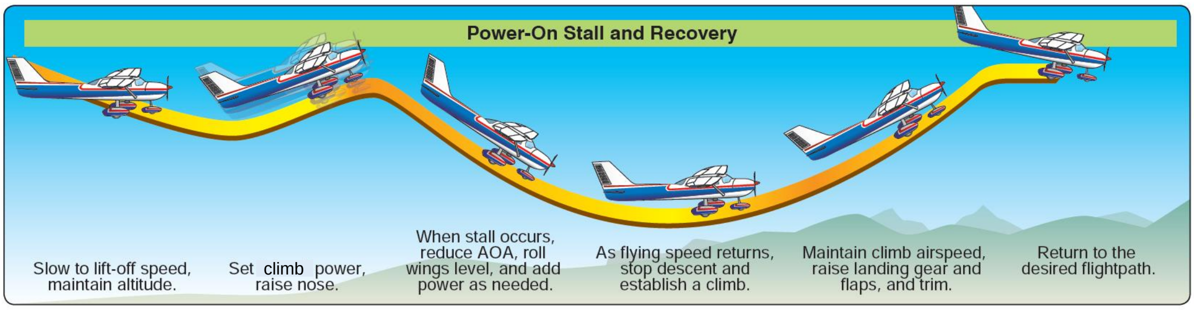
<u>Full stall, Power OFF</u>

- ➢ establish straight and level flight with cruise power, on a desired heading;
- ➢ reduce power to idle, confirm the landing configuration, establish normal approach speed;
- ➢ smoothly raise the airplane's nose to an attitude that induces a stall;
- ➢ maintain the pitch, wings level and heading till stall occur, and then
- ➢ reduce AOA by applying nose-down control input, as necessary to eliminate the stall warning (check pitch down as on the picture above);
- ➢ maintain pitch down, wings level and constant heading, and then apply power as needed;
- ➢ when safe speed returns, stop the descent and start climbing to the desired altitude (if required);
- ➢ clean aircraft configuration;
- ➢ return to the straight and level flight with cruise power, on the desired heading.



Full stall, Power ON

- establish straight and level flight with appropriate cruise power, on a desired heading;
- reduce power, set landing configuration, slow down to the lift-off speed and maintain constant altitude;
- raise the airplane's nose and set the climb power;
- maintain desired pitch, wings level and heading till the stall occur, and then
- reduce AOA applying nose-down control input as necessary to eliminate the stall warning;
- maintain pitch down, wings level and heading and then apply power as needed;
- when safe speed returns, stop the descent and start climbing if necessary;
- clean the aircraft configuration;
- return to the straight and level flight with cruise power, on the desired heading.



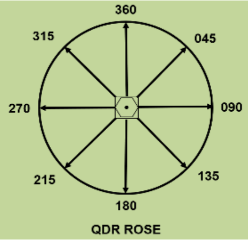
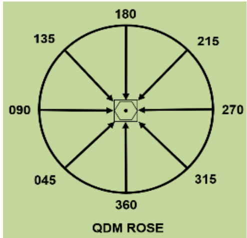
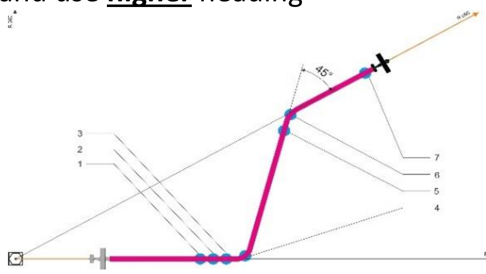
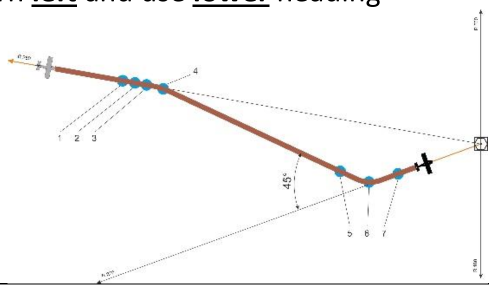
Approaches to Stalls (Impending Stalls)

An impending stall occurs when the airplane is approaching, but does not exceed the critical AOA. Pilot initiates recovery at the first indication, such as by a stall warning device activation or pre-stall buffet warning.

Approach to stall in landing configuration, Power ON:

- establish straight and level flight with cruise power, on desired heading;
- reduce power to idle, confirm the landing configuration, establish normal approach speed and maintain altitude;
- raise the airplane's nose and set climb power;
- maintain pitch, wings level and heading till stall warning device be activate, and then
- reduce AOA applying nose-down control input as necessary to eliminate the stall warning;
- level the wings with ailerons, coordinate with rudder and then apply power as needed;
- when safe speed returns, stop the descent and start climbing to the desired altitude (if required);
- clean aircraft configuration;
- return to straight and level flight with cruise power, on desired heading.

3.8. Radial interceptions

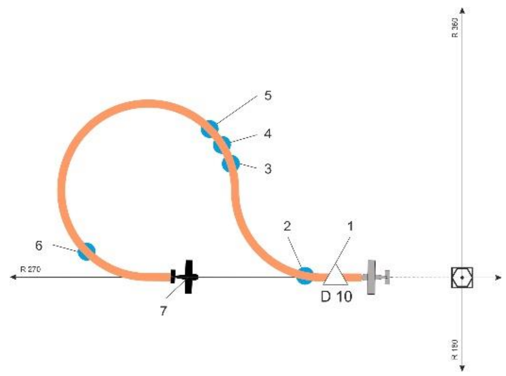
<table>
<tr><td>RADIAL (RADIAL OUTBOUND)</td><td>RADIAL INBOUND</td></tr>
<tr><td>It is
magnetic bearing outbound
<u>FROM</u> a VOR to airplane
It is equal to QDR
11 
</td><td>We can assume that is
magnetic bearing inbound
from airplane <u>TO</u> a VOR
It is equal to QDM

</td></tr>
<tr><td colspan="2">Interceptions</td></tr>
<tr><td colspan="2">1. Determine the Radial / Radial Inbound on which the airplane is located now</td></tr>
<tr><td colspan="2">2. Calculate the difference between the new Radial to be intercepted and the Radial on which the airplane is located now, and determinate the method
• „45” - when the difference between Radials is in the range of 0-30°, use 45° angle for intercepting
• „90/45” - when the difference between Radials is in the range of 30 - 70°, use 90° and next 45° angle for intercepting
• „Through the station" - when the difference between Radial is greater than 70°</td></tr>
<tr><td colspan="2">3. Calculate the heading for interception („45” method)</td></tr>
<tr><td>When intercepting Radial is <u>smaller</u> than the one you are on,
it is to the <u>left</u>,
so the heading you will take to intercept it will be 45° <u>lower</u> than new intercepting Radial,
similarly for the <u>bigger</u> Radial - turn <u>right</u> and use <u>higher</u> heading

</td><td>When intercepting Radial Inbound is <u>smaller</u> than the one you are on,
it is to the <u>right</u>,
so the heading you will take to intercept it will be 45° <u>higher</u> than new intercepting Radial Inbound,
similarly for the <u>bigger</u> Radial Inb. - turn <u>left</u> and use <u>lower</u> heading

</td></tr>
<tr><td colspan="2">4. Turn to the calculated interception heading and maintain it for interception</td></tr>
<tr><td colspan="2">5. Observe „Needle” moving on Course Deviation Scale
and when approaching central position -</td></tr>
<tr><td colspan="2">6. Start turning to the ”Arrowhead”</td></tr>
<tr><td>7. Maintain intercepted
Radial, flying <u>FROM</u> <u>a VOR</u></td><td>7. Maintain intercepted
Radial Inbound, flying <u>TO</u> <u>a VOR</u></td></tr>
</table>

3.9. Procedure turns

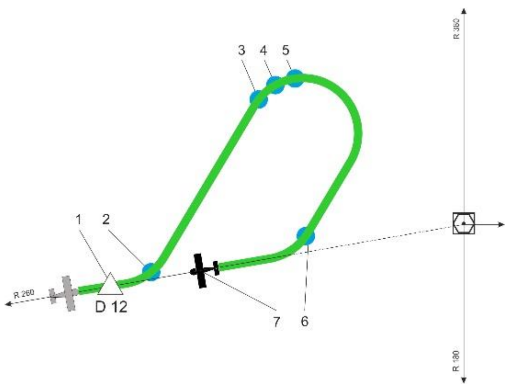
Procedure turns have been established for instrument approaches to reverse the aircraft's flight direction. They are created based on a facility (VOR, NDB) or a FIX determined by the direction and distance or time from NAV aid/FIX. They usually have a specific Outbound Track, Outbound time or distance, and Inbound Track.

The following procedure turns are in use:

- The 80/260 Procedure Turn consists of two turns:
  - the first by 80°, and immediately after reaching
  - the second by 260° in the opposite direction, to intercept the required course



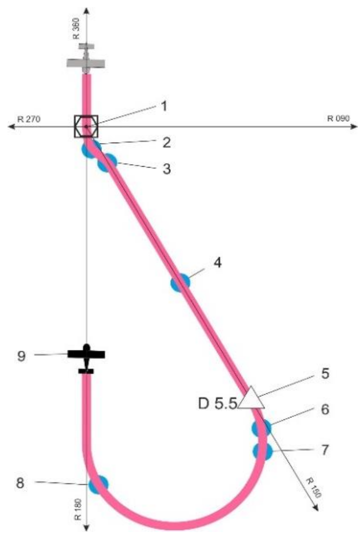
- The 45/180 Procedure Turn involves three turns:
  - the first by 45°,
  - the second, a minute after strart timming, by 180° in the opposite direction, then
  - the third by 45° in the same direction, for intercepting required Radial (Inbound Track)



3.10. Base turn

The base turn start at NAV aid or FIX and consists of:

- deviation by a certain angle,
- Outbound in a straight line (i.e. Radial) for a specific time or distance,
- the turn in the opposite direction to the previous deviation,
- interception a required Radial (Inbound Track), and
- arrive to this NAV aid or FIX



3.11. DME Arc

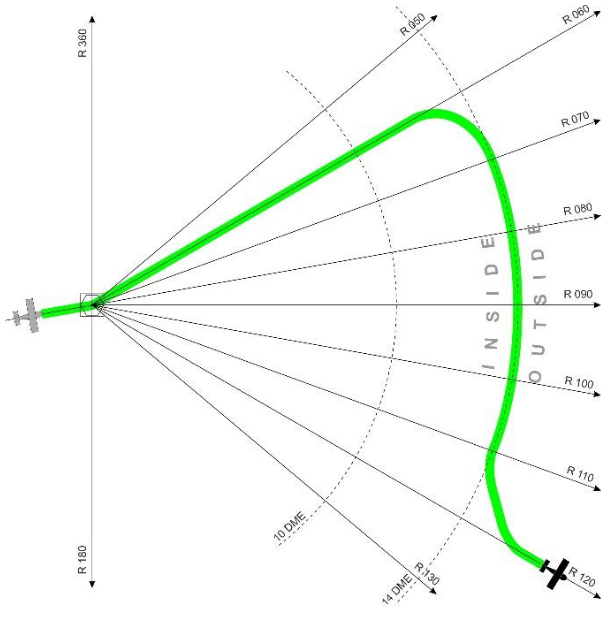
DME Arcs are sometimes used as Initial Approach Procedures

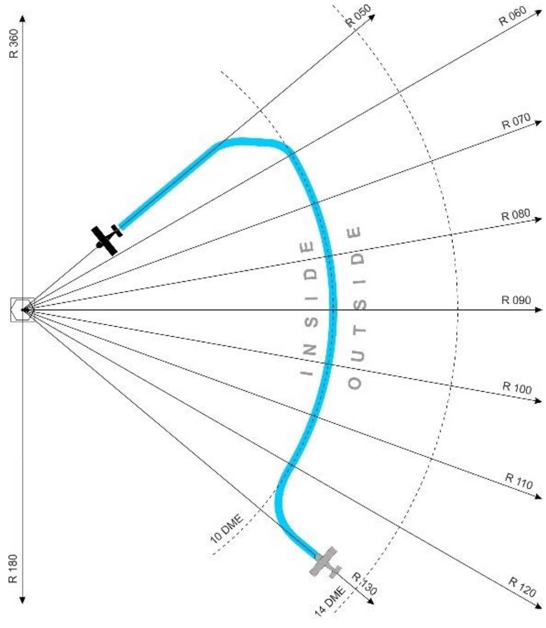
They require DME equipment in conjunction with VOR and HSI

When flying on a DME Arc it is important to maintain continuous mental picture of your position on the arc relative to the VOR station

3.11.1. DME Arc rules

1. Set VOR/DME frequency and check signal
2. You can join the DME Arc flying Outbound and Inbound VOR
3. Interception of DME Arcs require initial turn of 90°
4. To specify the Arc as „RIGHT” or „LEFT”, look **FROM** VOR:
   - in „RIGHT” Arc - crossing Radials will be increased
   - in „LEFT” Arc - crossing Radials will be decreased
   - flying Outbound and turning right, you are joining „RIGHT” Arc
   - flying Inbound and turning right, you are joining „LEFT” Arc
5. On the Arc maintain required DME distance +/- 0,5 NM
6. When present DME distance is <u>bigger</u> than required, set Heading Bug and turn <u>„Inside”</u> Arc, (to the TO/FROM triangle **<u>TOP</u>**)
7. When present DME distance is <u>smaller</u> than required, set Heading Bug and turn <u>„Outside”</u> Arc (to the TO/FROM triangle **<u>BASE</u>**)
8. On Arc always keep „Arrowhead” on **FROM** position (or „Outside”)
9. To leave a DME Arc and intercept a desired Radial, start turning when the airplane is 10° before the required radial, using “45” method





3.11.2. Flying DME Arc

- Start „Rate 1” initial turn about 1 NM before required DME Arc distance
- Set „Arrowhead” to the next 10° right or left on desired direction,
  (greater for „RIGHT” Arc, smaller for „LEFT” Arc)
- Set HB perpendicular to the „Needle”
- Reaching 90° turn, check and, if needed, correct required distance
  - if smaller – turn „Outside”
  - when greater – turn „Inside”
- When the „Needle” reaches its central position on Course Deviation Scale, set „Arrowhead” to the next 10° and HB perpendicular to the „Needle”
- On lower distances i.e. 6 NM, set „Arrowhead” to the next 20° due to short distances between Radials

I N T E N T I O N A L L Y

L E F T

B L A N K

I N T E N T I O N A L L Y

L E F T

B L A N K

4. MODULE 2 – IFR PROCEDURES

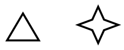
The first flights in Module 2, according to training program, are devoid of en-route segment. After departure via SID or Tower clearance, holding and approach procedures are trained. In second part of this module cross-country flights are introduced.

4.1. FLIGHT PREPARATION

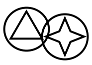
Flight preparation for IFR flight is generally the same as for VFR flights in controlled airspace, however some aspects of IFR flights require additional knowledge.

One of those requirements is pilots' familiarity with Jeppesen Airway Manual. This publication contains information necessary to perform IFR flights, including airport layouts, arrival and departure procedures, airways, etc., therefore it is very important to familiarize yourself with the symbols used in maps and airport charts (see Jeppesen Airway Manual, Introduction, Chart Legend).

REMEMBER:

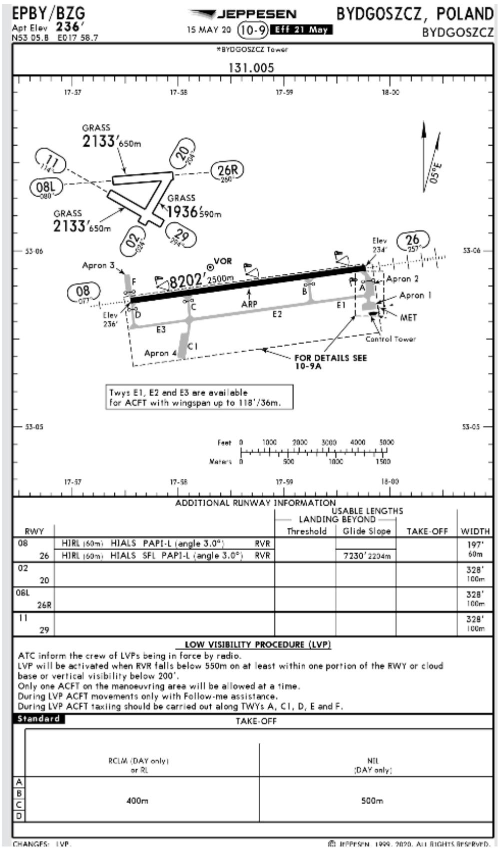


Fly-by waypoint. A waypoint which requires turn anticipation to allow tangential interception of the next segment of a route or procedure, or



Flyover waypoint. A waypoint at which a turn is initiated in order to join the next segment of a route or procedure.

Runway/airport information i s described on chart 10-9. We can find there: radios frequencies (e.g. TWR, ATIS) runway length and width, information on runway lighting system and approach lights, layout of taxiways, aprons, location of the tower, weather office; take-off minima and details of low visibility procedures (LVP).



NOTE: At the bottom of this chart, Take-Off minimas are presented. They apply to IFR flights only.

Be aware that take-off minima are lower than those required for landing at the given airport. Pilots should take that into account when departing in poor weather.

REMEMBER: **In flight preparation:**

- **check validity of GPS database and RAIM**
- **check signal/availability of expected NAV aids (in NOTAM)**
- **compare GPS SID points versus SID chart points**

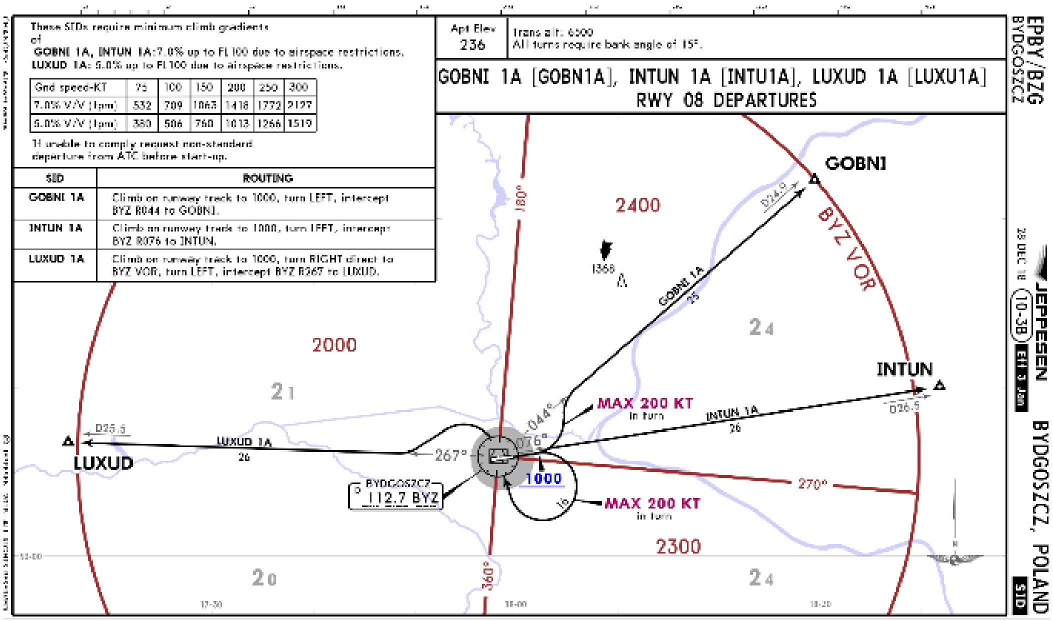
4.2. DEPARTURE

Aeroplanes departing from an airport usually follow published SID procedures. Executing an SID pilots should adhere to altitude, speed, bank etc. restrictions and minimum climb gradients, descreibed on the chart.

