NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS **CNATRA P-871 (Rev. 07-07)**

FLIGHT TRAINING INSTRUCTION

PRIMARY/INTERMEDIATE INSTRUMENTS NFO/WSO T-6A

2007

DEPARTMENT OF THE NAVY
CHIEF OF NAVAL AIR TRAINING
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CNATRA P-871 (Rev. 07-07)

Subj: FLIGHT TRAINING INSTRUCTION, PRIMARY/INTERMEDIATE INSTRUMENTS NFO/WSO, T-6A

1. CNATRA P-871 (Rev. 07-07) PAT, "Flight Training Instruction for Primary/Intermediate Instruments NFO/WSO T-6A" is issued for information, standardization of instruction, and guidance to all flight instructors and student aviators within the Naval Air Training Command.

2. This publication shall be used as an explanatory aid to the T-6A Primary/Intermediate NFO/WSO Flight Curriculum. It will be the authority for the execution of all flight procedures and maneuvers herein contained.

3. Recommendations for changes shall be submitted via CNATRA TCR form 1555/19 in accordance with CNATRAINST 1550.6E.

4. CNATRA P-871 (Rev. 03-06) PAT is hereby cancelled and superseded.

R. A. RALL
By direction

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INSTRUMENT FLIGHT TRAINING INSTRUCTION

FOR

PRIMARY/INTERMEDIATE INSTRUMENTS NFO/WSO

T-6A

Q-2A-0017

LIST OF EFFECTIVE PAGES

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INTERIM CHANGE SUMMARY

The following changes have been previously incorporated in this manual:

CHANGE NUMBER	REMARKS/PURPOSE
1	Changes made per transmittal letter (05-08-09)

The following interim changes have been incorporated in this Change/Revision:

INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

SECURITY AWARENESS NOTICE

This course does not contain any classified material.

SAFETY/HAZARD AWARENESS NOTICE

There are no special safety precautions to be observed during this lesson.

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TERMINAL OBJECTIVES (PRIMARY AND INTERMEDIATE)

1. Apply without error the policies and guidance of Squadron and Naval Aviation Safety Programs to identify, avoid, and report hazards.

2. Maintain spatial orientation while directing the control of an aircraft through the use of an instrument scan in Visual Meteorological Conditions (VMC) or Instrument Meteorological Conditions (IMC) with instructor assistance, during day and night shore-based operations.

3. Direct the navigation of an aircraft using aircraft instruments and ground-based Navigational Aids (NAVAID).

4. Make recommendations to execute a VHF Omnidirectional Range (VOR) approach, Localizer (LOC) approach, Instrument Landing System (ILS) approach, Ground Controlled Approach (GCA), or Global Positioning System (GPS) approach, in accordance with published procedures.

5. Communicate with appropriate facilities via two-way radio using standard naval aviation and Federal Aviation Administration (FAA) terminology.

6. Comply with specified flight policies, guidance, and procedures provided by OPNAVINST 3710.7, NATOPS, JPATS, Federal Aviation Regulations (FARs), and command directives.

7. Use Flight Information Publications (FLIP), Notices to Airmen (NOTAM), and other applicable flight information to plan and fly in the FAA's Air Traffic Control (ATC) system.

8. Apply crew coordination concepts and procedures during aircraft operations.

9. Relay safety of flight information to instructor, VMC, IMC, day and night, without error.

10. Demonstrate adequate preparation for flight and mission accomplishment.

PRIMARY AND INTERMEDIATE ENABLING OBJECTIVES

Reference: CNATRA Primary and Intermediate Multi-Service NFO/AF WSO Training System T-6A Curriculum (Master Curriculum Guide) Course Training Standards (CTS)

CHAPTER ONE
INTRODUCTION TO INSTRUMENT NAVIGATION

100. INTRODUCTION

In this stage of your flight training, you will be introduced to the elements of Instrument Navigation (INAV). You will build upon the skills learned thus far to safely navigate from one point to another in actual or simulated IMC.

You will learn to depart from one airfield, navigate using radio and Global Positioning System (GPS) navigation procedures, and direct the aircraft for an approach and landing at your destination. You will accomplish these maneuvers by maintaining a constant awareness of your geographical position through the operation and interpretation of the aircraft's navigation systems and instruments.

You will also learn flight planning and the standard procedures for communicating with ATC agencies in an IFR environment.

To learn what you need to about instrument navigation, you must be thoroughly familiar with FTI and JPATS references. Additionally, you must also consult other sources of information including, but not limited to:

1. Aircraft NATOPS Manual.
2. TW-6 In-Flight Guide.
3. OPNAV 3710.7.
4. CTW-6 and VT-4/10 Standard Operating Procedures (SOP).
5. NATOPS Instrument Flight Manual (NIFM).
6. DoD FLIP.
    a. General Planning (GP).
    b. Area Planning (AP/1, AP/1A, AP/1B).
    c. Flight Information Handbook (FIH).
    d. IFR Enroute Supplement.
    e IFR Enroute Charts.
    f. Instrument Approach and Departure Procedures.
    g. Standard Terminal Arrivals (STARs).
7. NOTAM.

8. Federal Aviation Regulations, Part 91 - Aeronautical Information Manual (FAR/AIM).

9. FAA ATC Manual 7110.65.

As you probably realize, instrument navigation is a demanding stage of training requiring dedicated study. A thorough working knowledge of procedures is essential to your success on instructional flights, but you must go beyond simply memorizing procedures and strive for a clear understanding of each maneuver before you get into the plane. Remember, the knowledge gained in this stage is the foundation of the instrument navigation concepts you will be expected to master as you progress through training and into your operational squadrons.

As important as instrument procedures and concepts are, you must be aware of your basic priorities in flight. Remember the golden rule: **"AVIATE, NAVIGATE, COMMUNICATE, CHECKLISTS."** These functions must be addressed in that order of priority. In other words, monitoring desired flight parameters (attitude, altitude, airspeed, etc.) and aircraft systems performance should be your first priority. Do not become preoccupied with navigation at the expense of safety of flight. It is pointless to have a precise plot of your position if you inadvertently allow the pilot to stall the aircraft while you are “heads down” over your chart.

Likewise, properly navigating your aircraft takes priority over communicating with the outside world. During many flights, there are situations when just navigating takes almost all of your concentration capability. In these situations, an attempt to engage in radio chatter could overload your already task-saturated situational awareness. While necessary radio transmissions should not be omitted or delayed excessively, a slight delay in reporting to ATC is preferable to ending up in an unsafe situation because you overloaded yourself with communication tasks. Your last priority should be briefs and checklists between the pilot and yourself.

101. GENERAL ENROUTE PLANNING

This section outlines procedures and considerations for preflight preparation. For all instrument flights and simulator events, routes **SHALL** be prepared with DD-175 flight plans and flight logs adjusted for winds. For your Primary phase, plan on flying the pre-filed (also called “canned” or “stereo”) NPA routes, found in the TW-6 In-Flight Guide. In the Intermediate phase, if you are scheduled for an "out-and-in" or cross-country flight, **YOU SHALL CONTACT YOUR INSTRUCTOR THE NIGHT PRIOR TO YOUR FLIGHT FOR ROUTING INFORMATION**. Several considerations must be kept in mind, such as the availability of military or contract fuel, services available, FAA preferred routing, weather, etc.

Flight Log

Flight logs (often referred to as jet cards) are primarily used for preflight fuel planning. The flight logs **SHALL** be completed prior to arriving at the preflight brief. While flight logs are a good reference for preflight information, in the aircraft **USE YOUR CHARTS AS YOUR PRIMARY NAVIGATION REFERENCE.**

Route Preparation

As you gain more experience, you will learn how to visualize your route of flight. Study the route to include a general overview and confirmation of your flight log data, so you will know which way the aircraft should turn after arriving at a given point. Check applicable NOTAMS, Temporary Flight Restrictions (TFR), the IFR Supplement, and the AP/1 for supplemental airport information, flight hazards and preferred IFR routing.

Once airborne, refer to your chart frequently to confirm progress along your route. Know where suitable enroute airfields are in case unexpected problems arise. Referencing your position on your chart while airborne is one of the best things you can do to help yourself "stay ahead of the aircraft," or maintain constant situational awareness.

Mentally fly the approach from the Initial Approach Fix (IAF) to the Missed Approach Point (MAP) and determine all lead points and procedures that apply during the approach. Identify the point where the aircraft should be configured for landing. Take note of courses, NAVAID frequencies and locations, and any published holding patterns.

Frequencies are listed at the top of each approach plate. The most commonly used frequencies and the name of the controlling ATC facility will be listed on the approach plate, so you can load the next applicable frequency into the Radio Management Unit (RMU) standby field. Be aware, however, that if ATC directs you to a frequency other than what is depicted on the approach plate, the ATC-issued frequency takes precedence. LISTEN UP on the radios, and when in doubt, ASK.

Review the approach minima. You will need to know

1. if you have the weather to attempt the approach,

2. where to start descent(s), and

3. how low to descend.

To find this information, you need to know which approach category you are in. Normally, the T-6A is a category “B” aircraft (final approach speed 91-120 KIAS), but becomes a category “C” aircraft when final approach speed increases to 121-140 KIAS. If you adjust your final approach speed for wind gusts, controllability, or any other factor, your approach minima may change.

Determine how to identify the Final Approach Fix (FAF) and the MAP. If you are flying an approach with timing depicted, note the time from the NON-PRECISION FAF to the MAP; if flying an ILS approach, you must begin backup timing at the non-precision localizer FAF when applicable. Remember, the timing is based on GROUNDSPEED, not Indicated Airspeed (IAS). Calculate your actual groundspeed using the known winds relative to your indicated airspeed (IAS), then look at the approach-plate timing table and interpolate to get accurate timing from the FAF to the MAP.

Gouge

Prepare your flight materials carefully. Gouge is NOT ALLOWED, and if discovered prior to flight, will result in a READY ROOM UNSAT. Any gouge found during or after a flight will result in a FLIGHT UNSAT. The intent of this restriction is to push you to become proficient using published materials and confident in your ability to apply prescribed procedures. Gouge is defined as:

1. Enroute Charts: Anything other than the route of flight marked in a temporary fashion (erasable highlighter, highlighter tape, pencil). As you gain more experience, you will hopefully no longer need to trace your route.

2. STARs, Approach Plates, Terminal Change Notice (TCN), IFR Supplement, FIH, NATOPS Pocket Checklist (PCL): Any marks other than NOTAMs or those specifically approved by your instructor.

3. Flight Logs: Any information other than that specified in the Flight Planning course.

4. Miscellaneous: Calculators or any tabulated charts/tables not included in the TW-6 In-Flight Guide.

The following materials are approved for in-flight use. Any other written materials carried in flight will be treated as gouge:

T-6 NATOPS PCL/Trifold Checklist	Flight Logs
TW-6 In-Flight Guide	NOTAM
FLIP	CR Series “Whiz Wheel”
DD175/DD175-1	Scratch paper (blank at pre-flight)

102. COCKPIT ORGANIZATION

The cockpit of the T-6A, much like the cockpits of most tactical aircraft, is less than spacious. You have to be well-organized in flight, making sure that all required materials are properly stowed and still easily accessible.

You are required to carry ALL applicable, current (up-to-date) Enroute and Terminal FLIP – including TCN, the FIH, and the IFR Supplement. However, given the space constraints of the cockpit, you will not be able to keep all of these publications out at one time. Consider keeping your PCL, enroute chart, and approach book out, while stowing your TW-6 In-Flight Guide and all other FLIP in the cockpit map cases and/or a navigator’s bag.

Have a scratch pad on your kneeboard for all calculations, and keep your notes clearly organized in flight. Before your first sortie, have your kneeboard configured in a way that makes it easy to find what you need. When you chair fly, practice using your pubs and kneeboard until you find the cockpit organizational method that works best for you.

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103. CONCLUSION

For each flight, you must rehearse all your procedures, from brief to debrief. Simulators, 2B47 Trainers, and the RIOT Trainer are all excellent training tools and you are strongly encouraged to use them. Practice as often as possible until you are 100% proficient with the required procedures. Mentally visualize your route of flight ("chair fly") before every sortie. These habits will help you tremendously as you progress through the syllabus.

As you progress through the syllabus, your instructor will become less directive and you will be required to perform more independently. You are training to be a mission commander; act like it. Direct the pilot to do everything. Take charge of each situation and recommend a solution to any conflicts. If your instructor doesn't agree with it, he will let you know. The more proactive you are as a crewmember, the better your mission commander skills will become. Someday your life – and the lives of your crew – may depend on this training.

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CHAPTER TWO
INTRODUCTION TO FLIGHT INSTRUMENTS

200. INTRODUCTION

Aircraft flight instruments are divided into three categories, according to specific function. Control instruments display immediate power and attitude indications, navigation instruments convey the aircraft's location in space, and performance instruments show how the aircraft is performing as a result of attitude and power changes.

In order to navigate properly on instruments and gain a thorough understanding of the procedures discussed later in this manual, you must be able to visualize your position in relation to a NAVAID. Specifically, you need a thorough knowledge of navigation instruments, how they function, and what they depict.

**REFERENCE T-6A NATOPS*
**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN101 AND IN104)*

201. AIR NAVIGATION AIDS

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN101)*

202. AIRCRAFT NAVIGATION SYSTEMS

Refer to the aircraft NATOPS Manual Section I for a complete discussion of navigation systems and their proper use. You should have a working knowledge of the following systems:

1. Standby Flight Instruments
2. Digital Clock
3. Angle of Attack (AOA) System
4. Intercommunications System (ICS)
5. Transponder
6. RMU
7. Ultrahigh Frequency (UHF) Backup Control Unit
8. Electronic Flight Instrument System (EFIS)
9. Attitude Heading and Reference System (AHRS)
10. Naval Aircraft Collision Warning System (NACWS)

11. Very high frequency (VHF) Navigation System

12. Distance Measuring Equipment (DME)

13. Global Positioning System (GPS)

14. Interior Lighting

15. Exterior Lighting

203. RADIO AND EQUIPMENT CHECKOUT

VOR azimuth can be tested over select stations or certified checkpoints, either in the air or on an airport surface. The VOR transmits a test signal, identified by either a continuous series of dots or a continuous 1020-hertz tone. With the proper VOR Test (VOT) Facility frequency tuned, the VOR bearing pointer points to 180. Selecting a course of 180 should center the Course Deviation Indicator (CDI) with a "TO" indication. VOT frequencies are listed in the IFR Enroute Supplement (in the “NAVAIDS” section for selected airports) and in Enroute Low Altitude and Area charts (in the “AG Voice Communication” section).

Certified airborne checkpoints have been established on airways and in the vicinity of VOR stations to check the accuracy of VOR azimuth in flight. VOR airborne checkpoints are published in the FLIP AP/1 under Chapter 3, under “VOR Receiver Checkpoints”. For instance, "CRESTVIEW, FL (Bob Sikes) – 106°, 8.6 NM; over rotating beacon; 1200 feet." When flying directly over the rotating beacon at Bob Sikes airport with the Crestview VORTAC tuned in, the VOR bearing pointer and Horizontal Situation Indicator (HSI) should indicate a course of 106° with 8.6 in the DME.

NOTE

With error in excess of $\pm$ 4° during a ground check or $\pm$ 6º during an airborne check, IFR flight should not be attempted.

CHAPTER THREE
GROUND PROCEDURES

300. INTRODUCTION

You will be navigating from the rear cockpit, so the way you will run checklists in the Primary and Intermediate Instrument stages is not the same as the way you ran them in the Contact stage. For example, you still give the challenges, but now the instructor gives the replies for most of the front-cockpit items. Practice these checklists when you chair fly, until you are used to the changes.

