TABLE OF FIGURES

NOTE

SNA should plan for de-confliction measures between other training areas and course rules traffic while transiting to and from the route. SNA should determine how many other aircraft are expected to be in the area and at the LZs. This enables the members of the flight to have higher SA about the expected working area and LZ traffic.

COORDINATING INSTRUCTIONS – Coordinating Instructions are the immediate actions or considerations in the event the conduct of flight deviates from the Scheme of Maneuver. Brief these considerations in view of the flight profile. Low-level navigation considerations may be different from other phases of flight. This is a mission brief, not a NATOPS brief. The NATOPS brief (by exception) is briefed after the mission brief and will include how to handle the cockpit in the case of emergencies.

Emergencies/System Failures

"Coordinating Instructions – Emergencies/System Failures – If we have an emergency/system failure during the flight, we will handle in accordance with NATOPS. We will always endeavor to turn a flying emergency into a ground emergency."

Inadvertent Instrument Meteorological Conditions (IIMC) – Brief a plan on how to handle this emergency. Once in IIMC is not the time to "discuss how to regain VMC." In order to build a plan, the SNA should study the chart/map to find the highest obstacle in the area taking into account the Maximum Elevation Figure (MEF). Add a minimum of 200' to the height of the obstacle in MSL and designate a Minimum Safe Altitude (MSA) for the route. Then study the chart/map for a cardinal direction that leads away from the majority of obstacles and clear of all airspaces. Designate this as the Safe Heading (SH). It is possible that more than one SH is necessary at different phases of the flight; however, assigning too many will render the safety measure ineffective. The SNA needs to understanding that de-confliction on the route might dictate a different heading and the primary job of the crew is to execute a turn in the safest direction given the variables at that time. Additionally, SNA should study the chart/map to determine the proper controlling agency to contact if IIMC is encountered.

"IIMC – IIMC is an emergency. If we go IIMC, the PAC will switch to an instrument scan, level the wings, level the nose, center the ball, and start a 500 FPM rate climb to the established MSA and execute a standard rate turn the shortest direction to the SH. PNAC will squawk 7700, dial up 124.05 Eglin Approach in the VHF, request handling, and a discrete squawk for an approach back to (KNDZ or appropriate airfield). If we regain VMC, we will remain VMC."

Disorientation Procedures

"Disorientation Procedures – If we become disoriented on the route of flight, we will attempt to identify a known reference point. Options include; climbing, orbit or hold until reoriented, or return to the last known checkpoint and continue the flight."

4. After the second 180º of turn, reverse the turn at 30º AOB for 360º of heading change. After the 360º of turn, reverse the turn at 30º AOB for 360º of heading change. Maintain airspeed and altitude.

5. After the second 360º of turn, roll wings level on heading, altitude, and airspeed.

Amplification and Technique

1. The reversals will begin at a point prior to the reversal heading which is 1/2 the number of degree AOB. For instance, 10º AOB turn should be reversed 5º prior to the reversal heading.

2. Little or no power change is required for the 10º AOB turn, but some additional power may be required for the 20º AOB turn, and usually a definite power increase will be required to maintain altitude for the 30º AOB turn.

Common Errors and Safety Notes

1. Failure to maintain the proper AOB due to a breakdown in scan and trim techniques.

2. Failure to maintain altitude and airspeed because of a need for additional power in the steeper AOB turns.

3. Ballooning during reversal due to poor power management/scan breakdown.

4. Failure to scan IVSI for climb/descent trends. Watch tendency to pull the nose up or allow it to fall during reversals.

5. Failure to begin reversals on the appropriate heading.

6. Failure to keep ball centered during reversals.

7. Failure to roll out of a turn at the same rate at which SNA rolled into the turn.

307. VERTICAL S-1 PATTERN

Maneuver Description and Application

[(Reference: NIFM Paragraph 18.4 (CLIMBS AND DESCENTS), Paragraph 19.2.1 (Vertical S-1, S-2, S-3, S-4)).]

The vertical S-1 pattern is a proficiency maneuver that develops control coordination while climbing and descending at 500 FPM. The vertical S-1 will be performed with airspeed and heading as constants.

Crew Resource Management

1. PAC alerts PNAC if vertigo or disorientation is encountered. (Situational Awareness)

2. PNAC verbally notifies PAC of deviations from established parameters. (Assertiveness)

3. PNAC provides heading, attitude, altitude, VSI, navigational position and other points of reference to PAC. (Situational Awareness)

4. PNAC provides PAC (when experiencing vertigo) verbal corrective control movements. (Assertiveness)

5. PNAC assumes the controls in a timely manner following exceedance of briefed safety of flight parameters and procedures. (Assertiveness)

Procedures

(Expedite procedures through step 4.)

1. Level the wings.

2. Level the nose.

3. Center the ball.

4. Set power for 80 KIAS. Stop any climb or descent, and achieve 80 KIAS.

5. Recheck the wings, nose, and ball.

6. Execute a 500 FPM climb or descent to base recovery altitude.

7. Execute a level standard rate turn to base heading.

Amplification and Technique

1. Most aircraft are equipped with independently operating attitude gyros. When attitude reference information is suspect, a crosscheck of the other gyro will likely reveal whether the aircraft is full or partial panel. In reality, the controls would normally be transferred to the pilot with the reliable instruments; however, for the purposes of this exercise, you will fly the recovery.

2. Make corrections smoothly and moderately to avoid over-correcting and achieving an opposite unusual attitude, particularly in the case of partial panel recoveries. For instance, over-correcting from a descending left turn could result in a climbing right turn if corrections were made too abruptly or were too great a magnitude. At the discretion of the IP, once the aircraft is in a level flight attitude, recovery altitude and heading can be established simultaneously (i.e., turn to 360 while climbing to 2000 ft).

4. Set power for 80 KIAS, stop any climb or descent, and achieve 80 KIAS.

5. Recheck the ball, wings, and nose.

6. Execute a 500 FPM climb or descent to base recovery altitude.

7. Execute a level standard rate turn to base heading.

Amplification and Technique

1. During the initial steps of the maneuver, the pilot should check turn needle and ball as the wings/IVSI/nose are leveled. The pilot does this to determine that the attitude indicator is providing accurate information.

2. In the case of partial panel recoveries (as with all partial panel flight) the pilot makes corrections smoothly and moderately to avoid over-correcting and achieving an opposite unusual attitude. For instance, over-correcting from a descending left turn could result in a climbing right turn if corrections were made too abruptly or were of too great a magnitude.

Common Errors and Safety Notes

1. Avoid rapid, random control inputs as they cause over-controlling and severely complicate the recovery.

2. Making corrections for several errors at once may lead to incorrect instrument interpretation.

3. Low "G" situations and large, rapid cyclic movements can lead to mast bumping.

4. At no time shall airspeed be allowed to decrease below 40 KIAS.

5. A common tendency encountered in these recoveries is a failure to properly interpret the aircraft instruments. For example, the pilot will see the attitude indicator in a wings level position with no climb or descent evident. The pilot believes everything is perfectly normal, but has failed to notice the airspeed is decreasing through 40 KIAS due to a low power setting. Similarly, the pilot has centered the ball, leveled the wings, and leveled the nose, but the pilot's failure to check the turn needle denied an early opportunity to detect a partial panel condition.

6. Attempting to recover the aircraft by sensory feel rather than by proper instrument interpretation.

7. Fixating rather than continuing an efficient instrument scan.

VORTAC is considered a unified navigational aid, providing VOR azimuth, TACAN azimuth, and TACAN distance (DME) at one site.

TACAN station passage is determined when the range indicator stops decreasing (minimum DME).

When tuning a TACAN station, utilize TINTS:

1. Tune in the proper TACAN channel, selecting "X" or "Y" as appropriate. Ensure the waypoint indicator (WPT) is not flashing by pressing the "USE" button. Ensure "TACAN" mode is selected and not "TACAN RNAV" or "TAC RNAV APP."

2. Identify the station. TACAN stations are identified through the DME button on the audio selector panel. The volume cannot be adjusted from the cockpit. Do not select the associated NAV1 button, as this button selects VOR audio only.

3. Choose needle mode. Ensure the "ADF/VOR" selector buttons are in the "VOR" position for TACAN and VOR operation.

4. Twist desired radial information into the CDI and HIS using the Omni-Bearing Selector knob (OBS). Digital radial information may be presented on the DME indicator by selecting the "RAD" button on the NAV receiver panel.

5. Select NAV 1. In the TH-57, you must receive DME in order to receive TACAN azimuth. Since there is only one DME receiver in the TH-57, the pilot can receive only one TACAN station at a time."

VHF Omnidirectional Range (VOR)

The VOR was developed to replace ADF. Its primary advantage: weather does not affect it like it does ADF.

Most VORs are equipped for voice transmission on their respective frequency. VORs without voice capability are indicated by the letter "W" (without voice) included in the class designator (VORW) On VFR sectionals and IFR Enroute Low Altitude charts, underlined VOR frequencies indicate No Voice transmitted on the frequency."

Some VOR stations broadcast ATIS or Transcribed Weather Broadcasts (TWEB) on the VHF frequency used for VOR navigation. To hear this information, depress the appropriate NAV button, pull the volume knob out, and adjust volume. Where the frequency 122.1R is listed over a VORTAC frequency box on a Low-Altitude IFR Navigation chart, the pilot may talk to FSS by broadcasting on 122.1 with the VHF radio, then listen for a reply on the VOR frequency through the NAV radio.