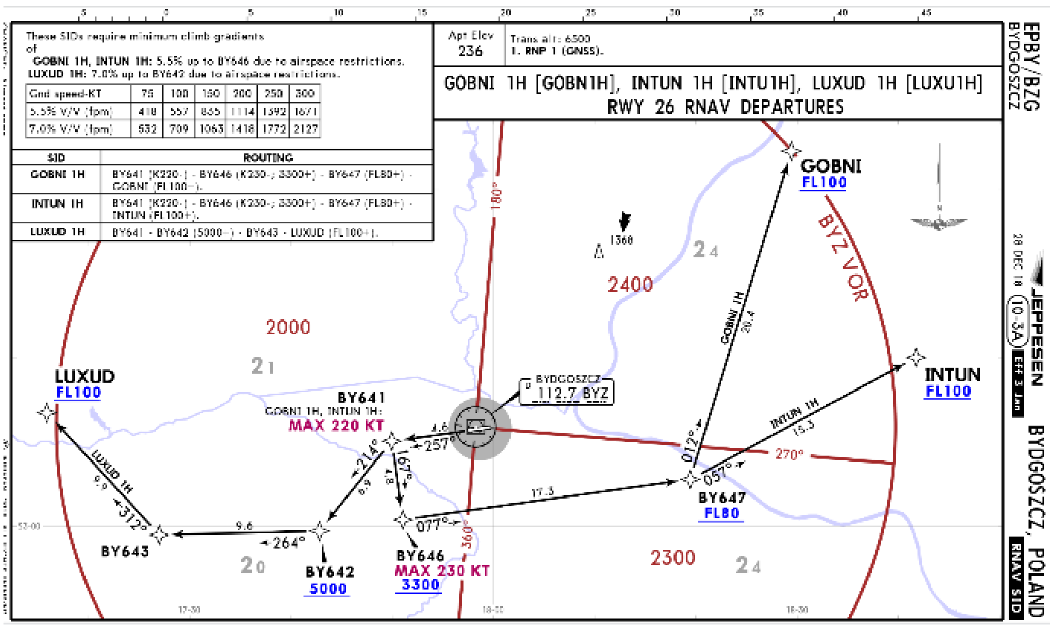
Standard Instrument Departure (SID) procedure links the aerodrome or a specified runway with a significant point, normally on a designated ATS route, usually at the TMA boundary, at which the en-route phase of a flight commences.

SIDs may be executed based on:

➢ VOR (see Jeppesen chart EPBY 10-3B) or



➢ GNSS (see Jeppesen chart EPBY 10-3A).



Sometimes ATC gives different departure clearance. In that case always follow the ATC instructions.

Departing airplanes maintain communication with BYDGOSZCZ TOWER within CTR/TMA, and next change frequency to WARSZAWA RADAR or GDAŃSK APPROACH (controlled airspace); or GDAŃSK INFORMATION (outside controlled airspace).

NOTE: At certain controlled aerodromes (e.g. EPGD, EPPO, EPWA) the APPROACH service is provided on a separate frequency. In that case, after departure, change the radio frequency and call APPROACH; provide your call sign and present altitude.

DEPARTURE – SUMMARY:

1. Copy ATIS (if available).
2. On first contact with TWR/GND/DELIVERY report stand number, ATIS information code (if received, OR - ask for departure information).
3. Report *"READY TO COPY ATC CLEARANCE"* .
4. Note and read back ATC clearance.
5. Do the BEFORE ENGINE START checklist and request engine start clearance.
6. Conduct STARTING ENGINE procedure.
7. Enter the flight plan route to the GPS, set COM and NAV frequencies, identify NAV aids.
8. Conduct the TAKE OFF briefing.
9. Do the BEFORE TAXI checklist.
10. Request taxi clearance.
11. Note block off time, set taxi light ON, start taxi and do the TAXI checklist.
12. Report at the HOLDING point of the RWY in use.
13. Perform an engine RUN-UP .
14. When ready, report *"READY FOR DEPARTURE".*
15. Line up the RWY and do the LINE UP checklist,
16. When cleared for take-off: landing light ON, timer ON, adjust full throttle, and maintain runway center line.
17. At the proper speed rotate airplane; when positive climb, apply brakes and select gear up.
18. At 400ft + Airport elevation, do the FLOW followed by the AFTER TAKE-OFF checklist.
19. At a suitable time note TAKE-OFF time.
20. Contact Approach if required, report callsign and present altitude.
21. Proceed via the Standard Instrument Departure procedure, or ATC clearance.

4.3. ALTIMETER SETTING PROCEDURES

Procedures for altimeter setting describe methods which are to be used to ensure proper vertical separation between aeroplanes and safe clearance of terrain during all phases of a flight. The procedures are based on the following basic principles:

After departure, below or at the transition altitude, an aeroplane is flying at altitudes determined by altimeters set to QNH, and its position in the vertical plane is expressed in units of altitude – feet, e.g. 3000 ft above the mean sea level.

Climbing through the Transition Altitude (the highest existing altitude), the altimeter setting is changed to Standard (STD) 1013.2 hPa and the airplane's position in the vertical plane is determined as Flight Levels (e.g. FL90 = 9000 feet on the altimeter set to 1013.2 hPa).

In descent, the altimeter setting is changed to QNH at the lowest existing Flight Level, the Transition Level.

After departure, when you receive clearance for climb above transition altitude (e.g. *"CLIMB FL 100"*) you may set standard air pressure 1013 hPa on the altimeter, if you are above Minimum Save Altitude.

When you are above the Transition Level and receive a clearance for descent below it (e.g. *"…DESCENT 4000 ft, QNH 1005"*), you may set the local QNH, but be aware, in case of *"…STOP DESCENT…"* clearance above the Transition Level, you have to change the altimeter setting back to STD. In descents it is recommended to change the altimeter setting close to the Transition Level.

REMEMBER:

- **On the ground, altimeter set to local QNH value shows the airport elevation.**
- **Transition altitude is the altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes (based on QNH). In Warsaw FIR the TA is equal to 6500 ft.**
- **Transition layer is the airspace between the transition altitude and the transition level. The thickness of this layer depends on the difference between the actual QNH pressure and the standard pressure.**
- **Transition level is the lowest flight level available for use above the transition altitude. In FIR Warszawa it is FL 80 or (in case of low air pressure) FL 90, always check the ATS information.**

I N T E N T I O N A L L Y

L E F T

B L A N K

4.4. HOLDING PROCEDURE

4.4.1. Basic holding parameters

Holding procedure is a predetermined maneuver which keeps the aircraft within a specified airspace while awaiting further clearance. Basic holding parameters are shown in the picture below.

Each Holding consists of:

F – Fix:

VOR, NDB,

Rad/Dist,

RNAV point

L – Level:

Flight Level or

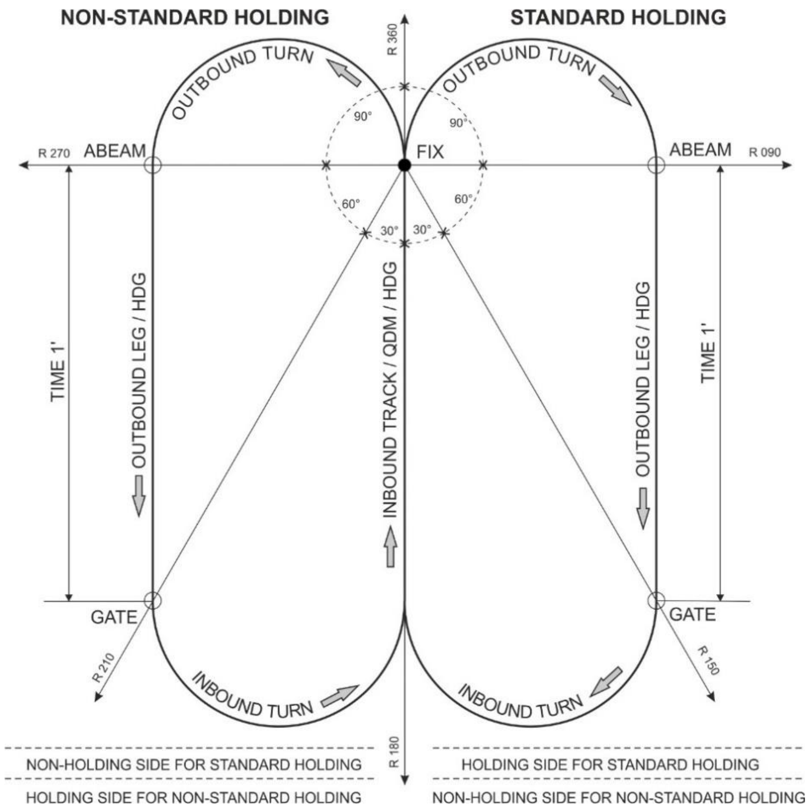
Altitude

I – Inbound Track /

QDM / HDG

R – Right or Left turns

T – Time for Outbound Leg

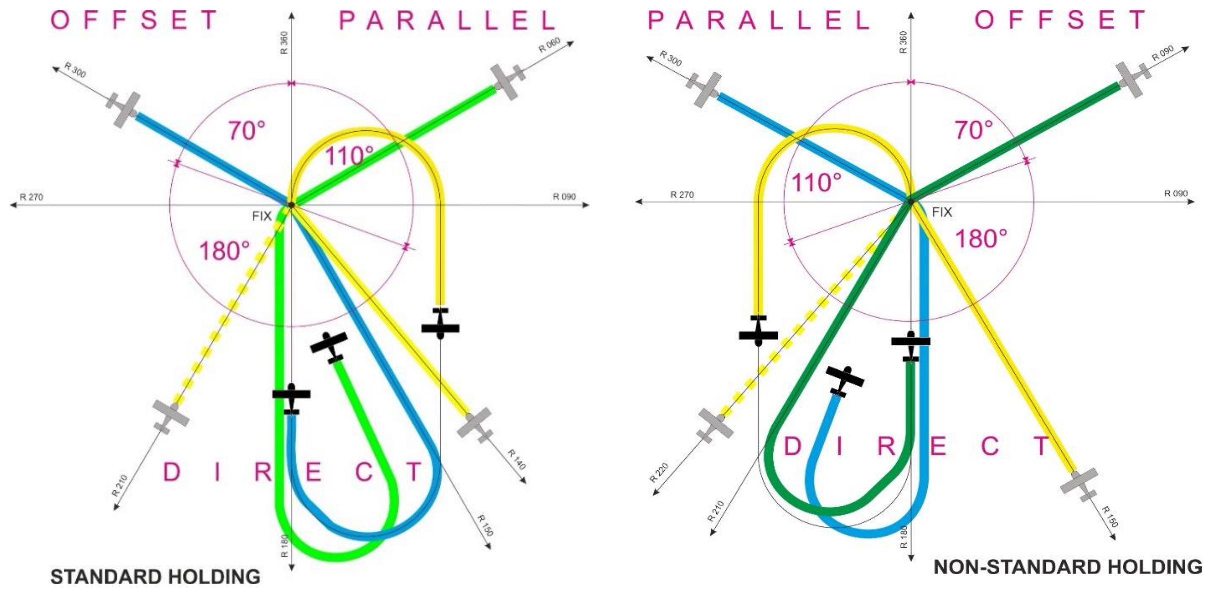


4.4.2. Execution of holding

1. When passing the FIX, use the 5 – T Rule:
   - start timing
   - start a „Rate 1” Outbound Turn: right (STD) or left (N-STD)
   - set the „Arrowhead” to the ABEAM Radial
   - set Heading Bug to Outbound Heading and continue Outbound Turn to the ABEAM
2. When reaching the ABEAM:
   - start timing
   - set the „Arrowhead” to the GATE Radial
   - continue flying towards the GATE
3. When reaching the GATE:
   - start a „Rate 1” Inbound Turn: right (STD) or left (N-STD)
   - set the „Arrowhead” to the Inbound Track
   - set Heading Bug to the „Needle” side ±45° and continue Inbound Turn for Interception
4. When intercept Inbound Track continue fly to FIX

4.4.3. Methods of entry

The method of entry depends on the Inbound Track and the type of holding. There are three methods presented in the following pictures:



DIRECT ENTRY (yellow line): (sector 180°) – after passing FIX, start a „Rate 1” Outbound Turn according to holding type (STD – right, N-STD – left) to the ABEAM and continue via the GATE, Inbound Turn, Inbound Track to the FIX.

OFFSET ENTRY, “TEARDROP” (blue line): (sector 70°) – after passing the FIX, Intercept Radial to the GATE and fly 1’ 10”, then start a „Rate 1” Outbound Turn for interception of the Inbound Track to the FIX.

PARALLEL ENTRY (green line): (sector 110°) – after passing the FIX, turn on Outbound Heading and fly on the Non-Holding Side for 1’ 00” parallel to the Inbound Track, then turn to the Holding Side (opposite to the type of holding: Standard holding – left, Non-Standard – right), fly directly to the FIX or intercept the Inbound Track, and then take a Direct Entry for holding.

I N T E N T I O N A L L Y

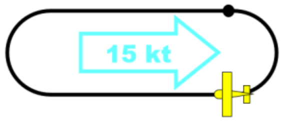
L E F T

B L A N K

4.4.4. Wind corrections

Wind always has a big influence on holding, so proper wind correction should be used

- <u>In case of head / tail wind:</u>
  - **increase** the Outbound Time by 1sec per 1kt of **headwind**
  - **reduce** the Outbound Time by 1sec per 1kt of **tailwind**

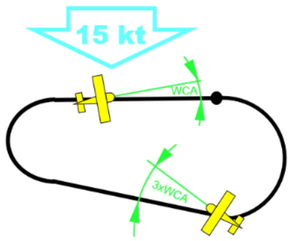


1 min + 15 sec = 75 sec

1 min - 20 sec = 40 sec

- <u>In case of cross wind:</u>
  - determine **WCA** on Inbound Leg
  - apply **triple WCA** (max 30°)
  - correct into wind on the Outbound Leg

NOTE : If you reach the GATE Radial before expected time, intercept and fly on this Radial, until the time elapses.



W = 15kt
IAS = 110kt (15 x 60) : 110 = 8
WCA = 8° 3 x 8 = 24
3 x WCA = 24°

4.4.5. Holding summary

When use of a holding procedure is needed, follow the sequence below:

1. Determine the Method of Entry
2. Specify the entry maneuver after passing the FIX:
   - Direct entry – Take a „Rate 1" Outbound Turn to the ABEAM
   - Offset entry (Teardrop) – Intercept Radial to the GATE and fly for 1' 10"
   - Parallel entry – Turn to the Outbound Track and fly for 1' 00"
3. Determine the directions of the next turns after passing the FIX:
   - Direct and Offset entry – all turns according to type of Holding:
     - for Standard holding – right turns
     - for Non-Standard holding – left turns
   - Parallel entry – first turn opposite to the Holding type, next – according to:
     - for Standard holding: first to the left, then all to the right
     - for Non-standard holding: first to the right, then all to the left
4. Calculate the ABEAM and GATE Radials:
   - for Standard holding: Inbound Track + 90° (ABEAM) + 60° (GATE)
   - for Non-Standard holding: Inbound Track – 90° (ABEAM) – 60° (GATE)

4.5. EN-ROUTE PROCEDURES

Information presented in point 1.3.8. page 1-17 in the scope of leveling off, cruise checklist and filling NAV log, also applies to IFR flights.

REMEMBER: Cruise check should be performed at least every 10 minutes or after changing flight parameters (heading, altitude, power setting).

When changing the ATC frequency, at first contact report your call sign and present flight level (or altitude, if applicable).

If ATC ask "*REPORT POSITION* ", report altitude and NAV aid/NAV point/Fix sector in regard of geographical North e.g. North-West BYZ, South-East NUDMO

For IFR flights, landing condition information or ATIS should be recorded before the Top of Descent. If the weather conditions are not good enough for landing, consider diversion to an alternate airport. If weather conditions are good enough, knowing runway in use and expected arrival and approach procedure, perform the APPROACH BRIEFING.

When RNP approach is expected, 30NM inbound the destination airport check status of the system and satellite coverage. If LPV approach is to be used, check that appropriate SBAS is on. Make a RAIM prediction, revise ETA within the Prediction Window and then perform the APPROACH BRIEFING.

Approach briefings should consist of:

- Relevant information from the Instrument Approach Chart
- Runway information (length, width, type of lighting available) - if required
- Expected airplane configuration and speeds
- Any extra information, if needed (e.g. thunderstorm activity, slippery runway etc.)

All runway information is presented on chart 10-9, see page 8-09.

NOTE: Brief the Landing Distance Available, runway lights and max speed ONLY if they are a factor. There is NO point to brief lights system for CAVOK, daylight conditions, or speed below 220 kt for C-172 with V_{NE} 160 kt.

REMEMBER: Always check signals generated by the NAV aids expected for use during the approach. Compare GPS STAR points versus STAR chart points.

REMEMBER: All of the avionics, other systems and minima should be set correctly before starting the brief, in order to allow for cross-checks!

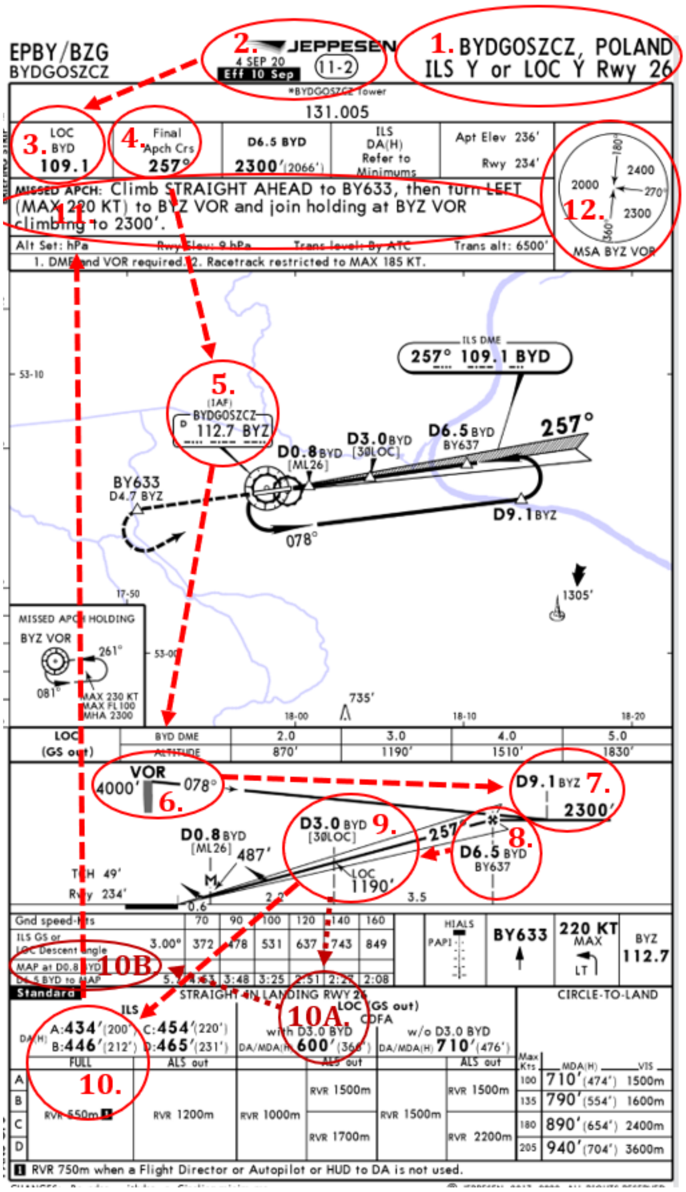
After reaching the transition level and setting the altimeters to the destination airport QNH, perform the APPROACH CHECKLIST. If the IFR flight is conducted below the transition altitude, APPROACH CHECKLIST should be completed before reaching the IAF.