301. PREFLIGHT THROUGH ENGINE START

1. Perform the Before Exterior Inspection Checklist.

2. Perform those portions of the Exterior Inspection Checklist assigned by your instructor.

3. Perform the Cockpit Checklist.

4. Perform the Engine Start Checklist.

302. TAXI

1. Perform the Before Taxi Checklist.

Copy ATIS and place your clearance on request with Clearance Delivery (or Ground Control, as appropriate) in accordance with the Before-Taxi Checklist and squadron SOP.

NOTE

In accordance with AIM Chapter 4, you must get clearance to taxi prior to moving the aircraft onto the "movement area" while the Tower is in operation. At NAS Pensacola, the "movement area" is all taxiways excluding the ramp area. Away from NAS Pensacola, assume all concrete belongs to Ground Control; get taxi clearance before moving the aircraft out of its parking spot.

An example of a departure clearance using assigned radar vectors after takeoff follows:

"KATT 603 is cleared as filed to Navy Pensacola. 1 DME past the TACAN, turn right heading 150, climb and maintain 3000, expect 9000 ten minutes after departure. Departure Control frequency 270.8, squawk 4002."

NOTES

1. During primary and intermediate flight training, you are required to read back the entire ATC departure clearance. If your

clearance is not available prior to taxi, it is **YOUR** responsibility to reestablish contact with Clearance Delivery (or Ground Control, as appropriate) some time before takeoff to copy the departure clearance.

2. Normally, an ATC departure clearance is relayed by Clearance Delivery. (If the airport does not have a Clearance Delivery, aircrews must contact Ground Control to place their IFR clearance on request.) Clearance Delivery does not exercise any surveillance or control over the movement of aircraft. Clearance Delivery instructions **DO NOT** supersede subsequent ATC-issued altitude restrictions on departure. Only ATC can override departure procedures (DP).

2. Contact Base (as applicable) and report taxiing outbound in accordance with squadron SOP.

3. Request taxi clearance from Ground Control and perform the Taxi Checklist.

When the duty runway is confirmed, give your instructor the Taxi Brief in accordance with squadron SOP. Keep the airport diagram readily available and provide your instructor with progressive taxi instructions while proceeding to the runway hold-short line.

Set your altimeter according to the information included in your taxi clearance if it differs from the ATIS information.

NOTES

1. You are not required to read back ATC taxi clearances (except runway assignment, altimeter settings, and hold short instructions). However, clarify any portion of any clearance that is not completely understood. In addition, understand that ATC controllers may request a read back of any clearance, in which case you must comply.

2. At NAS Pensacola, you will commence taxi before you get a clearance to do so. This is a **LOCAL** procedure only. At most other controlled airports, **YOU MUST GET TAXI CLEARANCE BEFORE MOVING THE AIRCRAFT**. At an unfamiliar field, you may request a "progressive" taxi from Ground Control if unsure how to get to the active runway.

303. INSTRUMENT CHECKLIST

The Instrument Checklist is a TRAWING SIX local checklist, found in your NATOPS trifold checklists. Initiate the Instrument Checklist after the Taxi Checklist is complete, using the following script:

1. Student: *"Airspeed Indicator FORTY."*
   Instructor: *"I show forty."*

2. Student: *"ALTIMETER __.__, SET TWICE. PRIMARY INDICATES ____ FEET, SECONDARY INDICATES ____ FEET."*
   Instructor: *"__.__ set twice. Primary indicates ____ feet, secondary indicates ____ feet."*

3. Student: "Vertical Speed Indicator ZERO."
   Instructor: "I show zero."

4. Student: *"EADI ERECT, STABLE, NO FAULTS."*
   Instructor: "Erect, stable, no faults."

5. Student: *"EHSI ALIGNED AND SLAVED, HEADING ___, WET COMPASS HEADING ___."*
   Instructor: *"Aligned/Slaved, heading ___, wet compass ___."*

6. Student: *"NAVAIDS SET."*

7. Student: *"EFIS CONTROL PANEL MODE SET VOR/GPS, HEADING BUG SET ___, COURSE SET ___. NEEDLE ONE (as applicable), NEEDLE TWO (as applicable)."*

8. Student: *"TRANSPONDER SQUAWKING ____, STANDBY."*

9. Student: *"CLOCK SET."*

Make sure the radios, NAVAIDs and Electronic Horizontal Situation Indicator (EHSI) are set for flight. When configuring the NAVAIDs and EHSI, consider all the requirements for departure, an approach back to the departure airfield in the event of an emergency return, and navigation to the first fix(es) along your cleared flight path.

In aviation it is important to know what the current time is. A "time hack" is one of the ways aircrew synchronize their timing devices, either to validate specific events based on time or to perform certain actions or arrive at certain places at specified times. For your training, the time hack can refer to one of two scenarios:

1. Tracking the current Local or Zulu time, used for events such as a holding EFC, and normally synchronized in the Instrument Checklist (see Step 9, above).

2. Tracking elapsed minutes and seconds, used for student responsibilities such as the two-minute prior call, and normally initiated before taking the runway for departure (see Step 4 of Section 304 of this FTI).

Setting the current Local or Zulu time can be done during the preflight brief with the aircraft clock, wristwatches, or "egg timers." Your instructor may or may not have you set Local or Zulu time on the aircraft clock, so you should be familiar with the Greenwich Mean Time (GMT) and LT functions of the cockpit digital clock. Do not rely on your instructor to teach you how to use these.

Zulu time is the standard time used in aviation but you may also use Local time, as long as you are clear about which (Zulu or Local) time your are using. Any time you give a time hack, give some kind of warning to the rest of your crew (usually, a count down works best). For example:

"On my hack, the time will be 1335 Zulu. 3-2-1-HACK. The time is 1335 Zulu."

304. PREPARING FOR TAKEOFF

1. Perform the Overspeed Governor Checklist. You will read the challenges, while your instructor operates the controls and gives the appropriate responses.

2. Perform the Before Takeoff Checklist. For this checklist, you will read both the challenges **AND** the responses.

3. Give your instructor the Departure Brief. A helpful mnemonic is "**THAR**"

   a. **T**urn: First turn/DME.

   b. **H**eading: Initial heading.

   c. **A**ltitude: Initial altitude.

   d. **R**estrictions: As applicable (refer to DP, Standard Instrument Departure (SID), or ATC instructions).

For example:

"Sir/Ma'am, Departure Brief. 1 DME past the TACAN, turn right heading 150. Climb to 3000. No restrictions."

NOTES

1. If you are ready for takeoff and did not receive departure instructions with your clearance, Tower Control should provide you with instructions.

2. Unless otherwise specified, obstacle clearance for all departures is based on the aircraft crossing the departure end of the runway at or above a certain altitude (35 feet above the departure end of runway elevation at civilian and Army airfields, 0 feet at

Air Force and Navy airfields), climbing to 400 feet above the departure end of runway elevation before making the initial turn, and maintaining a minimum climb gradient of 200 feet per nautical mile (FPNM), unless required to level off by a crossing restriction, until the minimum IFR altitude. A greater climb gradient may be specified in the DP to clear obstacles or to achieve an ATC crossing restriction. DPs will be listed by airport in the IFR Takeoff Minimums and Departure Procedures, Section C, of the Terminal Procedures Publications (TPPs, also known as approach books). An Obstacle Departure Procedure (ODP) that has been developed solely for obstacle avoidance will be indicated with the symbol  ("Trouble T") on appropriate approach plates and DP charts for that airport.

4. Hack the elapsed timer and contact Tower Control for takeoff.

For the minutes and seconds required for turn point procedures, we normally use the elapsed timer (ET) function of the aircraft clock, giving a warning countdown to hack and counting out the first few seconds after hack to check proper clock operation. For example:

"On my hack, we will start the elapsed timer. 3-2-1-HACK-1-2-3."

NOTES

1. The elapsed timer function of the aircraft digital clock displays minutes and seconds until reaching 59 minutes and 59 seconds. After that, it displays hours and minutes. If the enroute portion of your flight will exceed 59 minutes, you will need to re-hack the clock. This should be done on any leg where a groundspeed computation can be completed in order to establish an Estimated Time of Arrival (ETA) to your next point. This step **SHALL** be accomplished prior to the end of the hour.

2. The elapsed timer should also be re-hacked departing the terminal area after drop-in approaches. This step allows students and instructors to get back on the "same page" for further enroute timing.

5. After cleared for "Takeoff" or "Position and Hold" by Tower Control, perform the Lineup Checklist.

NOTE

At all airfields, including NAS Pensacola, the frequency change to Departure Control is normally given by Tower Control with takeoff clearance for single-piloted aircraft (per FAA ATC Manual 7110.65). Switch frequencies when directed by ATC unless a

greater emergency exists. If you were not given the frequency change as part of your takeoff clearance, Tower Control will direct you to switch to Departure Control once you are airborne.

305. TAKEOFF ROLL

Required student ICS calls during a takeoff roll **SHALL** include:

1. *"Off the peg."*

2. *"85 knots* (or gust corrected rotate speed), *rotate."*

306. LANDING

Like takeoff roll, landing roll also has a student ICS call - the "rollout call." After the aircraft touches down, reference the airspeed with the runway distance remaining at each 1000 foot marker (board) and report this to your pilot. Make these calls until the airspeed indicates 40 KIAS. For example:

"Five board, 80 knots, four board 60 knots, three board, 40 knots."

307. AFTER LANDING

1. Exiting the runway, have the airport diagram or sketch available for taxi information so you can direct your instructor's taxi to parking.

2. Once clear of the active runway(s), complete the After Landing Checklist, contact Ground Control for taxi clearance, and taxi to park.

3. Perform the Engine Shutdown Checklist.

4. Perform the Before Leaving Aircraft Checklist.

5. Perform those portions of the Postflight Inspection Checklist assigned by your instructor.

308. COMMON ERRORS

1. Not completing the Taxi Checklist.

2. Not giving the Taxi Brief.

3. Incorrectly using the DME Hold function of the RMU.

4. Setting up NAVAIDs improperly:

    a. Not setting the departure course in the CDI.

3-6 GROUND PROCEDURES

b. Selecting an incorrect navigation source.

c. Not identifying the tuned station. You must identify each station tuned by pulling out the NAV Mixer Knob on the Audio Control Panel, listening to the Morse Code identifier, and confirming the identifier with the published code.

5. Not giving the Departure Brief.

6. Not performing a time hack for an elapsed timer.

7. Not performing, or not completing, the Lineup Checklist.

8. Not discussing the "Trouble T" when applicable.

9. Not checking actual gear and flap indications before reporting, "*Gear and flaps up.*"

10. Not making a gust correction to the rotate speed when applicable.

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CHAPTER FOUR
ENROUTE PROCEDURES

400. INTRODUCTION

Staying ahead of the aircraft is critical during all phases of flight training. Thorough preflight planning (including chart and approach study) and strong procedural knowledge are critical to a safe and successful flight. This section covers enroute procedures required to successfully navigate and transition to the terminal phase of flight.

In general, your instructor will act as your "voice-activated autopilot." It is your responsibility to direct your instructor as necessary to execute your mission. You are required to give timely direction for navigation, including (but not limited to) climbs, descents, turns, acceleration/deceleration, and aircraft configuration changes. When directing a change, include both the desired change and a **SPECIFIC TARGET**. For example:

INCORRECT: *"Sir/Ma'am, turn right 5 degrees."*

CORRECT: *"Sir/Ma'am, turn right heading 095."*

401. INSTRUMENT DEPARTURES

**REFERENCE: JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE (IN202)*

1. After takeoff, **CONFIRM TWO POSITIVE RATES OF CLIMB**, then report on ICS:

   "*Two positive rates of climb, gear up…110 knots, flaps up."*

Your instructor will raise the gear and flaps. When gear and flaps indicate up, report on ICS:

   "*Gear and flaps up at* (actual indicated airspeed) *knots."*

2. Once safely airborne, comply with ATC instructions and perform the initial Operations Check. If your instructor has not already cycled the NACWS to the Enroute Mode, advise him to do so.

NOTE

Maintain constant situational awareness of your position. Question any assigned heading or altitude you believe to be incorrect or unsafe.

3. Report to your instructor when passing 1000 feet prior to assigned altitude. For example:

   "*Passing five thousand for six thousand,"* or *"One thousand feet prior to six thousand."*

Also report to your instructor when level at the assigned altitude.

4. The departure phase is considered complete when established on the air route structure or when ATC gives the verbiage:

"BUCK 303, resume own navigation," or *"BUCK 303, cleared on course."*

At this point, provide navigational inputs to your instructor for the enroute phase of your mission.

NOTE

Your instructor should provide you the GPS CDI (i.e., GPS NAV mode, without groundspeed readout) on the first leg of an instrument route when that first leg does not afford an opportunity to get a groundspeed check and develop a "Wind T". Before you can use the GPS CDI for groundspeed calculations, you must first be leveled off, with the correct True Airspeed (TAS) and heading established to the next fix. You will be allotted approximately two minutes of GPS CDI usage before your instructor deselects the GPS CDI.

402. OPERATIONS CHECKS

The initial Operations Check **SHALL** be performed immediately after checking in with Departure Control, safety of flight permitting. Subsequent Operations Checks **SHALL** be initiated at least every 20-25 minutes (and are recommended after each Wings Level call). Brief the nearest suitable divert airfield with all Operations Checks. Your preflight planning should include the identification of airfields to use as emergency diverts along your proposed route.

1. If you are VMC, your emergency divert will be the nearest suitable paved airfield.

2. If you are IMC, your emergency divert will be the nearest "blue field" on the low chart, assuming that particular field has a published approach compatible with your aircraft. "Green fields" on the high chart may have suitable DoD published low approaches and should be identified during preflight planning.

403. ALTITUDE WARNINGS

Altitude warnings are given to facilitate altitude awareness and **SHALL** be given:

1. During all climbs and descents outside the FAF:

   a. Passing FL 180.

   b. Passing 10,000 feet MSL.

   c. Passing 1000 feet prior to any level-off altitude.

4-2 ENROUTE PROCEDURES

d. At all level-off altitudes.

2. During all descents outside the FAF:

a. Passing 15,000 feet MSL.

b. Passing 6000 feet AGL (Minimum Uncontrolled Ejection Altitude).

c. Below 6000 feet AGL, warning calls **SHALL** be made passing each 1000 feet MSL.

3. During all climbs and descents inside the FAF:

a. Passing 200 feet prior to any Minimum Descent Altitude/Decision Height (MDA/DH).

b. At all level-off altitudes, MDA, and DH.

4. Anytime the aircraft is off altitude by more than 100 feet from assigned altitude.

404. AIRCRAFT DEVIATION

Any time you see your aircraft more than 100 feet off assigned altitude, 10 KIAS off assigned airspeed, or 5º off assigned heading, you **SHALL** advise your instructor of the deviation and direct a correction. Any deviations within the standards listed above are generally acceptable and normally should not be addressed outside the FAF. Use specific terminology when you give any correction. For example:

INCORRECT: *"Sir/Ma'am, you're a little low."*

CORRECT: *"Sir/Ma'am, I have you 150 feet low. Climb to 9000 feet."*

405. ALTIMETER CHANGEOVER PROCEDURES

1. Climbing:

a. Dial 29.92 in both altimeters upon reaching or passing 18,000 feet MSL.

b. Perform the FL180 Check (a TRAWING SIX local checklist, found in your NATOPS Trifold Checklists).

2. Descending:

a. Dial local altimeter setting in both altimeters no later than reaching or passing through a flight level equivalent to 18,000 feet MSL (see the table depicted in the FIH, Section B, Altimeter Changeover Procedures).

b. Perform the Descent Checklist.

406. CLIMBS AND DESCENTS

This section describes the various types of climbs and descents used for transition from the terminal area to the enroute structure and vice versa.