The only positive method of identifying a VOR is by its Morse Code identification or by the recorded automatic voice identification which is always indicated by use of the word “VOR” following the station's name.

Station passage occurs when the TO-FROM indicator makes the first positive change to FROM, provided the inbound course to the station is twisted in the HSI.

1. ***Tune VOR frequency***, ensuring “VOR” mode is selected. Push “USE.”

2. ***Identify the station***. Select the NAV1 button on the audio selector panel. Adjust the volume as necessary by pulling out the volume knob on the NAV receiver panel on the KNS-81, and adjusting the volume.

3. Ensure ***needles*** are in “VOR” mode.

4. ***Twist*** in the desired course using the “OBS” knob.

5. ***Select NAV 1***.

Non-Directional Radio Beacon (NDB)

Automatic Direction Finding (ADF) equipment, such as the low-frequency radio compass and UHF/ADF, are normally used as backup navigational aids for more sophisticated navigation equipment such as TACAN, VOR, GPS, or Radar. Frequently, helicopters operating in remote areas do not have this more sophisticated equipment available and LF/ADF or UHF/ADF becomes the primary means of radio navigation. The range of LF/ADF is beyond line of sight, which makes it of special use to low flying helicopters.

Dip error in turns causes erroneous bearing indications. Therefore, turns must be made to predetermined headings.

Since ADF receivers do not have a “FLAG” to warn the pilot when erroneous bearing information is being displayed, the pilot must continuously monitor the NDB identification for excessive static and interference to ensure proper reception.

NOTE

If receiver fails, needle will remain in the last relative position when failure occurs.

Station passage is indicated when the ADF needle swings through the 90/270 degree position (falls through the wingtip).

402. ORIENTATION

Maneuver Description and Application

[(Reference NIFM Paragraph 21.2 (EQUIPMENT AND OPERATION), Paragraph 22.2 (EQUIPMENT AND TRANSMISSION PRINCIPLES), Paragraph 23.1 (AUTOMATIC DIRECTION FINDING)).] Orientation is the procedure for determining aircraft position with respect to the NAVAID.

Procedures

1. Tune and identify the station.

2. Ensure the VOR/ADF needle is in the proper position.

3. Determine the radial/course and DME (TACAN/VOR) or bearing/heading (ADF), as applicable.

Amplification and Technique

1. With an operable directional gyro, the head of the ADF needle indicates the magnetic heading to the station from the position of the aircraft. The position of the aircraft relative to the station and magnetic *bearing* is always on the tail of the needle.

2. The TACAN/VOR indicates the *radial* on which the helicopter is located and the course to the station will appear under the head of the needle.

3. With a TACAN or VORTAC, slant range from the station is shown by the DME.

Common Errors and Safety Notes

1. If the directional gyro is frozen or will not slave, the ADF needle will still indicate relative bearing to the station.

2. Nearly all disturbances affecting the ADF bearing also affect the facility's identification. Noisy identification usually occurs when the ADF needle is erratic. Voice, music, or erroneous identification may be heard when a steady false bearing is being displayed. Since ADF receivers do not have a “FLAG” to warn the pilot when erroneous bearing information is being displayed, the pilot must continuously monitor the NDB identification to alert him when a signal becomes unreliable.

3. A TACAN/VOR station should not be used for navigation unless it can be identified even though it appears a good lock-on is obtained.

4. TACAN/VOR signals are subject to line of sight restrictions and unlock may occur when the aircraft fuselage or other obstructions interfere with the transmitted signal.

5. TACAN is susceptible to azimuth errors of 40º or multiples thereof (i.e., 80º, 120º, etc.). This may be caused by a weak airborne receiver and rectified by merely re-channelizing the unit.

6. The only positive method of identifying a VOR is by its three-letter Morse Code identification or by the recorded automatic voice identification which is always indicated by use of the word "IVOR" following the station's name.

7. Utilize available backup NAVAIDs to prevent in-flight use of erroneous navigation signals.

403. HOMING

Maneuver Description and Application

[(Reference: NIFM Paragraph 21.3.8 (Homing), Paragraph 22.1.1.7 (Homing)).]

Homing is accomplished when the aircraft is turned to place the head of the needle under the top index, and keeping it there. By keeping the needle under the index, the station will always be directly ahead of the aircraft. Since homing does not incorporate wind drift correction, in a crosswind the aircraft follows a curved path to the station.

Procedures

Maintain needle under the top index until station passage.

Amplification and Technique

Homing results in a curved path over the ground unless the aircraft has no crosswind component.

Common Errors and Safety Notes

1. When close to the station, the ADF needle will become very sensitive. Avoid large heading changes when this occurs.

2. Homing is not an approved IFR procedure and should be used only when close to the station.

404. TRACKING

Maneuver Description and Application

[(Reference NIFM Paragraph 21.3.7 (Estimating Drift Correction)).]

Tracking is the procedure for determining a magnetic heading which will correct for wind drift and enable the aircraft to maintain a straight track over the ground which coincides with a desired bearing/radial to or from a station, and is the most direct route from one point to another.

4. As you approach the destination fix note the relationship between the rate of change in DME and radial. Adjust heading to have them change at a rate putting you right on the fix.

5. Use of the HSI/CDI, while not required for this maneuver, may assist in the intercept of the new radial.

Common Errors and Safety Notes

Failure to adequately account for wind. A pilot can overcome the wind drift with frequent updates of the point-to-point, particularly as he approaches the destination fix.

409. HOLDING

Maneuver Description and Application

[(Reference: NIFM Paragraph 29.8 (Holding), AIM 5-3-8 (Holding), FAA-H-8083-15A, P. 10-9 (Holding Procedures).]

Holding is the airborne delay of an aircraft at some identifiable fix such as a station, waypoint, intersection, or in the case of TACAN/VORTAC holding, a radial/DME as specified by a controlling agency, enroute chart, or approach plate while awaiting further clearance. Holding may be assigned on short notice due to an unforeseen traffic conflict or another aircraft receiving emergency priority handling. The following procedural sequence will allow you to quickly determine the holding entry and establish the pattern, without having to rely on drawing out the pattern beforehand.

Procedures

1. **Determine the outbound heading for the assigned holding pattern.** The outbound heading is either the same heading as the holding radial or the reciprocal of the holding radial. This is the heading while flying away from the holding fix. The easiest way to determine the outbound heading is to listen to the holding clearance and visualize the holding pattern on an approach plate, chart, or kneeboard. For example, if instructed to hold northeast on the 030 radial at 10 miles, the outbound heading is 030. If instructed to hold southwest on the 030 radial at 10 miles, the outbound heading is 210 (the reciprocal of 030).

2. **Determine the holding entry.** Approaching the holding fix (on the heading you will cross the fix), superimpose the appropriate holding entry pie diagram over the HSI (see figure 4-1). The region of the diagram where the outbound heading falls determines the entry orbit. If the outbound heading falls within 5° of two entry sectors, either entry may be used. It is preferable to choose a teardrop entry, if it is an option.
There are three different entry orbits:

   a. **Parallel Entry:** When approaching the holding fix from sector (a) on Figure 4-1, turn to parallel the holding course on the outbound heading on the non-holding side for one minute or holding DME for TCN or GPS entries.

b. **Teardrop Entry:** When approaching the holding fix from sector (b) on Figure 4-1, turn outbound on the holding side, 30 degrees away from the holding radial. Time outbound for one minute or proceed outbound for the distance required if DME is being used.

c. **Direct Entry:** When approaching the holding fix from sector (c) on Figure 4-2, turn to follow the holding pattern.

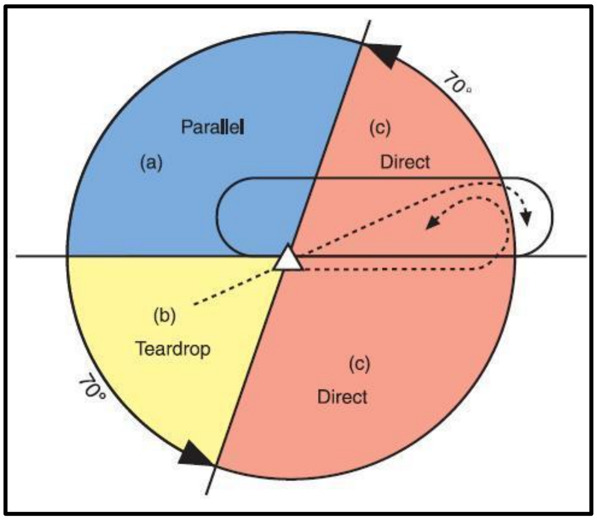

Figure 4-2 Standard Holding Entry Sector Diagram

A useful way to visualize the appropriate holding entry is to overlay your right hand on the RMI card for standard turns or the left hand on the RMI card for non-standard (left) turns, as depicted in Figures 4-3 and 4-4. Remember that you determine which quadrant the *outbound* heading falls.