Examples of Approach Briefings are presented below.

EXAMPLE 1 Precision approach (3D) – ILS Approach Briefing

Airplane arriving to EPBY from the South-East at 4000 ft. Information received from TWR:

„Expect ILS Y approach for Rwy 26".



APPROACH BRIEFING

BYDGOSZCZ, ILS Y RWY 26 (1)

CHART 11-2, EFFECTIVE 10th SEPTEMBER 2020 (2)

LOC BYD 109.1 → CHECKED, PRESELECTED ON NAV1 & NAV2 (3)

FINAL APPROACH COURSE 257 DEGREES (4)

IAF at BYZ VOR 112,7 → CHECKED, SET ON NAV1 AND NAV2 (5)

APPROACH COMENCES AT 4000ft, OUTBOUND TRACK 078 (6) TO D9,1 BYZ, DESCENT TO 2300ft (7), CHANGE NAV FOR ILS, INTERCEPT GLIDE SLOPE AT D6,5 BYD (8)

ALTITUDE CHECK at D3,0 BYD 1190ft (9), DA 434 ft (10)

MISSED APPROACH: CLIMB STRAIGHT AHEAD to BY633, THEN TURN LEFT TO BYZ VOR CLIMBING TO 2300 ft (11)

MSA FOR APPROACH SECTOR 2400ft, FOR GO AROUND SECTOR 2000 ft (12)

CONFIGURATION: FLAPS TAKE-OFF POSITION,

APPROACH SPEED 90 kt

APPROACH BRIEFING COMPLETED

Approach Briefing for LOC minima is the same, except point 10 as presented:

…. ALTITUDE CHECK D3,0 BYD 1190 ft (9)

DA 600 + 20 = 620 ft ***(10A)***

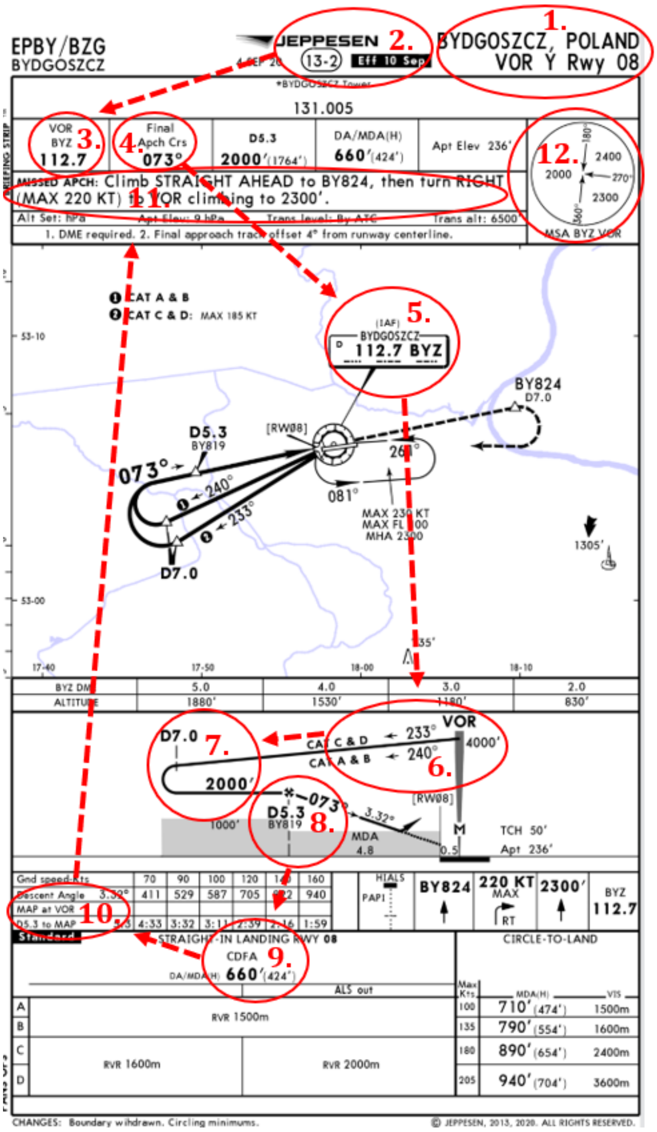
MAPt AT D0,8 BYD ***(10B)***

MISSED APPROACH: CLIMB STRAIGHT AHEAD …

EXAMPLE 2 Non-Precision approach (2D) – VOR Approach Briefing

Airplane arriving from the East at FL 80. Information received from TWR:

„Expect INTUN 1S arrival and VOR Y approach for Rwy 08".



APPROACH BRIEFING

BYDGOSZCZ, VOR Y RWY 08 (1)

CHART 13-2, EFFECTIVE 10th of SEPTEMBER 2020 (2)

VOR BYZ 109.1 → CHECKED, SET ON NAV1 AND NAV2 (3)

FINAL APPROACH COURSE 073 DEGREES (4)

IAF at BYZ VOR 112,7 WILL BE REAHED AFTER INTUN 1S ARRIVAL (5)

APPROACH COMENCES AT 4000ft, OUTBOUND TRACK FOR CAT A – 240° (6) TO D7,0 BYZ, DESCENT 2000ft (7)

START DESCENT AT FAF, D5,3 BYZ (8), CROSSCHECK DISTANCE VERSUS ALTITUDE AS CHARTED,

DA 660 + 20 = 680 ft (9)

MAPt AT VOR (10)

MISSED APPROACH: CLIMB STRAIGHT AHEAD to BY824, THEN TURN RIGHT TO BYZ VOR CLIMBING TO 2300 ft (11)

MSA FOR APPROACH SECTOR 2000ft, FOR GO AROUND SECTOR 2400 ft (12)

CONFIGURATION: FLAPS FULL,

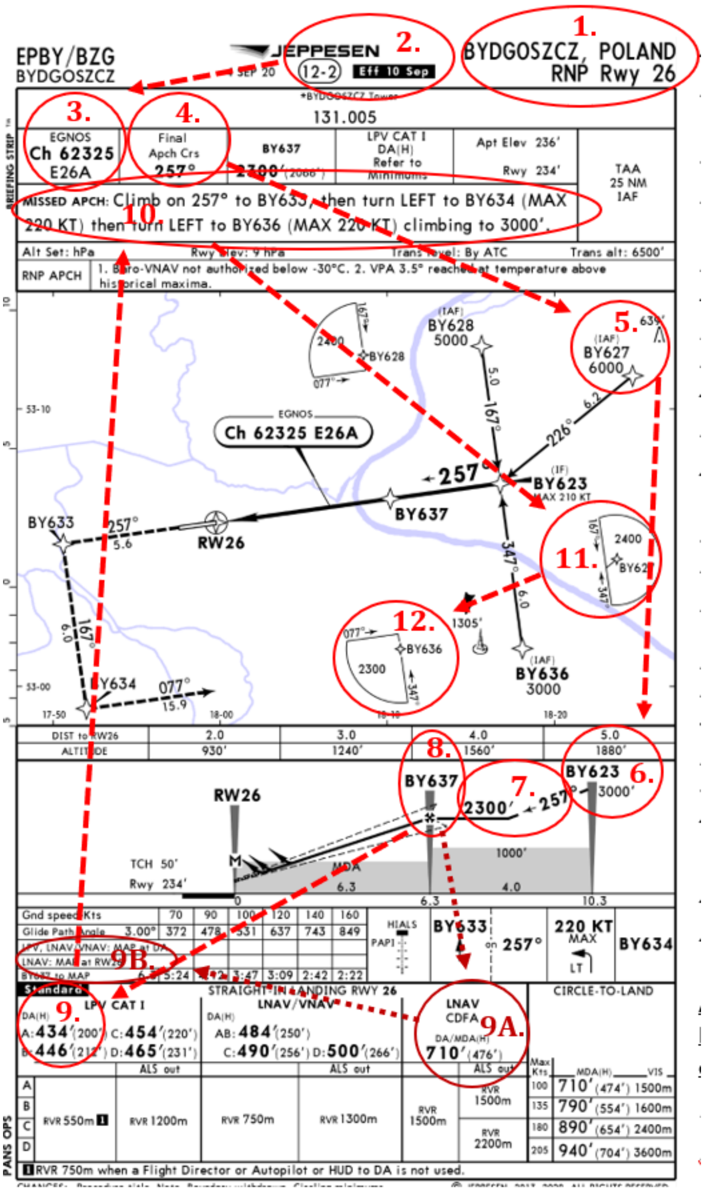
APPROACH SPEED 85 kt

APPROACH BRIEFING COMPLETED

EXAMPLE 3 RNP approach 3D / 2D Approach Briefing

Airplane arriving from the North-East at FL 90. Information received from TWR:

„Expect GOBNI 1T arrival and RNP approach for Rwy 26" .



APPROACH BRIEFING FOR

BYDGOSZCZ, RNP RWY 26 (1)

CHART 12-2, EFFECTIVE 10th of SEPTEMBER 2020 (2)

EGNOS CH 62325 → CHECKED (3)

FINAL APPROACH COURSE 257 DEGREES (4)

IAF AT BY627, WILL BE REACHED AFTER GOBNI 1T ARRIVAL AT 6000 ft (5)

NEXT BY623 3000 ft (6)

AND WITH FINAL APCH COURE DESCENT 2300ft (7)

START FINAL DESCENT AT BY637 (8)

DA 434 ft (9)

MISSED APPROACH: CLIMB ON HDG 257 to BY633, THEN TURN LEFT TO BY634, THEN TURN LEFT TO BY636 CLIMBING 3000 ft (10)

MSA FOR APPROACH SECTOR 2400ft, (11) FOR GO AROUND SECTOR 2300ft (12)

CONFIGURATION: FLAPS 30°

APPROACH SPEED 70 kt

APPROACH BRIEFING COMPLETED

Approach Briefing for LNAV minima is the same, except point 9 as below:

….START FINAL DESCENT AT BY637 (8), CROSSCHECK DISTANCE VERSUS ALTITUDE AS CHARTED,

DA 710 + 2 0= 730 ft ***(9A)***

MAPt AT RW26 ***(9B)***

MISSED APPROACH: CLIMB ON HDG 257 to BY633….

4.6. INSTRUMENT APPROACH

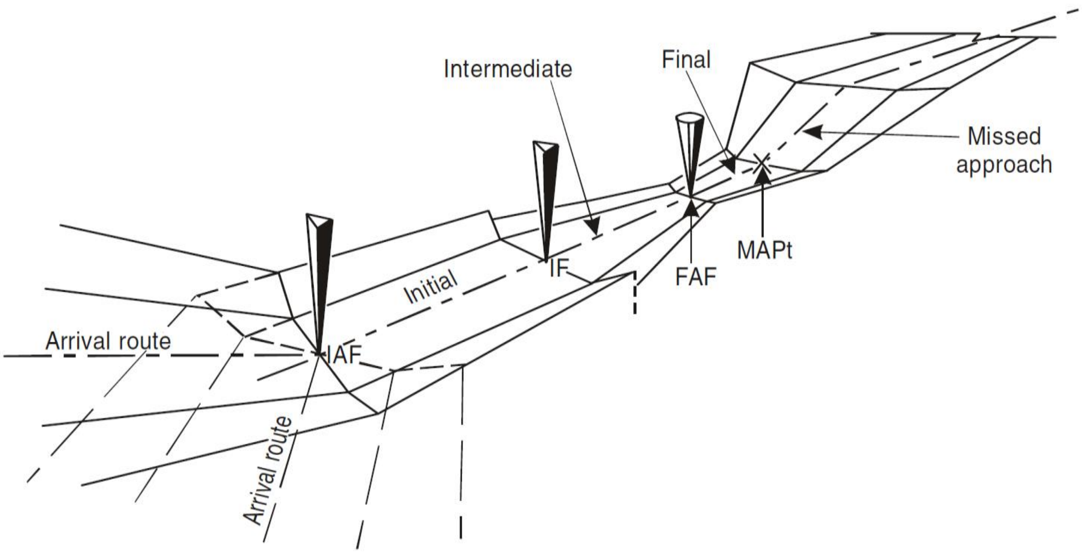
Instrument approach procedure (IAP) is a series of predetermined maneuvers by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and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

Non-precision approach (NPA) procedure – 2D. An instrument approach procedure which utilizes lateral guidance but does not utilize vertical guidance.

Precision approach (PA) procedure – 3D. An instrument approach procedure using precision lateral and vertical guidance with minima as determined by the category of operation.

The complete Instrument Approach may be divided into five segments:

- Arrival Segment
- Initial Approach Segment
- Intermediate Approach Segment
- Final Approach Segment
- Missed Approach Segment



First three segments and the last one are the same for both non-precision and precision approaches. In principle, distinction between precision and non-precision approach is relevant to the final approach segment only. For this reason, the name for start final descent position was differentiated and concept of Final Approach Point (FAP) for precision approach and Final Approach Fliix (FAF) for non-precision approach was introduced.

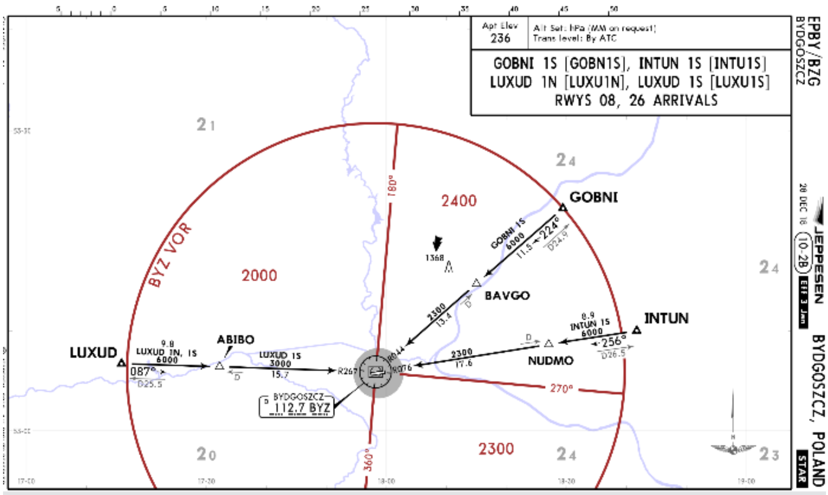
4.6.1. Arrival

Aeroplanes arriving to an airport usually follow a published STAR procedure. Executing a STAR, the pilot should adhere to altitude and speed restrictions described on the chart.

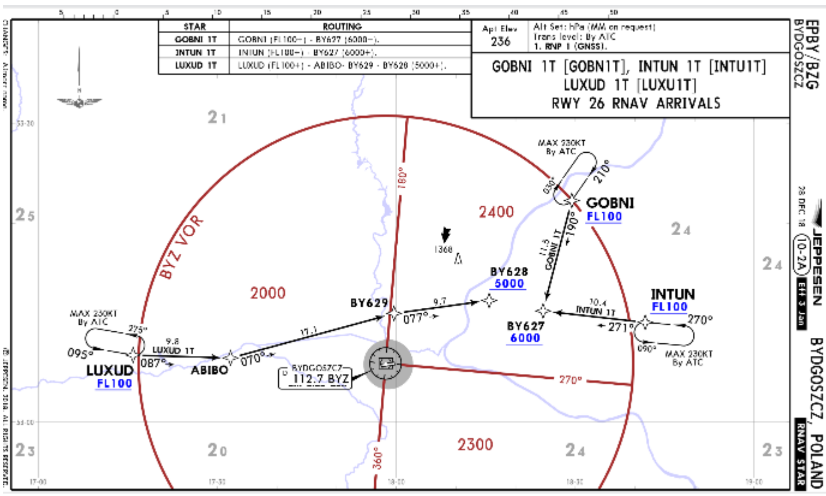
Standard Instrument Arrival (STAR) procedure links a significant point, normally on an ATS route, usually at the TMA boundary, with a point from which a published instrument approach procedure can be commenced - Initial Approach Fix (IAF).

STARs may be based on:

- VOR (see Jeppesen chart EPBY 10-2B) or



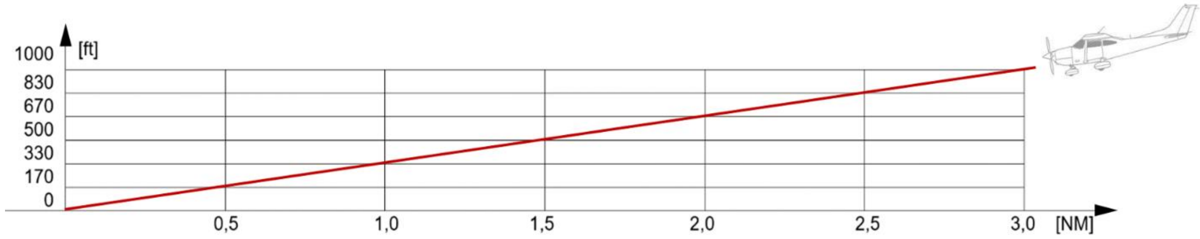
- GNSS (see Jeppesen chart EPBY 10-2A).



Sometimes ATS gives different arrival clearances. In that case always follow the ATS instructions.

NOTE: At certain controlled aerodromes (e.g. EPGD, EPPO, EPWA) with an APPROACH and DIRECTOR (e.g. EPWA) service on a separate frequency, arrival airplanes under radar control may receive radar vectors to intercept final approach courses.

Without any ATC restrictions, arrival segment should be flown with constant rate of descent (ROD). The pilot needs to calculate the distance for descent. The distance depends on altitude to be lost during descent and ROD. In IFR flights, the standard descent path is 3 degrees. In this case, on a 3NM distance, the airplane loses 1000ft of altitude, 2 NM – 670 ft, 1,5 NM– 500 ft, 1 NM – 330 ft etc.



Knowing the altitude that should be lost, pilot can calculate proper distance for start descent for a 3-degree descent path, according to formula:

Distance [NM] for descent = Altitude to be lost [ft] /1000 x 3

Example:

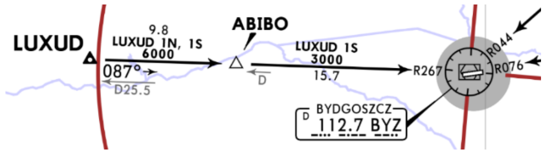
Cruise altitude at LUXUD = FL 100 (10000 ft),

Required VOR BYZ altitude = 4000 ft,

Altitude to be lost = 10000 – 4000 = 6000 ft,

Dividing by 1000 → 6000 / 1000 = 6

Distance [NM] for descent = 6 x 3 = 18 NM



From EPBY chart 10-2B STAR

In order to have a margin in descent, it is recommended to add between 1 NM and 3 NM to this calculated distance, due to the descent rate establishment, difference in altitude resulting from changing altimeter setting from STD to QNH and wind effect.