NOTE

ATC requires a climb/descent rate consistent with the operating characteristics of the aircraft to a point 1000 feet prior to the assigned altitude, followed by a climb/descent rate of 500 - 1500 feet per minute to the assigned altitude (i.e., 500 - 1500 fpm for the last 1000 feet). If you cannot meet these climb/descent rates for any reason, you must notify ATC. A voice report to ATC upon reaching assigned altitude is not required unless specifically requested by ATC.

Occasionally, ATC will assign you a higher or lower altitude to comply with IFR separation requirements. Also, aircrew may request a different altitude to take advantage of more favorable winds or other in-flight conditions.

The general climb/descent procedure follows:

1. Receive climb/decent clearance. For example, say you are at 12,000 feet MSL and ATC wants you at 16,000 feet MSL:

"KATT 603, Atlanta Center, climb to and maintain one six thousand."

2. Acknowledge the transmission and report leaving altitude to ATC. For example:

"Atlanta Center, KATT 603, leaving one two thousand for one six thousand."

3. Over the ICS, report 1000 feet prior to assigned level-off altitude. For example:

"Sir/Ma'am, passing one five thousand for one six thousand."

Note the indicated outside air temperature and begin computing a new IAS to maintain your desired TAS.

4. Over the ICS (and to ATC, if required), report reaching assigned altitude. Direct your instructor to set the new IAS, as computed in Step 3.

407. AIRSPEEDS

The following airspeed profiles apply to both INAV flights and simulator events:

1. Climbing: Adjust pitch as necessary to accelerate to desired climb airspeed of 140-180 KIAS. Charted climb performance is based on 140 KIAS. If obstacle clearance and/or noise abatement are not factors, 160-180 KIAS will result in improved forward visibility during the climb.

2. Level Enroute: Primary Instrument sorties (low-altitude structure) will be planned and flown at 240 KTAS. Intermediate Instrument sorties (high-altitude structure) will be planned and flown at 270 KTAS. All "canned" NPA routes are listed at 240 KTAS.

   You are familiar with the procedures for computing a target IAS and are also provided a TAS-to-IAS conversion chart for in-flight use. TAS is important mainly for flight planning, but in the air, you must report any TAS change of 10 KIAS or 5%, whichever is greater.

3. Descending: There are four T-6 descent profiles: Enroute, Maximum Range, Penetration, and Rapid (reference T-6A NATOPS, Appendix A).

NOTE

"Pilot's Discretion" descents are sometimes authorized by ATC to allow a pilot to descend at their discretion. With a pilot's discretion descent clearance, you may descend at a point of your choosing and level off at any point between your current altitude and your cleared altitude. You may not, however, climb once descent has been initiated.

4. On Approach:

   a. Radar Vectors (prior to Basic Approach Configuration (BAC)): 150-200 KIAS on downwind, 120-150 KIAS on base, unless otherwise directed by ATC.

   b. Initial approach (from IAF to BAC): 120-150 KIAS.

   c. Final approach: 110-120 KIAS (gear down, flaps takeoff).

5. Holding: 150 KIAS (or as necessary).

408. FREQUENCY CHANGES

Every time you are handed off to a new controller**,** the new frequency **SHALL** be written down. As a technique, write down both the UHF and VHF frequencies. Write each frequency in an orderly fashion so the frequency in use is the last in the line. This method will keep assigned frequencies in sequence and allow you to identify the previous channel if communication problems occur**.**

VHF is the primary radio at civilian airfields, so it is a good idea for you to use VHF while flying civilian patterns. If you switch from using UHF to VHF or vice versa, inform your instructor.

409. TURNPOINT CALLS

There are three required ICS calls at each turnpoint along your route of flight. The intent of these reports is to teach you to stay ahead of the aircraft and develop good crew-coordination habits.

1. TWO-MINUTE PRIOR CALL: A Two-Minute Prior call is made when the aircraft is two minutes prior to the last updated ETA to the next turnpoint. There are several options for computing the two-minute prior point, given in order of descending accuracy:

   a. If you are radial tracking with DME and groundspeed is known, multiply groundspeed (in miles per minute) by two, then add/subtract that distance to the next point's DME to compute your projected two-minute prior DME.

   b. If your groundspeed is known, use it to update the Estimated Time Enroute (ETE) to the next point, add the previous point's Actual Time of Arrival (ATA), and subtract two minutes to compute your projected elapsed time two minutes out from the next turnpoint.

   c. Add the previous point's ATA to your preflight ETE to the next point, then subtract two minutes to compute your projected elapsed time two minutes out from the next turnpoint.

   d. If your course cuts across a VOR/DME or VORTAC radial at roughly right angles on a Point-To-Point (PTP), you can convert distance to radials and use a crossing radial to confirm your two-minute prior point.

You should always use the most accurate method available to you.

The intent of the Two-Minute Prior call is to give a brief description of your method of navigation to the next turnpoint, and it follows the format:

"*We are two minutes prior to* (next turnpoint)."

"*The outbound heading is ___, for a course of ___.*"

"*ETA to* (turnpoint after next) *is __+__.*"

"*We will be proceeding via* (V22, direct, PTP, etc.)."

NOTE

You are not allowed to update the ETA for the next turnpoint inside the two-minute prior point.

2. MARK ON TOP (MOT) CALL: The MOT call is given over the turnpoint or at the designated lead turn point. Clear the turn and give the MOT call, using the following format:

"Clear left/right."

"Turn left/right, heading ___."

"Time is __+__."

"Place is (turnpoint)*."*

"Fuel on board is ____."

"NAVAID is switching to __._ /remains the same."

"CDI Course changes to ___ /remains the same."

Use a course intercept technique to proceed to the next point.

NOTE

Your instructor understands that you may begin leading the turn prior to actually arriving over the fix at the ETA. The time difference should be nominal and will not affect subsequent legs, as ETAs are reestablished after each leg.

3. WINGS LEVEL (WL) CALL: Check your navigation and make required course corrections prior to initiating the WL call, using the format:

"We are ± ____ from preflight fuel."

"EFR at the IAF is ____."

Operations Checks are recommended after each WL call. Update groundspeed and ETA to next point.

410. TIMING

Both front- and rear-cockpit elapsed timers SHALL be synchronized during Ground Operations, after the Departure Brief. Be as accurate as possible with the MOT (to the nearest second),

ETAs, and ETEs. State time in minutes plus seconds. For example, 15 minutes and 30 seconds elapsed time should be stated as "15+30" (one five plus three zero).

NOTES

1. The elapsed timer function of the aircraft digital clock displays minutes and seconds until reaching 59 minutes and 59 seconds. After that, it displays hours and minutes. If the enroute portion of your flight will exceed 59 minutes, you will need to re-hack the clock. This should be done on any leg where a groundspeed computation can be completed in order to establish an ETA to your next point. This step **SHALL** be accomplished prior to the end of the hour.

2. The elapsed timer should also be re-hacked departing the terminal area after drop-in approaches. This step allows students and instructors to get back on the “same page” for further enroute timing.

411. FUELS

The MOT fuel should be computed immediately after completion of the Two-Minute Prior call by subtracting 15 pounds from your fuel at the two-minute prior point (15 pounds of fuel approximates a two-minute fuel burn for most INAV profiles).

412. TIME-FUEL UPDATES

Times and fuels should be updated as often as possible. The first step in updating your ETA should happen after completion of the WL call. Add your last MOT time to the current leg’s ETE, then compare that value to the next turnpoint’s ETA. Any time you get a new groundspeed computed, update your ETEs and ETAs. You may update your ETA right up until the two-minute prior point; any updates between the two-minute prior point and the turnpoint itself will not be accepted.

413. FUEL MANAGEMENT

Fuel management is accomplished in two phases:

1. Preflight planning, accomplished using the flight-log fuel plan taught in INAV Ground School. The T-6A NATOPS is also an excellent reference for aircraft performance data.

2. In-flight monitoring and updating. During flight, check the accuracy of your fuel planning by comparing the fuel on board with the flight log estimates for enroute fixes. Re-compute the fuel plan if there are significant variances in actual vs. predicted performance. Monitor the fuel flow indicator and compare it with the predicted flow. Check for fuel splits and take corrective action as necessary. If at any point you doubt your ability to reach your destination (or alternate)

with required reserves (i.e., your current fuel load is less than Mission Completion Fuel (MCF)), inform your instructor of the situation and provide a solution. This may include the need to modify your flight plan or request ATC assistance as necessary. Finally, if actual fuel usage is grossly greater than predicted usage, check for fuel leaks and consider aborting the mission altogether.

414. GROUNDSPEED CALCULATIONS

Knowing your groundspeed will allow you to accurately determine ETAs, facilitate fuel planning, and gain wind information. All methods of determining groundspeed are similar; they either measure the amount of time required to cover a known distance or measure the distance traveled in a known amount of time. In order to perform a groundspeed check you must be:

1. tracking a radial,

2. at cruising altitude, in unaccelerated flight,

3. at the correct calculated IAS for desired TAS,

4. at a DME larger than your altitude (in thousands of feet) above the selected NAVAID. For example, if you're flying at 12,000 feet with the NAVAID at sea level, you cannot perform a groundspeed check unless you are outside 12 DME.

Note the elapsed timer and note DME. After one minute of elapsed time, note DME again and subtract the first DME to get distance flown. Distance flown (divided by 1 minute) is your groundspeed in NM per minute. Give this value to your instructor. To get groundspeed in knots, multiply your groundspeed in miles per minute by 60. Again, give this value to your instructor.

Rough Cut:	At 210 KIAS, you are traveling at approximately 3.5 miles per minute (210 NM per hour / 60 = 3.5 NM per minute), no wind. This no-wind value allows you to make reasonably accurate ETAs until the refined procedures in the phase below can be accomplished.
Refinement:	Timing for one minute, you travel 3.7 DME. Your groundspeed is therefore 3.7 miles per minute. 3.7 x 60 = 222, so your groundspeed is 222 knots.

More accurate groundspeed checks can be accomplished by timing for periods greater than one minute and adjusting the math accordingly. In addition, most Air Route Traffic Control Centers (ARTCC) will be able to provide a groundspeed readout if you are in radar contact. This information may be used to check your own calculations, but for training purposes **SHALL NOT** be used as the primary method of groundspeed computation.

415. WIND ANALYSIS

Wind analysis involves determining both magnitude and direction of the winds. There are always two components (head/tailwind and crosswind) to the total wind, and there are two methods (the Wind "T" and the CR-2 Wind Side) to find the total wind vector. The use of the CR-2 is covered in INAV Ground School. The basic procedures for the Wind "T" method are:

1. Compute the head/tailwind component by comparing groundspeed to TAS.

If your groundspeed is less than your TAS, you have a headwind. If your groundspeed is greater than your TAS, you have a tailwind. The difference between your groundspeed and your TAS (both in knots) is the head/tailwind component in knots.

For example, if you have calculated a 222 knot groundspeed and are flying 240 KTAS, you have a headwind component of 18 knots.

2. Compute the crosswind component by first computing your guide number, which is your TAS in miles per minute. Second, compare the course/radial you are tracking to your actual heading; the difference between the two is your crab angle. Compute the crosswind component using the following formula:

Crab angle x guide number = crosswind component (in knots).

For example, if you are flying at 240 KTAS, your guide number is 4.0. If you are tracking a course of 360^{o} and fly a drift-corrected heading of 003^{o} to maintain that course, then your crab angle is 3^{o} to the right. You therefore have a (4.0 x 3^{o} =) 12 knot crosswind from the right.

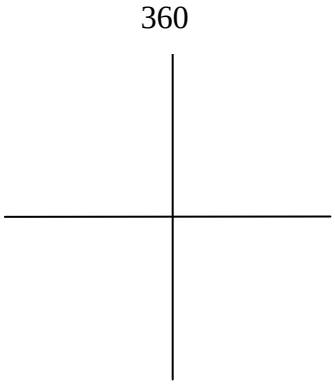
3. Estimate the total wind magnitude by adding the larger component to half of the smaller component (i.e., "all the big plus half the small").

For example, if you have computed an 18 knot headwind and a 12 knot right crosswind, your total wind magnitude is (18 knots + ½ (12 knots) =) 24 knots.

4. Estimate the direction of the total wind vector with the Wind "T".

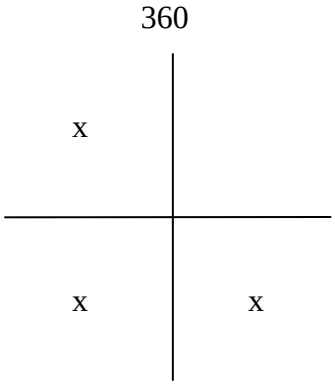
   a. Draw a basic cross diagram, with the desired course at the top of the cross. The top half of the vertical axis represents headwind and the bottom half of the vertical axis represents tailwind. Likewise, the right half of the horizontal axis represents a right crosswind and the left half of the horizontal axis represents a left crosswind.

For example, with a desired course of 360°:



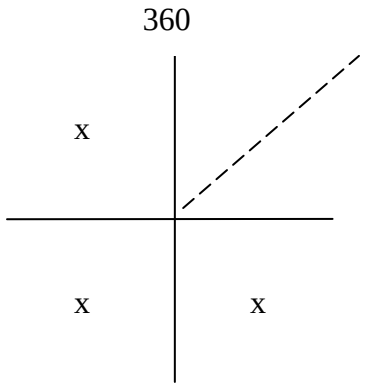
b. Determine the quadrant affected by your head/tailwind and crosswind components, and draw a small "x" in the other three quadrants.

For example, with an 18 knot headwind and a 12 knot right crosswind, the upper right quadrant (for right quartering headwind) is the affected quadrant.



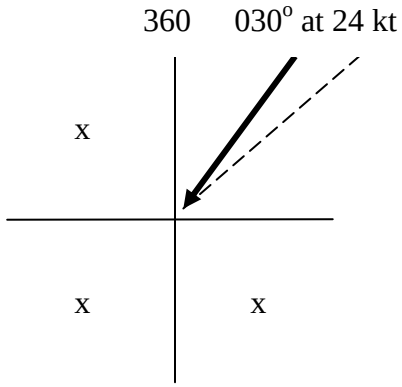
c. Draw a 45° dashed line through the affected quadrant. This line indicates where the wind vector would be if the head/tailwind component equals the crosswind component. If your headwind/tailwind component is greater than your crosswind component, your total wind vector will be between the 45° dashed line and the vertical axis. If your crosswind component is greater than your head/tailwind component, your total wind vector will be between the 45° dashed line and the horizontal axis.

For example, with an 18 knot headwind and a 12 knot right crosswind, your head/tailwind component is greater than your crosswind component. Your total wind vector is between the 45° dashed line and the vertical axis of the Wind "T".



d. Use proportional plotting to place your wind vector in the proper quadrant, relative to your 45° dashed line and the appropriate axis.

For example, a crosswind component of 12 knots is two-thirds a headwind component of 18 knots, so the estimated total wind vector looks something like this:



416. COURSE INTERCEPTS/RADIAL TRACKING

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN104)*

417. DIRECT TO A STATION

***REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN104)*

418. STATION PASSAGE

Station passage is defined as the moment the aircraft passes directly over or abeam the navigation facility. VOR station passage occurs when the TO-FROM indicator makes the first positive change to FROM.

NOTE

The head of the VOR bearing pointer may fall through a radial 90° from the dialed course. If the TO/FROM flag is unavailable, this 90° offset may be used as a secondary indication of station passage. If both the TO/FROM flag and the bearing pointer are unavailable, minimum DME may be used to determine station passage.

419. LEADING TURNS

With the exception of three cases (noted below), lead all of your turns. You can use any of the following techniques for lead-point computation on a 90° turn:

1. Lead Distance (in NM) = ½ of 1 percent of groundspeed (in NM per hour).

If groundspeed is unknown, use TAS. If TAS is unknown, use IAS. This method is most accurate when using a Standard Rate Turn (SRT), the bank angle for which can be calculated using TAS/10 + 7.