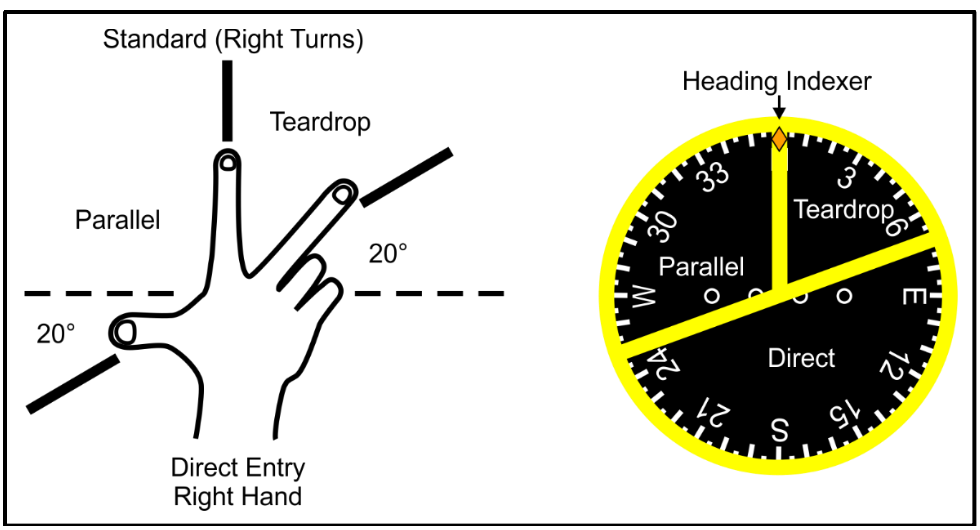

Figure 4-3 Standard Entry Diagram on HSI/CDI Display

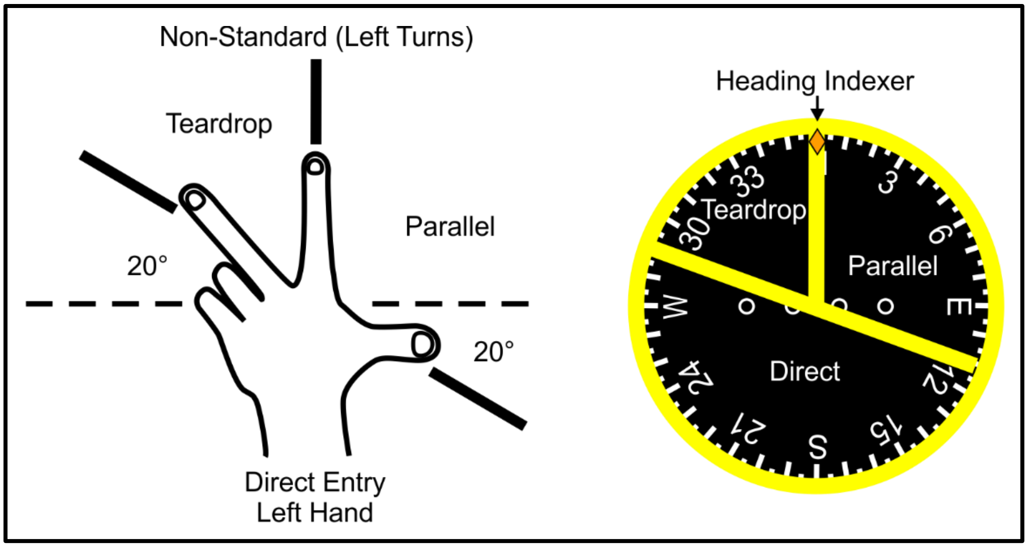

Figure 4-4 Non-Standard Entry Diagram on HSI/CDI Display

3. **Fly the holding pattern.** Upon crossing the holding fix, perform the 6 Ts.

a. ***TIME.*** Note time on initial arrival over holding fix (for PTA report).

b. ***TURN.*** Turn to the appropriate outbound heading.

c. ***TIME*** (VOR/NDB). Begin timing when over the fix (for a teardrop entry) or abeam the fix, whichever occurs later. If the abeam position cannot be determined, start timing when the turn to outbound is completed.

d. ***TRANSITION***. Slow to 80 KIAS for a holding delay or 90 knots for a holding pattern approach.

e. ***TWIST***. Set inbound course in HSI/CDI (VOR, TACAN, LOC, or GPS).

f. ***TALK.*** Make voice report (PTA).

For training purposes, the holding pattern is broken down into three types of orbits, which are accomplished sequentially.

a. ***Entry orbit.*** Fly the no wind outbound or teardrop heading. Reaching 1 minute or required DME outbound, turn toward and intercept the holding radial/bearing (remember tail-radial-turn and use intercept procedures from section 406). Track inbound to the fix.

b. ***No wind orbit.*** The no-wind orbit is flown to determine wind direction and calculate the crab angle required to maintain the desired radial/bearing. Reaching the fix for the second time, turn in the pattern direction to the no-wind outbound heading. At the end of the outbound leg, turn toward the holding radial/bearing. Set up an intercept for the holding radial and start timing, if required (VOR/NDB). As you intercept the inbound radial, note the wind direction. This can be done by determining the direction from the tail of the RMI needle to the holding radial and continue in that direction to determine where the winds are originating (tail-radial-wind). This determines the quadrant the wind is coming from which can be verified against the weather information from the nearest airport (e.g., ATIS, ASOS, etc.). There are three possible outcomes:

i. On course with no crosswind component,

ii. Undershoot with a crosswind from the non-holding side of the pattern, or

iii. Overshoot with the crosswind component from the holding side of the pattern. Intercept the radial and apply a crab correction into the wind to maintain the inbound course.

c. ***Wind corrected orbit.*** Reaching the fix, note the time needed to fly inbound (VOR/NDB). Use this information to adjust the outbound timing to ensure 1 minute timing inbound. To determine the outbound heading correction, *double* the amount of the crab angle used to track the inbound course, and apply it to the outbound course into the wind. Monitor the wind corrections on subsequent orbits to refine the wind corrections for accuracy.

Amplification and Technique

1. Unless otherwise instructed by ATC, pilots are expected to hold as depicted or in a standard pattern.

2. If you receive a clearance limit (i.e., cleared to a point short of the filed destination) and holding instructions have not been issued, hold as depicted at that fix. If no pattern is depicted, ask for holding instructions prior to reaching the fix. If unable to receive holding instructions prior to reaching the fix, hold in a standard pattern on the course on which the aircraft approaches the fix. Maintain the last assigned altitude unless otherwise directed.

3. The following general information will be given in a holding clearance:

a. Direction of the holding pattern from the holding fix.

b. Name of the holding fix

c. Bearing/radial on which the aircraft is to hold.

d. Left turns if a non-standard pattern is to be used.

e. Expected further clearance time.

f. Holding altitude. (Not required if remaining at present altitude).

For published holding patterns ATC may omit all holding instructions except holding direction and the statement "as published."

4. The aircraft is abeam when it is positioned exactly 90° relative to the holding bearing/radial, not necessarily when the needle passes through the 3:00/9:00 (or 90/270) position on the RMI. Remember, your position is always on the tail of the needle. (The TO-FROM flag is not used to indicate the abeam position).

5. ***At the end of each outbound leg, always turn toward the holding radial (tail-radial-turn) regardless of the pattern direction***. If the proper inbound course is twisted into the HSI (VOR, TACAN, GPS), this turn will be toward the deviation bar. (It will be away from the deviation bar when using the CDI in the copilot seat.). If you are already on the radial at the end of the outbound leg, turn toward the protected, holding side of the pattern, e.g., standard pattern turn left).

6. Make all turns during entry and while holding at standard rate (3° per second).

7. Wind compensation will be made on inbound and outbound headings, not when turning.

8. Update expected further clearance (EFC) time at least 5 minutes prior to EFC.

9. Report leaving holding (PTA format not required).

Common Errors and Safety Notes

1. Determine the impact of a delay on fuel state and current aircraft status prior to accepting a holding clearance.

2. Upon receipt of holding instructions, ensure the expected further clearance time has been received.

3. Failing to report entering and leaving holding.

4. Failure to keep airspeed and outbound/inbound headings constant. Failure to make all turns during entry and holding at standard rate (3° per second). Basic airwork is critical to effective wind corrections.

5. Failure to plan ahead for what follows holding such as follow-on navigation or an approach, as appropriate. If an approach is to be made, ensure all preparations have been made prior to commencing that approach (WRNTB, WAR, etc.). As soon as you are talking to the controlling agency that can provide WAR information, request it. Do not wait!

410. ARCING

Maneuver Description and Application

[(Reference: NIFM Paragraph 22.2.3.4 (TACAN Arcs)).]

Arcing provides a means of maintaining a constant DME from a station and is an integral part of TACAN/VORTAC approaches and departures.

Procedures

1. Proceed to the radial and DME at which the arc begins.

2. Turn in the proper direction perpendicular to the present radial.

3. Set the HSI/CDI to the course to be tracked on at the end of the arc.

4. Maintain the desired arc, correcting for wind as necessary until the CDI/HSI begins to center.

5. Turn inbound or outbound on the new radial.

Amplification and Technique

1. Lead turns onto the arc as appropriate. If tracking in or out on a radial to intercept the arc lead the turn by approximately 0.5 DME (calculated using 100 knots ground speed) or by multiplying Ground Speed by .5%.

   Example: 110 Knots Ground Speed *.5% = .55 DME, lead the turn by .55 DME.

2. There are two techniques used for maintaining the arc:

   a. Make frequent but small heading changes to maintain a constant DME. The head and tail of the needle should remain in a fairly constant position close to the 90/270 degree position on the RMI.

   b. Maintain heading and allow the head of the needle to move 5º to 10º below the wingtip position. Then turn toward the station to place the TACAN/VOR needle 5º to 10º ahead of the wingtip and maintain this heading until the needle is again behind the wingtip.

3. Utilize the Lead Radial Procedures in Paragraph 405.

4. Push “RAD” button in to get LED readout on console for viewing.

Common Errors and Safety Notes

1. Failure to adequately account for wind on the arc.

2. Remember, the CDI/HSI is only a secondary reference. The TACAN/VOR needle is the primary course indicator. If any disparity exists between the CDI/HSI and TACAN/VOR needle, utilize the needle for navigation.