Rate of descent depends on ground speed (increasing when GS increases, decreasing when GS decreases) and can be calculated for 3 degree descent path according to formula:

ROD [ft/min] = GS [kt] x 5

e.g. for 150 kt ROD = 750 ft /min, for 120 kt = 600 ft /min, for 80 kt = 400 ft / min etc.

In our example the airplane starts a descent at D20 BYZ VOR (4,3 NM before ABIBO point) with GS = 110 kt and expected ROD = 550 ft/min.

During arrival descent pilot can check required altitude versus distance (at a distance of 15 NM airplane should be at FL 90, 12 NM – FL 80, 9 NM – 7000ft, 6 NM – 6000 ft, 3 NM – 5000 ft), this will allow to make necessary corrections in the ROD value.

REMEMBER: To maintain a fixed descent path - headwind requires to reduce the calculated ROD, tailwind requires to increase the calculated ROD.

Another calculation is needed, if you want to maintain a constant ROD for descent path other than 3 degrees.

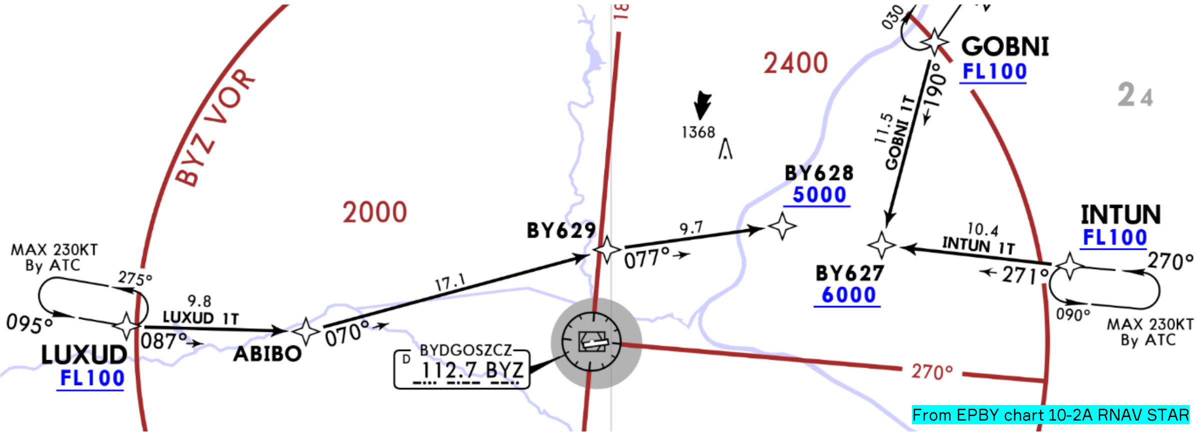
Example: Look at the picture below.

Question: How much should be the ROD value for a constant descent speed on presented STAR procedure between LUXUD at FL100 and BY628 at 5000 ft with GS = 110 kt?

Calculations:

Altitude to be lost: 10000 ft - 5000 ft = 5000ft

Distance: 9,8 + 17,1 + 9,7 = 36,6; ~37 NM



First we calculate how many feet we will lose per 1 NM distance:

5000 : 37 = 135,14; => per 1 NM we will lost about 135 ft

With speed 60 kt airplane fly 1 NM per 1 minute, so for GS = 60 kt ROD will be 135 ft/min.

For higher speeds we need to multiply calculated value by GS coefficient, which can be calculated according to formula:

C_{GS} = GS/60 = 110/60 = 1,83

Finally we multiply calculated value 135 ft by C_{GS}

ROD = 135 x 1,83 = 247,05; ~ 250 ft/min

Answer: We should maintain Rate of Descent 250 ft/min.

Exercise:

Question: How much should be the ROD value for a constant descent speed on the presented STAR procedure between GOBNI at FL120 and BY627 at 6000 ft with GS = 80 kt?

Calculations: 6000 : 11,5 = 522; => per 1 NM we will lost about 520 ft

C_{GS} = GS/60 = 80/60 = 1,33

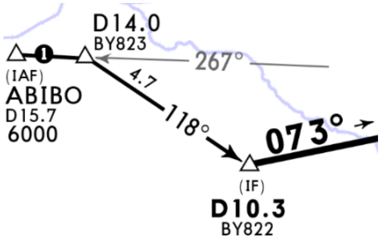
ROD = 520 x 1,33 = 691,6; => ~ 700 ft/min

Performing an approach in a controlled airspace, we obtain clearances from the ATC for individual procedures. Usually we receive clearance for descend according to the STAR procedure to the IAF, another clearance for approach and, after reporting stabilization, clearance for landing. When the controller gives a clearance for a given procedure, he always says its full name e.g. *„CLEARED INTUN 1S”*, *„CLEARED ILS Y RUNWAY 26”*, *„CLEARED TO LAND RUNWAY 26”* etc.

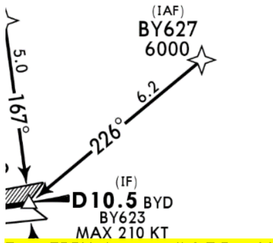
4.6.2. Initial Approach

Initial Approach Segment

is a segment of an instrument approach procedure between the Initial Approach Fix (IAF) and the Intermediate Fix (IF).



From EPBY chart 13-1 VOR Z Rwy 08



From EPBY chart 11-1 ILS Z Rwy 26

Sometimes Initial Approach Segment can finish at the Final Approach Fix (FAF), for VOR Y Rwy 08; or Final Approach Point (FAP), ILS Y Rwy 26 (see below).

The goal of the Initial Approach Segment is to lead the airplane to intercept the final approach course. For this purpose we can use track reversal and racetrack procedures.

4.6.2.1. Reversal procedures

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.

4.6.2.2. 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.

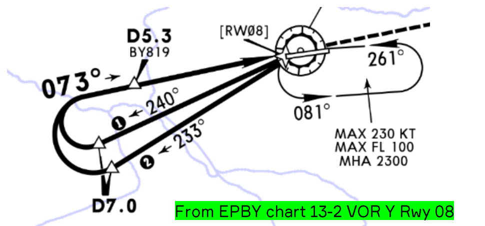
NOTE : Procedure turns are designated “left” or “right” according to the direction of the initial turn. There are two kinds of Procedure turns:

- 45°/180° (see point A in the picture below);
- 80°/260° (see point B in the picture below).

NOTE : Procedure turns may be designated either level flight or descending, according to the requirements of each procedure.

4.6.2.3. Base turn

A turn executed by the aircraft during the initial approach between the end of the outbound track and the beginning of the intermediate or final approach track. The tracks are not reciprocal (see point C in the picture below).

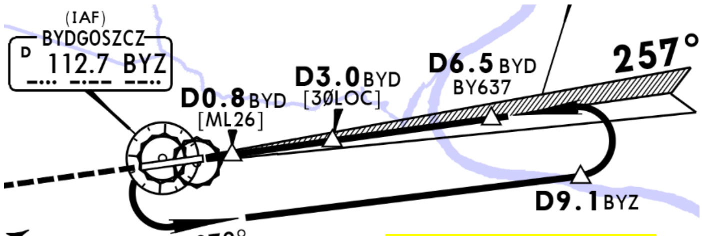


From EPBY chart 13-2 VOR Y Rwy 08

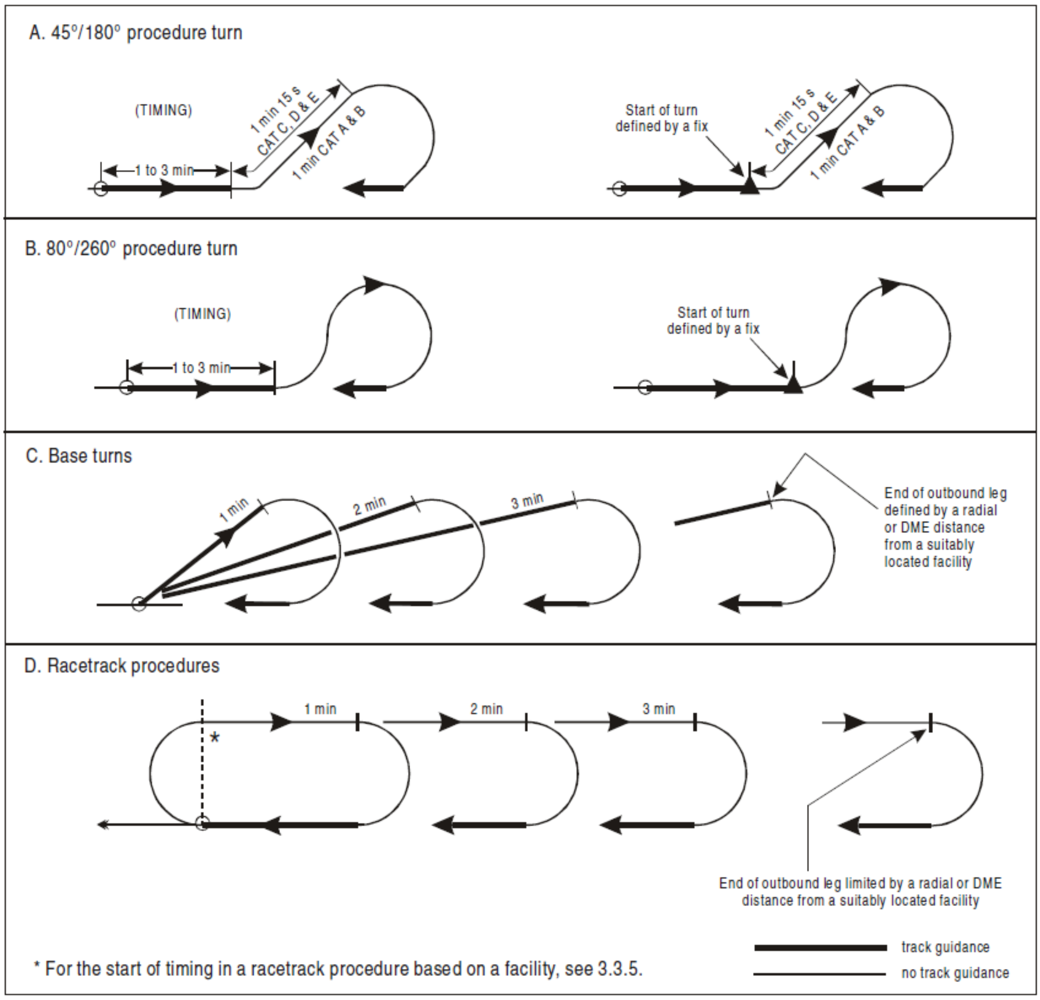
NOTE : Base turns may be designated either level flight or descending, according to the requirements of each procedure

4.6.2.4. Racetrack procedure

A procedure designed to enable the aircraft to reduce altitude during the initial approach segment and/or establish the aircraft inbound, when the entry into a reversal procedure is not practical (see point D in the picture below)

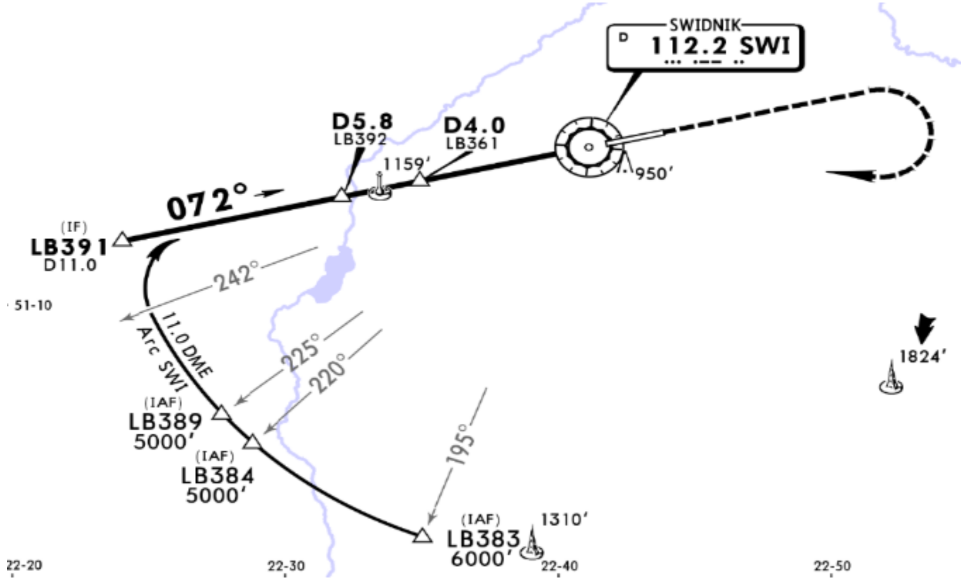


From EPBY chart 11-2 ILS Y Rwy 26



4.6.2.5. DME Arc

Another type for initial approach is a DME Arc. This method is used at the EPBL airport for VOR Z Rwy 07 presented on the right (from chart 13-1).

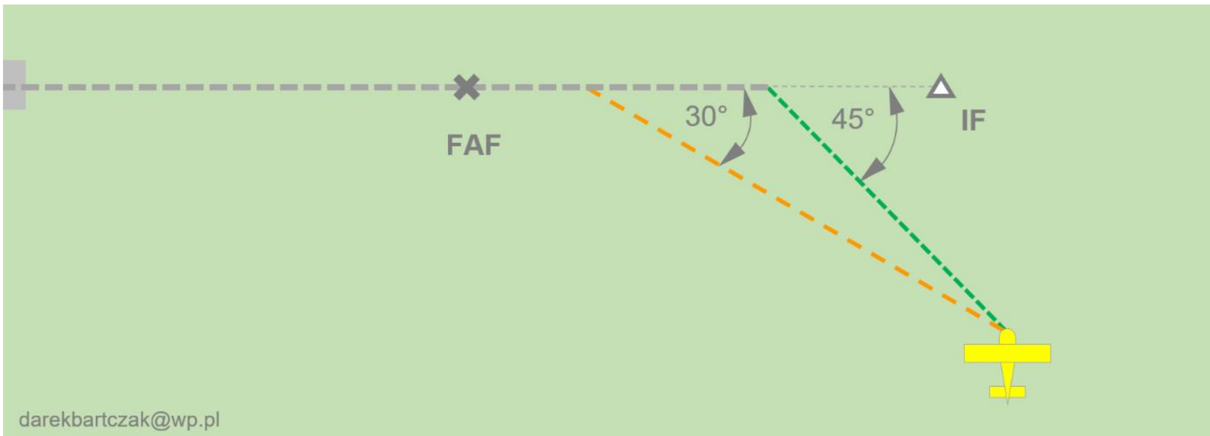


We can NOT start the initial approach without clearance for approach, so if we are close to the IAF and have not received the clearance yet, we may call *„READY FOR APPROACH"*…

Crossing IAF we should first note present time and fuel quantity, and finally - report passing – if required (according to 5-T rule).

In a racetrack procedure, both 180° turns are expected to be made in level flight. If we are higher than the published altitude, we can descent during turns.

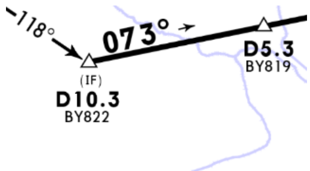
Intercepting final from base turn, procedure turn or racetrack, we should pay attention to the intercept angle. Smaller angles reduce distance on intermediate segment, as shown below, so 45° angle looks better.



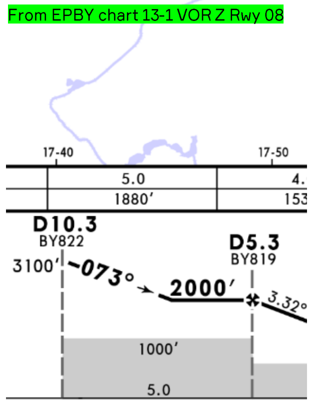
For straight in approach we can use DRIECT TO function in the GPS and fly directly to the IF.

4.6.3. Intermediate Approach

Intermediate Approach Segment is a segment of an instrument approach procedure between either the Intermediate Fix (IF) and the Final Approach Fix (see on the right) or Final Approach Point, or between the end of reversal, racetrack or dead reckoning track procedure and the Final Approach Fix or Point, as appropriate.



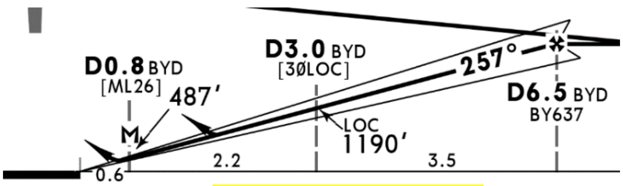
From EPBY chart 13-1 VOR Z Rwy 08



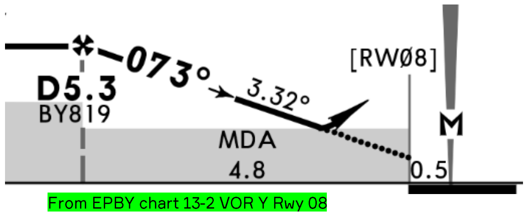
The purpose of the Intermediate Approach Segment is to configure the airplane for final approach. On this segment airplanes reduce speed to the approach speed, extend landing gear and flaps in straight and often level flight or, if needed, in a descent, as shallow as possible.

4.6.4. Final Approach

Final Approach Segment is a segment of an instrument approach procedure between the Final Approach Fix or Final Approach Point and the Missed Approach Point or Decision Altitude, as appropriate.



From EPBY chart 11-2 ILS Y Rwy 26



From EPBY chart 13-2 VOR Y Rwy 08

The purpose of the Final Approach Segment is to align the airplane's track and descent for landing. Final approach may be made to a runway for a straight-in landing, or to an aerodrome for a visual maneuver – e.g. circling approach.

The FAF is a position sited on the final approach track at a distance that permits selection of final approach configuration, and descent from intermediate approach altitude to the appropriate DA/MDA either for a straight-in approach or for circling. The optimum distance between the FAF and the threshold is 5.0 NM. The maximum distance should not normally be greater than 10 NM.

The FAP is a point in space on the final approach track where the intermediate approach altitude intercepts the nominal glide path angle at heights from 1 000 ft to 3000 ft above runway elevation. In this case, for a 3° glide path, interception occurs between 3 NM and 10 NM from the threshold.

On final approach airplanes should keep a constant ROD for the designated descent angle. Calculated values for different ground speeds are presented in the table below. As you can see, the rules for calculating approximate ROD values described previously, are confirmed here.

Gnd speed-Kts		70	90	100	120	140	160
Descent Angle	3.00°	372	478	531	637	743	849
MAP at D0.9							
D7.2 to MAP	6.3	5:24	4:12	3:47	3:09	2:42	2:22

From EPBY chart 11-2 ILS Y Rwy 26

Gnd speed-Kts		70	90	100	120	140	160
Descent Angle	3.32°	411	529	587	705	822	940
MAP at VOR							
D5.3 to MAP	5.3	4:33	3:32	3:11	2:39	2:16	1:59

From EPBY chart 13-2 VOR Y Rwy 08

For higher wind speeds it is recommended to use approach speed increment as presented below:

- wind up to 10 kt – increment is not needed
- wind between 11 – 20 kt – use inctement + 5 kt
- wind above 21 kt – use increment + 10 kt

Crosswind has an influence on final approach drift angle. Knowing present wind direction and speed, and the airspeed, we can simply calculate in memory approximate value of wind correction angle (WCA) in 2 steps.

