

**Louisiana Tech University
Flight Operations
IFR Maneuvers Guide**

Attitude Instrument Flying

Preferred Method: Control and Performance Method: Set the pitch attitude with the attitude indicator and the power with the Tachometer to achieve the desired performance. Crosscheck the performance instruments to verify the desired performance
Control Instruments: Attitude Indicator, Tachometer
Performance Instruments: Airspeed Indicator, Turn Coordinator, Directional Gyro, Vertical Speed Indicator, Altimeter.

Method #2: Primary and Supporting Method: Each task has instruments that are primary and instruments that are supporting. Focus mainly on the primary instruments and use the supporting instruments to back up the indications on the primary instruments.

Basic Fundamental Skills for Instrument Flying

1. Instrument Scan
 2. Instrument Interpretation
 3. Airplane Control
- Common Errors During Instrument Scan
 1. Fixation
 2. Omission
 3. Emphasis

IFR Clearances (CRAFT)

1. Ground
 - a. Clearance limit
 - b. Route
 - c. Altitude
 - d. Frequency
 - e. Transponder code
2. Airborne – Before entering IMC
 - Same as above

Instrument Scan: There are many types of scans; listed are three of the most common.

1. Selected radial cross check
2. V cross check
3. Rectangular cross check

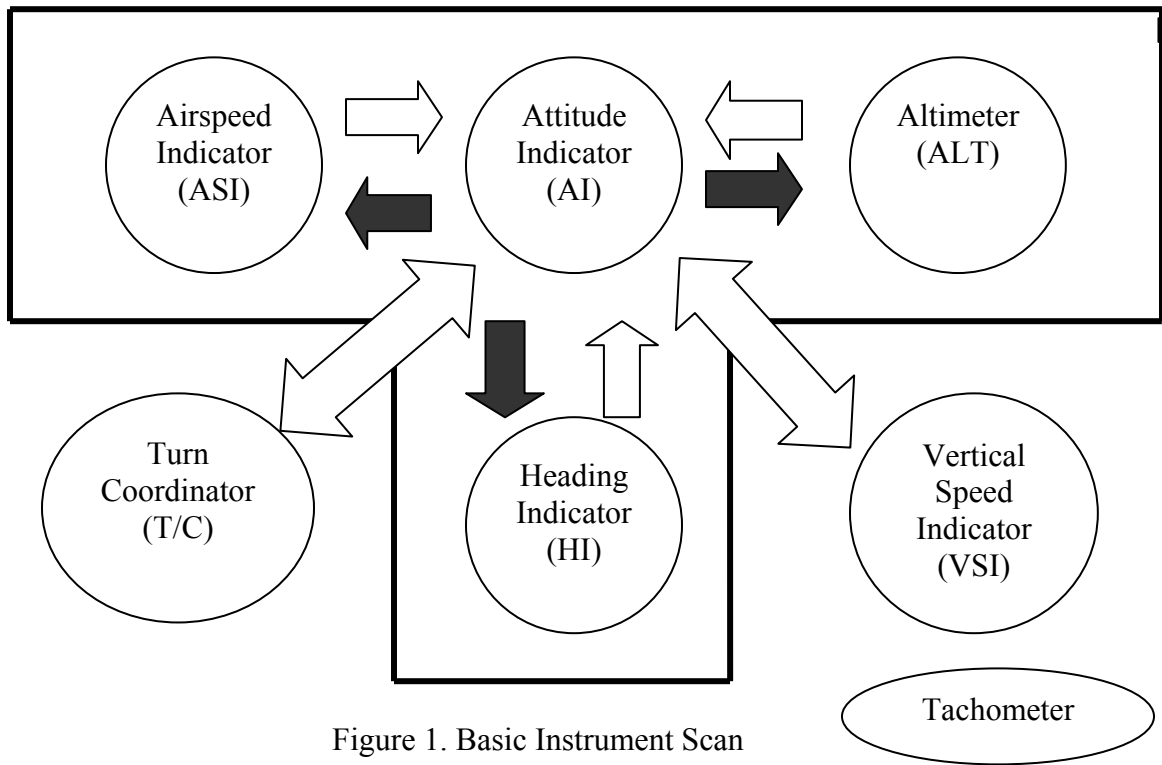


Figure 1. Basic Instrument Scan

Straight Level Flight	Primary	Supporting		Standard Rate Turns	Primary	Supporting
Bank	HI	AI, TC, MC		Bank	TC	AI, MC, HI
Pitch	ALT	AI, VSI, ASI		Pitch	ALT	AI, ASI, VSI
Power	ASI	Tach		Power	ASI	Tach
Climb Constant Airspeed	Primary	Supporting		Climb Constant Rate	Primary	Supporting
Bank	HI	TC, AI, MC		Bank	HI	TC, AI, MC
Pitch	ASI	AI, ALT, VSI		Pitch	VSI	AI, ASI, ALT
Power	Tach	ASI		Power	ASI	Tach
Descent Constant Airspeed	Primary	Supporting		Descent Constant Rate	Primary	Supporting
Bank	HI	TC, AI, MC		Bank	HI	TC, AI, MC
Pitch	ASI	AI, ALT, VSI		Pitch	VSI	AI, ALT, ASI
Power	Tach	ASI		Power	ASI	Tach

Approach Briefing

1. Briefing strip
2. Plan view
3. Profile view
4. MDA, DH, and visibility minimums
5. Time or DME to MAP
6. MAP procedure

Recovery from unusual flight attitudes

A turning **nose-high** unusual attitude indicated by:

1. A turn on the T/C
2. Decreasing airspeed
3. Increasing altitude

--Recovery Procedure

1. Max power
2. Reduce pitch - to prevent a stall
3. Level the wings

A turning **nose-low** unusual attitude indicated by:

1. A turn on the T/C
2. Increasing airspeed
3. Decreasing altitude

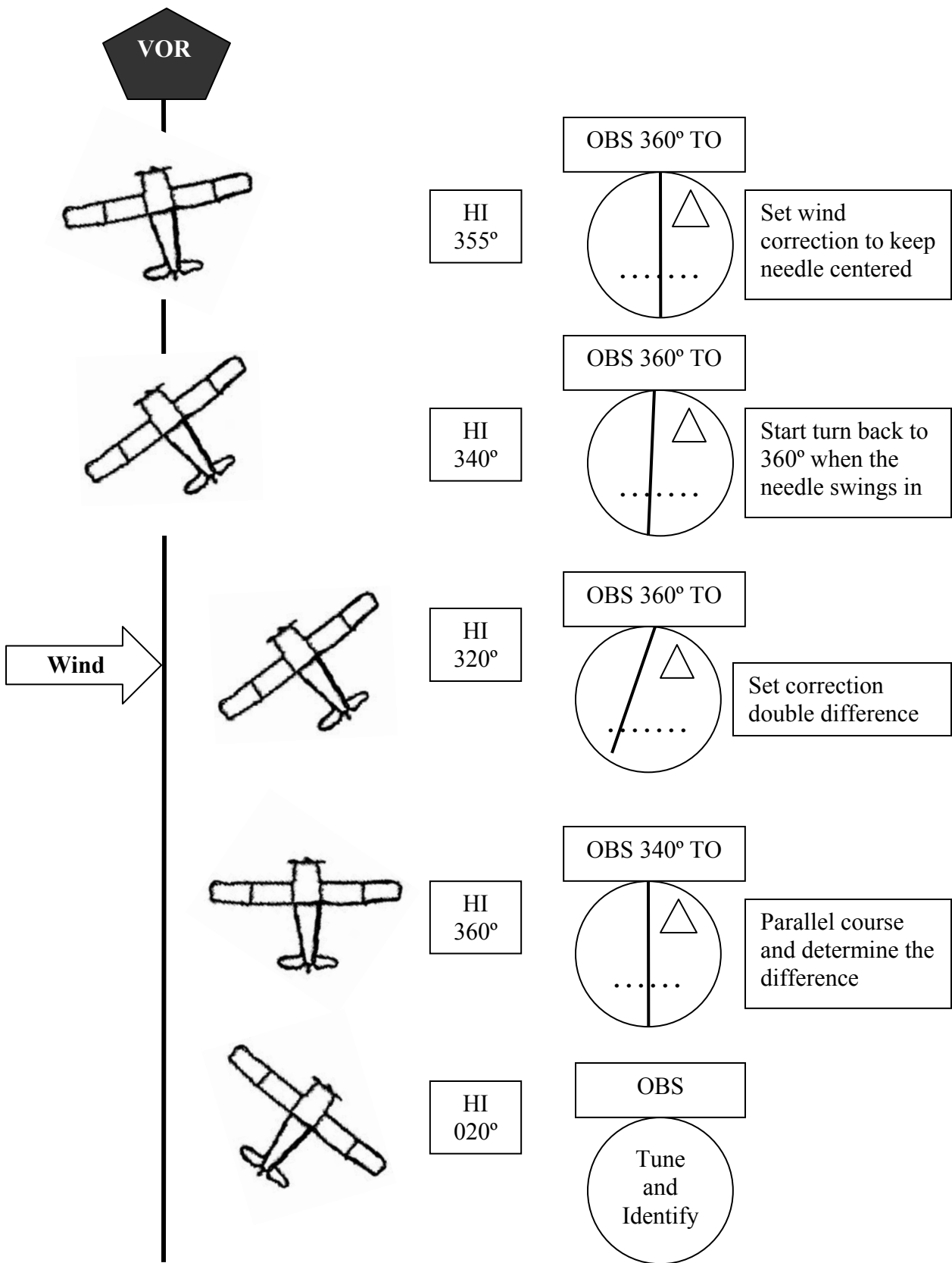
--Recovery Procedure

1. Reduce power
2. Level the wings - to prevent a stall
3. Raise the nose

NAV/COM Stage

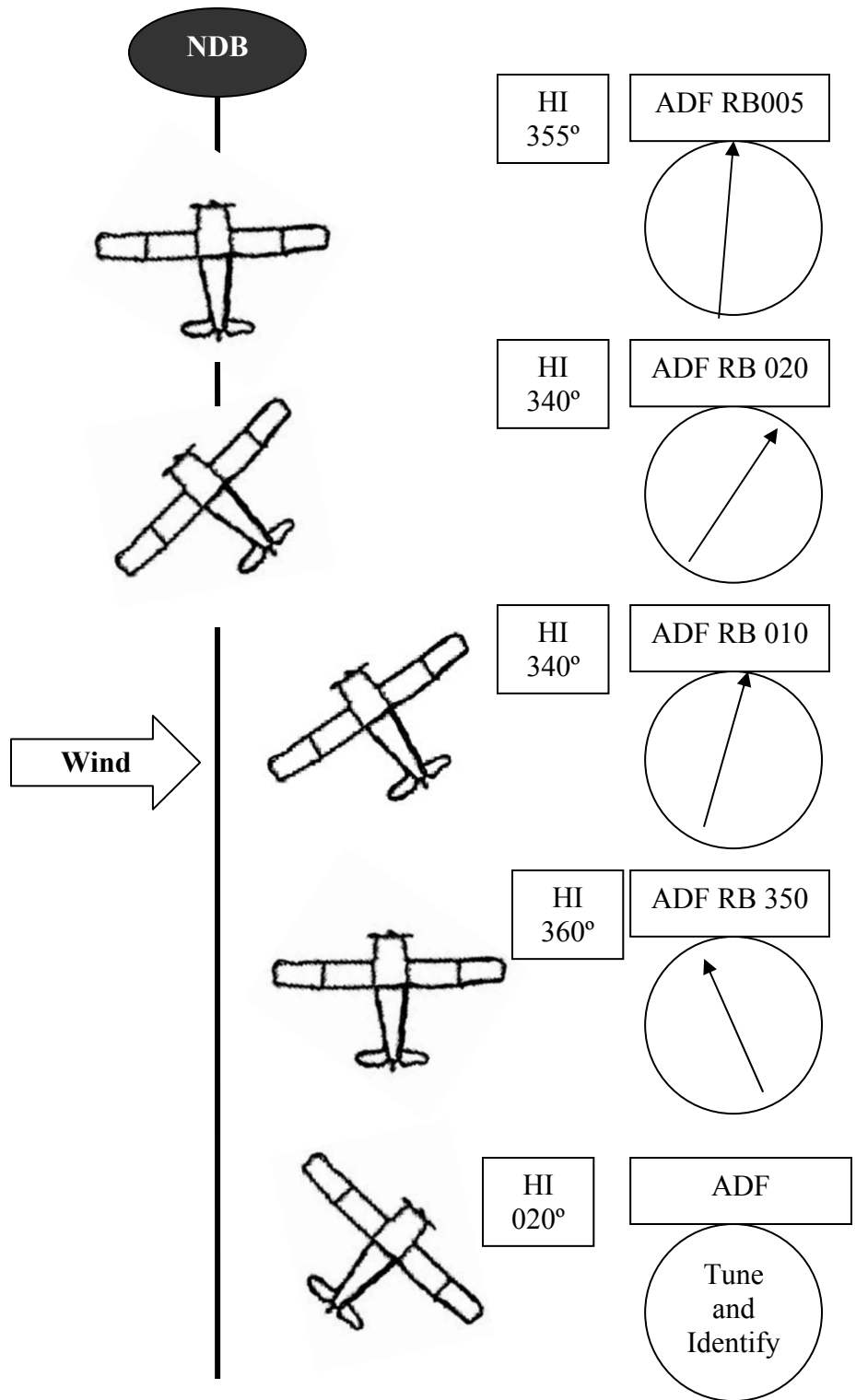
VOR Intercept and Tracking

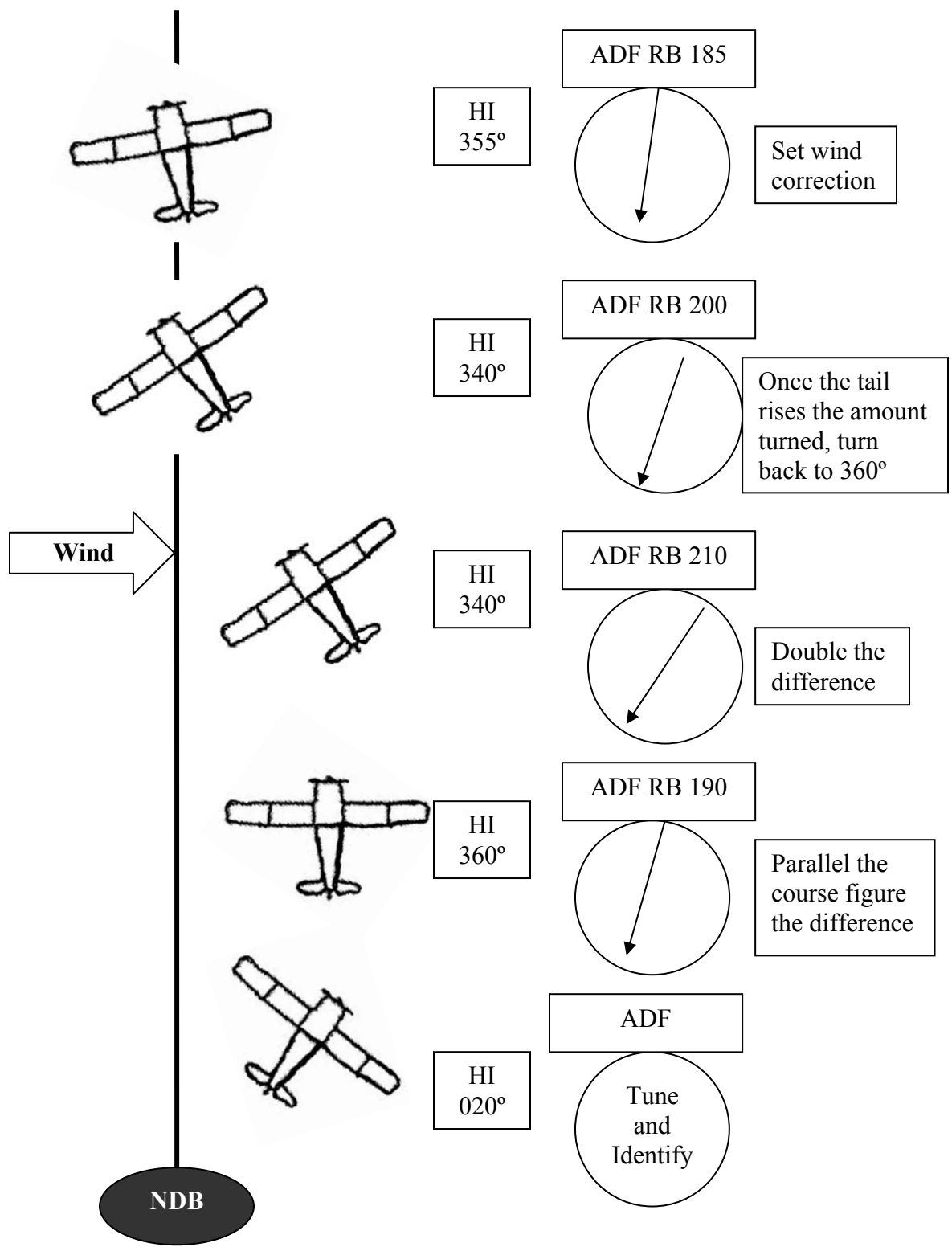
1. Tune and identify the VOR facility.
2. Turn to a heading to parallel the desired course.
3. Determine the difference between the radial to be intercepted and the radial on which you are located (Center of CDI).
4. Double the difference to determine the interception angle (20° ~ 90°).
5. Rotate the OBS to the desired radial or inbound course.
6. Turn to the interception heading and maintain heading until the CDI starts to move to center.
7. As the needle approaches center, turn to intercept the course.
8. Add appropriate wind correction as necessary.



NDB Intercept and Tracking

1. Tune and identify the NDB or LOM facility (leave it on while using ADF).
2. Turn to a heading to parallel the desired course.
3. Determine the difference between the desired and present bearings by looking at the head of the needle if going to the station or tail if going from the ADF.
4. Double the difference to determine the interception bearing.
5. Add correction to intercept the desired course in the direction of the head of the needle.
6. Maintain the intercept heading until the amount of correction equals the amount of deflection on the ADF.
7. Turn to intercept the desired bearing.
8. Add appropriate wind correction as necessary.