411. INTERSECTIONS

Maneuver Description and Application

[(Reference: NIFM Chapter 21 (VOR)).]

Intersections are geographic points defined by any combination of radials, or bearings from two or more navigational aids.

Procedures

1. Maintain aircraft on radial until approximately 3 miles prior to the intersection.

2. Tune and identify the new station. Maintain heading/course.

3. Set the new radial or course in the CDI/HSI.

4. As the deviation bar approaches center, begin a turn early to arrive on course when the deviation bar arrives at the center, then track on the new radial.

Amplification and Technique

These procedures are intended for operation when only one navigational aid and needle is available for navigation and identification of the intersection. In most cases in the TH-57C, intersections will be identified utilizing two NAVAIDs and needles. In this case the flying pilot will be tracking on one needle with the other needle tuned to the intersection-identifying NAVAID. The non-flying pilot will set the flying pilot's CDI/HSI to the radial of this identifying NAVAID. As the deviation bar approaches center, turn to intercept and track on the new radial. Retune the other NAVAID once established.

Common Errors and Safety Notes

Remember, the CDI/HSI is only a secondary reference. The TACAN/VOR needle is the primary course indicator. If any disparity exists between the CDI/HSI and the TACAN/VOR needle, utilize the needle for navigation.

412. VISUAL DESCENT POINTS

The Visual Descent Point (VDP), identified by the symbol (V), (See Figure 4-2) is a defined point on the final approach course of a nonprecision straight–in approach procedure from which a stabilized visual descent from the MDA to the runway touchdown point may be commenced. The pilot should not descend below the MDA prior to reaching the VDP. The VDP will be identified by DME or RNAV along–track distance to the MAP. The VDP distance is based on the lowest MDA published on the IAP and harmonized with the angle of the visual glide slope indicator (VGSI) (if installed) or the procedure Vertical Descent Angle (VDA), if no VGSI is installed. A VDP may not be published under certain circumstances which may result in a destabilized descent between the MDA and the runway touchdown point. Such circumstances include an obstacle penetrating the visual surface between the MDA and runway threshold, lack of distance measuring capability, or the procedure design prevents a VDP to be identified.

- VGSI systems may be used as a visual aid to the pilot to determine if the aircraft is in a position to make a stabilized descent from the MDA. When the visibility is close to minimums, the VGSI may not be visible at the VDP due to its location beyond the MAP.

- Pilots not equipped to receive the VDP should fly the approach procedure as though no VDP had been provided.

- On a straight-in nonprecision IAP, descent below the MDA between the VDP and the MAP may be inadvisable or impossible. Aircraft speed, height above the runway, descent rate, amount of turn, and runway length are some of the factors which must be considered by the pilot to determine if a safe descent and landing can be accomplished.

A visual segment obstruction evaluation is accomplished during procedure design on all IAPs. Obstacles (both lighted and unlighted) are allowed to penetrate the visual segment obstacle identification surfaces. Identified obstacle penetrations may cause restrictions to instrument approach operations which may include an increased approach visibility requirement, not publishing a VDP, and/or prohibiting night instrument operations to the runway. There is no implicit obstacle protection from the MDA/DH to the touchdown point. Accordingly, it is the responsibility of the pilot to visually acquire and avoid obstacles below the MDA/DH during transition to landing.

- Unlighted obstacle penetrations may result in prohibiting night instrument operations to the runway. A chart note will be published in the pilot briefing strip "Procedure NA at Night."

- Use of a VGSI may be approved in lieu of obstruction lighting to restore night instrument operations to the runway. A chart note will be published in the pilot briefing strip "Straight-in Rwy XX at Night, operational VGSI required, remain on or above VGSI glidepath until threshold."

The highest obstacle (man-made, terrain, or vegetation) will be charted on the planview of an IAP. Other obstacles may be charted in either the planview or the airport sketch based on distance from the runway and available chart space. The elevation of the charted obstacle will be shown to the nearest foot above mean sea level. Obstacles without a verified accuracy are indicated by a ± symbol following the elevation value.

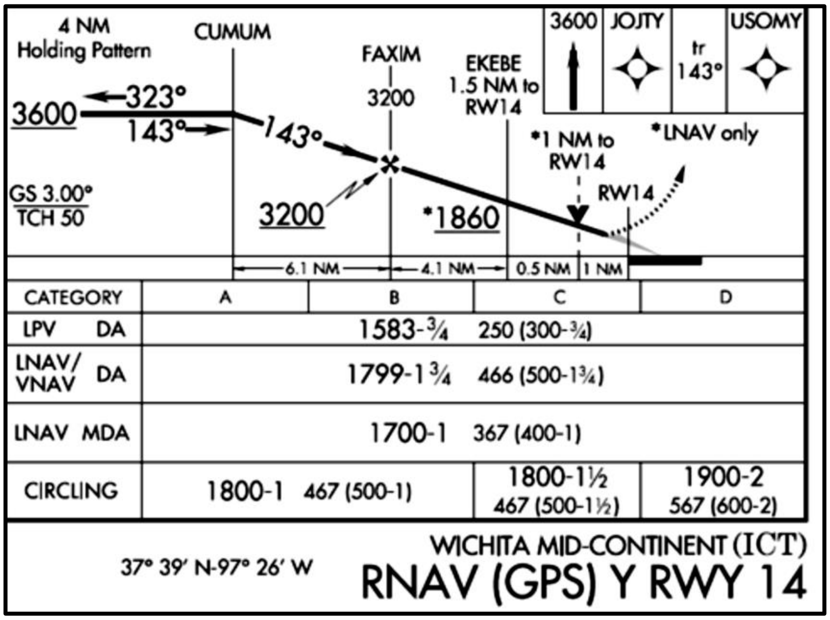

Figure 4-5 Visual Descent Point

Calculating a VDP

WARNING

While the FAA is attempting to place more VDPs on approaches, it should be noted that if there is a penetration of the obstruction clearance surface on final, they will not publish a VDP. If there is no VDP published, it may be for a reason. If choosing to calculate a VDP, it may be used, but be vigilant looking for obstacles from the VDP to landing.

The first step to computing a VDP is to divide the HAT by your desired descent gradient. Most pilots desire approximately a 3° (300 ft/NM) glidepath for landing utilizing the following formula:

HAT/Gradient (normally 300) = VDP in NM from end of runway

This distance can then be added/subtracted to/from the DME at the end of the runway to get a DME for your VDP.

Example: HAT = 665 FT, MDA = 700 FT MSL, DME at the end of the runway = 7.4 DME

VDP = HAT/Gradient = 665/300 = 2.2 NM from end of runway

VDP DME = DME at end of runway - VDP distance = 7.4 DME - 2.2 DME = 5.2 DME

413. NON-PRECISION APPROACH

Maneuver Description and Application

[(NIFM Paragraph 21.3.12.2 (Approaches), Paragraph 22.2.4 (TACAN Approach Procedures), Paragraph 23.1.2.3 (Approach Procedures), AIM Chapter 5 Section (Arrival Procedures), AIM Chapter 5 Section 5 (Pilot/Controller Roles and Responsibilities)).]

An instrument approach is a navigation procedure used to make effect a safe letdown to an airport while in IMC.

Procedures

1. ***Before*** reaching the IAF: (***W***e ***R***eally ***N***eed ***T***o ***B***rief)

    a. Obtain ***W***eather, ***A***ltimeter, and duty ***R***unway (***WAR***) if ATIS is not available.

    b. ***R***equest approach from ATC.

    c. Tune and identify ***N***AVAIDs using TINTS (See Paragraph 209)

    d. Compute **t**iming, as required.

    e. ***B***rief the approach and copilot duties.

2. ***At*** the IAF: (6 Ts)

    a. ***TIME*.** Note the time at IAF for use in fuel tracking/calculations after the approach.

    b. ***TURN*.** Turn to intercept approach course.

    c. ***TIME*.** Begin timing outbound when wings level or abeam (VOR/ADF) in accordance with the approach procedure being flown.

    d. ***TRANSITIO*N.** Decelerate to final approach speed of 90 KIAS; descend as required, complete landing checklist.

    e. ***TWIST*.** Set desired course in CDI/HSI (VOR/TACAN).

    f. ***TALK*.** Make voice report, as required.

Execute approach procedure as depicted on the approach plate, make voice reports as directed, and proceed to FAF.

3. ***At*** the FAF: (6 Ts again!)

   a. ***TIME.*** N/A.

   b. ***TURN.*** Turn as required, to intercept the final approach course.

   c. ***TIME.*** Begin timing, as required (VOR/ADF). As required (VOR/ADF).

   d. ***TRANSITION.*** Descend to MDA (allowing for intermediate restrictions), review landing checklist complete.

   e. ***TWIST.*** Set inbound course in CDI/HSI (VOR/TACAN).

   f. ***TALK.*** Make voice report, as required.

Crew Resource Management

1. PNAC reviews and sets up NAVAIDs for IAP. (Situational Awareness)

2. PNAC gives Approach Brief. (Communication)

3. PAC/PNAC asks controller for clarification of instructions (as needed). (Assertiveness)

4. PNAC ensures lookout doctrine is maintained and reports "airport in sight." (Situational Awareness)

5. PAC ensures landing checklist complete. (Situational Awareness)

6. PAC confirms landing clearance. (Communication)

Amplification and Technique

1. When the instructor tells you to prepare for your next approach or as you approach the airport at which you intend to execute an approach follow the ***WRNTB*** (***W***e ***R***eally ***N***eed ***T***o ***B***rief) format as delineated in the procedures above.