Step 1: Calculate maximum WCA according to formula:

Max WCA = wind speed / airplane air speed x 60

For a 20kt wind and air speed of 80 kt, Max WCA = 20 [kt] / 80 [kt] x 60 = 15°

Step 2: Calculate difference between wind direction and runway track. If difference is between:

- ± 0 – 15°, or ± 180 – 165° → correction is not needed
- ± 15 – 35°, or ± 165 – 145° use 1/3 Max WCA → 1/3 x 15° = 5°
- ± 35 – 65°, or ± 145 – 115° use 2/3 Max WCA → 2/3 x 15° = 10°
- ± 65 – 90°, or ± 115 – 090° use 3/3 Max WCA → 3/3 x 15° = 15°

When airplane is equipped with G1000 avionics (or similar) displaying wind data window, set option with head and crosswind components and calculate WCA for crosswind component only, using formula from step 1 and then apply the required correction.

Altimeter checkpoint (GS check) – is a point marked by OM, or a specific DME distance DME (in our example is D3,0). Tolerance of the ALT CHECK is ±75ft. If:

- current altitude is greater than the required ±75ft, you should add this difference to your minimums,
- current altitude is less than required ±75ft, your DA stays the same.

If no ALT CHECK is marked in the approach chart, it should be done at D4,0 or D3,0.

For final approaches, both precision and non-precision, stabilization criteria have been establish. They are presented in the table on the next page.

CONDITION FOR STABILIZED APPROACH	
Approach speed	between - 5 kt and +15 kt of the calculated V_{REF}
Altitude in accordance with the approach procedure performed	± half of the instrument deviation scale for precision – 3D approaches ± 150 ft for non-precision approaches
Stabilisation on final approach track	± half of the instrument deviation scale for ILS, LOC, VOR and RNP – 2D approaches ± 5° for NDB approaches
Correct landing configuration	expected for landing flaps setting and gear down
Bank angle	≤ 15°
Rate of descent	maximum 1000 ft/min
Power	above IDLE position
Landing checklist	*„LANDING CHECKLIST COMPLETED"*

Stabilisation range on HSI for precision (left side) and non-precision (right side) approach.

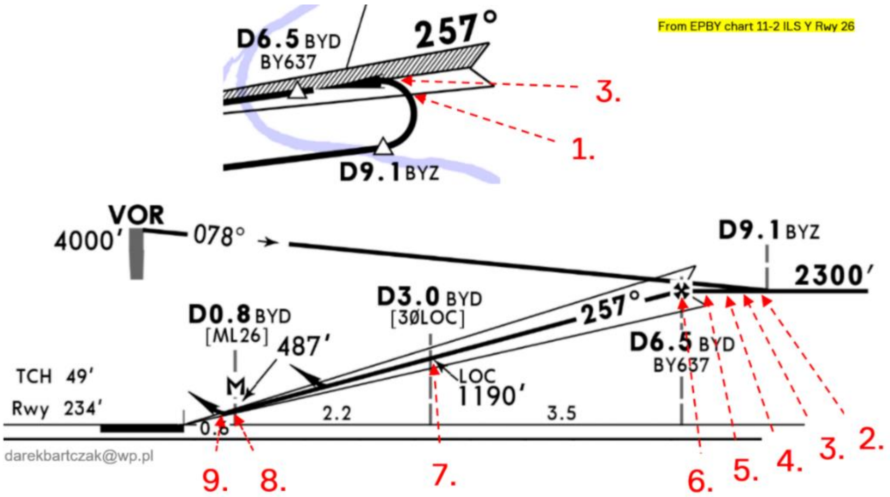
REMEMBER: **If at any time during final approach the stabilization criteria are lost and can NOT be maintained, a Missed Approach must be initiated.**

Decision to land can be made if all of the following conditions occur:

- permanent visual contact with runway environment or runway lights,
- full stabilization,
- full landing configuration,
- you are sure of safe landing from the current position.

4.6.4.1. Precision Approach – 3D

According to ICAO standards, 3D operations are those, in which vertical guidance is provided throughout the final segment. Precision Approach presented here is based on EPBY chart 11-2 ILS Y Rwy 26.



PRECISION APPROACH – 3D			
No.	INDICATIONS / / POSITION	PILOT'S ACTIVITIES	CALL-OUTS
1.	Localiser needle starts moving	Continue interception	*„LOCALISER ALIVE"*
2.	GS indicator start moving	Continue interception	*„GLIDE SLOPE ALIVE"*
3.	Localiser is captured	Set HB to Rwy heading	*„LOCALISER CAPTURE, RUWAY HEADING"*
4.	One dot below GS	Check speed, set flaps for T/O position*	*„ONE DOT – SPEED CHECKED, FLAPS T/O"*
5.	0,5 dot below GS	Set gear down and flaps for landing*	*„SPEED CHECKED, GEARS DOWN, FLAPS FULL"*
6.	On GS - FAP	Start descent, start timing, set GA altitude	*„DESCENDING, TIMER ON, GO AROUND ALTITUDE SET"*
	Between **6.** and **7.**	Conduct the final checklist	*„FINAL CHECKLIST COMPLETED"*
7.	On D3,0 BYD	Check altitude and stabilisation criteria	*„ALTITUDE CHECKED, STABILISED – CONTINUE"* or *„NOT STABILISED – GO AROUND"*
8.	100 ft above DA	If stabilised - Continue	*„APPROACHING DECISION"*
9.	At DA	DECISION	*„CONTACT – LANDING"* or *„NEGATIVE CONTACT – GO AROUND"*

* - Example applies to Tecnam P2006T

4.6.4.2. Non-Precision Approach – 2D

According to ICAO standards, 2D operations are those, in which vertical guidance is NOT provided throughout the final segment. This definition includes Non-precision Approaches.

For some time Continuous Descend Final Approach (CDFA) has been a compulsory procedure for all EASA operators (with some exceptions). The approach is flown with a constant descend angle without any level offs after the FAF, as it used to be before.

Constant descent angle for different ground speeds is shown in the tables on page 8- 29, and it is checked by comparing, for a given DME distance, the actual airplane altitude and the charted altitude from the Jeppesen chart table (see example below).

BYZ DME	5.0	4.0	3.0	2.0
ALTITUDE	1880′	1530′	1180′	830′

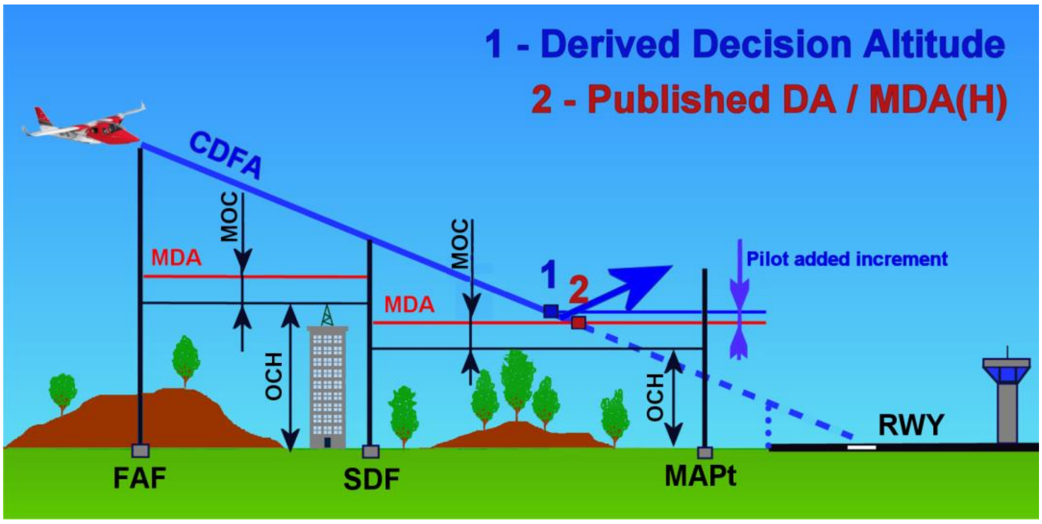
Instead of MDA, DA is used for CDFA and there is no level flight at this altitude. When DA is reached and decision to land is made, the aircraft continues descent with the constant angle until flare. If a go-around is to be executed it is initiated immediately when reaching the DA (without any level off segment).

Since aircraft must not descend even 1 ft below the MDA, if visual reference is not established, corrected DA must be used. MDA is depicted as DA on Jeppesen charts nowadays, but this altitude is still the "old" MDA with no margin for height loss for initiation of the go around. Thus higher DA must be briefed and used, so called **DDA – Derived Decision Altitude**.

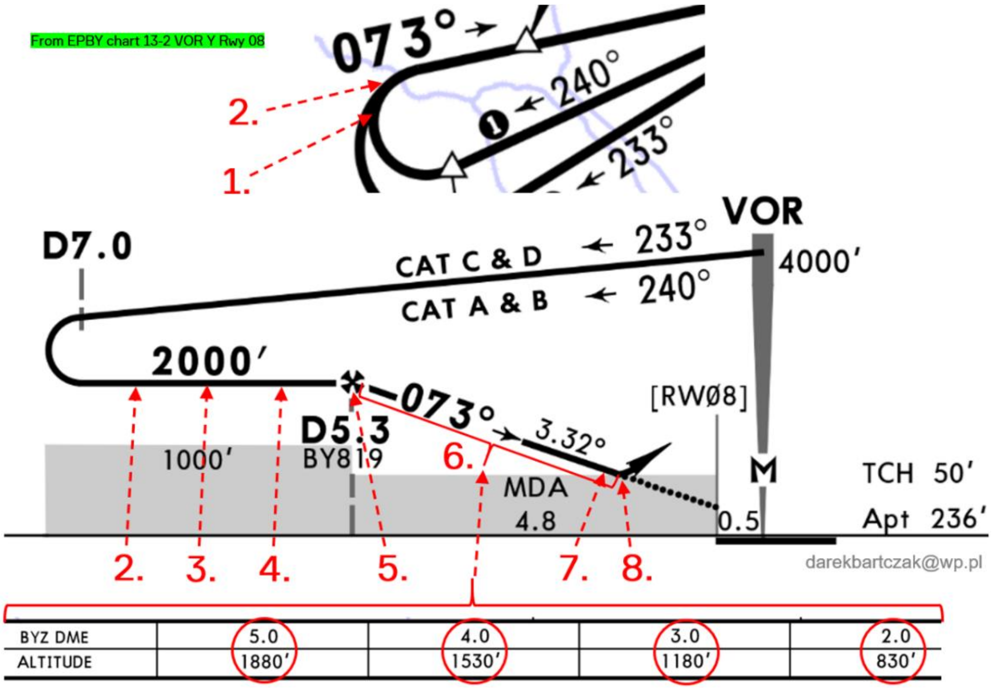
The DDA applies to all Non-Precision Approaches. It does not apply to approaches with vertical guidance such as ILS, LPV, or LNAV/VNAV. Minima for those approaches already incorporate the possible height loss in case of a go-around.

On many airliners this altitude increment is as much as 50ft, however due to much smaller size and less momentum of ATO Adriana Aviation airplanes, **ATO Adriana Aviation establishes this increment to be 20 ft.**

DDA = published DA/MDA + 20 ft



Non-Precision Approach presented below is based on EPBY chart 13-2 VOR Y Rwy 08



NON-PRECISION APPROACH – 2D			
No.	INDICATIONS / / POSITION	PILOT'S ACTIVITIES	CALL-OUTS
1.	VOR „needle" starts moving	Continue interception	*„VOR ALIVE"*
2.	VOR is captured	Set HB to Rwy heading	*„VOR CAPTURE, RUWAY HEADING"*
3.	1,5 NM before FAF	Check speed, set flaps to T/O position*	*„SPEED CHECKED, FLAPS T/O"*
4.	Below 1 NM to FAF	Check speed, set gear down and flaps for landing*	*„SPEED CHECKED, GEARDOWN, FLAPS FULL"*
5.	At FAF	Start descent, start timing, set GA altitude	*„DESCENDING, TIMER ON, GO AROUND ALTITUDE SET"*
	Shortly after FAF	Conduct the final checklist	*„FINAL CHECKLIST COMPLETED"*
6.	Between **5.** and 8.	Check present distance and altitude versus the charted data	*„DISTANCE X, ON (or ABOVE / BELOW) PATH"*
7.	100 ft above the DA	If stabilised - Continue	*„APPROACHING DECISION"*
8.	At DA (660+20=680 ft)	DECISION	*„CONTACT – LANDING" or „NEGATIVE CONTACT – GO AROUND"*

* - Example applies to Tecnam P2006T

4.6.4.3. Localiser Approach

Localiser approach is a non-precision – 2D approach. It is almost the same as a VOR approach, but localiser is more sensitive and more accurate in lateral guidance than VOR. Vertical profile is checked by comparing, for a given DME distance, the actual airplane altitude and the charted altitude from the Jeppesen chart table (see example below).

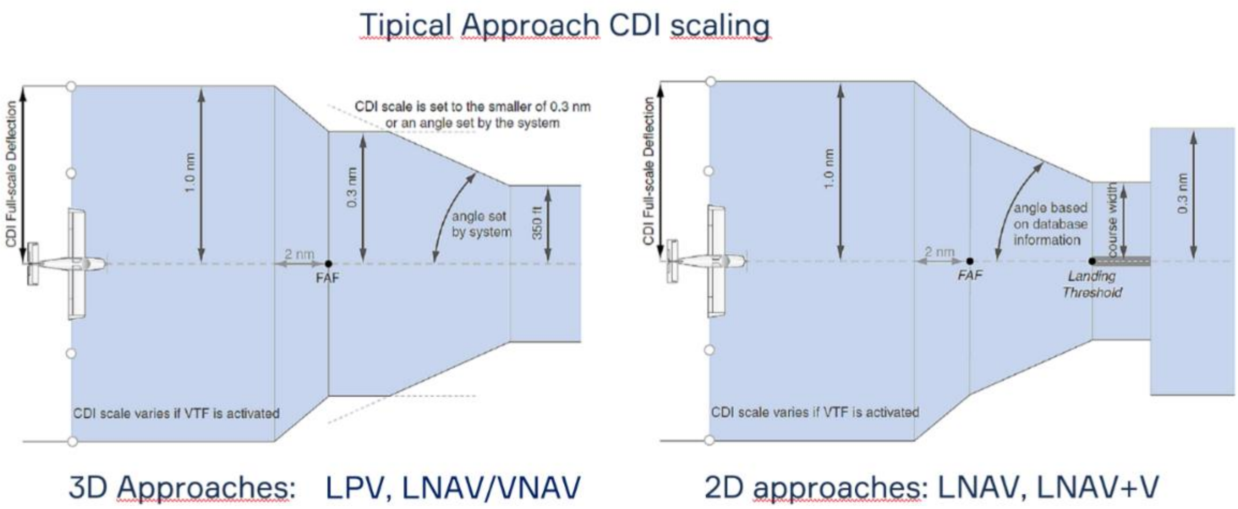
LOC (GS out)	BYD DME	2.0	3.0	4.0	5.0
	ALTITUDE	870′	1190′	1510′	1830′

In case of the glide slope failure during an ILS approach, it is possible to continue approach, but it is required to change the DA to LOC approach DDA and check the MAPt. A short briefing covering these elements is necessary.

NOTE: At certain controlled aerodromes (e.g. EDDH) localizer is NOT linked to the DME. In that case use DME from the terminal VOR. Always consult approach charts and NOTAMs.

4.6.4.4. RNP Approaches

Use of RNP approaches requires to conduct a RAIM check and - for 3D - SBAS check before commencing approach. RNP 3D and 2D approaches are almost the same as respectively ILS and VOR. One difference is change of CDI scaling 2 NM before the FAF from TERMINAL to APPROACH mode, as shown below.



When change of CDI scaling occurs, use call-out *„LPV / LNAV MAGENTA"* .

I N T E N T I O N A L L Y

L E F T

B L A N K

4.6.4.5. Circling Approach

Circling approach is an extension of an instrument approach procedure which provides for visual circling above the aerodrome prior to landing. Airplane should be configured for landing, except of full flaps selection. After initial visual contact at or above MDA (specified for different airplane categories - for category A it is 710 ft), start timming and turn left 45° (for right hand circle) or right (for left hand circle).

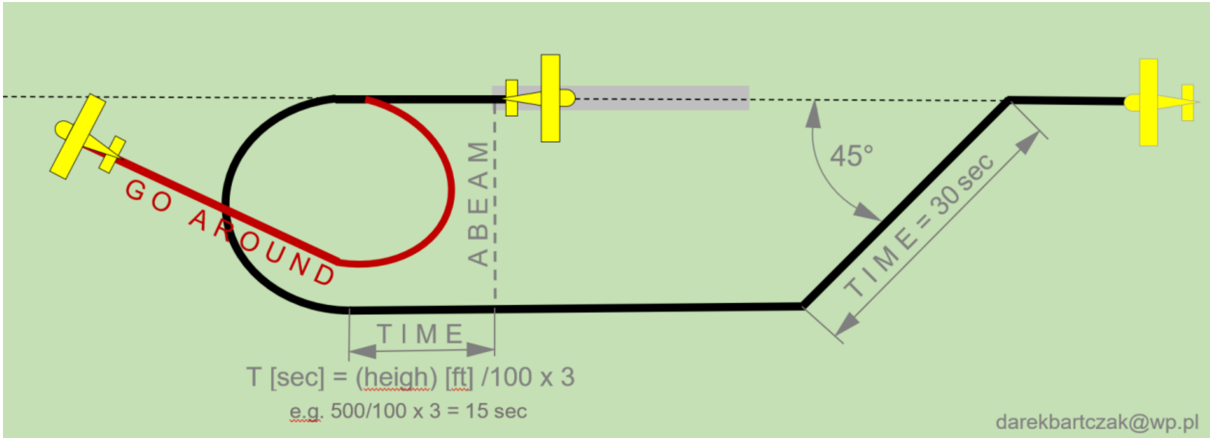
CIRCLE-TO-LAND

Max Kts	MDA(H)	VIS
100	710' (474')	1500m
135	790' (554')	1600m
180	890' (654')	2400m
205	940' (704')	3600m

From EPBY chart 11-2 ILS Y Rwy 26

The basic assumption is that the runway environment should be kept in sight all time. The runway environment includes features such as the runway threshold or approach lighting or other markings identifiable with the runway.

After 30 sec turn back to runway track and continue to abeam of the landing runway treshold. Abeam the landing runway start timming and calculate outbound time (multiply your heigh in hundred of feet by 3). When time elapsed, start turn to final. Descent during turn is possible only when airplane is above MDA. Descending below MDA should commence only after establishing on final and selecting full flaps.