For example, at 240 KTAS and 200 knots groundspeed, your lead distance is 1 NM and your bank angle is 31^{o}.

2. Lead distance = groundspeed (in NM per minute) – 2.
This method is most accurate when using a 30° bank angle.

3. Lead distance = (MACH x 10) – 2.
This method is most accurate when using a 30° bank angle.

For turns of some fraction of 90°, cut (or add to) the lead distance by the same fraction. For example, with a 30° turn, 30° is a third of 90°, so the lead distance for a 30° turn is a third of the lead distance for a 90° turn. Likewise, for a 120° turn, 120° is four-thirds of 90°, so the lead distance for a 120° turn is four-thirds the lead distance for a 90° turn.

If you are turning over a NAVAID, add the computed lead distance to the minimum DME (altitude over the NAVAID elevation, divided by 6000) to get your lead-point DME. If leading a turn over a fix some distance away from a NAVAID, add (or subtract, as appropriate) the lead distance to the fix DME to get the lead-point DME.

All of the methods listed above provide an approximate lead point. It is crucial that, regardless of technique used to calculate lead distance, you make an appropriate correction to establish yourself on desired course/track.

YOU DO NOT LEAD YOUR TURN WHEN:

1. You intend to intercept a course/track outbound from the IAF on a procedure-turn or procedure-track approach (i.e., 45/180, 80/260, teardrop with course guidance, arcing or straight-

in approach) and your heading is **GREATER THAN 90°** from the outbound course/track. In this case, you must overfly the IAF and then turn immediately in the shorter direction to intercept the outbound course/track (see the Terminal Procedures Section in this supplement).

2. You elect to use the AIM racetrack/holding technique (such as the parallel, direct, or teardrop without course guidance) for your course-reversal maneuver on a procedure-turn approach. In this case, you will be flying a **HEADING** and not a defined course/track outbound from the IAF. You will overfly the IAF and turn to the predetermined outbound heading (see the Terminal Procedures Section in this supplement).

3. You are flying a PTP. In order to allow your instructor to evaluate your PTP proficiency, plan to overfly the desired fix on all PTPs.

WARNING

If you are flying a PTP to intercept an airway or route, you must be aware that turns initiated at or after fix passage may exceed the boundaries of the airway or route you are turning to intercept. In the absence of leading a turn, aircraft operating in excess of 290 KTAS might exceed the normal airway or route boundaries, depending on the amount of course change required, wind direction and velocity, and fix type (DME, overhead navigation aid, or intersection).

420. COMMON ERRORS

1. Omitting required altitude or deviation warnings.

2. Calling *"6000 feet AGL"* at 6000 feet MSL.

3. Omitting checklists.

4. Not directing a new IAS for each leveloff altitude.

5. Not notifying your instructor when switching between VHF and UHF radios.

6. Not updating ETAs.

7. Dialing reciprocal of desired course into CDI or not dialing any course into CDI.

8. Not allowing instrument indications to "settle" prior to establishing radial-intercept heading.

9. Not intercepting or grossly overshooting radial prior to initiation of radial-tracking procedures.

10. Not applying drift-corrected headings or not using CDI to update drift-corrected headings.

11. Making large course corrections near a NAVAID. Remember slant range! When you are close to the station, limit heading changes to within 10° of your desired course unless absolutely necessary.

12. Not recognizing station, fix, or waypoint passage.

13. Not computing or not applying correct lead points for turns.

14. Proceeding direct when cleared to follow an airway or vice versa.

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CHAPTER FIVE
HOLDING

500. INTRODUCTION

Holding is a predetermined maneuver that keeps aircraft within a specified airspace until further clearance is received from ATC. It can be accomplished at an intersection, GPS Waypoint, DME fix, or navigation facility. When ATC clears you to hold, a specified airspace oriented around the holding fix has been reserved, clear of other traffic. The extent of the cleared airspace is based on the maximum holding airspeed, as listed in the FLIP GP and FAA AIM.

501. HOLDING CLEARANCE

If the holding pattern is charted and ATC doesn't issue complete holding instructions, you are expected to hold as published on the appropriate chart. When the pattern is charted, ATC may omit all holding instructions except the charted holding direction, altitude and the statement "as published" (e.g., hold east as published, 5000 feet). ATC will always issue complete holding instructions whenever you request them.

An ATC clearance requiring an aircraft to hold at a fix where the pattern is not charted will include the following information:

1. Direction to hold from the fix, in terms of one of eight cardinal compass points (N, NE, E, SE, S, SW, W, NW).

2. Holding fix (may be omitted if included at the beginning of the transmission as the clearance limit).

3. Radial, course, bearing, airway, or route on which the aircraft is to hold.

4. Leg length in miles, if DME is to be used (leg lengths will be specified in minutes on aircrew request or if the controller considers it necessary).

5. Direction of turns (if left turns are to be made, the aircrew requests it, or the controller considers it necessary).

6. Time to Expect Further Clearance (EFC) and any pertinent additional delay information. If no holding pattern is charted and holding instructions have not been issued, you are expected to ask ATC for holding instructions prior to reaching any enroute clearance limit.

Report to ATC the time and the altitude/flight level when you reach the holding fix, and report leaving the holding fix. You are considered established in holding when you cross the holding fix for the first time. An example of this report is:

"Pensacola Approach, BUCK 303, established in holding at SAUFLEY, (current Zulu time in minutes past the hour - NOT the elapsed time!), *6000 feet."*

NOTE

In accordance with FAR/AIM, you should report the time and altitude/flight level reaching a holding fix (or point cleared) to ATC or Flight Service Station (FSS) facilities, even without a specific ATC request. This report may be omitted by pilots of aircraft involved in instrument training at military terminal-area facilities when radar service is being provided.

502. TERMINOLOGY

1. Standard Pattern: Right turns

2. Nonstandard Pattern: Left turns

If turns not specified, assume standard pattern/right turns.

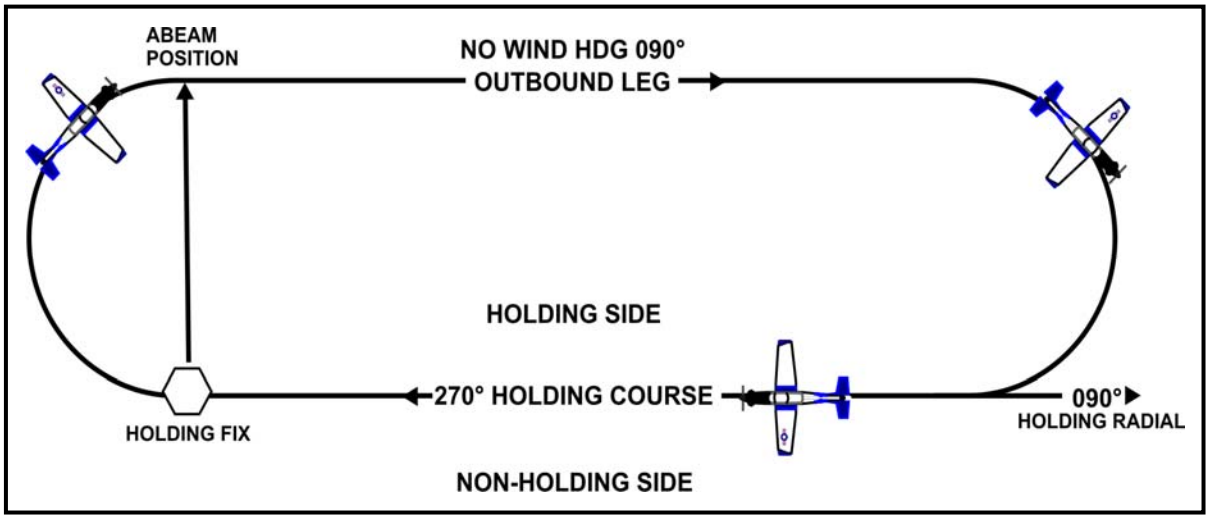

Figure 5-1 Standard Holding Pattern

503. AIRSPEEDS

All aircraft may hold at the following altitudes and maximum holding airspeeds:

Altitude (MSL)	Maximum Airspeed (KIAS)
Minimum Holding Altitude (MHA) – 6000	200
6001 – 14,000	230
14,001 and above	265

NOTE

The normal holding airspeed for the T-6A is 150 KIAS. When fuel endurance is a factor, fly the maximum endurance airspeed or AOA (reference T-6A NATOPS, Appendix A).

Exceptions to the holding airspeed limits are:

1. Holding patterns from 6001 feet to 14,000 feet may be restricted to a maximum airspeed of 210 KIAS. A note on the approach plate will depict this nonstandard pattern.

2. Holding patterns at USAF airfields may be flown up to 310 KIAS, unless otherwise depicted.

3. Holding patterns at USN fields may be flown up to 230 KIAS, unless otherwise depicted.

504. ORBITS

For training purposes, the holding pattern will be broken down into three types of orbits, which are accomplished sequentially:

1. Entry Orbit.

2. No-wind Orbit.

3. Correction Orbit(s).

The Entry Orbit expeditiously establishes the aircraft inbound on the holding course. The No-wind Orbit determines the initial corrections required to compensate for existing winds. The Correction Orbits update and refine the wind corrections. Normally, ATC will expect you to correct for winds immediately upon entering holding. However, this three-step procedure is used in training to simplify the learning process. You **SHALL** accomplish each turn in holding sequentially.

505. TIMING

Timing is adjusted on the outbound leg of each Correction Orbit to maintain the following leg lengths inbound:

	Altitude (MSL)	Inbound leg length
1.	At or below 14,000 feet MSL	1 minute
2.	Above 14,000 feet MSL	1 1/2 minute.

506. GENERAL HOLDING FLOW

1. Receive, copy, and read back holding clearance.

2. Determine the holding course and its reciprocal. Determine the direction of holding from the fix in terms of the eight cardinal compass points.

3. Determine the direction of the entry turn.

4. Give the Holding Brief.

5. Execute the Entry Orbit.

6. Execute the No-Wind Orbit.

7. Execute the Correction Orbit(s).

8. Confirm the EFC time.

9. Receive and acknowledge clearance out of holding.

507. HOLDING PROCEDURES

Although holding may be required enroute, you will be introduced to holding in the terminal area. Steps 1 through 3 below must be performed prior to arrival at the holding fix:

1. Contact Approach Control with current ATIS information and your approach request(s).

2. If Approach Control is unable to clear you for an immediate instrument approach, you may be put into holding until they can make room for you and issue your approach clearance. For most of your INAV sorties, you will request holding practice as part of your approach requests, given in Step 1 above. In any event, when ATC issues you a holding clearance, copy the instructions and read back the clearance. For example:

Student:	*"ATLANTA CENTER, KATT 603, LEVEL 6000, REQUEST VOR RWY 3 AT MONROEVILLE, NEGATIVE ATIS."*
ATC:	*"KATT 603, Atlanta Center, unable to approve your request due to fouled runway. Hold east of Monroeville on the 090 radial. Current Monroe County weather is 900 foot broken, two miles visibility with light rain, altimeter 30.06, runway 21 in use. Time is now 1557, expect further clearance at time 1620."*
Student:	*"ATLANTA CENTER, KATT 603, HOLD EAST OF MONROEVILLE ON THE 090 RADIAL, ROGER WEATHER AND RUNWAY, ALTIMETER 30.06. EXPECT FURTHER CLEARANCE 1620."*

NOTES

1. Request an EFC time if it is not automatically provided by ATC. This time will be used to depart the holding pattern and either proceed enroute (or commence the approach, if holding at your destination) in the event of communications failure.

2. Legally, you may hold to wait for the weather to improve when it is below minimums for the approach, provided you do not go below a fuel state (MCF), which would preclude you from reaching a suitable alternate with required reserve fuel. However, because of the limited fuel capacity of the T-6A, you will not normally hold for an approach you cannot legally execute due to weather.

3. Tell your instructor to reduce airspeed to 150 KIAS (or maximum endurance airspeed when required) when three minutes or less (based on 150 KIAS, not your enroute airspeed) away from the holding fix. Cross the holding fix at or below 150 KIAS.

4. Make all turns during entry and holding at 3º per second SRT, not to exceed 30° Angle of Bank (AOB).

A formula to calculate a SRT AOB is TAS/10 + 7. For example, if you are holding at 150 KIAS and your approximate TAS is 160 KTAS, use 160/10 = 16 + 7 = 23° AOB.

5. Determine the holding course and the reciprocal of the holding course. The holding course is the course inbound to the holding fix (Figure 5-2). The reciprocal of the holding course is used to determine the direction of entry turn. When the holding fix is a station, the reciprocal will be the same as the radial.

6. Determine the entry turn by observing the aircraft's heading ($\pm$ 5°) when it reaches the holding fix and comparing it to the reciprocal of the holding course.

a. Standard Pattern Entry

i. Sector A (**TEARDROP**): If the reciprocal of the holding course is between the heading index and 70° to the right of the heading index, execute a teardrop entry. This is accomplished by turning in the shortest direction (left or right) to a heading 30° less than the reciprocal of the holding course.

ii. Sector B (**PARALLEL**): If the reciprocal of the holding course is between the heading index and 110° to the left of the heading index, turn left to parallel the reciprocal of the holding course.

iii. Sector C (**DIRECT ENTRY**): If the reciprocal of the holding course does not meet the criteria listed in (i) or (ii) above, turn right to the reciprocal of the holding course.

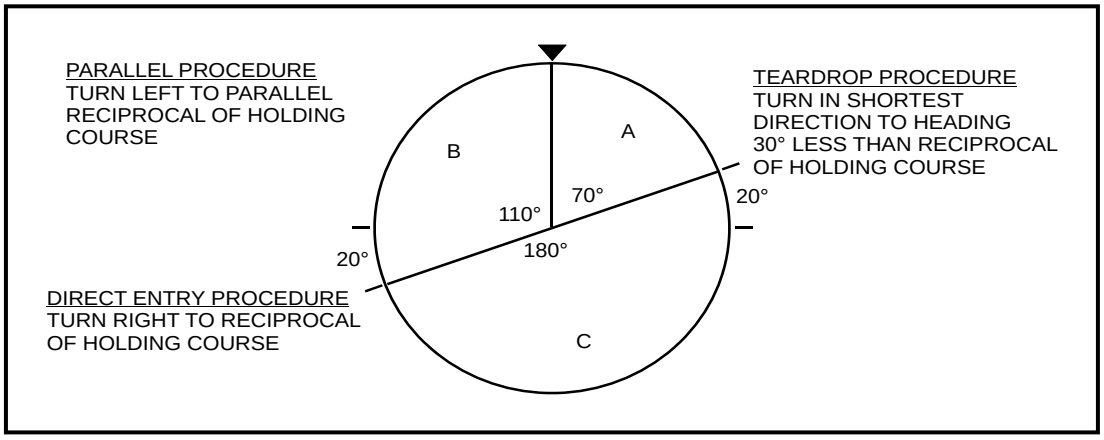

Figure 5-2 Standard Holding

b. Non-Standard Pattern Entry

i. Sector A (**TEARDROP**): If the reciprocal of the holding course is between the heading index and 70° to the left of the heading index, execute a teardrop entry. This is accomplished by turning in the shortest direction (left or right) to a heading 30° more than the reciprocal of the holding course.

ii. Sector B (**PARALLEL**): If the reciprocal of the holding course is between the heading index and 110° to the right of the heading index, turn right to parallel the holding course reciprocal.

iii. Sector C (**DIRECT ENTRY**): If the reciprocal of the holding course does not meet the criteria listed in (i) or (ii) above, turn left to the reciprocal of the holding course.