2. Transitions from the enroute structure to the initial approach fix (IAF) may occur in the following ways:

   a. Radar vectors to the final approach course. In this case, the pilot is vectored to intercept the final approach course. This saves time and space and eliminates the need for a procedure turn. When being radar vectored to the final approach course maintain 100 KIAS until given the instructions, "cleared for the approach," then transition and complete the landing checks.

b. Clearance direct to the IAF. When receiving a clearance to the IAF, the pilot should expect to execute the published approach including the procedure turn unless instructed otherwise. The type, degree, and point of turn are at the discretion of the pilot when a barbed type pattern is depicted as long as the turn is executed on the proper side of the outbound course and the "Remain Within" distance is not exceeded. Students should plan to use the headings provided on the plate and time for 2 minutes outbound before turning. After the turn is complete time for another minute and then begin the inbound turn.

c. Departing the enroute structure from a "No Pt" fix. In this situation, a pilot should proceed direct to the final approach fix (FAF).

3. Remember, since there is no DME associated with VOR and NDB approaches, the pilot has no idea how close or far from the station the aircraft is located. Therefore, when inbound on an approach, plan a comfortable rate of descent enabling you to reach the MDA before the MAP. The intent is to have sufficient time to acquire the runway environment. Do not descend below the MDA!

4. It is permissible to listen to one turn of ATIS prior to contacting the terminal area controller when the ATIS frequency is located on the same radio you intend to use for primary communications.

Common Errors and Safety Notes

1. Cockpit organization is imperative in completing a successful approach. Utilize backup NAVAIDs to the maximum extent possible. Take best advantage of the acronyms described above to help organize your thoughts and actions.

2. A missed approach shall be executed when runway environment is not in sight at the MAP, when directed by the controlling agency, or when the pilot determines he is unable to continue to a safe landing.

3. In the event of a missed approach (see para 416), it is imperative that a positive rate of climb be established prior to turning, talking, or twisting. Make the appropriate voice report as soon as practicable once established.

4. If an early missed approach is executed, the pilot shall fly the published approach as specified to the MAP at or above the MDA before executing a turn.

5. Remember, the CDI/HSI is only a secondary reference. The TACAN/VOR needle is the primary course indicator. If any disparity exists between the CDI/HSI and the TACAN/VOR needle, utilize the needle for navigation.

6. If a VDP is depicted on the IAP, do not descend below MDA until at the VDP or past it. (See Paragraph 412 for VDP Discussion)

414. TACAN/VOR DIRECTIONAL GYRO FAILURE

Maneuver Description and Application

[(Reference: NIFM Paragraph 18.6.1 (Heading Indicator Failure), Directional Gyro Failure Flight Techniques and Procedures (NATC Booklet)).]

Directional gyro failure procedures are practiced in order to enable the pilot to execute a TACAN/VOR approach with a failed directional gyro.

Procedures

1. The instructor will initiate the maneuver by pulling the HSI circuit breaker. This will secure power to the HSI and the RMI card.

2. Stabilize the aircraft straight and level in balanced flight. Execute NATOPS emergency procedures.

3. Troubleshoot. Secure searchlight, landing light, ECS, defog blower, and pitot heat. Report problem and request radar service.

4. Level the wings and look at the tail of the needle to determine the radial on which the aircraft is located.

5. Check the wet compass for magnetic heading.

6. Set the appropriate course in the CDI/HSI.

7. Utilizing radial intercept techniques, select an intercept heading then make a standard rate turn to that heading using the wet compass.

8. Upon intercepting the bearing, apply tracking procedures.

9. Utilize full panel procedures for other maneuvers.

Crew Resource Management

1. PNAC reviews and sets up NAVAIDs for IAP. (Situational Awareness)

2. PNAC gives Approach Brief. (Communication)

3. PAC/PNAC asks controller for clarification of instructions (as needed). (Assertiveness)

4. PNAC ensures lookout doctrine is maintained and reports “airport in sight.” (Situational Awareness)

5. PAC ensures Landing Checklist complete. (Situational Awareness)

6. PAC confirms landing clearance. (Communication)

Amplification and Technique

1. With a failed directional gyro, the TACAN/VOR needle tail will be on the correct radial.

2. To avoid confusion and orientation problems, always look at the RMI and NAVAID needles to select an intercept heading. Then, make the turn to that heading utilizing magnetic compass techniques.

3. Depending on the position of the failed directional gyro, you might see the tail of the needle fall and the head rise, contrary to what you are accustomed to seeing.

4. Remember, your heading is on an arc roughly 80º to 100º from the radial you are on at a given time.

Common Errors and Safety Notes

1. Failure to remain oriented, often because the position the directional gyro gives turns the pilot around.

2. Failure to stabilize and maintain level, balanced flight when interpreting magnetic compass heading information.

3. Failure to maintain a solid instrument scan due to fixation, resulting in a breakdown of Basic Airwork (BAW).

4. Failure to utilize magnetic compass turn skills learned in the BI stage.

5. Remember, the CDI/HSI is only a secondary reference. The TACAN/VOR needle is the primary course indicator. If any disparity exists between the CDI/HSI and the TACAN/VOR needle, utilize the needle for navigation.

415. ADF DIRECTIONAL GYRO FAILURE

Maneuver Description and Application

[(Reference: NIFM Paragraph 18.6.1 (Heading Indicator Failure), Directional Gyro Failure Flight Techniques and Procedures (NATC Booklet)).]

Directional gyro failure procedures are practiced in order to enable the pilot to execute an ADF approach with a failed directional gyro.

Procedures

1. The instructor will initiate the maneuver by pulling the HSI circuit breaker. This will secure power to the HSI and the RMI card.

2. Stabilize the aircraft in straight and level balanced flight. Execute NATOPS emergency procedures.

3. Troubleshoot. Secure searchlight, landing light, ECS, defog blower, and pitot heat. Report problem and request radar service.

4. Turn ***directly*** inbound or outbound.

5. Level the wings and use the wet compass to determine the bearing on which the aircraft is located.

6. Utilizing bearing/radial intercept techniques, select an intercept reading then make a standard rate wet compass turn to that heading.

7. Upon intercepting the bearing, apply tracking procedures.

8. Utilize full panel procedures for other maneuvers.

Crew Resource Management

1. PNAC reviews and sets up NAVAIDs for IAP. (Situational Awareness)

2. PNAC gives Approach Brief. (Communication)

3. PAC/PNAC asks controller for clarification of instructions (as needed). (Assertiveness)

4. PNAC ensures lookout doctrine is maintained and reports “airport in sight.” (Situational Awareness)

5. PAC ensures Landing Checklist complete. (Situational Awareness)

6. PAC confirms landing clearance. (Communication)

Amplification and Technique

1. With a malfunctioning directional gyro, the Automatic Direction Finder (ADF) needle will display relative bearing.

2. Some pilots utilize a technique where they mentally superimpose the heading from the magnetic compass onto the failed directional gyro when determining intercept headings. This visualization prevents turns in the wrong direction and expedites intercepts.

3. Most Non-Directional Radio Beacon (NDB) approaches depict the 45º/180º procedure turn. Keep in mind the inbound half of the turn is intended to give you a 45º intercept with the FAC. When you roll out on that heading, ensure it is the published 45º heading and wait for the needle to fall to the 45º benchmark. If the intercept heading is wrong, you might find yourself on a shallow intercept with no hope of reaching the FAC prior to the airport.

Common Errors and Safety Notes

1. Failure to remain oriented, often because the position the directional gyro gives turns the pilot around.

2. Failure to stabilize and maintain level, balanced flight when interpreting magnetic compass heading information.

3. Failure to maintain a solid instrument scan due to fixation, resulting in a breakdown of BAW.

4. Failure to utilize magnetic compass turn skills learned in the BI stage.

416. GROUND CONTROLLED APPROACH (GCA): PRECISION APPROACH (PAR) AND SURVEILLANCE APPROACH (ASR)

Maneuver Description and Application

[(Reference: NIFM Chapter 25 (RADAR APPROACHES), AIM Chapter 5 Section 4 (Arrival Procedures) Chapter 5 Section 5 (Pilot/Controller Roles and Responsibilities)).]

Radar control is one of the most precise methods used for accomplishing an instrument approach. A radar-controlled approach provides positive separation, sequencing for landing, and assistance in navigation for the pilot during the approach.

A radar approach is accomplished by a controller providing course, glideslope, and range information. The two types of radar approaches are the PAR (Precision) and the ASR (Non-Precision).

Both the PAR and ASR begin with radar positioning or vectors to the final approach course utilizing surveillance radar. During this “transition to final” segment, the controller directs heading and altitude changes as required to position the aircraft on final approach.

Both types of GCA are ground controlled radar approaches, but the PAR is a precision approach and the ASR is not. The primary difference between the two is that glideslope information is provided to the pilot during a PAR but not during an ASR. Consequently, landing weather minima are higher for an ASR than a PAR. Although no glideslope information is available during an ASR approach, the pilot may request the controller to provide recommended altitudes on final.

Procedures

1. Obtain ***W***eather, ***A***ltimeter, and duty ***R***unway (***WAR***) if ATIS is not available. (***W***e ***R***eally ***N***eed ***T***o ***B***rief)

2. ***R***equest approach from ATC.