Holding (Standard and non-standard hold)

- Holding entries:
 1. Direct
 2. Teardrop
 3. Parallel

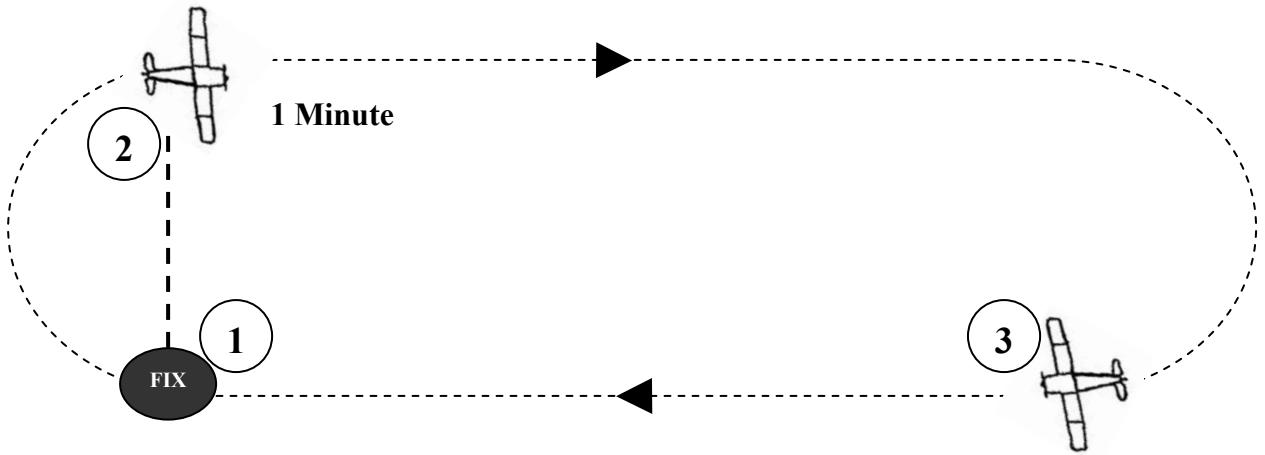
- DO 5 T's list while completing holds
 1. Turn – To the corresponding heading.
 2. Time – Start time for 1 minute or DME when wings level or abeam the fix whichever occurs later.
 3. Throttle – Verify below maximum holding speed.
 4. Twist – OBS to inbound course.
 5. Talk - Notify to ATC or traffic of holding pattern (time & altitude).

Holding Procedure (Refer to figures 6 - 11)

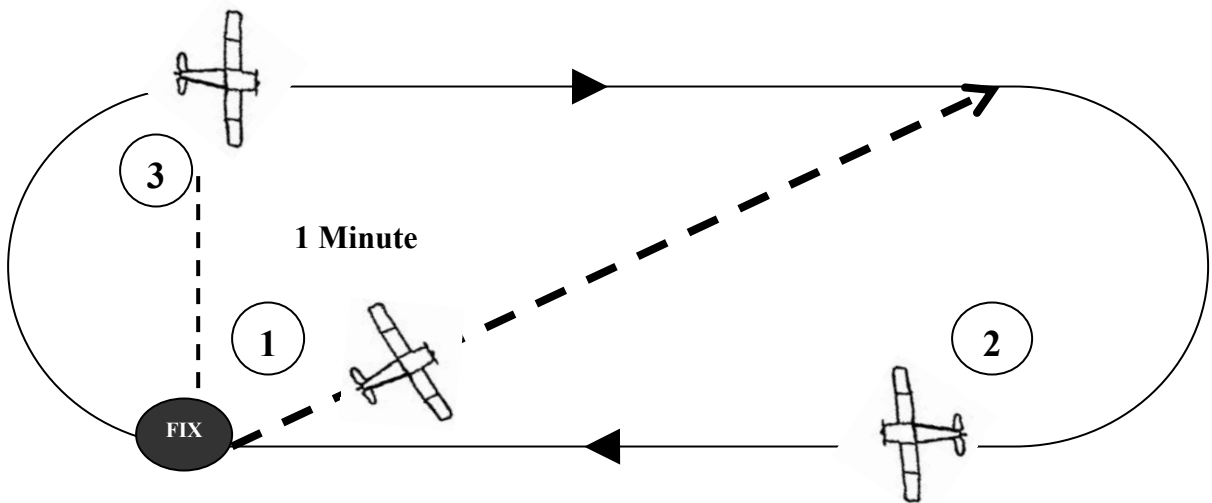
1. Direct entry
 - a. Fly to the fix.
 - b. Turn to the outbound course.
 - c. After 1 minute or DME, turn to the inbound with appropriate wind correction.
 - d. May depart before EFC if cleared

2. Teardrop entry
 - a. Fly to the fix.
 - b. Subtract 30° from the outbound course for standard holds and add 30° for non-standard holds and fly that heading for 1 minute.
 - c. After 1 minute or DME, turn in the direction of the holding pattern to intercept the inbound leg.
 - d. May depart before EFC if cleared.

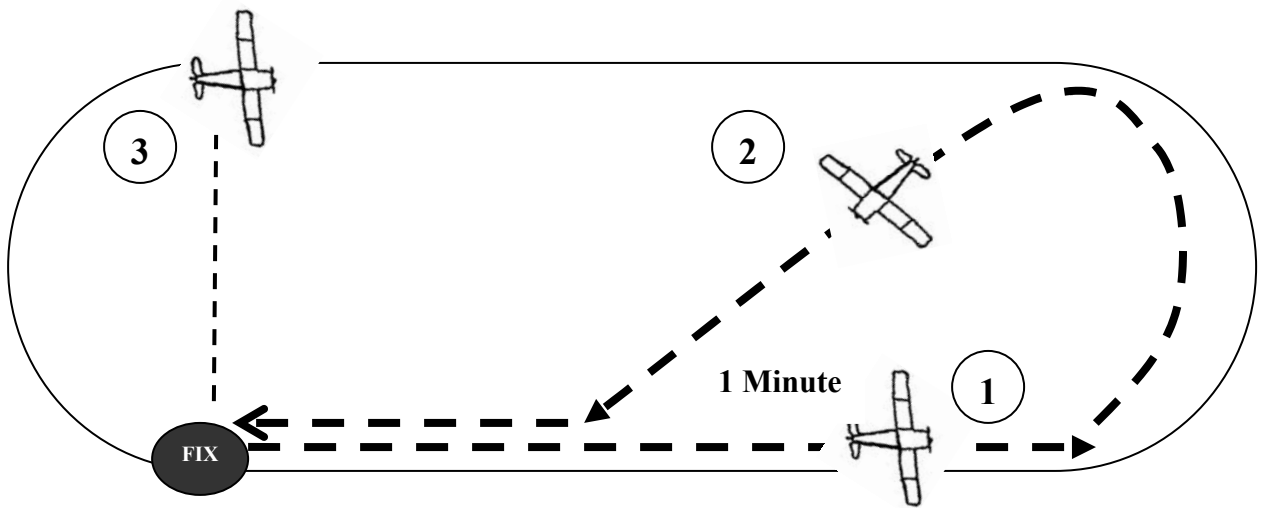
3. Parallel entry
 - a. Fly to the fix.
 - b. Turn to an outbound heading to parallel the inbound course (Don't backtrack on it).
 - c. After 1 minute or DME, turn in the direction of the holding side through more than 180° to intercept the inbound course.
 - d. May depart before EFC if cleared.