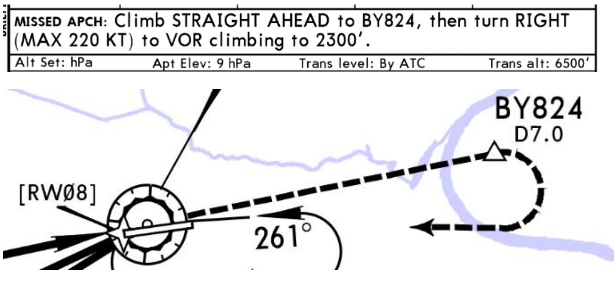


If visual reference is lost while circling to land from an instrument approach, the missed approach specified for that instrument procedure must be followed. The pilot will make the initial climbing turn toward the landing runway and overhead the aerodrome. At this point, the pilot will establish the aircraft climbing on the missed approach track.

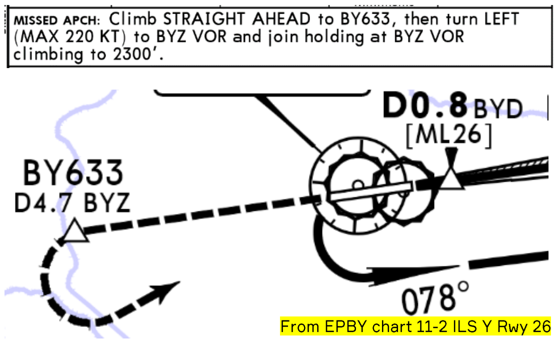
REMEMBER: **If go around procedure is initiated on final, as shown above, do NOT start turn below 400 ft AAL (in case of EPBY 700 ft).**

4.6.5. Missed Approach

Only one missed approach procedure is established for each instrument approach procedure. It is designed to provide protection from obstacles throughout the missed approach maneuver. It specifies a point where the missed approach begins, and a point or an altitude where it ends.



From EPBY chart 13-2 VOR Y Rwy 08



From EPBY chart 11-2 ILS Y Rwy 26

The missed approach should be initiated not lower than the decision altitude DA for precision approach procedures, or, for non-precision approach procedures, at a specified Missed Approach Point (MAPt) at an altitude not lower than the MDA.

It is expected that the pilot will fly the missed approach procedure as published. If a missed approach is initiated before arriving at the MAPt, the pilot will normally proceed to the MAPt and then follow the missed approach procedure in order to remain within the protected airspace.

NOTE : This does not preclude flying over the MAPt at an altitude greater than that required by the procedure.

The MAPt may be defined by:

- the point of intersection of an electronic glide path with the applicable DA in precision approaches, or
- a navigation facility, a fix, or a specified distance from FAF in non-precision approaches.

When the MAPt is defined by a navigation facility or a fix, the distance from the FAF to the MAPt is normally published as well, and may be used for timing to the MAPt (see below).

Gnd speed-Kts		70	90	100	120	140	160
Descent Angle	3.32°	411	529	587	705	822	940
MAP at VOR							
D5.3 to MAP	5.3	4:33	3:32	3:11	2:39	2:16	1:59

From EPBY chart 13-2 VOR Y Rwy 08

Gnd speed-Kts		70	90	100	120	140	160
Descent Angle	3.00°	372	478	531	637	743	849
MAP at D0.9							
D7.2 to MAP	6.3	5:24	4:12	3:47	3:09	2:42	2:22

From EPBY chart 11-2 ILS Y Rwy 26

If upon reaching the MAPt the required visual reference is not established, a missed approach must be initiated immediately in order to maintain protection from obstacles.

NOTE : Sometimes, due to traffic or other reasons, ATC can issue different than published instructions for missed approach.. In that case follow the ATC instructions.

REMEMBER : **Missed approach procedure must also be initiated when the approach stabilisation criteria are not met, or lost and can NOT be maintained.**

When missed approach procedure is commenced, inform ATC and wait for their instructions. Usually after a missed approach procedure, clearance for next approach is expected.

Instructors may decide, in cooperation with ATC, to alter the published procedures to provide more efficient training.

EN-ROUTE AND APPROACH – SUMMARY

1. Change to standard pressure while passing TRANSITON ALTITUDE.
2. Do "5-T" over every point (time, turn, twist, tabulate, talk).
3. If no heading changes when passing a point is required, only complete: time, tabulate and talk.
4. Changing NAV aid frequency, identify the new NAV aid before use.
5. If ATC ask to report position, report altitude and NAV aid/NAV point/Fix sector in regard of geographical North.
6. Before Top Of Descent, receive/record ATIS, do the APPROACH BRIEFING.
7. APP BREIFING: chart title, page, date, NAV aid and its frequency, final approach course, MSA, IAF, entry procedure, FAF/FAP, altitude check, DA, MAP, MA procedure, Set frequencies and identify NAV aids, prepare entry procedure (abeam, gate, altitude, courses, etc.), prepare cockpit for approach.
8. While reading APP chart, maintain constant attitude and instruments control.
9. Request descent or report *READY FOR DESCENT.*
10. Descend with constant rate of descent, check ground speed, keep the required track.
11. After passing TRANSITION LEVEL, do the APPROACH checklist.
12. Receive/record the Approach clearance before commencing the initial approach.
13. Do 5-T over IAF.
14. Do the FINAL checklist not later than passing the OM or equivalent position.
15. Stabilize on Localizer / Final Approach Course / Glide Slope.
16. If Localiser, VOR or Glide Slope deviation is larger than ½ scale – GO AROUND.
17. Fly the Final approach with constant rate of descend, control the airplane's position .
18. If minimums reached and NO visual contact – GO AROUND, in non-precision approach when MAPt reached, even if above DA – GO AROUND.
19. If visual contact is established, continue to land.
20. After leaving RWY, note LDG time, and do the AFTER LANDING checklist.
21. On the parking stand, note BLOCK ON time, fuel quantity and MPH if required.

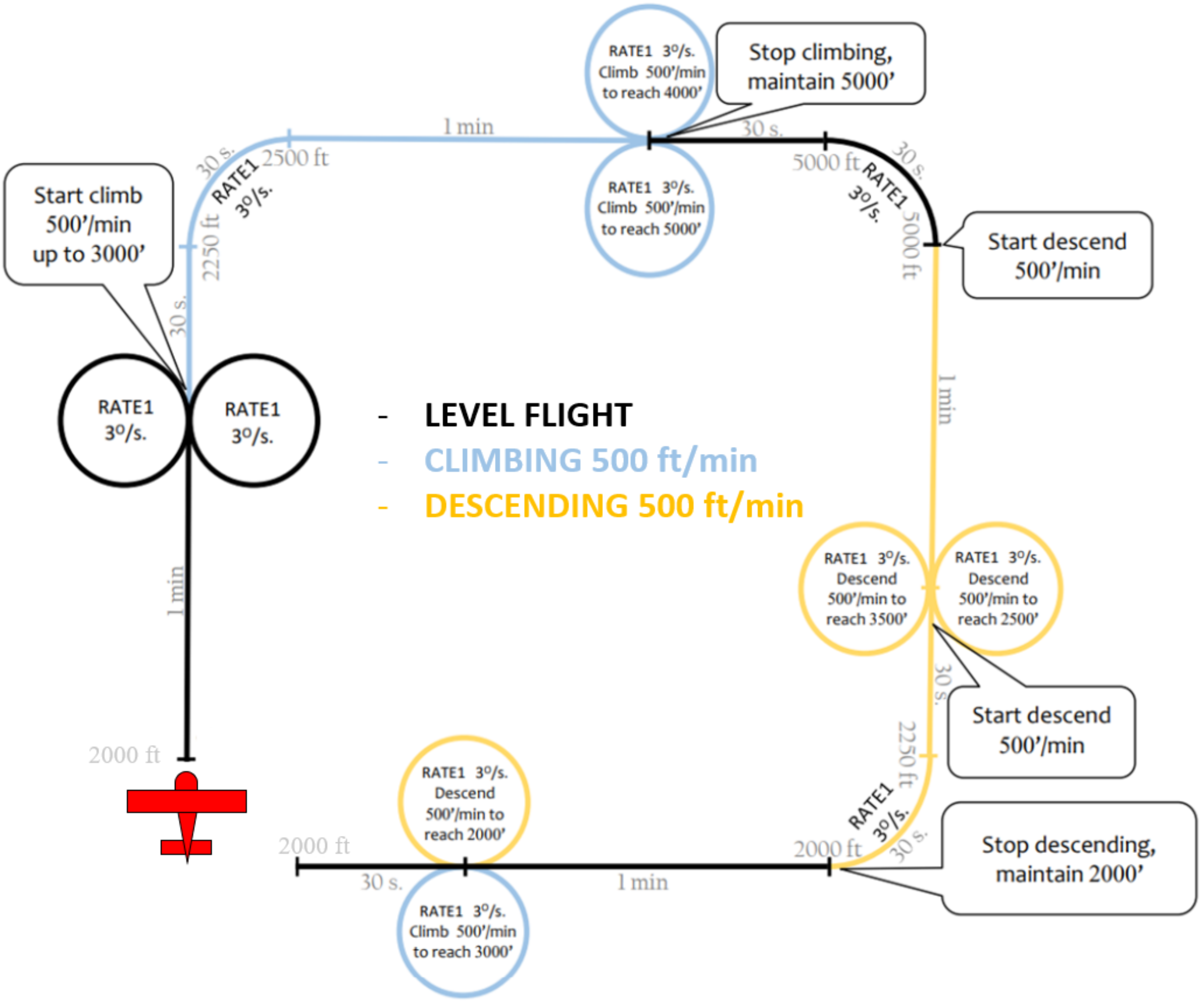
I N T E N T I O N A L L Y

L E F T

B L A N K

APPENDIX 1: Flight diagram samples for Basic Instrument flying

SAMPLE A

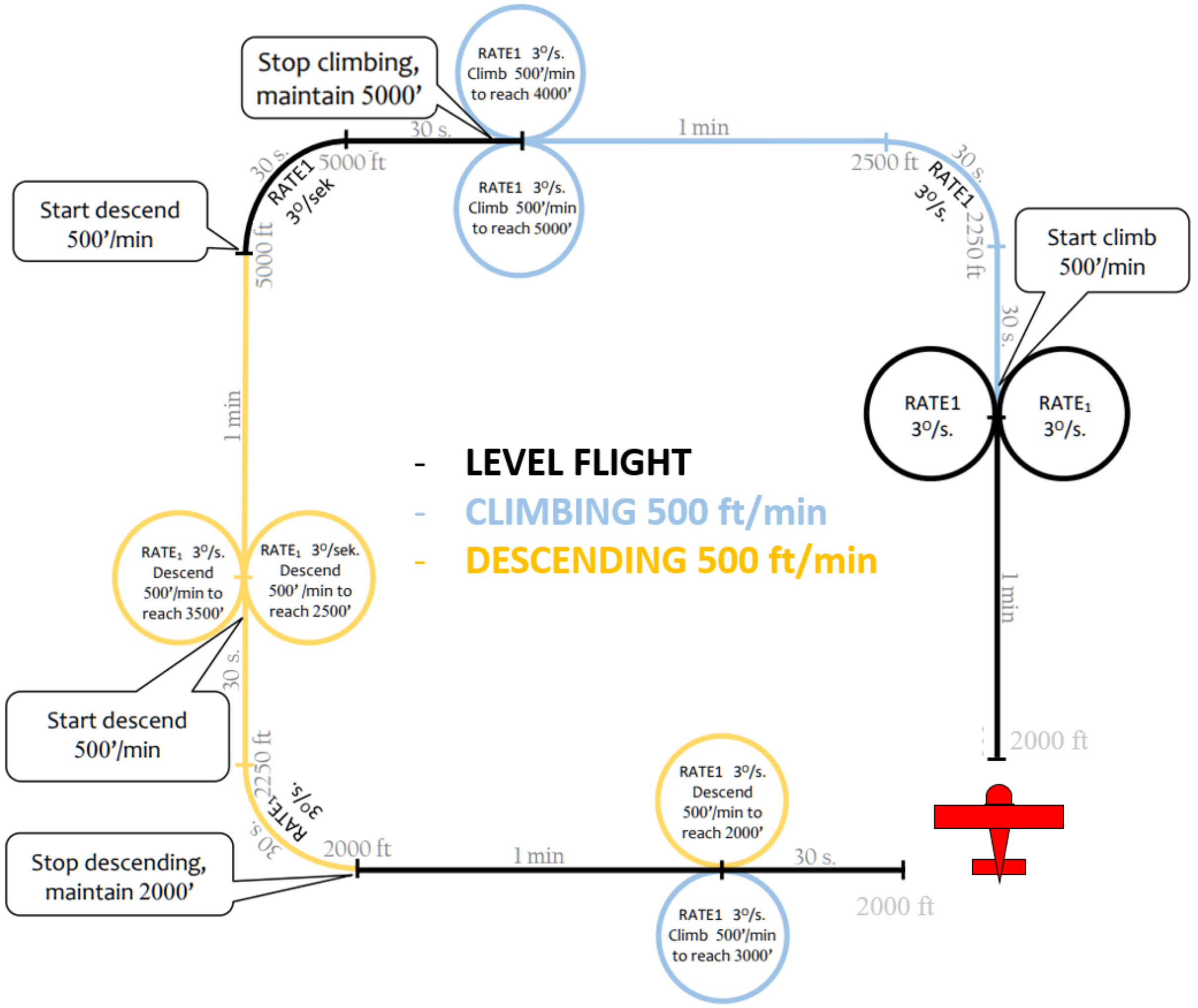


I N T E N T I O N A L L Y

L E F T

B L A N K

SAMPLE B



I N T E N T I O N A L L Y

L E F T

B L A N K

APPENDIX 2 INTRODUCTION FOR PRESENTATIONS

IR(A) Training HOLDINGS

INTRODUCTION

HORIZONTAL SITUATION INDICATOR (HSI)

1. „Arrowhead" - Course Select Pointer
2. „Tail" - Reciprocal Course Pointer
3. „Needle" - Course Deviation Indicator (CDI)
4. Course Deviation Scale
5. CRS - Course Select knob
   (or OBS - Omni Bearing Selector)
6. TO/FROM Indicator
7. HEADING Select knob
8. HEADING BUG (HB)
9. 9. Wind Rose (Compass Card)

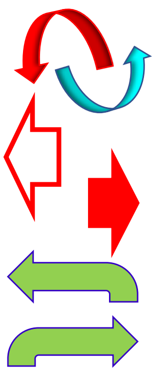
NOTE: The line passing through the center of HSI and „Needle's" top, in full left or right deflections, shows on the Wind Rose value ±45° from „Arrowhead"

ATO ADRIANA AVIATION – 2021 3

IR(A) Training HOLDINGS

INTRODUCTION

SYMBOLS USED FOR THE PRESENTATION



- CRS/OBS knob rotation and „Arrowhead" movement
- Heading Select knob rotation and Heading Bug movement
- „Needle" movement caused by CRS/OBS knob rotation
- „Needle" movement caused by airplane movement
- The airplane turns left — 00:15 – Stopwatch
- The airplane turns right — ST – Start timing

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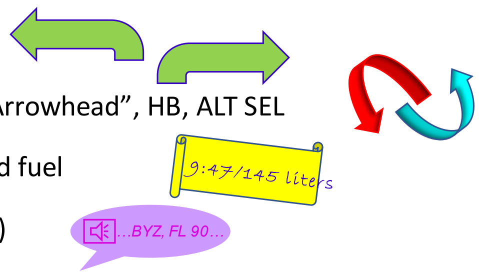
IR(A) Training HOLDINGS

INTRODUCTION

THE 5-T RULE

This Rule is helpful when reaching the Turning Point or NAV aid/FIX, organizing the performed activities:

- TIME – start timming, reset stopwatch ST
- TURN – start turn left or right
- TWIST – set desired values on „Arrowhead", HB, ALT SEL
- TABULATE – note actual time and fuel
- TALK – report to ATC (if required)



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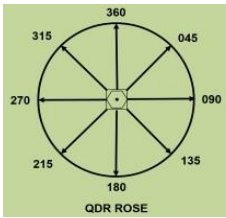
APPENDIX 3 RDAIAL INTERCEPTIONS

IR(A) Training RADIAL INTERCEPTIONS

INTRODUCTION

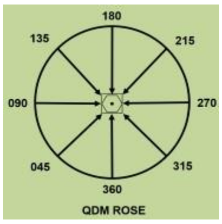
According to ICAO definition:

QDR is the magnetic bearing **FROM** the facility



RADIAL is magnetic bearing outbound **FROM** a VOR to airplane.
It is equal to **QDR**

QDM is Magnetis Bearing **TO** the facility



RADIAL INBOUND – **we can assume** that is magnetic bearing inbound **TO** a VOR from airplane.
It is equal to **QDM**

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IR(A) Training RADIAL INTERCEPTIONS

METHODS OF RADIAL INTERCEPTIONS

- „45" - when the difference between RADIALS is in the range of 0 - 30°, use 45° angle for intercepting
- „90/45" - when the difference between RADIALS is in the range of 30 - 70 degrees, use 90° and next 45° angle for intercepting
- „Through the station" - when the difference between RADIALS is greater than 70 degrees

NOTE: When you overfly VOR, after leaving the „cone of silence", maximum angle for Radial intercepting is 30 °, apply when diff erence between present and intercepting Radial is more then 90 °

Only the first method will be discussed in this presentation

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INTERCEPTIONS BY THE „45" METHOD

1. Determine the RADIAL on which the airplane is located now
2. Calculate the difference between the new RADIAL to be intercepted and the RADIAL onwhich the airplane is located now, and determinate themethod (30° or less - method „45")
3. Calculate the heading for interception the new RADIAL (±45°)

   When intercepting RADIAL smaller than the one you are in, it is on the left, so the heading you will take to interceptit will be 45° lower than new intercepting RADIAL, similarly

   for the bigger RADIAL - turn right and use higher heading
4. Turn to the calculated interception heading and maintain it for interception
5. Observe „Needle" moving on Course Deviation Scale and when approaching to central position-
6. Start turning to the "Arrowhead"
7. Maintain intercepted RADIAL flying FROM a VOR

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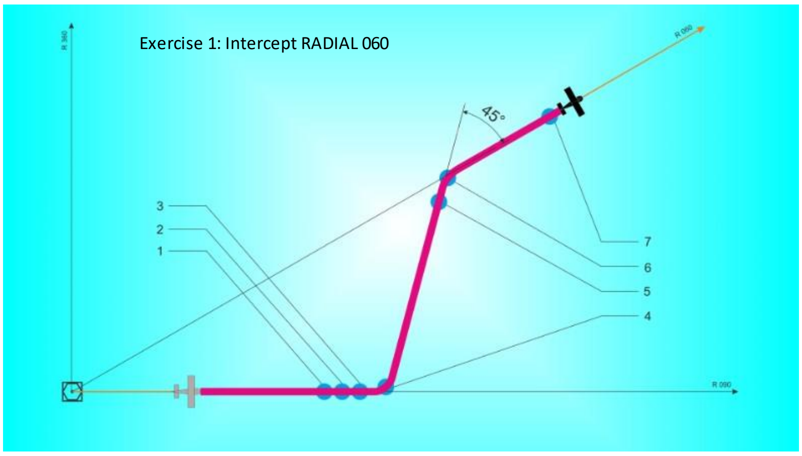
RADIAL INTERCEPTIONS BY THE „45" METHOD



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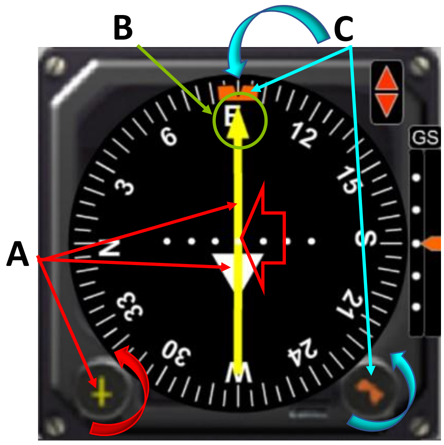
IR(A) Training RADIAL INTERCEPTIONS

RADIAL INTERCEPTIONS BY THE „45" METHOD



1:

A. Specify the RADIAL you are ON, by turning the CRS knob so that the „Needle" is in the middle of the scale and triangle shows **FROM**

B. On the Wind Rose, on the Arrowhead, read the value (here is 090°)

C. Position the aircraft on the same course

D. You are flying with heading 090° on RADIAL 090°

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INTERCEPTIONS BY THE „45" METHOD

2: Set by the CRS/OBS knob the RADIAL you have to intercept.