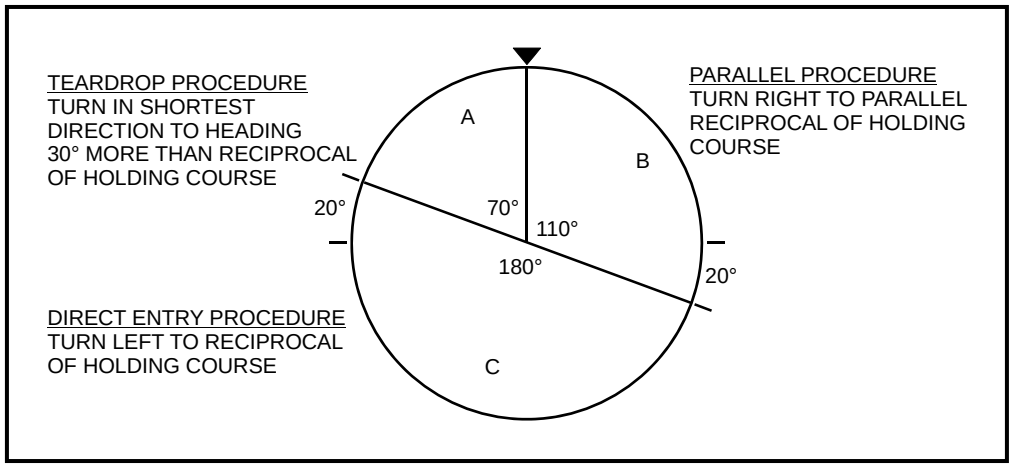

Figure 5-3 Non-Standard Holding

7. Give the Holding Brief when the following conditions are met:

   a. The Descent Checklist is complete (for terminal-area holding only).

   b. You are proceeding direct to the holding fix with a clearance to hold.

   c. You have determined the direction of holding, entry turn, and leg lengths.

The Holding Brief is a crew-coordination measure describing the holding pattern and a helpful mnemonic is **FETL**:

Fix: Name and/or radial/DME of holding fix.

Entry: Type of entry and initial heading.

Turns: Direction of turns.

Length: Leg lengths (time or distance).

For example, a typical holding brief prior to executing the Mobile Regional VOR-A is:

"Sir/Ma'am, Holding Brief. We will be holding at SEMMES, on the 285 radial. Entry turn is a left turn to parallel, heading 285, right hand turns, one minute legs."

8. Execute the Entry Orbit. The first time the aircraft crosses the holding fix, perform the 6T's.

   a. **TIME:** Write down the time you crossed the holding fix, in hr:min Zulu (not elapsed time).

   b. **TURN:** Turn to establish yourself on the entry heading you determined in Step 6 above.

   c. **TIME:** Begin initial outbound timing when outbound and over/abeam the holding fix (in some cases, such as a teardrop entry, outbound, and over/abeam will occur simultaneously). If unable to determine over/abeam, begin timing when wings level outbound.

      Subsequent outbound timing is started when outbound and abeam the holding fix on successive orbits. Again, if the abeam position cannot be determined, start timing when wings level outbound.

      When holding overhead a station, the best indicator of the "abeam" position is the TO-FROM indicator. With the **CORRECT HOLDING COURSE** set into the CDI, you will have a TO indication when proceeding inbound to the station. At station passage, the indication will change to a FROM indication. A secondary indication of

station passage is the bearing pointer falling through a radial 90° from the holding course.

When holding over a radial/DME fix, the best indicator of the "abeam" position is the DME. While the geometry of slant range means that a given DME outbound is not *exactly* abeam the same DME inbound, its the best indicator reasonably available. In this case, begin outbound timing when outbound and at the same DME as the holding fix.

d. **TRANSITION:** If not already at 150 KIAS, tell your instructor to transition to holding speed. Procedurally, you should have already directed transition to holding speed three minutes out from the holding fix, so this "T" normally serves as a reminder to check your airspeed. Also, direct your instructor to transition to ATC-assigned holding altitude.

e. **TWIST:** Tune the proper NAVAID for holding, select the proper NAV MODE for the EHSI, and set the holding course in the CDI. This "T" may be done anytime after the entry turn, but must be completed prior to the inbound turn.

f. **TALK:** Give ATC a voice report stating position, time, and altitude established in holding, if required. For example:

"*Atlanta Center, BUCK 303, established in holding at Monroeville, 1603, 6000."*

At the expiration of outbound timing (or upon reaching assigned/published DME), turn to intercept the holding course inbound. Be careful here; you must remain within the holding airspace, so you must turn in the proper direction. To figure out the direction you should turn, first determine your present position and compare it to the holding radial**.** Do this by visualizing yourself on the tail of the bearing pointer. Turn toward the holding radial. For example, in Figure 5-4, aircraft A is on the 070 radial with the holding radial of (090) to the right, indicating a right turn. Meanwhile, aircraft C is on the 110 radial with the holding radial (090) to the left, indicating a left turn. Remember: **TAIL – RADIAL – TURN.**

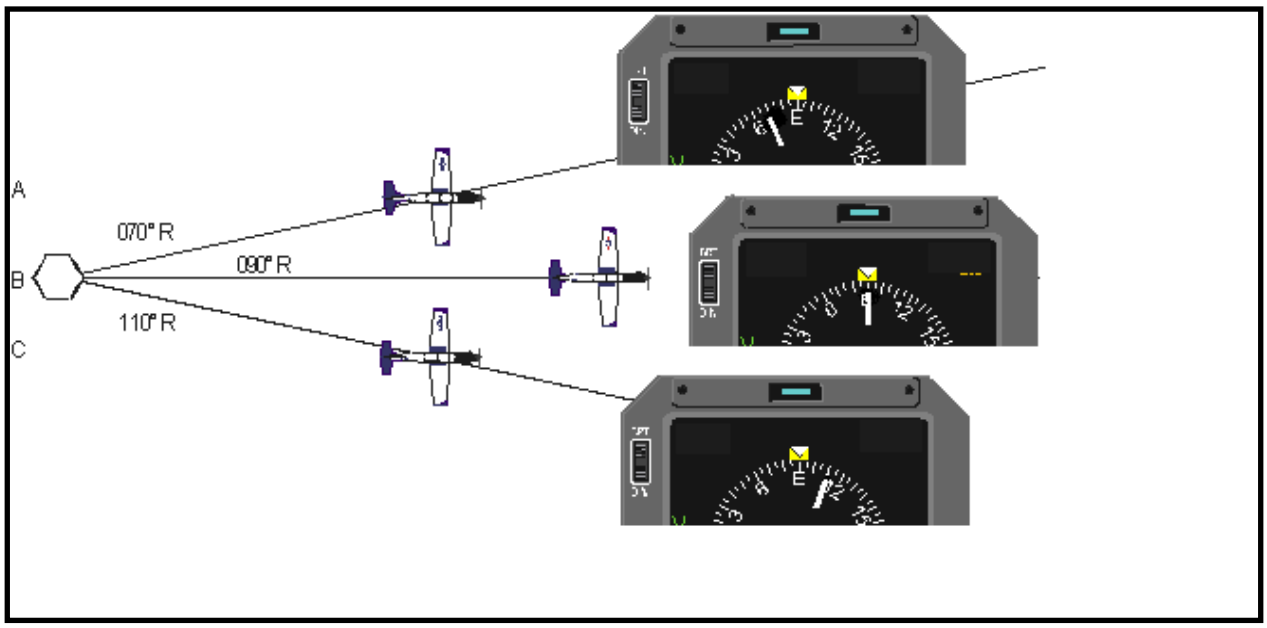

Figure 5-4 TAIL – RADIAL – TURN

If the aircraft (tail of the bearing pointer) is on the holding radial (as with aircraft B), turn toward the holding side of the pattern to remain within holding airspace (a left turn for a standard holding pattern or a right turn for a nonstandard pattern).

During the last half of the turn, check the position of the head of the bearing pointer relative to the holding course. This will enable you to determine whether you will roll out on the holding course, undershoot it, or overshoot it. If the aircraft is on the holding course at the completion of the turn, simply track inbound. If this is not the case, use a course-intercept technique previously discussed.

You must establish the aircraft on the holding course prior to crossing the holding fix. Hold the course-intercept heading until the head of the VOR bearing pointer drops toward the holding radial. Judge the rate of bearing-pointer movement to roll out on the holding course with the CDI and/or bearing pointer centered.

In Figure 5-5, aircraft A will be on the holding course at the completion of the turn. Although the head of the bearing pointer is not directly on 270° at the point illustrated, it will fall the remaining few degrees during the completion of the turn. Aircraft B in Figure 5-5 shows an undershoot situation. The head of the bearing pointer is on 255°, 15° away from the holding course of 270°. Aircraft B should stop the turn at heading 240° (15° away from 255°) and set up a double-the-angle intercept technique. Always check to be sure the head of the bearing pointer is in a position to fall to the desired course. Aircraft C in Figure 5-5 depicts an overshooting situation. Aircraft C should continued the turn until a double-the-angle intercept heading of 310° is established.

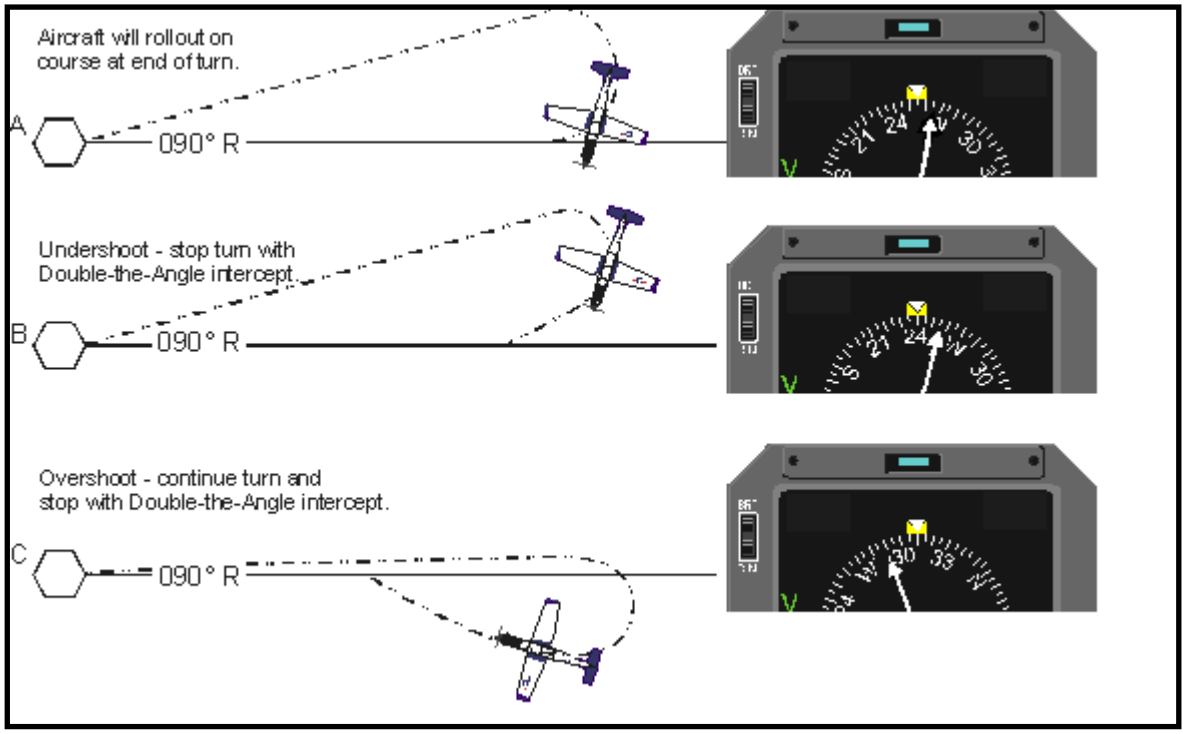

Figure 5-5 TAIL – RADIAL – TURN II

NOTE

The purpose of the double-the-angle intercept technique is to provide for a manageable intercept of the holding course. With strong crosswinds, a double-the-angle intercept technique may not be sufficient. In this event, use a greater than double-the-angle intercept.

9. Execute the No-wind Orbit, which starts the second time you cross the holding fix. In order to see what the wind is doing to you, fly the No-wind Orbit as if there were no wind at all. If there were indeed no wind, you would:

a. Roll out of your inbound turn on the holding course.

b. Take exactly one minute to reach the holding fix (for timed holding at or below 14,000).

If the above conditions are not met, you have winds you need to compensate for during the Correction Orbit(s). How far, and in what direction, you deviate from these two conditions are determined as time and heading correction factors. Applying these factors to a No-wind Orbit gives you a Correction Orbit, which is flown so that the two conditions above are met.

Perform the 6 Ts:

a. **TIME:** Note the current Zulu time and compare it to your EFC time.

b. **TURN:** Turn to the reciprocal of the holding course (right for standard holding, left for non-standard holding).

c. **TIME:** Begin outbound leg timing (one minute at or below 14,000 MSL, 1 1/2 minutes above 14,000 MSL) when outbound and abeam the holding fix. If unable to determine abeam, begin timing when wings level outbound.

d. **TRANSITION:** Check airspeed and altitude; adjust as required.

e. **TWIST:** Not required.

f. **TALK:** Not required.

At the expiration of outbound-leg timing (or DME if appropriate), tell your instructor to turn toward the holding radial and intercept the holding course inbound. Remember, **TAIL - RADIAL - TURN**. At the completion of your turn inbound, you will either be established inbound on the holding course or have a course intercept set.

For timed holding, as you roll wings level inbound, rehack the clock for inbound timing. At station passage, note the elapsed time to the second. The difference between the No-wind Orbit inbound timing and one minute (1 1/2 minutes if above 14,000 feet MSL):

1. indicates the existence of a head/tailwind

2. is the correction factor you will use for the Correction Orbit's outbound timing.

If you had to set an intercept heading to get established on the holding course when you turned inbound, there is a crosswind. To make your Correction Orbit headings easier, think of the wind as being from a cardinal direction, not left or right. **TAIL - RADIAL – WIND** is a helpful memory aid.

Figure 5-6 illustrates a typical no-wind orbit. In this example, the inbound turn resulted in an overshoot and an intercept heading must be used to establish the aircraft on the holding course. The TAIL-RADIAL-WIND rule indicated a wind from the North. The inbound timing of 50 seconds indicated a 10-second timing correction is needed on the outbound leg of the Correction Orbit.

Once you are established on the holding course, note the crab angle you need to maintain that course. This angle will determine the correction factor for the Correction Orbit's outbound heading.

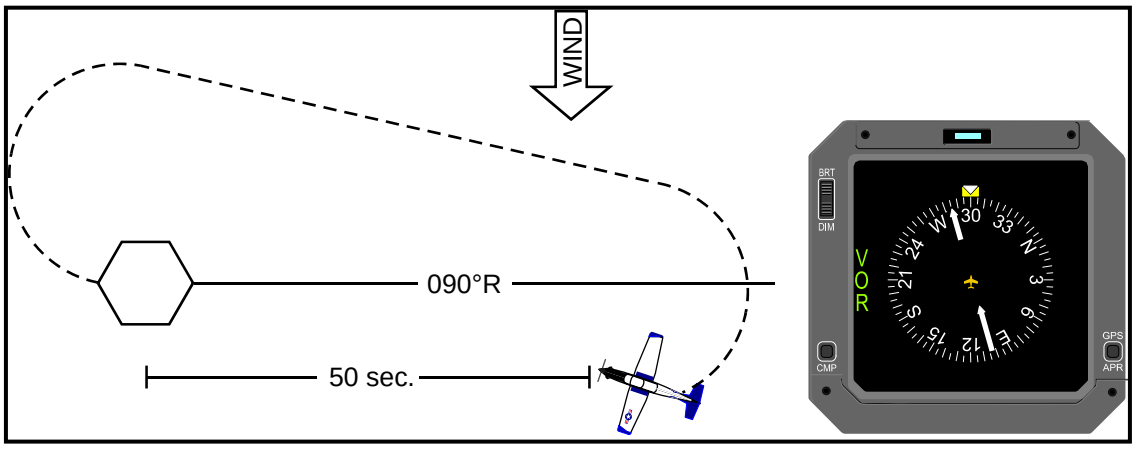

Figure 5-6 No Wind Orbit

10. The third and subsequent holding orbits are all called Correction Orbits. The first Correction Orbit is flown using the correction factors determined on your No-wind Orbit; subsequent Correction Orbits are flown using the correction factors determined on the previous Correction Orbit.