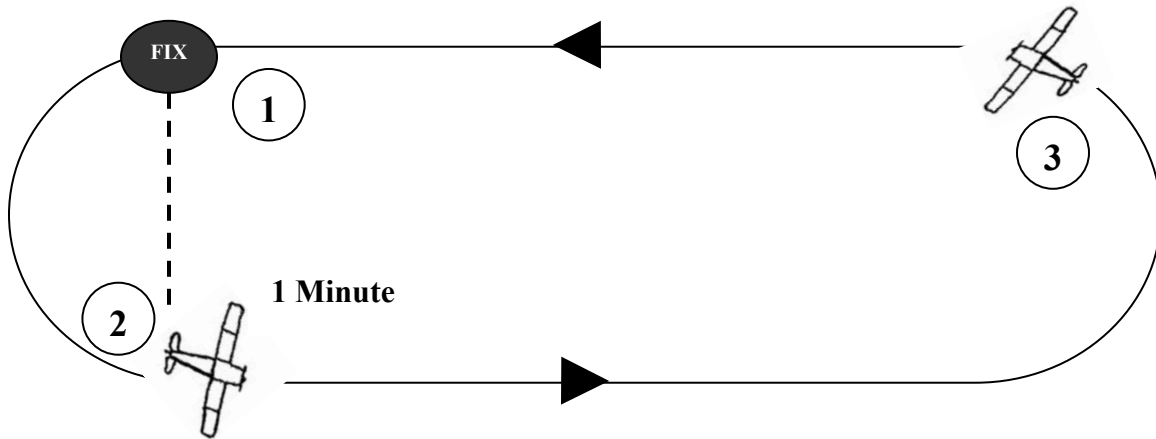
Direct



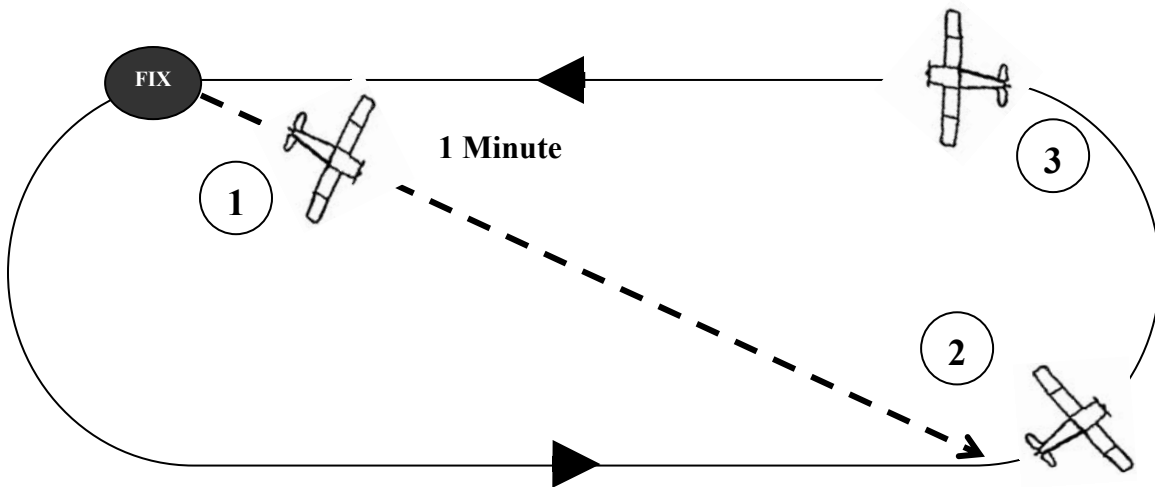
Teardrop



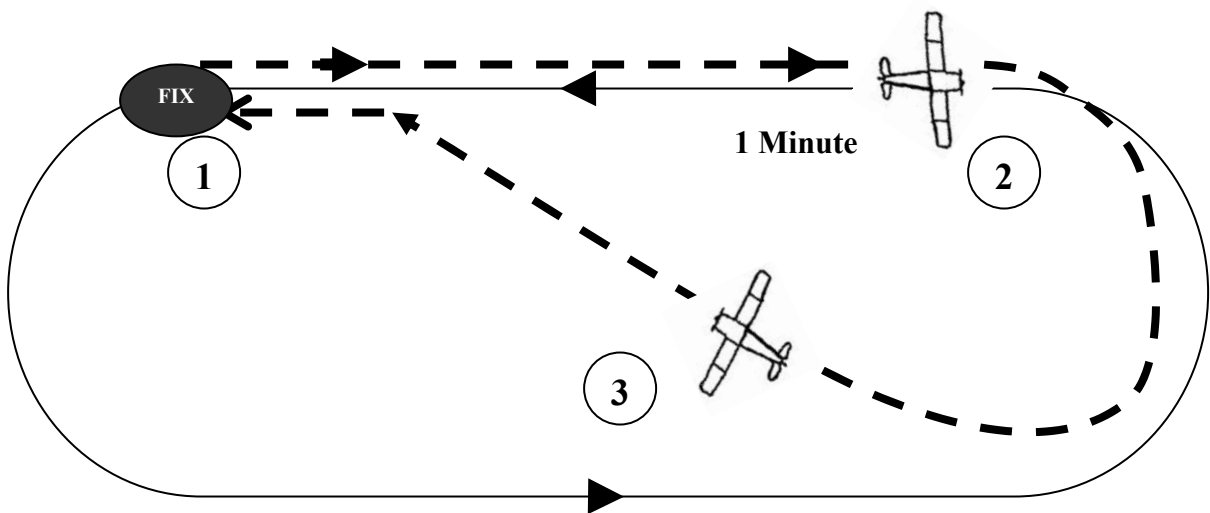
Parallel



Nonstandard Direct



Nonstandard Teardrop

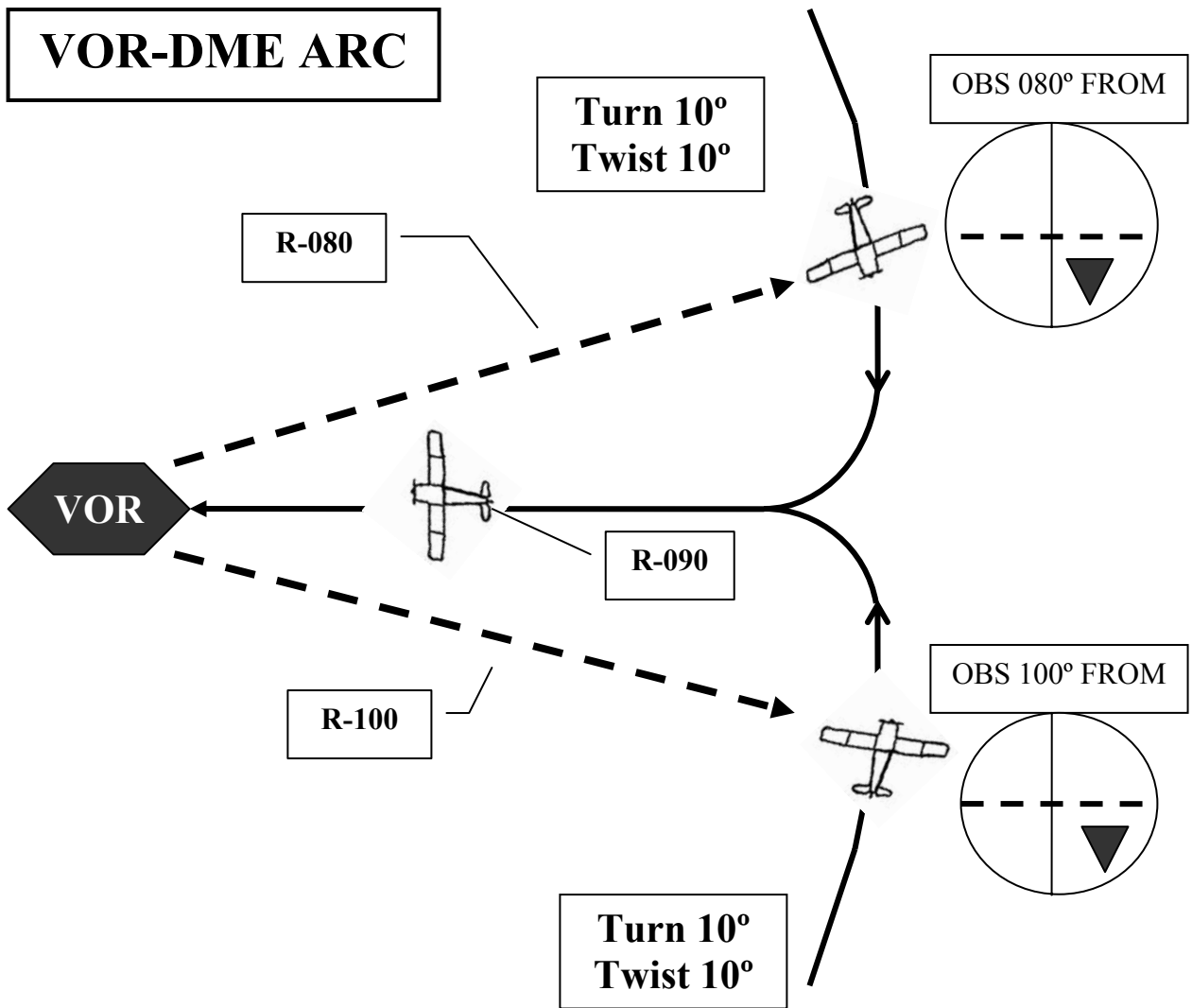


Nonstandard Parallel

Approaches Stage

DME Arc

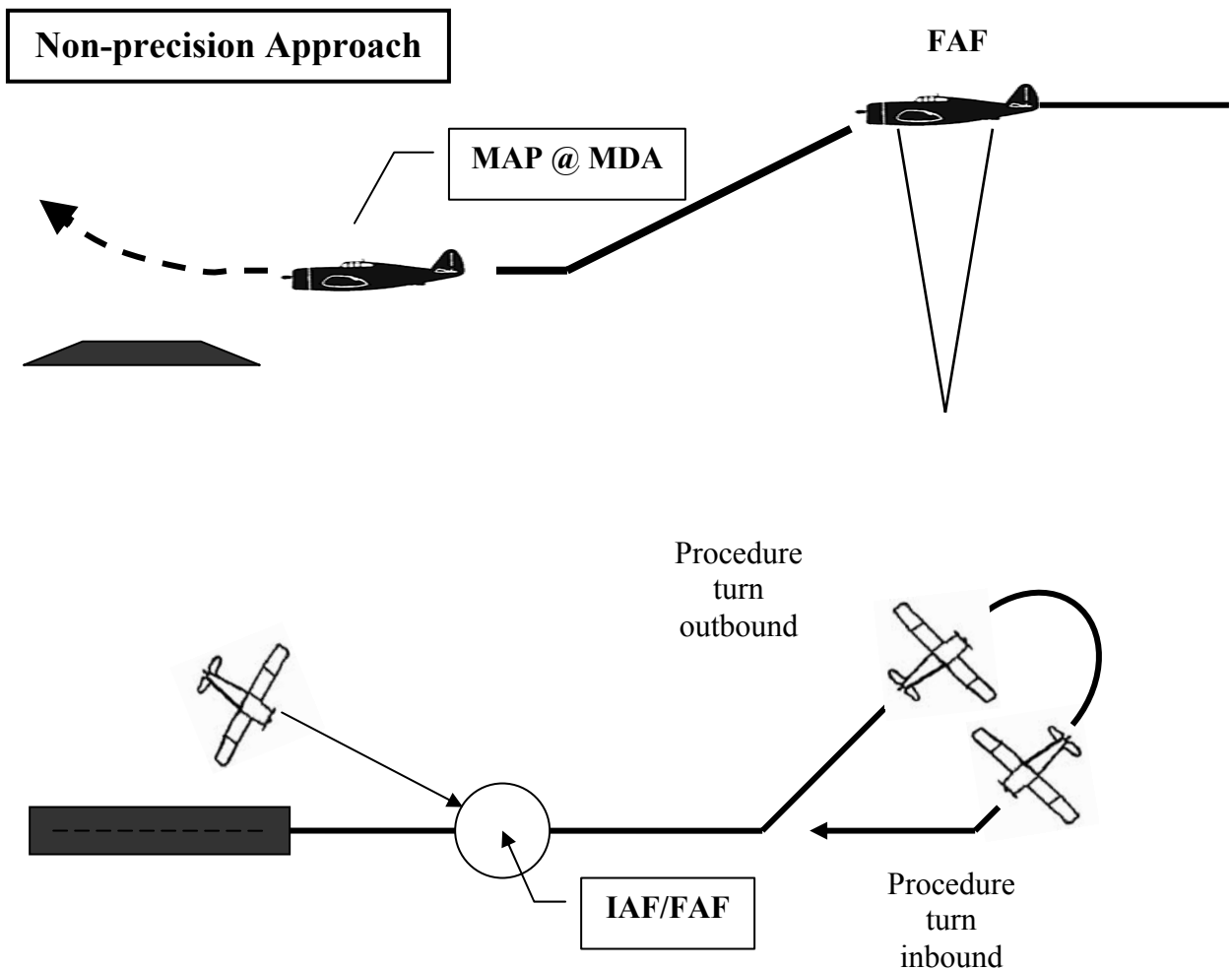
1. Tune and identify VOR and DME
2. Check and set heading indicator against the magnetic compass
3. Track the course to or away from the DME fix
4. Determine the direction of turn from the heading indicator
5. Lead the turn onto the arc by $\frac{1}{2}$ NM or 10% of the ground speed (90° turn)
6. Twist the OBS 10° in the correct direction along the arc
7. When the CDI centers, turn the airplane 10° towards the arc and twist the OBS 10° in the direction to continue along the arc.
8. If the airplane gets too far out turn more than 10°; if the airplane gets too close in, turn less than 10° or don't turn at all.
9. Apply wind correction as necessary to maintain a constant DME distance from VOR
10. Continue to track the arc until you intercept the assigned radial



Non-precision approach