3. Tune and identify ***N***AVAIDs using TINTS acronym.

4. ***T***iming is not required.

5. ***B***rief the approach and copilot duties.

6. Maintain 100 KIAS until given the instructions, “contact final controller.” At that time transition to 90 KIAS and complete the landing checklist.

7. When directed to turn or descend by the controller, execute as soon as the instructions are received.

   a. ***PAR:*** The PAR starts when the final controller informs the pilot he is on final. When the controller advises the aircraft is “on glideslope,” adjust power to establish the predetermined approximate rate of descent while maintaining both airspeed and assigned heading.

   b. ***ASR:*** When cleared to descend to the MDA, adjust the rate of descent to ensure reaching the MDA before reaching the missed approach point (map), which is usually located one mile from the landing threshold.

8. Expect landing clearance to be relayed through GCA controller at 3 NM.

Crew Resource Management

1. PNAC reviews and sets up NAVAIDs for IAP. (Situational Awareness)

2. PNAC gives Approach Brief. (Communication)

3. PAC/PNAC asks controller for clarification of instructions (as needed). (Assertiveness)

4. PNAC ensures lookout doctrine is maintained and reports “airport in sight.” (Situational Awareness)

5. PAC ensures Landing Checklist complete. (Situational Awareness)

6. PAC confirms landing clearance. (Communication)

Amplification and Technique

1. Make standard rate turns in the pattern and 1/2 standard rate turns on final.

2. Using information found in the terminal approach charts, determine approximate initial rate of descent and decision height or MDA. Brief this during the approach brief.

3. After a new heading is assigned, the controller assumes it is being maintained and additional heading corrections will be based on the last assigned heading. Fly ***the assigned heading***.

4. In order to facilitate small, smooth, expeditious control corrections and have them result in the desired effect on the aircraft, balanced flight is essential.

5. Read back to the controller all headings, altitudes, altimeter settings, start/stop turn indications, landing clearances, and traffic until told, “Do not acknowledge further transmissions.” If understood, lost communications, and missed approach may be “rogered.” However, if any doubt exists, read the instructions back or ask for clarification.

6. Should the directional gyro fail during flight, comply with the emergency procedures described in the magnetic compass turns paragraphs earlier in this FTI. Remember to advise the controller and request a “no gyro PAR or ASR approach.” For training purposes, an attitude gyro failure may also be simulated. In this situation, the pilot will be flying partial panel. The controller will be providing turns to the appropriate directions (“turn left”). He will be advised to make standard rate turns in the pattern and 1/2 standard rate turns on final. Start and stop all turns immediately upon receipt of instructions from the controller.

7. It is permissible to listen to one turn of ATIS prior to contacting the terminal area controller when the ATIS frequency is located on the same radio you intend to use for primary communications.

Common Errors and Safety Notes

1. Failure to maintain appropriate rate of turn.

2. Failure to maintain assigned heading.

3. Failure to make appropriate glideslope adjustments.

4. Ensure lost communication and missed approach instructions are obtained from the controller.

5. Avoid excessive power corrections.

6. Never use AOB greater than the number of degrees to be corrected.

7. Resist the temptation to shallow the descent at the end of the approach before continuing visually.

8. If you are unable to comply with instructions alert the controller.

417. VOR/ILS/LOC APPROACH

Maneuver Description and Application

[Reference: NIFM Chapter 24 (Instrument Landing System) AIM Chapter 5 Section 4 (Arrival Procedures) Chapter 5 Section 5 (Pilot/Controller Roles and Responsibilities)]

The Instrument Landing System (ILS) is a precision approach system, allowing the pilot to precisely maintain proper glideslope and course, utilizing cockpit instruments, without the need for radar or ground control.

The localizer or back course approach is a non-precision approach that utilizes ILS CDI/HSI information with no glideslope information.

Procedures

1. ***Before*** reaching the IAF: (***W***e ***R***eally ***N***eed ***T***o ***B***rief) - usually within 18 NM of the station.

    a. Obtain ***W***eather, ***A***ltimeter, and duty ***R***unway (***WAR***) if ATIS is not available. (***W***e ***R***eally ***N***eed ***T***o ***B***rief)

    b. ***R***equest approach from ATC.

    c. Tune and identify ***N***AVAIDs using TINTS acronym.

    d. Compute ***t***iming, as required.

    e. ***B***rief the approach and copilot duties.

    f. Intercept the final approach course as the course deviation bar begins to center.

    g. Intercept the glideslope as the glideslope indicator begins to center (ILS approach). Maintain 90 KIAS.

2. ***At*** the IAF: (6 Ts)

    a. ***TIME.*** Note time, if applicable.

    b. ***TURN.*** Turn as required, to intercept approach course.

    c. ***TIME.*** Start timing.

d. ***TRANSITION.*** Decelerate to final approach speed of 90 KIAS, descend as required, complete landing checklist.

e. ***TWIST.*** Set desired course in CDI/HSI (back course approaches, set the front course in the HSI).

f. ***TALK.*** Make voice report, as required.

Execute approach procedure as depicted on the approach plate, make voice reports as directed, proceed TO FAF.

3. ***At*** the FAF: (6 Ts again!)

a. ***TIME.*** N/A

b. ***TURN.*** Turn as required, to intercept the final approach course.

c. ***TIME.*** Begin timing inbound (localizer/back course).

d. ***TRANSITION.*** Descend to DH/MDA, review that landing checklist is complete.

e. ***TWIST.*** Set inbound course in CDI/HSI (back course approaches, set the front course in the HSI).

f. ***TALK.*** Make voice report, as required.

g. Continue as cleared.

Crew Resource Management

1. PNAC reviews and sets up NAVAIDs for IAP. (Situational Awareness)

2. PNAC gives Approach Brief. (Communication)

3. PAC/PNAC asks controller for clarification of instructions (as needed). (Assertiveness)

4. PNAC ensures lookout doctrine is maintained and reports “airport in sight.” (Situational Awareness)

5. PAC ensures Landing Checklist complete. (Situational Awareness)

6. PAC confirms landing clearance. (Communication)

Amplification and Technique

1. The CDI gives proper sensing on front course localizer/ILS approaches regardless of course set with the course select knob when inbound on front course. FAC should still be set to avoid habit pattern disruption; however, on back course localizer approaches, the CDI will show reverse sensing regardless of the course selected by the course select knob when inbound on back course. On back course localizer approaches, the HSI will show reverse sensing unless the front course FAC is selected by the course select knob.

2. During ILS approaches, intercept the glideslope by reducing power as the glideslope indicators (GSI) begin to center from the top of the CDI/HSI. Maintain 90 KIAS. Once the GSI centers, adjust power to establish the predetermined approximate rate of descent while maintaining both airspeed and heading. Due to the extreme sensitivity of the GSI and CDI/HSI ensure you utilize small, smooth changes in pitch attitude and power setting to remain on glideslope and airspeed.

3. During localizer/backcourse approaches, required altitudes are defined on the approach plate as in any non-precision approach. The approach is non-precision, so apply non-precision procedures.

4. As you approach the airport, the glideslope and glidepath become extremely narrow and, therefore, sensitive.

5. It is permissible to listen to one turn of ATIS prior to contacting the terminal area controller when the ATIS frequency is located on the same radio you intend to use for primary communications.

6. Transitions from the enroute structure to the IAF may occur in the following ways:

   a. Radar vectors to the final approach course. In this case, the pilot is vectored to intercept the final approach course. This saves time and space and eliminates the need for a procedure turn. When being radar vectored to the final approach course maintain 100 KIAS until given the instructions, “cleared for the approach,” then transition and complete the landing checks.

   b. Clearance direct to the IAF. When receiving a clearance to the IAF, the pilot should expect to execute the published approach including the procedure turn unless instructed otherwise.

Common Errors and Safety Notes

1. Failure to make corrections in the proper direction.

2. Normally a course interception angle of 30º to 45º is sufficient, as CDI/HSI sensitivity in ILS mode is extremely high. Avoid interceptions of greater than 80º.

3. The ILS glideslope facility provides a path, which flares 18 to 27 feet above the runway; therefore, the glide path should not be expected to provide guidance to touchdown.

4. Do not "fly" the GSI and CDI/HSI; utilize a basic instrument scan to effect immediate, smooth corrections.

5. If a glideslope indicator disappears on the CDI/HSI during the approach, descend no lower than published localizer minima, or if not published, no lower than circling minima for your category aircraft. If course deviation bar is fully deflected when inside of FAF and runway is not in sight, execute missed approach.

6. Do not forget reverse sensing techniques.

418. MISSED APPROACH

Maneuver Description and Application

[(Reference: NIFM Paragraph 30.18 (Missed Approach) AIM Paragraph 5-4-21).]

A missed approach shall be executed when one of the following conditions exist:

- Arrival at the MAP or the DH and visual reference to the runway environment is insufficient to complete the landing.
- A safe approach is not possible.
- Instructed to execute a Missed Approach by ATC.

During training you will normally be given climb out instructions that will be different than the published missed approach instructions. When under positive control, ATC can also give alternate MAP instructions to follow. ATC issues climb out instructions to facilitate smoother traffic flow when conducting practice approaches. Terminology matters, so it is important to use the phrase "executing climb out" when appropriate. When "missed approach" is stated, it implies one of the above conditions was encountered which may cause unnecessary concern for other pilots flying in the local area. If you are actually executing a "missed approach" for any reason, it is appropriate to state "executing missed approach" and provide the reason for the missed approach. Use the below procedures for a missed approach or to execute climb out instructions.