Perform the 6 Ts:

a. **TIME:** Note the current Zulu time and compare it to your EFC time. Confirm your EFC time with Approach Control at least five minutes prior to the EFC. Receipt of EFC is not a clearance to commence approach at that time unless you have lost communications with ATC.

b. **TURN:** Turn to the reciprocal of the holding course, plus or minus your triple-drift correction factor.

Using Figure 5-7, let's assume the aircraft is established on a holding course of 270^{o} and a 5° right (to the north) drift correction (i.e., heading 275^{o}) is required to maintain course. Applying a triple-drift correction (5^{o} X 3), a 15° left (still to the north) correction to the outbound heading is required, making our outbound heading 075°.

c. **TIME:** Begin outbound leg timing when outbound and abeam the holding fix. If unable to determine abeam, begin timing when wings level outbound.

Apply the triple-drift correction immediately after rolling out on the outbound leg of the Correction Orbit, but do not begin your triple-drift timing until passing abeam the holding fix (see note below). Maintain your triple-drift correction for one minute once you commence timing on the outbound leg (or until the expiration of outbound timing, whichever occurs first). After one minute of triple-drift correction, fly a single-drift heading to compensate for wind.

NOTE

It is possible to roll out on the outbound leg with a triple-drift heading established prior to passing abeam the holding fix. In this case, a total triple-drift correction may indeed be established for longer than one minute. Nonetheless, the difference in timing should be minimal and have little effect on your holding corrections. Do not begin triple-drift or outbound timing until passing abeam the holding fix unless you are unable to determine the abeam position.

The inbound leg in Figure 5-6 took 50 seconds, indicating a tailwind component with a 10 second correction factor. To make the inbound leg a full 60 seconds, longer outbound timing is needed. Add that 10 second factor to your No-wind Orbit's outbound timing, which (for this example) gives us 70 seconds for Correction Orbit outbound timing. Begin outbound timing for 70 seconds when abeam the holding fix outbound. If you are unable to determine abeam, start timing when wings level outbound.

Likewise, if the inbound leg of the no-wind orbit was longer than 60 seconds, use that timing correction factor to shorten the next outbound leg.

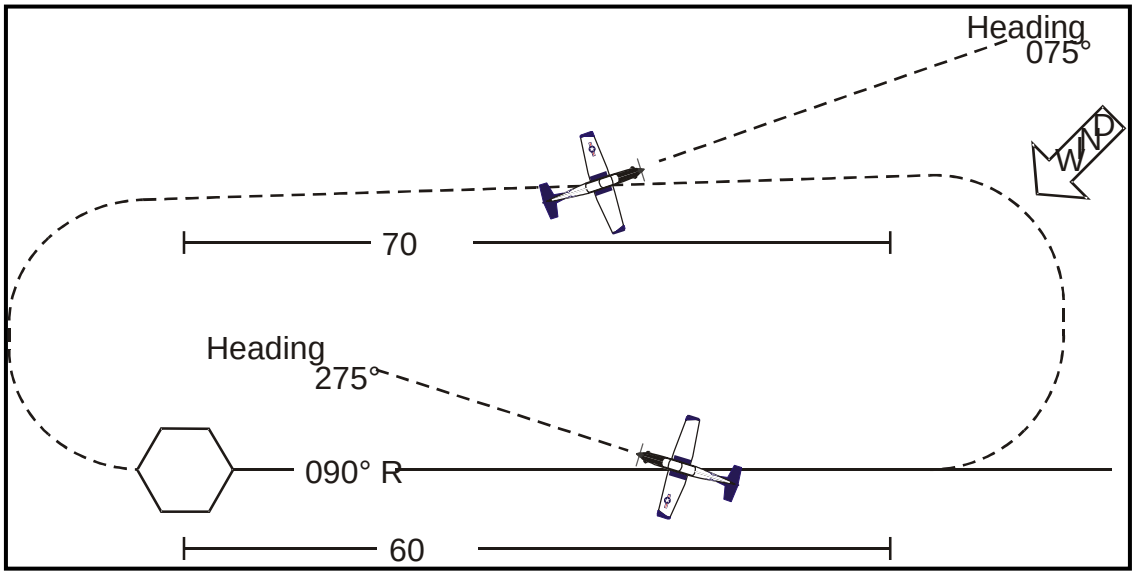

Figure 5-7 Correction Orbit

NOTE

Wind is thought of as being from a cardinal heading in holding. An examination of Figure 5-7 shows the wind must be from the northeast, since the inbound crab angle was to the right (toward the north) and the outbound timing was longer than the inbound timing.

If the no-wind orbit time and drift corrections do not put you on course for one minute on the first correction orbit, you must re-correct on the next orbit. The drift and time corrections are determined the same way as the original no-wind orbit, but the corrections must be applied based off the previous correction orbit, not the first, or you will negate your previous time corrections. It may take several orbits to get the heading and timing exactly right.

d. **TRANSITION:** Check airspeed and altitude; adjust as required.

e. **TWIST:** Not required.

f. **TALK:** Not required.

508. HOLDING DURING ADVERSE WIND CONDITIONS

It is not unusual for winds aloft to attain velocities well in excess of 20 knots. In these circumstances, modifications to the holding procedures discussed earlier may be necessary. How much you modify normal holding procedures will, of course, depend on wind speed and direction. If you feel you need to use modified procedures, be sure to discuss this with your instructor.

The key to successfully implementing triple drift is intercepting the holding course inbound as soon as possible. Use an aggressive course intercept when necessary to get on course before crossing the holding fix.

You should be able to predict high winds prior to entering the holding pattern. Pay attention to the forecasted winds aloft. During the enroute phase, a high crosswind component would be indicated by the need for an abnormally large drift correction. A high head/tailwind component would be indicated by a groundspeed that differs grossly from TAS. If wind speed and its angular relationship to the holding pattern make holding difficult, consider requesting a holding pattern better oriented with respect to winds.

509. CLEARANCE FOR AN APPROACH WHILE IN HOLDING

If established in a published holding pattern and subsequently cleared for the approach, you may commence the approach from within the holding pattern. It is very important to listen to your approach clearance once established in holding. Listed below are possible types of clearances you may receive:

"KATT 603, Pensacola Approach, at the completion of this turn in holding you are cleared for the VOR 8 approach."

In this case, you would complete this turn in holding and commence the approach upon arrival at the IAF. You must also maintain your assigned holding altitude until inside the IAF. Listen carefully for any further altitude restrictions from ATC.

"BUCK 303, Pensacola Approach, you are cleared for the VOR 8 approach."

In this case, you are NOT required to complete the turn in holding and you may:

1. Turn immediately towards the IAF (remaining within the established limits of the holding pattern), maintain holding airspeed, and commence the approach upon arrival at the IAF.

2. Descend to the published MHA. For those holding patterns where there is no published MHA, upon receiving an approach clearance, you must maintain the last assigned altitude until leaving the holding pattern and established on the inbound course. Thereafter, the published minimum altitude of the route segment being flown will apply.

NOTE

If an aircraft is established in a published holding pattern at an assigned altitude above the published MHA and subsequently cleared for the approach, the pilot may descend to the published MHA. The holding pattern is considered a segment of the approach only when it is published on the instrument procedure chart and is used in lieu of a procedure turn.

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CHAPTER SIX
TERMINAL PROCEDURES

600. INTRODUCTION

The last and sometimes most challenging phase of any sortie takes place in the terminal area. A strong working knowledge of all procedures is just as critical as it was in the enroute phase; for most INAV sorties, you can expect the task tempo to increase with a switch to Approach Control. The keys to successful terminal area-operations are to stay ahead of the aircraft, maintain constant positional and situational awareness, and **KNOW YOUR PROCEDURES**.

601. ATIS

About 100 nm away from your destination or drop-in airfield, get the current ATIS/Automated Surface Observation System (ASOS)/Automated Weather Observation System (AWOS) and check it against your approach weather minimums. Normally, you should try to check ATIS, etc., on one radio while you monitor the ATC frequency on the other radio (i.e., use VHF for ATIS and UHF for Center or vice versa). Ask your instructor to monitor the ATC frequency while you copy ATIS, then tell your instructor when you are done with ATIS and listening to the ATC frequency again. Your instructor will inform you of any changes from ATC. For example:

Student: "*SIR/MA'AM, LISTENING TO ATIS ON VHF. PLEASE MONITOR UHF.*"
Instructor: "*Roger, I have UHF.*"

Student: "*SIR/MA'AM, BACK UP ON VHF.*"
Instructor: "*Roger, we are (switched to a different frequency, instructed to descend, etc.).*"

If ATIS is available only on the radio you are using to talk to ATC, you have a few options for getting ATIS:

1. Ask ATC for their frequency for the other radio (preferred method). Establish contact with ATC on that radio, then get ATIS while your instructor monitors the new ATC frequency. For example, if you are talking to ATC on UHF and the only available ATIS frequency is also UHF:

UHF: "*Houston Center, BUCK 303, request VHF frequency.*"

"*Houston Center, BUCK 303, switching ___._.*"

VHF: "*Houston Center, BUCK 303, checking in on VHF.*"

2. Ask ATC for time off-frequency. With this request, advise ATC you will monitor guard and report back on frequency. For example:

"Houston Center, KATT 603, request two minutes off frequency. Will monitor Guard and report back up."

"Houston Center, KATT 603, back on frequency."

3. Your last resort is to report "negative information" or "negative ATIS" when you check in with Approach Control. This is not optimum because other aircraft will have to stand by while Approach Control reads the current information to you. Be ready to copy - if you use this method, Approach Control will reply immediately with the information.

602. FIELD BRIEF

The Field Brief is a crew-coordination measure that describes the airfield for planned approach. It is initiated after ATIS information is known. As a technique, remember the mnemonic aid **WERLONA**:

1. **W**eather: ATIS / ASOS / AWOS information.

2. **E**levation: Field elevation (see airport sketch on approach plate).

3. **R**unway: Description of intended runway(s) (length, width, and arresting gear). Briefly address names of other runways. This is a good time to bring up known NOTAM for displaced thresholds, closed runways/taxiways, etc.

4. **L**ighting: Description of runway and approach lighting for intended runway.

5. **O**bstructions: Location and height of highest obstruction at the airfield (see airport sketch) and the highest obstacle (see plan view on approach plate).

6. **N**AVAID: Name and location of NAVAID, relative to the airfield.

7. **A**ltitude: Highest Minimun Safe Altitude (MSA).

603. DESCENT CHECKLIST

Once you have initiated descent into the terminal area or established contact with your destination Approach Control, perform the Descent Checklist.

604. DRAFT REPORT

The DRAFT Report for a destination may be requested by your instructor for training purposes at any time, but **SHALL** be offered:

1. immediately following the Descent Checklist when a divert (for weather, fuel, etc.) to an alternate airfield may be required, and

2. when an actual divert situation occurs (i.e., an emergency at the primary destination closes the airfield unexpectedly). The intent of this report is to get the crew on the “same page” for a potential emergency plan, before approach tasks take priority. It is not required for drop-in approach fields. After completing the Descent Checklist, ask your instructor if he requires a DRAFT Report and have the information ready to brief. Remember the mnemonic aid-**DRAFT**.

6-2 TERMINAL PROCEDURES

1. **D**estination Intended divert airfield.

2. **R**oute Path from point of divert initiation to divert destination.

3. **A**ltitude Altitude proposed to divert destination (see discussion on altitude selection below).

4. **F**uel Fuel on board at point of divert initiation, expressed in hours and minutes of fuel remaining (see discussion on fuel-remaining computation below).

5. **T**ime Time to fly from point of divert initiation to divert destination.

Altitude flown to the divert destination is situation-dependent. Divert profiles planned at various altitudes to alternate airfields are listed on the flight log and are good references for the DRAFT Report. However, your primary focus should be on **FUEL CONSERVATION**, with situational awareness and good Crew Resource Management (CRM) being critical.

Fuel computation is also dependent on the situation. If ATIS for your primary destination reports current weather above minimums prior to your approach, unless given other direction by your instructor, plan your DRAFT to go from the MAP/DH of the primary destination to the farthest IAF at the divert destination. This DRAFT Report indicates that you will attempt an approach at the primary destination before making the decision to divert. You will burn 50 pounds of fuel while executing the approach, so subtract 50 pounds from your current fuel load to get fuel at the point of divert initiation.

If ATIS for your primary destination reports weather below minimums and you do not attempt an approach, plan your DRAFT from your current location to the farthest IAF at the divert destination. This DRAFT Report indicates that you intend to begin divert procedures immediately, and your current fuel load is now fuel at the point of divert initiation.

To convert fuel at divert initiation from pounds to hours and minutes, divide by the fuel flow projected for the selected DRAFT altitude.

NOTE

"DRAFT" is a training term. Do not use the word "DRAFT" when communicating with ATC. However, consider giving a DRAFT Report (again, without using the word “DRAFT”) to ATC, before commencing an approach, if the weather is near minimums and there is a strong likelihood a divert to your alternate may be necessary. At minimum, the DRAFT should be reviewed with your instructor immediately after the Descent Checklist.

605. INSTRUMENT APPROACH PLATES

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN105, IN201)*

606. APPROACH BRIEFS

The Approach Brief is a crew-coordination measure describing the expected approach to be flown. If holding is required, the brief should be initiated once established in holding. If holding is not required, it should be initiated after the Descent Checklist and Field Brief are completed. If ATC assigns an approach other than what was expected, a new Approach Brief **SHALL** be given.

1. VOR, GPS, ILS or LOC approaches initiating at an IAF can be briefed using the **TICARMM** mnemonic.

a. **T**itle: Approach title (including page number and required NAVAID setup).

b. **I**AF: IAF name and/or radial/DME.

c. **C**ourse: Initial and Final Approach Course and arc description (as applicable).

d. **A**ltitude: Any altitudes depicted on the approach.

e. **R**estrictions: Any restrictions, including FAF location.

f. **M**DA/DH: MDA or DH.

g. **M**AB/CO: Missed Approach Brief/climbout instructions.

For example, the VOR-A at KMOB might be briefed as:

"Sir/Ma'am, Approach Brief. We will execute the VOR-A to Mobile Regional on page 259. NAV source is VOR, set to SEMMES, 115.3, Needle Number One set VOR. The IAF is SQWID, on the SEMMES 238 radial at 7 DME. Initial Approach track is the 7 DME arc, at or above 1800 feet. Final Approach Course is 104, at or above 1800 feet until the FAF, located at the SEMMES VORTAC. Inside SEMMES, we are cleared to MDA, 680 feet. Missed Approach Point is on the SEMMES 104 radial at 5.6 DME, timing from FAF to missed Approach Point is 2 minutes 48 seconds for 120 knots groundspeed. Missed Approach instructions are climb 900 feet, then climbing right turn to 2000 feet via heading 200 and the SEMMES 140 radial to SAINT and hold as published."

If you haven't already done so, tune the approach NAVAID and dial the appropriate course as you are briefing them.

NOTE

Missed Approach or climbout instructions issued by Approach Control or Tower Control supersede published instructions. If new instructions are issued, brief them to your instructor.