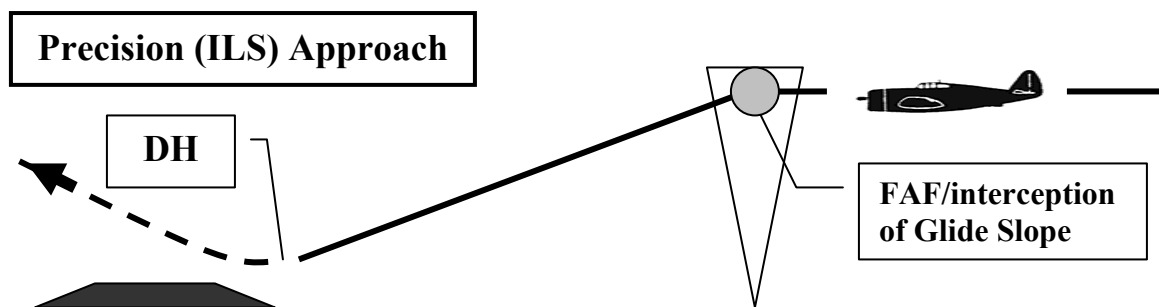
1. Before reaching IAF
 - a. Check and set heading indicator against the magnetic compass.
 - b. Tune and identify the appropriate NAV facilities.
 - c. Approach briefing.
2. At the IAF
 - a. Turn to track your outbound course.
 - b. Start time for 1 or 2 minutes (1 min if fix is off field, 2 min if fix is on field).
3. Procedure turn outbound
 - a. Turn to heading indicated on approach plate for procedure turn.
 - b. Start time for 1 minute.
 - c. Verify OBS set for inbound course.
4. Procedure turn inbound

- a. Reduce power – 90 KIAS
 - b. Intercept the final approach course.
 - c. Complete before landing checklist.
5. Turn to the final inbound course and establish wind correction as necessary.
6. At FAF
 - a. Start time for approach if required and descend.
 - b. Maintain speed – 90 kts GS with power setting (approximately 500~700FPM descent rate).
 - c. Flaps – 10° or as desired
7. At MDA
 - a. Level off at MDA and looking for the airport environment.
8. At missed approach point
 - a. Follow a missed approach procedure.



Precision (ILS) approach

1. Before reaching IAF
 - a. Check and set the heading indicator against the magnetic compass.
 - b. Tune and identify the appropriate NAV facilities (Localizer, OM, marker beacon, DME, and COM).
 - c. Approach briefing.
2. At IAF
 - a. Tracking outbound course of the localizer (Reverse sensing).
 - b. Start time when the localizer is intercepted (1 min).
3. Procedure turn outbound
 - a. Turn to the heading indicated on approach plate for the procedure turn.
 - b. Start time for 1 minute.
4. Procedure turn inbound
 - a. Reduce power – 90 KIAS
 - b. Intercept the final approach course.
 - c. Complete before landing checklist.
5. Turn to the final inbound course and establish wind correction as necessary.
6. At FAF (Interception of the glide slope)
 - a. Track the localizer inbound and intercept the glide slope to begin descent.
 - b. Adjust power and pitch to maintain speed (90 kts GS) and glide slope.
 - c. Track the localizer and the glide slope to the decision height (DH).
 - d. Flaps – 10° or as desired
7. Upon arrival at DH continue approach to land if any runway environment is in sight, or execute a missed approach if not.