Procedures

1. Set required 70 KIAS climb/100 KIAS cruise ***POWER***.

2. Set required 70 KIAS climb/100 KIAS cruise ***ATTITUDE***. (Check IVSI/altimeter for positive climb indications.)

3. ***SEARCHLIGHT*** off.

4. ***TURN.*** Turn to comply with missed approach or climb out instructions and direct copilot to tune navigation aids/GPS as appropriate.

5. ***TALK.*** Report executing climb out instructions or missed approach, reason for missed approach, and intentions as soon as practicable.

6. ***GAS.*** Note quantity.

7. ***GAUGES.*** Check engine and flight instruments.

Crew Resource Management

1. PAC properly performs missed approach when runway environment is not in sight at minimums, unable to make a safe landing, or directed by controlling agency. (Decision Making)

2. PNAC verbally states missed approach instructions to PAC. (Communication)

Amplification and Technique

1. It is imperative a positive rate of climb be established prior to turning, talking, or twisting. Aviate, navigate, and then communicate. Nonetheless, be as prompt as possible in reporting the missed approach to tower.

2. If a missed approach must be executed inside the FAF but prior to the MAP (for loss of GPS integrity, full scale deflection of CDI and unable to correct course, directed by ATC, etc.), do not continue descent down to MDA/DH. Begin an immediate climb to the depicted or assigned missed approach altitude, fly to the MAP and then execute missed approach procedures as required. This is important because obstacle clearance is not guaranteed when off published portions of the approach. Turns in the missed approach are predicated on being executed at the MAP. If full scale deflection of the CDI occurs prior to the MAP in areas of high terrain or obstacles, and the pilot is unable to immediately reestablish the aircraft on course, a climb to Minimum Safe Altitude (MSA) may be required.

Common Errors and Safety Notes

1. Failure to assume a positive rate of climb before doing anything else.

2. Failure to make a complete, timely missed approach call.

3. Failure to make note of the fuel state and plan for further contingencies.

419. KLN 900 GPS APPROACH

Maneuver Description and Application

[(Reference: AIM Chapter One, Instrument Navigation Workbook).] A Global Positioning System (GPS) approach via the KLN 900 is a non-precision instrument approach via lateral navigation (LNAV) based on satellite transmitted positioning information received by on-board equipment and not dependent on ground-based navigation aids.

420. GTN-650 GPS APPROACH

Maneuver Description and Application

[(Reference: AIM Chapter One, Instrument Navigation Workbook, Garmin GTN-650 Pilot's Guide).] A GPS approach via the Garmin GTN-650 is a non-precision approach that can be flown as an Approach with Vertical Guidance (APV) flown to a Decision Altitude (Localizer Performance with Vertical Guidance [LPV] or Lateral Navigation and Vertical Navigation [LNAV/VNAV]), or without approved vertical guidance (Local Performance [LP] or Lateral Navigation [LNAV]) flown to a Minimum Descent Altitude. An LPV approach uses the Wide Area Augmentation System (WAAS) ground stations in conjunction with GPS satellites to provide improved position accuracy and Decision Altitudes down to a minimum of 200 feet above touchdown. An LNAV/VNAV approach also incorporates approved vertical guidance but at a less accurate sensitivity than LPV. LP approaches take advantage of the improved accuracy of WAAS, but the vertical guidance is advisory only. LNAV approaches are based on satellite position information and are not dependent on ground-based navigation aids and the vertical guidance is advisory only.

Procedures (Full Approach)

1. ***Before*** reaching the IAF: (***W***e ***R***eally ***N***eed ***T***o ***B***rief).

   a. Obtain ***W***eather, ***A***ltimeter, duty ***R***unway and winds (***WAR***) or ATIS/ASOS/AWOS.

   b. ***R***equest approach from ATC.

   c. ***N***AVAIDs: Load approach into active flight plan.

      i. Select airport ICAO via the active flight plan or 'PROC' key on the Home page.

      ii. Select Approach key.

      iii. On 'PROC-Approach' page, select desired approach.

      iv. Select transition.

         (a). Select IAF based on the direction of the Terminal Arrival Area intercept.

         (b). Select 'Vectors' if Radar Vectors to Final are being utilized.

NOTE

When selecting Radar Vectors to Final via the GTN-650, it will extend the final approach course indefinitely to accommodate ATC's vectors. Pilot must ensure the final approach course does not enter prohibited or restricted airspace.

NOTE

It is recommended to preview the approach before loading it into the active flight plan to verify that the desired transition is selected. Select 'Preview' prior to loading the approach.

NOTE

If Vectors-to-Final is activated while on the “FROM” side of the FAF, automatic waypoint sequencing is suspended and the 'SUSP' annunciation will appear. Automatic waypoint sequencing will resume once the aircraft is on the “TO” side of the FAF and within full-scale deflection.

v. Select one of the following:

(a). "Load Approach" - This will result in the approach loading at the end of the flight plan. The GTN-650 will automatically sequence to the approach waypoints after the enroute waypoints.

(b). Load Approach and Activate" - This will result in Direct-to the selected transition waypoint (IAF). If Radar Vectors to Final are selected, it will activate an extended leg to the FAF along the final approach course.

vi. Ensure NAV 1 is selected and GPS appears on the GTN annunciator panel.

d. Timing does not apply.

e. ***B***rief approach and copilot duties.

WARNING

GTN-650 will default to an LPV approach when a GPS approach is loaded. If the GTN-650 loses precision accuracy, the message key will flash on the screen. Message will say “APPROACH DOWNGRADE” and crew should revert to LNAV approach minima. Vertical guidance will be removed from the HSI/CDI display.

WARNING

If the GTN-650 can no longer provide approach level of service, the message key will flash on the screen and on the GPS annunciator panel. Message will say “ABORT APPROACH” and crew shall abort the approach. Subsequent approaches with the message remaining should be a non-GPS based approach.

WARNING

If the GTN-650 cannot transition the approach to active mode, the message key will flash on the screen. Message will say “APPROACH NOT ACTIVE” and crew shall abort the approach. Subsequent approaches with the message remaining should be a non-GPS based approach.

2. ***At*** the IAF: (6 Ts)

   a. ***TIME.*** Note time at IAF.

   b. ***TURN.*** Turn outbound on procedure turn or towards next waypoint of the approach as appropriate.

   c. ***TIME.*** N/R

   d. ***TRANSITION.*** Decelerate to final approach speed of 90 KIAS. Descend as required, complete Landing Checklist.

   e. ***TWIST.*** Set desired course in HSI/CDI and ensure “GPS” indicated on the GTN-650 annunciator panel. Check that GPS has sequenced to next WPT via the Default NAV page.

   f. ***TALK.*** Make voice report as required.

   g. Execute approach as depicted on the approach plate, make voice reports as directed, and proceed to MAP.

3. ***At*** the FAF: (6 Ts again!)

   a. ***TIME.*** N/A

   b. ***TURN.*** Turn as required, to intercept the final approach course.

   c. ***TIME.*** N/A

   d. ***TRANSITION.*** Descend to next intermediate altitude, decision altitude (DA), or MDA as applicable.

e. Review landing checklist complete (give consideration to lighting configuration inside FAF).

f. ***TWIST.*** Set inbound course in CDI/HSI.

g. ***TALK.*** Make voice report as required/directed.

NOTE

If approach cannot sequence to active within 2 NM of FAF, Message Key will flash on the screen and GPS Annunciator Panel. Message will say "APPROACH NOT ACTIVE" and crew shall discontinue the approach.

NOTE

Distance to next waypoint will always count down to the active waypoint when inbound on approach.

Crew Resource Management

1. PNAC reviews and sets up NAVAIDs for IAP. (Situational Awareness)

2. PNAC gives Approach Brief. (Communication)

3. PAC/PNAC asks controller for clarification of instructions (as needed). (Assertiveness)

4. PNAC ensures lookout doctrine is maintained and reports "airport in sight." (Situational Awareness)

5. PAC ensures Landing Checklist complete. (Situational Awareness)

6. PAC confirms landing clearance. (Communication)

Amplification and Technique

1. There are multiple ways to load an approach with the GTN-650. Practice loading approaches using the computer-based trainer with the Garmin Pilot's Guide until comfortable manipulating flight plans and loading approaches.

2. At the bottom of the GTN-650 screen, with an approach loaded it should transition from 'ENR' to 'TERM' within 31 NM of the airfield. Within 2 NM of the FAF, it will switch from 'TERM' to 'LPV', or whichever approach is selected.

3. During vectors to final it is imperative the pilot verifies the approach is loaded correctly within their flight plan and stays oriented so the next WPT on the approach is the active WPT after intercepting final.

NOTE

If executing a procedure turn, the GTN-650 should sequence it like any other leg. Crew can manually select "Suspend" mode via the OBS/SUSP pushbutton on the GPS annunciator panel, if desired. If a holding pattern is depicted on an approach, the GTN-650 will automatically SUSPEND the approach and the pilot will have to select "Unsuspend" via the GPS annunciator panel or the "Unsusp" button that appears on the lower right corner of the GTN screen.

4. When disabling Suspend mode to enable automatic waypoint sequencing (and vice versa), ensure you are inbound to the desired waypoint.

5. Prior to 2 NM from FAF, check that no messages have appeared on the GTN-650 annunciator panel. Some messages may downgrade the approach or require crew to discontinue approach.

6. Only one approach can be loaded at a time in a flight plan.

Common Errors and Safety Notes

1. Receiver Autonomous Integrity Monitoring (RAIM) must be available to commence a GPS approach. A flashing Message indicator may be an indication of RAIM non-availability.