2. VOR, GPS, ILS or LOC approaches initiating with radar vectors to Final Approach Course (FAC) can be briefed using the **TCARMM** mnemonic.

a. **T**itle: Approach title (including page number and required NAVAID setup).

b. **C**ourse: FAC.

c. **A**ltitude: Any altitudes depicted on the FAC.

d. **R**estrictions: Any restrictions, including FAF location.

e. **M**DA/DH: MDA or DH.

f. **M**AB/CO: Missed Approach Brief/climbout instructions.

For example, the VOR-A at KMOB with radar vectors to final might be briefed as:

"Sir/Ma'am, Approach Brief. We are on radar vectors to final for the VOR-A to Mobile Regional on page 259. NAV source is VOR, set to SEMMES, 115.3, Needle Number One set VOR. Final Approach Course is 104, at or above 1800 feet until the FAF, located at the SEMMES VORTAC. Inside SEMMES, we are cleared to MDA, 680 feet. Missed Approach Point is on the SEMMES 104 radial at 5.6 DME, timing from FAF to missed Approach Point is 2 minutes 48 seconds for 120 knots groundspeed. Missed Approach instructions are climb 900 feet, then climbing right turn to 2000 feet via heading 200 and the SEMMES 140 radial to SAINT and hold as published."

3. GCA approaches can be briefed using the **TAGM** mnemonic, normally initiated on the downwind leg of the radar pattern:

a. **T**itle: Approach title (including page number and backup NAVAID setup).

b. **A**ltitude: MDA/DH.

c. **G**lideslope: Glideslope and decent rate (Precision Approach Radar (PAR) only).

d. **M**AB/CO/LC: Missed Approach Brief/climbout/lost-communication instructions.

If you are IMC, the controller should issue verbal Missed Approach or climbout instructions, since GCA Missed Approach procedures are not published. Also, the controller should provide lost-communication instructions. If these instructions are not provided by ATC, **YOU SHALL ASK YOUR INSTRUCTOR** if Missed Approach, climbout, and/or lost-communication instructions are required.

For example, the PAR RWY 7L at KNPA with a typical set of climbout and lost-communication instructions might be briefed as:

"Sir/Ma'am, Approach Brief. We will execute the PAR RWY 7L at Navy Pensacola, backed up by the RNAV RWY 7L. DH is 225 feet. Glideslope is 3°, with a descent rate of 600 feet per minute. Climbout instructions are to fly runway heading to 800 feet; 2 DME past the TACAN, turn right heading 180, then climb and maintain 1500 feet. In the event of lost communications, we will climb and maintain 2200 feet and proceed direct SIDNY to execute the RNAV RWY 7L approach."

607. LOW-ALTITUDE APPROACH

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN207)*

608. HIGH-ALTITUDE INSTRUMENT APPROACH

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN205)*

609. PROCEDURE TURN APPROACH

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN206)*

NOTE

Students will only be accountable for using the 45/180 maneuver during Primary Flight Training. Other procedure turn methods (i.e., 80/260, racetrack, teardrop) will be flown in Intermediate Flight Training.

610. ARCING

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN104)*

NOTES

1. JPATS procedures **SHALL** be used in lieu of the published lead radials on all terminal procedures.

2. Lead turns onto and off of the arc in accordance with "Leading Turns," Section 419.

3. CTW-6 does not encourage flying a constant AOB on the arc, due to the increased possibility of vertigo. The primary technique to maintain an arc is flying a series of short legs (i.e., the chord method).

611. ILS APPROACH

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN208)*

On an ILS approach you may transition to the localizer approach if the glideslope fails. You **SHALL NOT** descend below localizer minimums with the aircraft more than one dot below glideslope (half scale deflection) or two dots above glideslope (full scale deflection). If you subsequently recapture the glideslope prior to the localizer MDA and MAP, you may resume the ILS approach and descend to the ILS DH.

NOTES

1. The ILS FAF is glideslope intercept, when at or below the published glideslope intercept altitude as indicated by the lightning bolt symbol. The localizer FAF is normally indicated by a maltese cross. For many ILS approaches, the glideslope intercept point and FAF for the localizer approach are not co-located. Whether executing the ILS or the localizer approach, you must start back-up timing at the non-precision FAF (i.e. not glideslope intercept). This procedure allows you to identify the non-precision MAP, provided there is a timing block depicted on the approach plate.

2. If you are executing an ILS approach and glideslope indications fail, revert to localizer procedures and minimums.

3. If you are executing a localizer approach and DME defines the MAP, use DME as the primary means of MAP identification. If DME indications fail, use timing from the non-precision FAF to identify the MAP (provided there is a timing block depicted on the approach plate).

4. On an ILS approach, relay course/glideslope information to your instructor, similar to the way a GCA controller relays course/glideslope information during a PAR approach. If the aircraft deviates from course, state the aircraft's position and the action required to correct back to course (for example, *"we are left/right of course, turn right/left heading XXX"*). If aircraft deviates from glideslope, student should state the aircraft's position and the action required to correct back to glideslope (for example, *"we are above/below glideslope, increase/decrease rate*

of descent"). Specific power settings, nose attitudes, and rates of descent in FPM are not required.

612. CIRCLING APPROACH

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN210)*
It is your responsibility during a circling approach to direct the pilot's initial turn to commence circling in compliance with ATC circling instructions. Additionally, you must back up the pilot with airspeed and altitude deviation calls.

NOTES

1. On final and before commencing circle, you may fly to the circling MDA at T-6 final approach speed (110 KIAS minimum) or circling airspeed (120 KIAS). If you choose to fly 110 KIAS, you must accelerate to 120 KIAS before commencing circle.

2. The T-6A final approach airspeed is 110 KIAS minimum. If a higher final approach speed is used, you may be in a higher circling category, and minimums for the higher category must then be used. Gust corrections, inoperative flaps, icing, aircraft damage, and control malfunctions are all examples of situations that can necessitate the use of a higher circling category.

Circling Categories

1. Category A: Speed less than 91 knots.

2. Category B: Speed 91 knots or more but less than 121 knots.

3. Category C: Speed 121 knots or more but less than 141 knots.

4. Category D: Speed 141 knots or more but less than 166 knots.

5. Category E: Speed 166 knots or more.

613. RADAR APPROACH (RA)/GROUND CONTROLLED APPROACH (GCA)

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN209)*

614. GPS APPROACH

**REFERENCE JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE: (IN208)*

615. MISSED APPROACH REVIEW

**REFERENCE: JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE (IN210)*

After completion of the Before Landing Checklist but prior to the MAP/DH, you should ask your instructor if he would like a review of the Missed Approach procedures or climbout instructions. In your review, you should make note of the following (the mnemonic **PHA** is helpful):

1. **P**oint: MAP location.

2. **H**eading: Initial heading.

3. **A**ltitude: First altitude restriction.

616. THE 6 TS

The "6 Ts" are simply a memory aid to help you stay ahead of the aircraft during critical phases of flight. You can adapt these procedures and perform the 6 Ts upon arrival at any IAF, FAF, or holding fix. The basic format is:

a. **T**ime

b. **T**urn

c. **T**ime

d. **T**ransition

e. **T**wist

f.. **T**alk

Because numerous course-reversal techniques are authorized for procedure-turn approaches, it is important for you to understand how the 6 Ts may change based on your selected course-reversal maneuver. For example, the 6 Ts for intercepting a course/track outbound from the IAF are a little different from the 6 Ts for using the AIM method of course reversal.

NOTE

A procedure turn is the maneuver prescribed to perform a course reversal to establish the aircraft inbound on an Intermediate or FAC. Some procedure turns are specified by a procedure track (reference FAA AIM 5.4.9.a).

If you intend to intercept a course/track outbound from the IAF (i.e., 45/180, 80/260, teardrop with course guidance, arcing, or straight-in approach) and your heading is **GREATER THAN 90°** from the outbound course, you must overfly the IAF and then turn immediately in the shorter direction to intercept the outbound course/track. If your heading is **90° OR LESS** from the outbound course, use normal lead points to intercept the outbound course/track, **EVEN IF YOU ARE USING PTP TO ARRIVE AT THE IAF**.

NOTE

It may be necessary (especially in adverse wind conditions) to use an aggressive intercept angle (i.e., more than double-the-angle, etc.) to ensure course intercept in a timely fashion.

If, however, you elect to use the AIM racetrack/holding technique (such as the outbound parallel, direct, or teardrop without course guidance) for your course-reversal maneuver on a procedure-turn approach, you will fly a **HEADING,** not a defined course/track outbound from the IAF. In this case you will overfly the IAF and turn to the predetermined outbound heading. The outbound heading will be chosen based on normal holding-entry procedures and may or may not be a turn in the shortest direction outbound.

1. Execute these 6 Ts when your heading is greater than 90° from the outbound course and you intend to overfly the IAF and intercept a course/track outbound (i.e., 45/180, 80/260, teardrop with course guidance, arcing, or straight-in approach):

a. **TIME:** Not required.

b. **TURN:** Direct an immediate turn in the shortest direction to intercept the outbound course/track.

NOTE

It may be necessary (especially in adverse wind conditions) to use a relatively aggressive intercept angle (i.e., more than double-the-angle, etc.) to ensure course intercept in a timely fashion.

c. **TIME:** If executing a course reversal, start the clock for the appropriate time when abeam the IAF outbound. If the abeam position cannot be determined, start timing when wings level outbound.

NOTE

If DME is available, it should be used as the primary means of determining when to commence the procedure turn.

**REF: JPATS INSTRUMENTS 1& 2 STUDENT GUIDE (IN206)*

d. **TRANSITION:** Direct your instructor to slow to initial approach airspeed (if not previously accomplished) and descend as required.

NOTE

1. The T-6A initial approach speed is 120-150 KIAS. When executing any approach, you should slow to initial approach speed within three minutes of reaching the IAF. You should cross the IAF at initial approach speed.

2. ATC may assign an altitude restriction. Maintain this altitude until ATC tells you the altitude restriction is deleted. At that point, descend to the next altitude depicted on the approach plate, using the altitude you need to lose to figure out a safe descent rate.

e. **TWIST:** Set the required course in the CDI as applicable. Confirm that the proper navigation source (VOR, ILS, or GPS) is selected, and that DME Hold (if used) is set to the proper source.

f. **TALK:** Give the appropriate voice report (IAF inbound, leaving assigned altitude, etc.) as required.

2. Execute these 6 Ts when your heading is 90° or less from the outbound course and you intend to lead the turn prior to the IAF to intercept a course/track outbound (i.e., 45/180, 80/260, teardrop with course guidance, arcing, or straight-in approach):

a. **TIME:** Not required

b. **TURN:** Begin your turn at the designated lead-turn point, prior to the IAF. Establish the proper heading to intercept the outbound course/track.

c. **TIME:** Begin timing when over/abeam the IAF outbound (in some cases outbound and over/abeam will occur simultaneously). If the abeam position cannot be determined, start timing when wings level outbound.

NOTE

If DME is available it should be used as the primary means of determining when to commence the procedure turn.

**REF: JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE (IN206)*

d. **TRANSITION:** Direct your instructor to slow to initial approach airspeed (if not previously accomplished) and descend as required.

NOTES

1. The T-6A initial approach speed is 120-150 KIAS. When executing any approach, you should slow to initial approach speed

within three minutes of reaching the IAF. You should cross the IAF at initial approach speed.

2. ATC may assign an altitude restriction. Maintain this altitude until ATC tells you the altitude restriction is deleted. At that point, descend to the next altitude depicted on the approach plate, using the altitude you need to lose to figure out a safe descent rate.

e. **TWIST:** Set the required course in the CDI as applicable. Confirm that the proper navigation source (VOR, ILS, or GPS) is selected, and that DME Hold (if used) is set to the proper source.

f. **TALK:** Give the appropriate voice report (IAF inbound, leaving assigned altitude, etc.) as required.

3. Execute these 6 Ts when you use the AIM racetrack/holding technique (such as the outbound parallel, direct, or teardrop without course guidance) for course reversal. You will not be flying a defined course/track outbound from the IAF; you will simply overfly the IAF and turn to a predetermined outbound heading, just as you would for holding entry.

a. **TIME:** Not required.

b. **TURN:** Turn to the predetermined outbound heading. The outbound heading will be chosen based on normal holding-entry procedures and **MAY OR MAY NOT BE A TURN IN THE SHORTEST DIRECTION OUTBOUND.**

WARNING

If you cross the IAF at or above 180 KTAS using a parallel entry turn, you must correct toward the depicted outbound procedure turn course using at least 20^{o} of intercept.

**REF: JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE (IN206)*

c. **TIME:** Begin timing when over/abeam the IAF outbound (in some cases outbound and over/abeam will occur simultaneously). If the abeam position cannot be determined, start timing when wings level outbound.

NOTE

If DME is available it should be used as the primary means of determining when to commence the procedure turn.

**REF: JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE (IN206)*

d. **TRANSITION:** Direct your instructor to slow to initial approach airspeed (if not previously accomplished) and descend as required.

NOTES

1. The T-6A initial approach speed is 120-150 KIAS. When executing any approach, you should slow to initial approach speed within three minutes of reaching the IAF. You should cross the IAF at initial approach speed.

2. ATC may assign an altitude restriction. Maintain this altitude until ATC tells you the altitude restriction is deleted. At that point, descend to the next altitude depicted on the approach plate, using the altitude you need to lose to figure out a safe descent rate.

e. **TWIST:** Set the required course in the CDI as applicable. Confirm that the proper navigation source (VOR, ILS, or GPS) is selected, and that DME Hold (if used) is set to the proper source.

f. **TALK:** Give the appropriate voice report (IAF inbound, leaving assigned altitude, etc.) as required.

4. At the FAF perform the 6 Ts again:

a. **TIME:** Begin backup timing, based on groundspeed, over the applicable non-precision FAF (if required).

NOTE

If a timing box is depicted on the approach plate, begin timing from the **NON-PRECISION** FAF. This method gives you a backup way to identify the MAP in case of DME and/or glideslope failure.

b. **TURN:** Turn as required to intercept the FAC.

c. **TIME:** Not required.

d. **TRANSITION:** If you haven't done so yet, slow and take BAC. Descend as applicable.

NOTES

1. Minimum T-6A final approach speed is 110 KIAS. BAC is final approach speed, gear down, flaps takeoff.

**REF: T-6 NATOPS, P. 2-22*
**REF: JPATS INSTRUMENTS 1 & 2 STUDENT GUIDE (IN206)*

2. Aircraft **SHALL NOT** descend from the FAF altitude to MDA/DH until the aircraft is configured to land.

3. You should not direct descent below MDA prior to reaching the Visual Descent Point (VDP) and acquiring the necessary visual reference.

e. **TWIST:** Set or confirm the FAC in the CDI. Once again, confirm the proper navigation source (VOR, ILS, or GPS) is selected, and DME Hold (if used) is set to the proper source.

f. **TALK:** Report FAF inbound if requested by ATC.

617. COMMON ERRORS

1. Improper prioritization of AVIATE, NAVIGATE, COMMUNICATE, CHECKLISTS.

2. Directing your instructor to perform an approach at a (non-drop-in) destination when weather is below minimums.

3. Failure to account for NATOPS crosswind limits.

4. Improperly setting the NAVAIDs up for the approach.

5. Not setting the NAVAIDs up for the approach immediately upon receiving radar vectors from Approach Control in the terminal area.

6. Failure to make required altitude-warning calls to your instructor.

7. Failure to notice or issue correction when descending below published minimum altitudes.

8. Confusing the inbound/outbound courses and twisting the wrong course in the CDI.

9. Not performing the 6 Ts.

10. Performing the 6 Ts improperly.

11. Being either late or excessively early directing your instructor to slow and take BAC.

12. Making large course corrections near a NAVAID. Remember slant range! When you are close to the station, limit heading changes to within 10° of your desired course unless absolutely necessary.