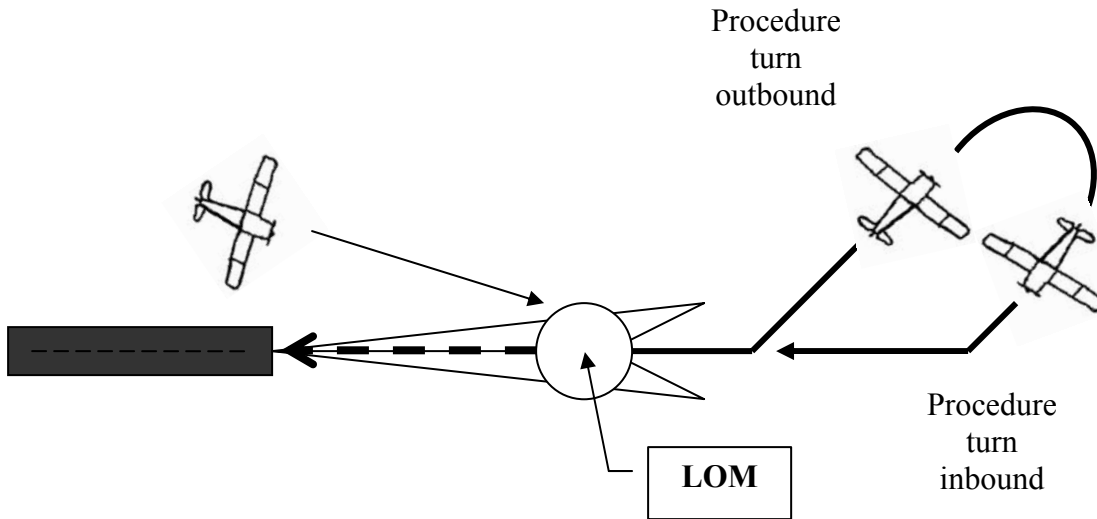
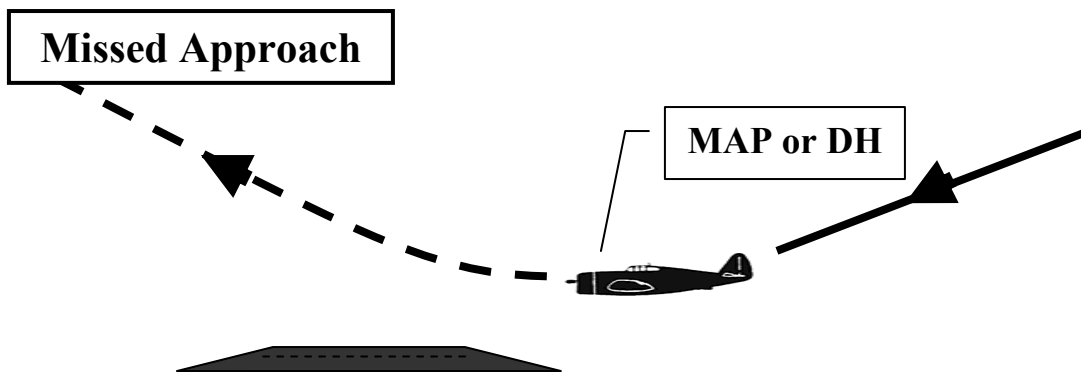


Figure 16. Precision approach plan view

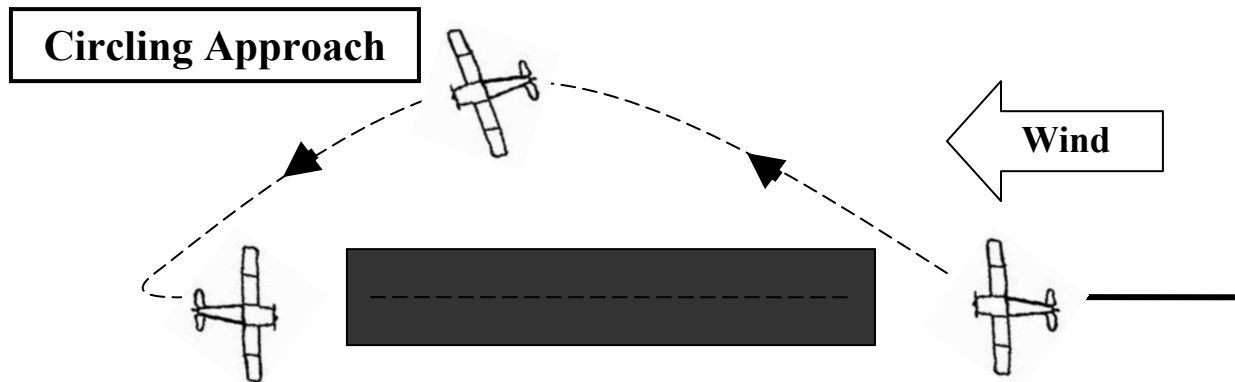
Missed approach

1. At MAP or DH
 - a. Set pitch attitude 74 kts (V_y) and simultaneously.
 - b. Apply full power and retract the flaps (0°)
2. Comply with published missed approach procedures or assigned missed approach procedures from ATC.
3. Notify ATC or traffic of the missed approach.
4. Once out of the airport area and in a stabilized climb complete the climb checklist.



Circling approach

1. Descend to the circling minimum.
2. Circle to the desired runway using maneuver the shortest path to the base or downwind leg or as directed by ATC.
3. Once a landing on the appropriate runway is assured, descend from circling minimums and complete the normal approach and landing procedure.
4. If visual contact with the runway is lost, make a climbing turn toward the original approach runway and execute the missed approach procedure.



Operation below DH or MDA

- At least one of the following visual references for intended runway is distinctly visible and identifiable to pilot

1. The approach light system, except that the pilot may not descend below 100ft above the touchdown zone elevation using the approach lights as a reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.
2. The threshold
3. The threshold marking
4. The threshold lights
5. The runway end identifier lights
6. The visual approach slope indicator
7. The touchdown zone or touchdown zone markings
8. The touchdown zone lights
9. The runway or runway markings
10. The runway lights