In this case it is RADIAL 060 °.

Calculate the difference between the given RADIAL and the RADIAL you are ON and select a method (90 - 60 = 30)

In this case, it is the „45" method

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INTERCEPTIONS BY THE„45" METHOD

3: If you are intercepting RADIAL smaller than the one you are on, you have it on the left, so the course you will fly for intercepting it, will be 45° lower than the given RADIAL, in this case 60 - 45 = 15.

Set the Heading Bug to the "Needle" side - value 015°

4: Turn **left** to the interception heading

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INTERCEPTIONS BY THE„45" METHOD

5: Observe the „Needle" movement on the indicator towards the central position, it means that you are approaching to the desired RADIAL

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INTERCEPTIONS BY THE„45" METHOD

6: When the „Needle" is very close to the center position, start turning **right** to the„Arrowhead", set Heading Bug to value 060 °

7: In a moment you will be on RADIAL 060 and you will fly on course 060°

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INBOUND INTERCEPTIONS BY THE „45" METHOD

1. Determine the RADIAL INBOUND on which the airplane is located now
2. Calculate the difference between the new RADIAL INBOUND to be intercepted and the RADIAL INBOUND on which the airplane is located now, and determinate the method (30° or less - method „45")
3. Calculate the heading for interception the new RADIAL INBOUND (±45°)

   When intercepting RADIAL smaller than the one you are in, it is on the right, so the heading you will take to intercept it will be 45° higher than new intercepting RADIAL INBOUND,
   similarly for the bigger RADIAL INBOUND - turn left and use lower heading
4. Turn to the calculated interception heading and maintain it for interception
5. Observe „Needle" moving on Course Deviation Scale and when approaching to central position-
6. Start turning to the "Arrowhead"
7. Maintain intercepted RADIAL INBOUND flying TO a VOR

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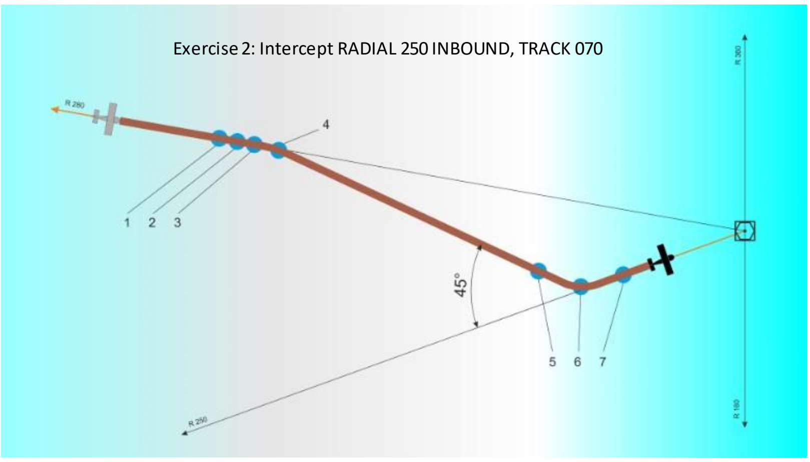
IR(A) Training RADIAL INTERCEPTIONS

RADIAL INBOUND INTERCEPTIONS BY THE „45" METHOD



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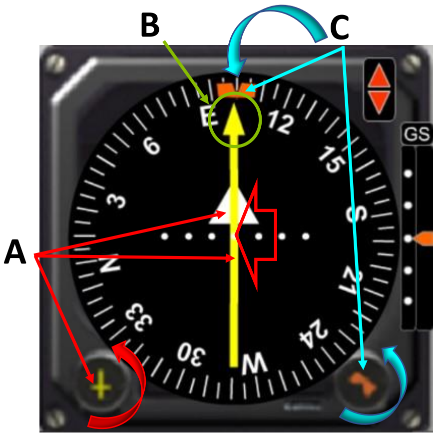
IR(A) Training RADIAL INTERCEPTIONS

RADIAL INBOUND INTERCEPTIONS BY THE „45" METHOD



1:

A. Specify the RADIAL INBOUND you are ON, by turning the CRS knob so that the „Needle" is in the middle of the scale and triangle shows **TO**.

B. On the Wind Rose, on the Arrowhead, read the value (here is 100)

C. Position the aircraft on the same course

D. You are on RADIAL 280 INBOUND, flying on TRACK 100

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INBOUND INTERCEPTIONS BY THE „45" METHOD

2: Set by the CRS/OBS knob the RADIAL INBOUND you have to intercept
In this case it is RADIAL 250 INBOUND (TRACK 070)

Calculate the difference between RADIALS and select a method
(90 - 60 = 30)

In this case, it is the „45" method

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INBOUND INTERCEPTIONS BY THE „45" METHOD

3: If you are intercepting RADIAL INBOUND smaller than the one you are on, you have it on the right, so the course you will fly for intercepting it, will be 45 ° bigger than the given RADIAL INBOUND, in this case
70 + 45 = 115

Set the Heading Bug to the "Needle" side - value 115°

4: Turn **right** to the interception heading

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INBOUND INTERCEPTIONS BY THE „45" METHOD

5: Observe the „Needle" movement on the indicator towards the central position, it means that you are approaching to the desired RADIAL

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IR(A) Training RADIAL INTERCEPTIONS

RADIAL INBOUND INTERCEPTIONS BY THE „45" METHOD

6: When the „Needle" is very close to the center position, start turning **left** to the „Arrowhead", set Heading Bug to value 070°

7: In a moment you will be on RADIAL 250 INBOUND, and you will fly on TRACK 070 °

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I N T E N T I O N A L L Y

L E F T

B L A N K

APPENDIX 4 REVERSAL PROCEDURES

IR(A) Training REVERSAL PROCEDURES

INTRODUCTION

Reversal procedures have been established for instrument approaches to reverse the aircraft's flight direction by 180 degrees. They are created based on the facility (VOR, NDB) or FIX determined by the direction and distance or time from NAV aid/FIX. They usually have a specific Outbound Track, Outbound time or distance, and Inbound Track.

The following procedures are in use:

- 80/260 Procedure Turn
- 45/180 Procedure Turn
- Base Turn
- Racetrack Pattern

Racetrack Pattern will be discussed later

In all these procedures we apply Inbound Track interceptions by the „45" method

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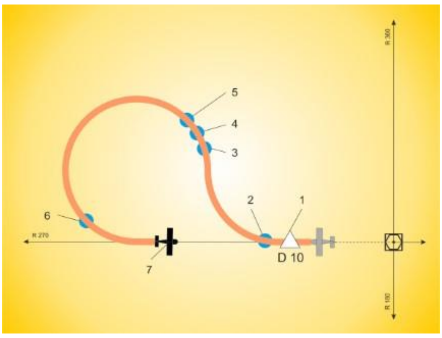
IR(A) Training REVERSAL PROCEDURES

80/260 PROCEDURE TURN



The 80/260 Procedure Turn consists of two connected turns:
the first by 80° and the second by 260° in the opposite direction

You are on RADIAL 270

Exercise 1:
Take 80/260 Procedure Turn to the right, on RADIAL 270 at distance 10 DME

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IR(A) Training REVERSAL PROCEDURES

80/260 PROCEDURE TURN

After reaching the designated position:

1. Start turning **right**
2. Set HB to 350° (270 + 80 = 350)

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IR(A) Training REVERSAL PROCEDURES

80/260 PROCEDURE TURN

~~After reaching the designated position:~~

~~1. Start turning right.~~

~~2. Set HB to 350° (270 + 80 = 350)~~

3. When you reach 350 °, turn **left**
4. Set „Arrowhead" to RADIAL 270 INBOUD, Track 090° (270 – 180 = 90)
5. Set HB to the "Needle" side - value 135° (090 + 45 = 135) for interception

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IR(A) Training REVERSAL PROCEDURES

80/260 PROCEDURE TURN

~~After reaching the designated position:~~

~~1. Start turning right.~~

~~2. Set HB to 350° (270 + 80 = 350).~~

~~3. When you reach 350 °, turn left~~

~~4. Set „Arrowhead" to RADIAL 270 INBOUD Track 090 (270-180=90)~~

~~5. Set HB to the "Needle" side value 135° (090 + 45 = 135) for interception~~

6. Intercept RADIAL 270 INBOUND, Track 090°

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IR(A) Training REVERSAL PROCEDURES

80/260 PROCEDURE TURN

~~After reaching the designated position:~~

1. ~~Start turning right.~~

~~2. Set HB to 350 ° (270 + 80 = 350).~~

~~3. When you reach 350 °, turn left~~

~~4. Set Arrowhead to RADIAL 270 INBOUD Track 090 (270-180=90)~~

~~5. Set HB to the "Needle" side value 135 ° (090 + 45 = 135) for interception~~

~~6. Intercept RADIAL 270 INBOUND, Track 090~~

7. Fly to the VOR on RADIAL 270 INBOUND, Track 090°

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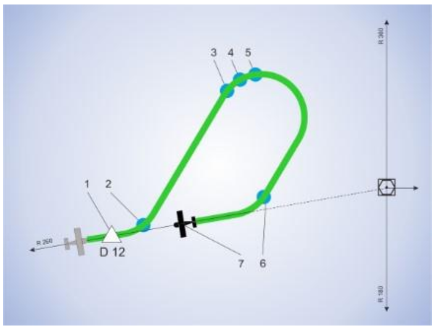
ADRIANA AVIATION

IR(A) Training REVERSAL PROCEDURES

45/180 PROCEDURE TURN



The 45/180 Procedure Turninvolves three consecutive turns:
<u>the first</u> by 45°, a minute after strart timming
<u>the second</u> by 180° in the opposite direction,
then <u>the third</u> by 45° in the same direction, for intercepting Inbound Track

You are on RADIAL 260 INBOUND, Track 080°

<u>Exercise 2</u>:
Take the left 45/180 Procedure Turn, on RADIAL 260 INBOUND,Track 080°, at distance 12 DME

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ADRIANA AVIATION

IR(A) Training REVERSAL PROCEDURES

45/180 PROCEDURE TURN

After reaching the designated position:

1. Start timing and start turning **left**

2. Set HB to 035 ° (80 - 45 = 35)

   and follow this course

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ADRIANA AVIATION

IR(A) Training REVERSAL PROCEDURES

45/180 PROCEDURE TURN

~~After reaching the designated position:~~

~~1. Start the timer and start turning left~~

~~2. Set HB to 035 ° (80 - 45 = 35) and follow this course~~

3. After one minute, turn **right**

4. Set „Arrowhead” to RADIAL 260

   (080 + 180 = 260)

5. Set HB to the ”Needle” side - value

   215° (260-45=215) for interception

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IR(A) Training REVERSAL PROCEDURES

45/180 PROCEDURE TURN

~~After reaching the designated position:~~

~~1. Start the timer and start turning left~~

~~2. Set HB to 035 ° (80 - 45 = 35) and follow this course~~

~~3. After one minute, turn right~~

~~4. Set „Arrowhead" to RADIAL 260 (080 + 180 = 260)~~

~~5. Set HB to the "Needle" side - value 215 ° (260-45=215) for interception~~

6. Intercept RADIAL 260

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IR(A) Training REVERSAL PROCEDURES

45/180 PROCEDURE TURN

~~After reaching the designated position:~~

~~1. Start the timer and start turning left~~

~~2. Set HB to 035 ° (80 - 45 = 35) and follow this course~~

~~3. After one minute, turn right~~

~~4. Set „Arrowhead" to RADIAL 260 (080 + 180 = 260)~~

~~5. Set HB to the "Needle" side - value 215 ° (260-45=215) for interception~~

~~6. Intercept RADIAL 260~~

7. Fly on RADIAL 260

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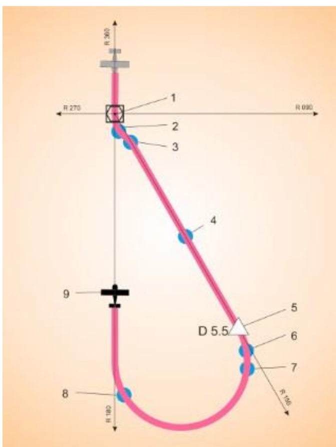
IR(A) Training REVERSAL PROCEDURES

BASE TURN



The base turn start at NAV aid or FIX and consists of:

1. Deviation by a certain angle,
2. Outbound flight in a straight line (i.e. Radial) for a specific time or distance,
3. Turn in the opposite direction to the previous deviation,
4. Interception a specific Inbound Track and
5. Arrive to this NAV aid or FIX

You are approaching to VOR on RADIAL 360 INBOUND, Track 180°

EXERCISE 3:

Based on the VOR take the Base Turn:

- OUTBOUND TRACK - RADIAL 150

- Distance - DME 5.5

- INBOUND TRACK – 360° (RADIAL 180 INBOUND)

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IR(A) Training REVERSAL PROCEDURES

BASE TURN

After passing the VOR:

1. Start timing and start turning **left**
2. Set „Arrowhead” to 150 °, HB to 140°

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IR(A) Training REVERSAL PROCEDURES

BASE TURN

~~After passing the VOR:~~

~~1. Start timing and start turning left~~

~~2. Set „Arrowhead” to 150 °, HB to 140 °~~

3. Follow the course 140 ° and intercept RADIAL 150

ATO ADRIANA AVIATION – 2021

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IR(A) Training REVERSAL PROCEDURES

BASE TURN

~~After passing the VOR:~~

~~1. Start timing and start turning left~~

~~2. Set „Arrowhead” to 150 °, HB to 140 °~~

~~3. Follow the course 140° and intercept RADIAL 150~~

4. Fly on RADIAL 150 to DME 5.5

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IR(A) Training REVERSAL PROCEDURES

BASE TURN

~~After passing the VOR:~~

~~1. Start timing and start turning left~~

~~2. Set „Arrowhead" to 150°, HB to 140°~~

~~3. Follow the course 140° and intercept RADIAL 150~~

4. Fly on RADIAL 150 to DME 5.5

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IR(A) Training REVERSAL PROCEDURES

BASE TURN

~~After passing the VOR:~~

~~1. Start timing and start turning left~~

~~2. Set „Arrowhead" to 150°, HB to 140°~~

~~3. Follow the course 140° and intercept RADIAL 150~~

~~4. Fly on RADIAL 150 to DME 5.5~~

~~5. After reaching DME 5.5, turn right.~~
~~Set „Arrowhead" to 360~~

~~6. Set HB to the „Needle" side – value 315° (360-45=315).~~

7. Intercept RADIAL 180 INBOUND
Track 360°

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IR(A) Training REVERSAL PROCEDURES

BASE TURN

~~After passing the VOR:~~

~~1. Start timing and start turning left~~

~~2. Set „Arrowhead" to 150°, HB to 140°~~

~~3. Follow the course 140° and intercept RADIAL 150~~

~~4. Fly on RADIAL 150 to DME 5.5~~

~~5. After reaching DME 5.5, turn right~~
~~Set „Arrowhead" to 360~~

~~6. Set HB to the „Needle" side – value 315° (360-45=315)~~

~~7. Intercept RADIAL 180 INBOUND Track 360~~

8. Fly to VOR on INBOUND Track 360 °
(RADIAL 180 INBOUND)

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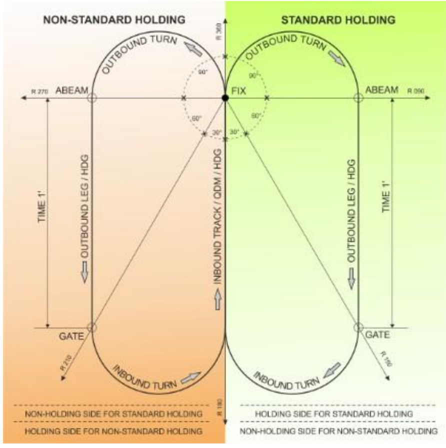
APPENDIX 5 HOLDINGS

IR(A) Training HOLDINGS

HOLDING PARAMETERS



Holding procedures are used to delay aircraft for a variety of reasons

Each Holding consists of:

F – Fix: VOR, NDB, Rad/Dist, RNAV point

L – Level (Flight Level or Altitude)

I – Inbound Track/QDM/HDG

R – Right or Left turns

T – Time for Outbound Leg

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IR(A) Training HOLDINGS

EXECUTION OF HOLDING

1. When passing FIX, according to 5 – T Rule:
   - start timing
   - start „Rate 1” Outbound Turn: right (STD) or left (N -STD)
   - set „Arrowhead” to ABEAM Radial
   - set HB to Outbound Heading and continue Outbound Turn to ABEAM
2. When reaching ABEAM:
   - start timing
   - set „Arrowhead” to GATE Radial
   - continue flying to GATE
3. When reaching GATE:
   - start „Rate 1” Inbound Turn: right (STD) or left (N -STD)
   - set „Arrowhead” to Inbound Track
   - set HB to the „Needle” side ±45° and continue Inbound Turn for Interception
4. When intercepting Inbound Track continue fly to FIX

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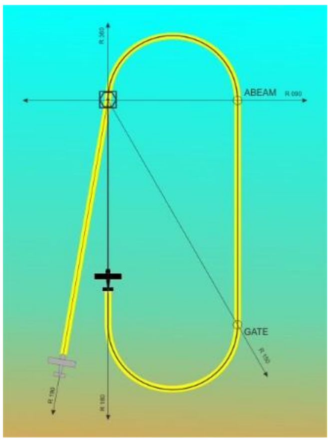
IR(A) Training HOLDINGS

EXECUTION OF HOLDING



You are approaching to VOR on Radial 190 Inbound, Track 010 °

Exercise 1:

Join Standard Holding at VOR, Inbound Track 360°

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IR(A) Training HOLDINGS

EXECUTION OF HOLDING

1. When passing FIX:

Start timing and
start turning right

Set „Arrowhead" to 090°
and HB to 180°

Continue Outbound
Turn to ABEAM

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IR(A) Training HOLDINGS

EXECUTION OF HOLDING

2. When reaching ABEAM:

Start timing

Set „Arrowhead"to 150°

Continue flying to GATE

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IR(A) Training HOLDINGS

EXECUTION OF HOLDING

3. When reaching GATE:

Start turning right

Set „Arrowhead" to 360°
and HB to 315°

Continue turning
for Interception

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IR(A) Training HOLDINGS

EXECUTION OF HOLDING

3. When reaching GATE:

Start turning right

Set „Arrowhead" to 360° and HB to 315°

Continue turning for Interception

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IR(A) Training HOLDINGS

EXECUTION OF HOLDING

3. When reaching GATE:

Start turning right

Set „Arrowhead" to 360° and HB to 315°

Continue turning for Interception

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IR(A) Training HOLDINGS

EXECUTION OF HOLDING

1. When passing FIX:

Start turning right

Set „Arrowhead" to 360° and HB to 180°

Continue Outbound Turn to ABEAM

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IR(A) Training HOLDINGS

EXECUTION OF HOLDING

1. When passing FIX:

Start turning right

Set „Arrowhead” to 360° and HB to 180°

Continue Outbound Turn to ABEAM

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IR(A) Training HOLDINGS

METHODS OF ENTRY

Flying for holding to the FIX we have to choose the method of entry, which depends on Inbound Track and type of holding. There are three methods presented in the following slides:

- DIRECT (sector 180°) – after passig FIX, start „Rate 1” Outbound Turn according to holding type (STD – right, N-STD – left) to ABEAM and continue via GATE, Inbound Turn, Inbound Track to FIX
- TEARDROP (sector 70°) – after passig FIX, Intercept Radial to GATE and fly 1’ 10”, then start „Rate 1” Outbound Turn for interception Inbound Track to FIX
- PARALLEL (sector 110°) – after passing FIX, Turn to Outbound Heading and fly on Non-Holding Side 1’ 00” parallel to Inbout Track, then turn to Holding Side (opposite to type of holding: STD – left, N-STD – right), fly directly to FIX or intercept Inbound Track, and then take Direct Entry for holding

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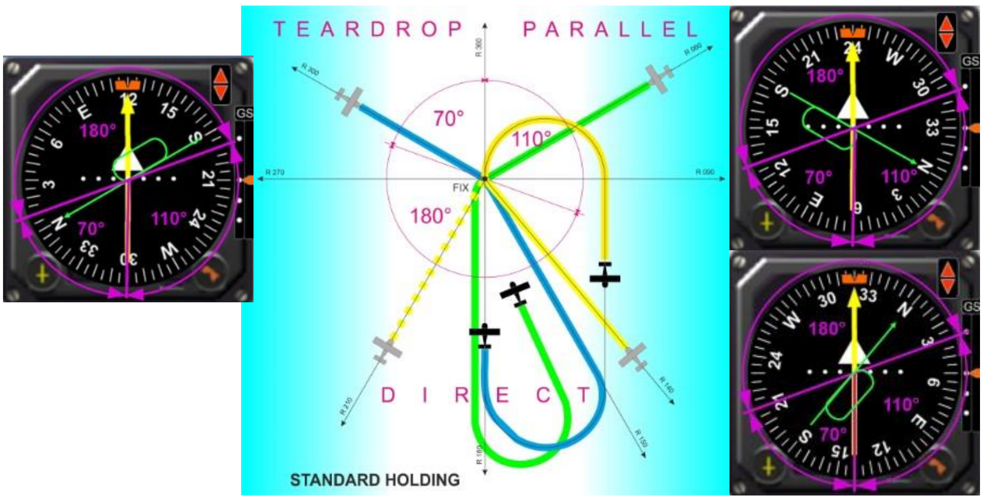
IR(A) Training HOLDINGS

METHODS OF ENTRY



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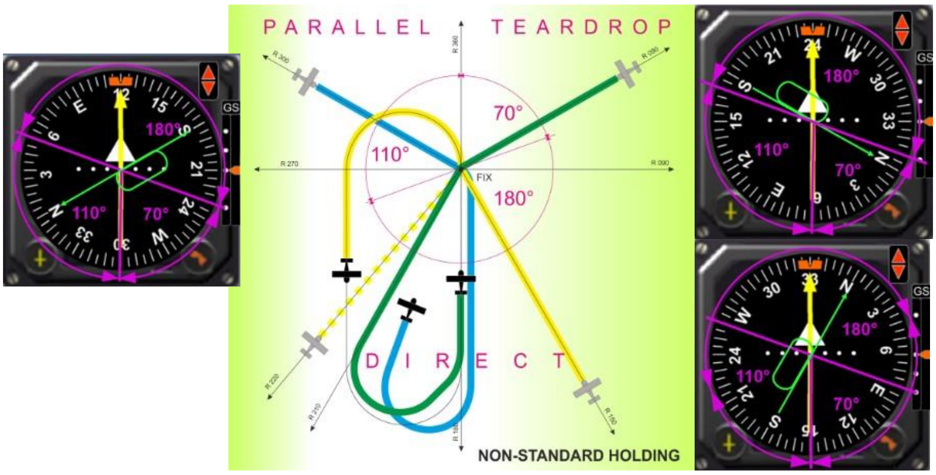
IR(A) Training HOLDINGS

METHODS OF ENTRY



IR(A) Training HOLDINGS

METHODS OF ENTRY

You are approaching to VOR on Radial 060 Inbound, Track 240 °

Exercise 2: Join Non-Standard Holding at VOR, Inbound Track 360 °

Method of entry:

- Teardrop

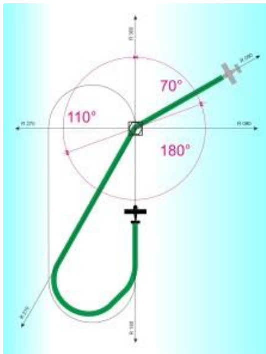
After passing FIX:

- GATE Radial 210

(360 – 90 – 60 = 210)

Next turns:

- All left



IR(A) Training HOLDINGS

METHODS OF ENTRY

1. When passing FIX:

Start timing and start turning left

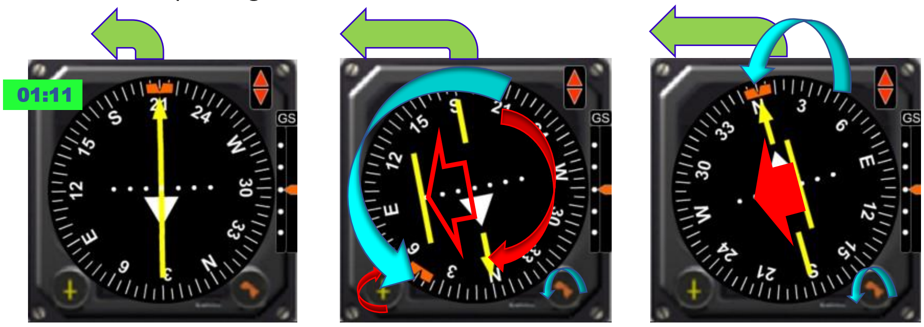
Set „Arrowhead” and HB to 210°

Intercept Radial 210° to GATE

IR(A) Training HOLDINGS

METHODS OF ENTRY

2. After passing scheduled time:



Start turning left

Set „Arrowhead" to 360° and HB to 045°

Intercept Radial 180° Inbound Track 360° to FIX

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IR(A) Training HOLDINGS

METHODS OF ENTRY

You are approaching to VOR on Radial 300 Inbound, Track 120 °

<u>Exercise 3:</u> Join Non-Standard Holding at VOR, Inbound Track 360 °

Method of entry:

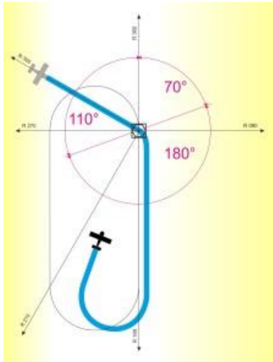
- Parallel

After passing FIX:

- fly Outbound 180°

Next turns:

- right, left



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IR(A) Training HOLDINGS

METHODS OF ENTRY

1. When passing FIX:

Start timing and start turning right

Set HB to 180°, „Arrow" may be set to 360°

Fly Outbound Leg 180°

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IR(A) Training HOLDINGS

METHODS OF ENTRY

2. After passing scheduled time:

Start turning right

HB may be set to 360̊

Continue right turn

IR(A) Training HOLDINGS

METHODS OF ENTRY

3. When crossing Inbound Track:

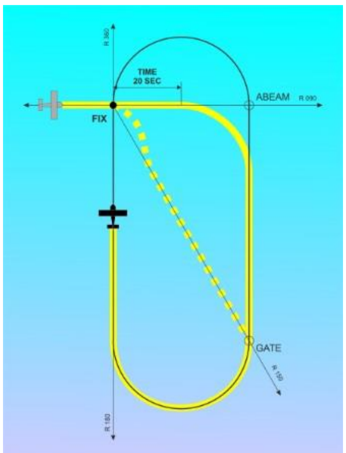
Continue right turn

Set „Arrowhead” and HB to estimated course to FIX

Intercept new Inbound Track to FIX

IR(A) Training HOLDINGS

METHODS OF ENTRY



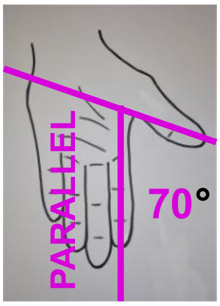
SPECIAL CASE of Direct Entry:
When you are flying to FIX with heading perpendicular to Inbound Track,

after passing FIX continue present heading for 20'', then turn to Outbound Leg,
or
use Teardrop method (intercept GATE Radial)

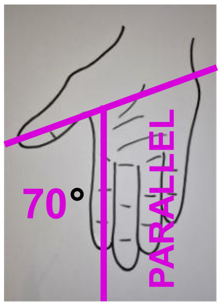
IR(A) Training HOLDINGS

METHODS OF ENTRY

If you have a trouble… look at the Wind Rose and the inside of your hand …



Non-Standard Holding (left)



Standard Holding (right)

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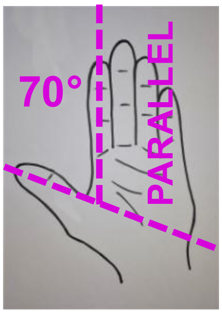
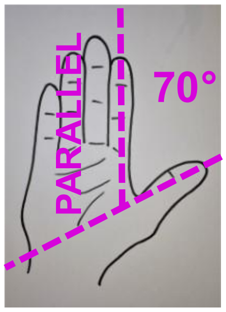
IR(A) Training HOLDINGS

METHODS OF ENTRY

Another case… look for **OUTBOUND** …





Created by Dariusz Bartczak 2020 / ATO ADRIANA AVIATION – 2021

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IR(A) Training HOLDINGS

WIND CORRECTIONS

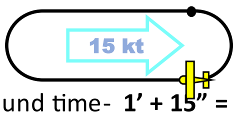
In case of head/tail wind:

- **increase** the Outbound Time by 1sec per 1kt of headwind
- **reduce** the Outbound Time by 1sec per each 1kt of tailwind

In case of side wind:

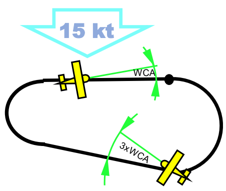
- determine WCA on Inbound Leg
- apply twice WCA (max 30°) into wind on Outbound Leg

NOTE: If you reach the GATE Radial before expected time, intercept and fly away on this Radial, untill the time elapses



Outbound time - **1' + 15" = 1'15"**

Outbound time - **1' - 20" = 0'40"**



W = 15kt
IAS = 110kt
WCA = 8° (15 x 60) : 110 = 8
3 x WCA = 24° 3 x 8 = 24

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IR(A) Training HOLDINGS

SUMMARY

1. Determine the Method of Entry
2. Specify manouver after passing FIX:
   - Direct – Take „Rate 1" Outbound Turn to ABEAM
   - Teardop – Intercept Radial to GATE and fly 1'10"
   - Parallel – Turn to Outbound Track and fly 1'00"
3. Determine the directions of the next turns
   - Direct and Teardrop – all turns according to type of Holding:
     for STD Holdings – right turns, for N-STD Holdings – left turns
   - Parallel – first turn opposite to Holding type, next – according to:
     for STD Holdings: left /right, for N-STD Holdings: right/left
4. Calculate ABEAM and GATE Radials:
   - for STD Holdings : Inbound Track + 90° (ABEAM) + 60° (GATE)
   - for N-STD Holdings: Inbound Track – 90° (ABEAM) – 60° (GATE)

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I N T E N T I O N A L L Y

L E F T

B L A N K

APPENDIX 6 DME ARC

IR(A) Training DME ARC

INTRODUCTION

DME Arcs are sometimes used as Initial Approach Procedures (see EPLB VOR Z Rwy 07 - Jeppesen card 13-1)

They are require DME equipment in conjunction with VOR and HSI

Flying on DME Arc it is important to maintain continuous mental picture of your position on the arc relative to VOR station

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IR(A) Training DME ARC

DME ARC RULES

1. Before use, set VOR/DME frequency and check signal
2. You can join to DME Arc flying Outbound and Inbound VOR
3. Join to DME Arc needs perform initial turn of 90°
4. To specify the Arc as „RIGHT" or „LEFT", look **FROM** VOR:
   a) in „RIGHT" Arc crossing Radials will be increase
   b) in „LEFT" Arc crossing Radials will be decrease
   c) flying Outbound and turning right, you are join to „RIGHT" Arc
   d) flying Inbound and turning right, you are join to „LEFT" Arc
5. During Arc fly mainain required DME distance +/- 0,5 NM
6. When present DME distance is bigger then required, set HB and turn „Inside" Arc, (to the TO/FROM triangle **TOP**)
7. When present DME distance is smaller then required, set HB and turn „Outside" Arc (to the TO/FROM triangle **BASE**)
8. Flying Arc always keep „Arrowhead" on **FROM** position (or „Outside")
9. To leave a DME Arc and intercept a desired Radial, start turning when the airplane is 10° before the required radial

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IR(A) Training DME ARC

EXECUTION OF DME ARC

1. Start „Rate 1" initial turn about 1 NM before required DME Arc distance
2. Set „Arrowhead" to the next 10° or left on desired direction,
3. (bigger for „RIGHT" Arc, smaller for „LEFT" Arc)
4. Set HB perpendicular to „Needle"
5. Reaching of 90° turn, check and, if needed, correct required distance (if smaller – turn „Outside", when bigger – turn „Inside")
6. When „Needle" reach central positon on Course Deviation Scale, set „Arrowhead" to the next 10° and HB perpendicular to „Needle"
7. On lower distances i.e. 6 NM, set „Arrowhead" to the next 20° due to short distances between Radials

ATO ADRIANA AVIATION – 2021 7

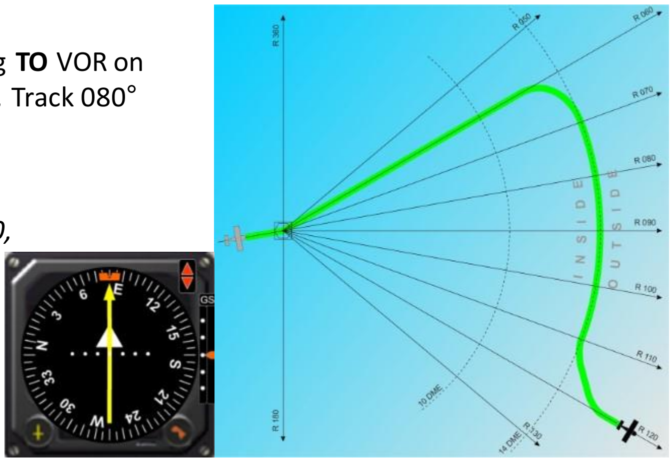
IR(A) Training DME ARC

EXECUTION OF DME ARC

You are approaching **TO** VOR on Radial 260 Inbound, Track 080°

EXERCISE 1:

After passing VOR intercept Radial 060, join „RIGHT" Arc 14 DME, continue to Radial 110, and Intercept Radial 120



ATO ADRIANA AVIATION – 2021

8

IR(A) Training DME ARC

EXECUTION OF DME ARC

On Radial 060, after reaching 13 DME start turning right…

…set „Arrowhead" to 070° and HB to 160°, and…

…continue till „Needle" reach central position

ATO ADRIANA AVIATION – 2021

9

IR(A) Training DME ARC

EXECUTION OF DME ARC

When „Needle" reach central position, start turning right…

…set „Arrowhead" to 080° and HB to 170° and…

…continue till „Needle" reach central position

ATO ADRIANA AVIATION – 2021

10

IR(A) Training DME ARC

EXECUTION OF DME ARC

If distance is bigger then required, start turning „Inside” Arc…

…set HB 10-15° to the right (see triangle **TOP**), and…

…continue, till distance reach proper value

ATO ADRIANA AVIATION – 2021

11

IR(A) Training DME ARC

EXECUTION OF DME ARC

If distance is smaller then required, start turning „Outside” Arc…

…set HB 10-15° to the left (see triangle **BASE**), and…

…continue, till distance reach proper value

ATO ADRIANA AVIATION – 2021

12

IR(A) Training DME ARC

EXECUTION OF DME ARC

After crossing Radial 110, start turning left…

…set „Arrowhead” to 120° and HB to 165°, and…

…intercept Radial 120

ATO ADRIANA AVIATION – 2021

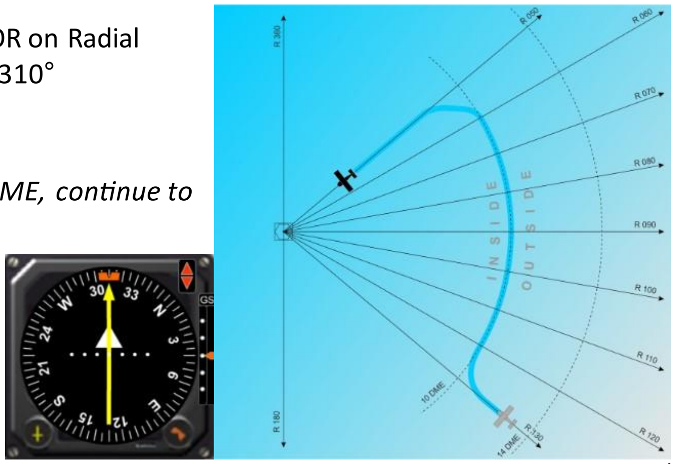
13

IR(A) Training DME ARC

EXECUTION OF DME ARC

You are flying **TO** VOR on Radial 130 Inbound, Track 310°

EXERCISE 2:
Join „LEFT" Arc 10 DME, continue to Radial 060, and Intercept Radial 050 Inbound, Track 230°



ATO ADRIANA AVIATION – 2021 14

IR(A) Training DME ARC

EXECUTION OF DME ARC

On Radial 130 Inbound, after reaching 11 DME start turning right…

…set „Arrowhead" to 120° and HB to 030°, and…

…continue till „Needle" reach central position

ATO ADRIANA AVIATION – 2021 15

IR(A) Training DME ARC

EXECUTION OF DME ARC

When „Needle" reach central position, start turning left…

…set „Arrowhead" to 110°, HB to 020° and…

…continue till „Needle" reach central position

Repeat the above steps till reach Radial 060

ATO ADRIANA AVIATION – 2021 16

IR(A) Training DME ARC

EXECUTION OF DME ARC

After crossing Radial 060, start turning left…

…set „Arrowhead" to 230° and HB to 275°, and…

…intercept Radial 050 Inbound, Track 230°

ATO ADRIANA AVIATION – 2021

17

I N T E N T I O N A L L Y

L E F T

B L A N K

I N T E N T I O N A L L Y

L E F T

B L A N K