2. Failure to monitor GTN-650 Messages during the approach. There are many messages that can populate, including airspace alerts and issues with the loaded approach. The crew needs to maintain SA of the flashing message annunciator to ensure the active approach is safe to continue.

3. The GPS unit will not automatically sequence to any waypoints required for a missed approach procedure. Automatic sequencing will cease at the MAP. If a missed approach is required, the pilot must UNSUSPEND the missed approach procedures for the GTN to provide guidance to the missed approach WPT. Message will appear on the screen to select "REMAIN SUSPENDED" if the MA is not necessary or "ACTIVATE GPS MISSED APPROACH."

4. Mistaking CDI/HSI scale change during the approach for actual deviations and subsequently making unneeded or unnecessarily large corrections.

5. Failure to properly load and activate the approach will result in GTN-650 remaining in Terminal rather than Approach mode for course sensitivity. The pilot loading the approach can preview the approach prior to loading/activating to prevent selecting the wrong transition. If confusion exists, check the approach status on the bottom of the screen to determine which mode the GTN-650 is in e.g., ENR, TERM, LPV, LNAV, etc.

421. GTN-650 VOR, ILS, LOC APPROACHES

Maneuver Description and Application

[(Reference: AIM Chapter One, Instrument Navigation Workbook, Garmin GTN-650 Pilot's Guide).] The GTN-650 can be used to set up and execute VOR, ILS, and LOC approaches. These approaches may use the GTN-650 GPS unit for approach set up, but they are ***not*** "GPS" approaches.

Clearly understanding when the GTN-650 should be in “GPS” versus “VLOC” (ground based radio NAVAID) mode is essential to proper execution of the approach. The KNS-81 can also be used to execute VOR, ILS, and LOC approaches without using the GTN-650.

Procedures (Full Approach)

1. ***Before*** reaching the IAF: (***W***e ***R***eally ***N***eed ***T***o ***B***rief).

    a. Obtain ***W***eather, ***A***ltimeter, duty ***R***unway and winds (***WAR***) or ATIS/ASOS/AWOS.

    b. ***R***equest approach from ATC.

    c. Tune and identify ***N***AVAIDs using TINTS acronym: Load approach into active flight plan.

        i. Select airport ICAO via active flight plan or 'PROC' key on Home page.

        ii. Select Approach key.

        iii. On 'PROC-Approach' page, select desired approach.

        iv. Select transition.

            (a). Select IAF based on the expected direction of approach intercept.

            (b). Select 'Vectors' if Radar Vectors to Final are being utilized.

        v. Select one of the following:

            (a). "Load Approach" - This will result in the approach loading at the end of the flight plan. The GTN-650 will automatically sequence to the approach waypoints after the enroute waypoints.

            (b). "Load Approach and Activate" - This will result in Direct-to the selected transition waypoint (FAF). If Radar Vectors to Final are selected, it will activate an extended leg to the FAF along the final approach course. If “Vectors” is selected as the transition, the GTN-650 will immediately change from GPS to VLOC, regardless of distance to the FAF.

NOTE

It is recommended to Preview the approach before loading it into the active flight plan to check that the desired transition is selected.

NOTE

Ensure NAV 1 is selected when performing ILS/LOC/VOR approaches using the GTN-650.

d. Compute ***t***iming, as required.

e. ***B***rief the approach and copilot duties.

f. Intercept the final approach course as the course deviation bar begins to center.

g. Intercept the glideslope as the glideslope indicator begins to center (ILS approach).

2. ***At*** the IAF: (6 Ts)

a. ***TIME.*** Note time at IAF.

b. ***TURN.*** Turn outbound on procedure turn or towards next waypoint of the approach as appropriate.

c. ***TIME.*** N/A

d. ***TRANSITION.*** Decelerate to final approach speed of 90 KIAS. Descend as required, complete Landing Checklist.

e. ***TWIST.*** Set desired course in HSI/CDI and ensure “VLOC” indicated on the GTN-650 annunciator panel.

f. ***TALK.*** Make voice report as required.

g. Execute approach as depicted on the approach plate, make voice reports as directed, and proceed to MAP.

NOTE

For ILS approaches only, the GTN-650 will perform an auto switch from GPS to VLOC when within 1.2 NM left or right of the FAC at a distance of 2-15 NM from the FAF if an IAF or feeder transition is selected. If the “Vectors” transition and “Load Approach and Activate” is selected, the GTN will immediately switch from GPS to VLOC regardless of distance to the FAF. This auto switch function can be deselected on the System CDI Setup page. If the crew elects to let the system auto switch to VLOC ***or*** elects to manually switch to VLOC (by toggling the GPS/VLOC pushbutton on the GPS annunciator panel), ensure “VLOC” is selected prior to reaching the FAF. For LOC or VOR approaches, the pilot must ensure VLOC is selected prior to reaching the FAF.

NOTE

VOR, ILS, and LOC approaches can be flown and/or backed up using the KNS-81 while in NAV 2 source without using the GTN-650.

3. ***At*** the FAF: (6 Ts again!)

   a. ***TIME.*** N/A

   b. ***TURN.*** Turn as required, to intercept the final approach course.

   c. ***TIME.*** Begin timing inbound (localizer).

   d. ***TRANSITION.*** Descend to next intermediate altitude, decision altitude (DA), or MDA as applicable.

   e. Review landing checklist complete (give consideration to lighting configuration inside FAF).

   f. ***TWIST.*** Set inbound course in CDI/HSI.

   g. ***TALK.*** Make voice report as required/directed.

Crew Resource Management

1. PNAC reviews and sets up NAVAIDs for IAP. (Situational Awareness)

2. PNAC gives Approach Brief. (Communication)

3. PAC/PNAC asks controller for clarification of instructions (as needed). (Assertiveness)

4. PNAC ensures lookout doctrine is maintained and reports "airport in sight." (Situational Awareness)

5. PAC ensures Landing Checklist complete. (Situational Awareness)

6. PAC confirms landing clearance. (Communication)

Amplification and Technique

1. Reference Amplification and Technique information in section 415.

2. There are multiple ways to load an approach with the GTN-650 and the crew must ensure the ground-based NAVAID is appropriately configured prior to commencing the approach.

3. Loading a VOR, ILS, or LOC approach using the GTN-650 does not remove the pilot's responsibility for performing TINTS to verify the proper NAVAIDs are in use. Once the approach is loaded with the GTN-650, ensure the appropriate NAVAID frequency is loaded into the active field (Tune). With the NAVAID frequency selected, momentarily press the volume knob on the GTN-650 and press the NAV 1 button on the communications panel (Identify). Ensure NAV 1 source is selected on both sides (Needles). Set the appropriate course into the HSI and CDI (Twist). Ensure VLOC (not GPS) appears once established on the FAC, or select it using the pushbutton on the GPS annunciator panel (Select).

4. Only one approach can be loaded at a time in a flight plan.

Common Errors and Safety Notes

1. Failure to ensure a switch from "GPS" to "VLOC" via the GPS annunciator panel or the bottom of the GTN-650 screen will result in flying the approach based off of GPS overlay information instead of the ILS/LOC/VOR frequency. Obstacle clearance is not guaranteed because it is not a certified approach.

2. Failure to make corrections in the proper direction.

3. If a glideslope indicator disappears on the CDI/HSI during the approach, descend no lower than the published localizer minima, or if not published, no lower than circling minima for your category of aircraft. If course deviation bar is fully deflected when inside of FAF and runway is not in sight, execute missed approach.

422. TERMINAL PROCEDURES

Maneuver Description and Application

Reference: Course training standards. Terminal procedures are those tasks that should be accomplished and/or reviewed for preparation for entering the landing environment and continuing on with ground operations.

Procedures

1. ***IFR: When departing the MDA/DH on a visual glidepath to the landing environment.***

2. ***VFR: At the termination of VFR NAV and commencement of ground operations.***

   a. Establish proper communication and comply with appropriate ATC instructions in a timely manner.

   b. Once VMC, maintain a safe visual glidepath to the landing environment and allow for safe visual maneuvering to land.

   c. Follow visual approach guidance as appropriate, i.e., VASI, PAPI, etc.

   d. If VASI/PAPI do not apply, maintain helicopter in a safe profile to either the runway threshold or short final for an appropriate helipad.

Crew Resource Management

PAC calls for the PNAC to review terminal procedures and verbalize those procedures to the PAC. (Situational Awareness, Assertiveness)

Amplification and Technique

l. To preclude getting busy in the terminal environment, when enroute within 20 NM of your destination cover terminal procedures as appropriate.

2. The best course of action is to utilize the appropriate approach plate and refer to the diagram of the landing environment, of which include all appropriate ground frequencies.

3. Whatever technique you use come up with a plan that keeps everyone in the cockpit oriented to all aspects of the flight.

Common Errors and Safety Notes

1. SNA waits too long to initiate terminal procedures and finds that SNA gets too far behind the power curve to even start the procedures.

2. SNA tries to initiate terminal procedures late in the approach and finds that airwork begins to suffer, due to overtasking.

3. Lack of proper procedure could cause SNA to fly or taxi into an area that may not be authorized due to an unsafe situation etc.

423. DEPARTURE PROCEDURES

General: While established in a climb and prior to leveling off at your desired altitude, heading and airspeed, comply with all appropriate departure, SID, or ATC instructions.

THIS PAGE INTENTIONALLY LEFT BLANK