13. Failure to begin backup timing at the non-precision FAF, when applicable.

14. Failure to ask your instructor if he/she requires Missed Approach/climbout instructions and/or review.

15. Failure to report when at the MAP/DH and/or direct the missed approach.

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CHAPTER SEVEN
OUT-AND-IN/CROSS-COUNTRY PROCEDURES

700. INTRODUCTION

Most Intermediate instrument navigation flights will be either out-and-in or cross-country flights. On these flights, you will file and fly an IFR flight plan to an airfield out of the local area. **YOU SHALL CONTACT YOUR INSTRUCTOR THE NIGHT PRIOR TO YOUR FLIGHT FOR ROUTING INFORMATION.**

The flying environment outside of the local area will be somewhat unfamiliar. For example, you may be in the high altitude structure and might operate out of a civil airfield with extensive commercial traffic.

701. FLIGHT PROCEDURES

Fuel Packets

Prior to departing on an out-and-in flight, your instructor will need to get a fuel packet from Maintenance. The fuel packet consists of a Jet Fuel Identaplate (DD Form 1896, used to pay for fuel at a military base) and a Government Air Card (used to pay for fuel at civilian air fields). Cross-country maintenance packets also include various government forms that can be used to pay for maintenance services and other official business expenses. At the completion of your flights, remind your instructor to turn in the fuel packet with receipts for all applicable expenses.

FLIP Publications

You will bring all necessary FLIP to cover your entire route of flight and any possible contingencies. These publications include, but are not limited to, low and high altitude enroute charts, low and high altitude approach plates, the IFR Supplement, the FIH, STARs, and area charts. Consult with your instructor to determine all necessary FLIP. Check publication currency for your entire enroute period; it is possible some FLIP publications will expire during a cross-country. Have a plan to adapt to this situation (i.e., take new FLIP with you or arrange to pick them up enroute).

Route of Flight

This is probably the first time you will fly a significant distance from home field. You will no longer be operating in an area where you are familiar with area landmarks, suitable fields, NAVAIDS, and radio frequencies.

Using a temporary method only (see Section 101), you may mark your route of flight on your navigational charts. Take note of (but do not mark) suitable emergency or divert fields in the vicinity of your route. Take care: if you elect to mark the planned route on your chart, use caution not to follow it if ATC changes your cleared routing.

Be aware of the VORs along your route that have voice capability. In the event you lose both your UHF and VHF radios, ATC may attempt to contact you via a voice-capable VOR. Additionally, certain VORs conduct scheduled weather broadcasts; use these broadcasts to update and verify your preflight weather briefing.

Flight Logs

Prepare a complete and accurate flight log for all portions of your flight (both primary and alternate route). During flight, compare estimated values for times, groundspeed, fuel flow, etc. with the actual values you observe. Modify your route as necessary when unexpected delays or in-flight winds will cause you to land at your destination below required fuel amounts.

Prior Permission Required (PPR)

To land, refuel, or remain overnight at certain fields, prior arrangements must be made. This requirement will be indicated in the IFR Supplement (or AP/1) in the aerodrome remarks section. Assist your instructor as directed in securing this permission.

Operations from Non–Military Fields

Be aware certain procedures and services may vary from what you are used to at military fields (e.g., availability of fire guards, follow-me trucks, base ops, weather, etc.). You may notice some fields do not have ATIS but have AWOS or ASOS instead. Some airports may not have an operational Control Tower, but will have a Common Traffic Advisory Frequency (CTAF). Refer to the AIM for further amplification.

At non-military fields, you may file your flight plan with FSS, generally contacted via telephone (1-800-WX BRIEF). For filing, you will need the civilian version of a DD-175; reference the rear cover of the IFR Enroute Supplement. When filing via FSS, request weather and NOTAM information as part of the FSS brief.

For off-station weather services, OPNAV 3710 states, "If Naval Meteorology and Oceanography Command (NMOC) or United States Marine Corps Weather Services are not locally available, an FAA-approved weather briefing from either a FSS or Direct User Access Terminal System (DUATS) may be substituted."

If the information locally available is not sufficient, contact the next nearest suitable military base. Military weather and NOTAM briefing facilities are listed in the FIH and are available via telephone or internet connection. For more information, refer to the FIH, Section C.

High Altitudes

Cross-country and out-and-in flights may be flown at the upper altitude extreme of the Victor Airway structure or on jet routes. There are certain factors that vary with increasing altitude. Among them are decreasing Outside Air Temperature (OAT), decreasing IAS for a given TAS, and increasing wind velocity.

7-2 OUT-AND-IN/CROSS-COUNTRY PROCEDURES

Remember, when flying at and above 18,000 feet MSL, altitudes are referred to as flight levels (FL). For example, 18,000 feet MSL is reported as *"Flight Level one – eight zero."* Refer to the FIH Section B to determine when to switch from local altimeter setting to 29.92, and vice versa.

702. CONCLUSION

Out-and-in and cross-country flights are a great exposure to the "real world" of aviation. It is important for you not to focus solely on the FTI as in past stages, but to incorporate information from all available sources, both military and civilian. Sample sources include but are not limited to OPNAV 3710, AIM, FIH, GP, and AP. All of these references contain information you will need to be familiar with in order to have a safe and successful flight.

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CHAPTER EIGHT
FLIGHT LOGS

800. INTRODUCTION

The primary purpose of the flight log is fuel management. Although it is not intended to replace FLIP, the flight log can be a ready reference for the entire flight to assist you with required enroute voice communications, navigational computations, NAVAID identification, and selected emergency data when filled out properly. The figure below shows the front and back sides of the flight log which is more often referred to as simply a "jet log." You will use this form in the preflight planning of your T-6A flights. In this chapter, the flight log is broken into sections with instructions for filling out each section of the log.

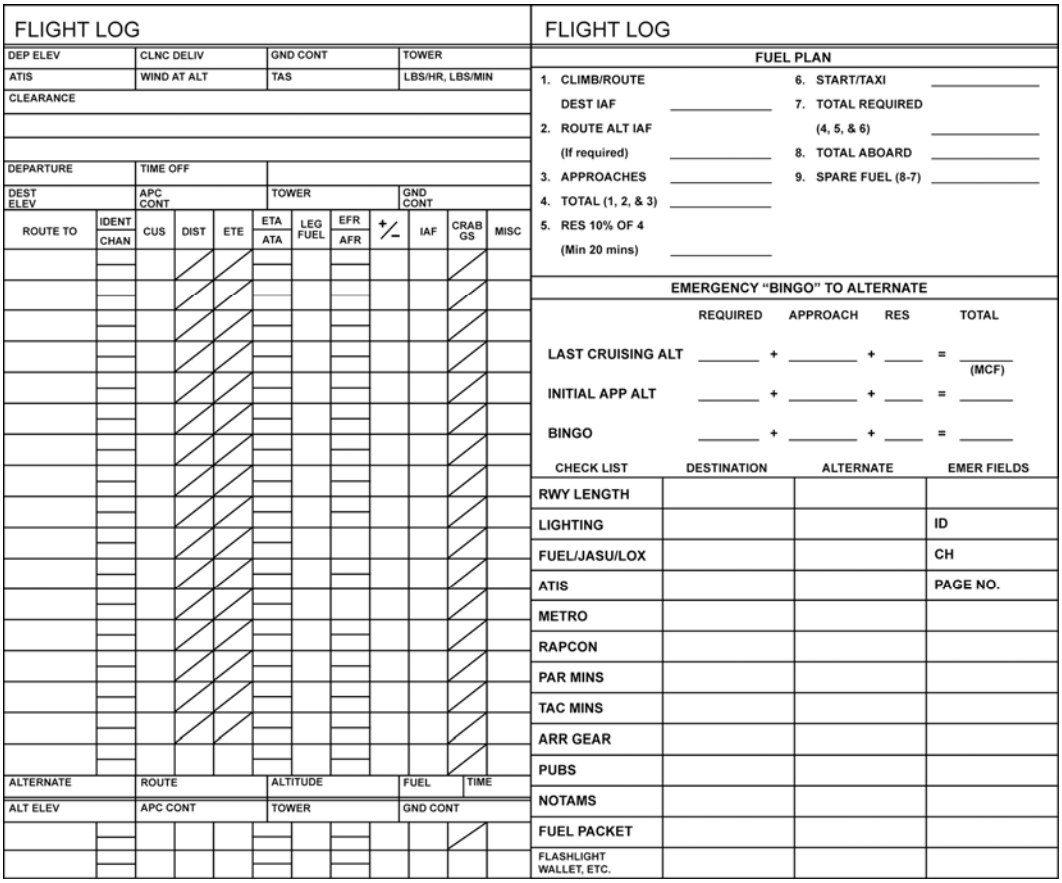

Figure 8-1 Flight Log Sections

801. DEPARTURE SECTION

The top part of the flight log is specifically designed as a place to copy information regarding your departure airfield, preflight airspeeds, and fuel-flow data. This information can be found in the IFR Enroute Supplement, approach plates, and the T-6A Planning Data given in Section 809. Entries for the Departure Section are:

FLIGHT LOG			
DEP ELEV	CLNC DELIV	GND CONT	TOWER
ATIS	WIND AT ALT	TAS	LBS/HR, LBS/MIN

Figure 8-2 Departure Section

DEP ELEV – Elevation of the departure airfield

CLNC DELIV – Clearance Delivery frequencies listed in IFR Enroute Supplement or approach plates.

GND CONT – Ground Control frequencies listed in IFR Enroute Supplement or approach plate.

TOWER – Tower Control frequencies listed in IFR Enroute Supplement or approach plates.

ATIS–ATIS frequencies listed in IFT Enroute Supplement or approach plates.

WINDS AT ALT – Forecast winds at flight planned altitude.

TAS – Preflight TAS (240 kts or 270 kts).

LBS PH/PMIN – Predicted fuel flow per hour and per minute (See Section 809).

802. CLEARANCE SECTION

The next four lines consist of space to copy your ATC clearance and takeoff information. You should develop a shorthand method of quickly and accurately copying the clearance because space is limited and clearances are generally issued rapidly.

CLEARANCE		
DEPARTURE	TIME OFF	

Figure 8-3 Clearance Section

CLEARANCE – ATC issued departure clearance. All valid ATC clearances consist of the following items:

1. Aircraft identification

2. Clearance limit

3. Departure procedures or SID

4. Route of flight

5. Altitude data

6. Departure instructions, frequency and IFF (transponder code) information

DEPARTURE – Abbreviated departure brief.

TIME OFF – Local takeoff (T/O) time.

803. DESTINATION SECTION

Next on the flight log, you will find spaces to use for destination airport information. Information for these blocks is found in the IFR Enroute Supplement and/or the approach plates.

DEST ELEV	APC CONT	TOWER	GND CONT

Figure 8-4 Destination Information

DEST ELEV – Elevation of Destination airfield.

APC CONT – Approach Control frequencies listed in IFR Enroute Supplement or approach plates.

TOWER – Tower Control frequencies listed in IFR Enroute Supplement or approach plates.

GND CONT – Ground Control frequencies listed in IFR Enroute Supplement or approach plates.

804. ENROUTE NAVIGATION SECTION

The majority of your flight log consists of the Enroute Navigation Section where the route of flight, courses, distances, times, fuels, and groundspeeds are recorded. Most blocks will be filled out during your pre-flight planning.

ROUTE TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR / AFR	+/−	IAF	CRAB GS	MISC

Figure 8-5 Enroute Navigation Section

ROUTE TO – All points that identify the route of flight (i.e., Level Off (L/O) point, DP/SID Transition Point, NAVAIDs, named or unnamed fixes, and points with greater than 7° course change). Last point should always be the IAF of the destination airfield.

IDENT/CHAN –3-letter identifier and frequency of VORs used to define each point.

CUS – Course measured or read from chart.

DIST – Distance measured or read from chart. For L/O line or any point before L/O, this information is found in Section 809.

ETE – Estimated Time Enroute for each leg, calculated using your pre-flight groundspeed and distance. For L/O line or any point before L/O, this information is found in Section 809.

ETA/ATA – Estimated Time of Arrival/Actual Time of Arrival. ETA is the time you estimate you will be over a given point. It is based off your mission clock and is filled out in the aircraft. ATA is written down when the aircraft actually passes over the point (MOT call).

LEG FUEL – Fuel expended each leg, calculated by multiplying leg ETE x preflight fuel flow. For L/O line or any point before L/O, this information is found in Section 809.

NOTE

Round fuels up to the nearest 5 pounds.

EFR/AFR – Estimated Fuel Remaining/Actual Fuel Remaining. EFR is entered during preflight planning; AFR is entered in flight.

(±) – Fuel above or below, entered in flight. Subtract EFR from AFR.

IAF – Fuel over the destination IAF, calculated in flight by multiplying the time left in flight x actual fuel flow (read from fuel flow gauge), then subtracting this amount from the actual fuel onboard (read from fuel gauge). In order to calculate destination IAF fuel when a drop-in is planned, you must also subtract 50 lbs for each planned drop-in approach not yet completed.

CRAB/GS – Crab angle and groundspeed for each leg, computed using your whiz wheel and based on pre-flight winds. For L/O line or any points before L/O line, assume groundspeed of 240 kts with no crab.

MISC – Miscellaneous information (i.e., altitudes, IAS, etc).

805. ALTERNATE SECTION

For all flights in the T-6A requiring a flight log, you must plan for an alternate airfield. All information for the alternate airfield can be found in the IFR Enroute Supplement and approach plates. The Alternate Section consists of three separate flight profiles: Profile I, Profile II, and Profile III.

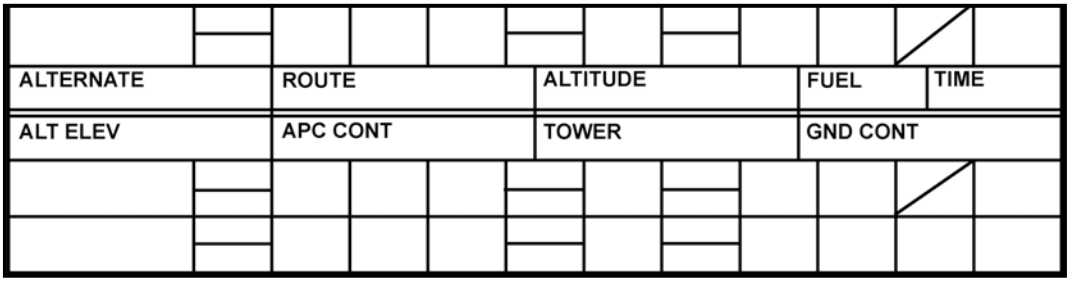

Figure 8-6 Alternate Section

ALTERNATE – Your alternate airfield's name and its three letter identifier.

ROUTE – The route you fly to your alternate (direct to alternate IAF).

ALTITUDE – Altitude to alternate (leave blank).

FUEL – Leg fuel to alternate (leave blank).

TIME – ETE to your alternate (leave blank).

ALT ELEV – Alternate airfield elevation.

APC CONT – Approach Control frequency serving the alternate airfield.

TOWER – Tower Control frequency.

GRD CONT – Ground Control frequency.

Profile I – This profile is planned at your cruising altitude and TAS from destination IAF to alternate IAF. Recorded on the very last line of the Enroute Navigation Section, immediately above the Alternate Section. All courses, distances, times, and fuels calculated in the same manner as in Enroute Navigation Section.

Profile II – This profile is planned at 5000 ft and cruise TAS, from destination IAF to alternate IAF. Recorded on the line immediately below the Alternate Section. All courses, distances, times, and fuels calculated in the same manner as in Enroute Navigation Section. Winds and fuel flow will be different than at cruising altitude.

Profile III – Bingo profile. Bingo parameters are determined by using the Bingo chart in Section 809. Planned from destination airfield to alternate airfield at 240 kts TAS.

806. FUEL PLAN SECTION

The backside of the flight log contains fuel plan information, completed during your preflight planning to simplify in-flight decision-making. It consists of:

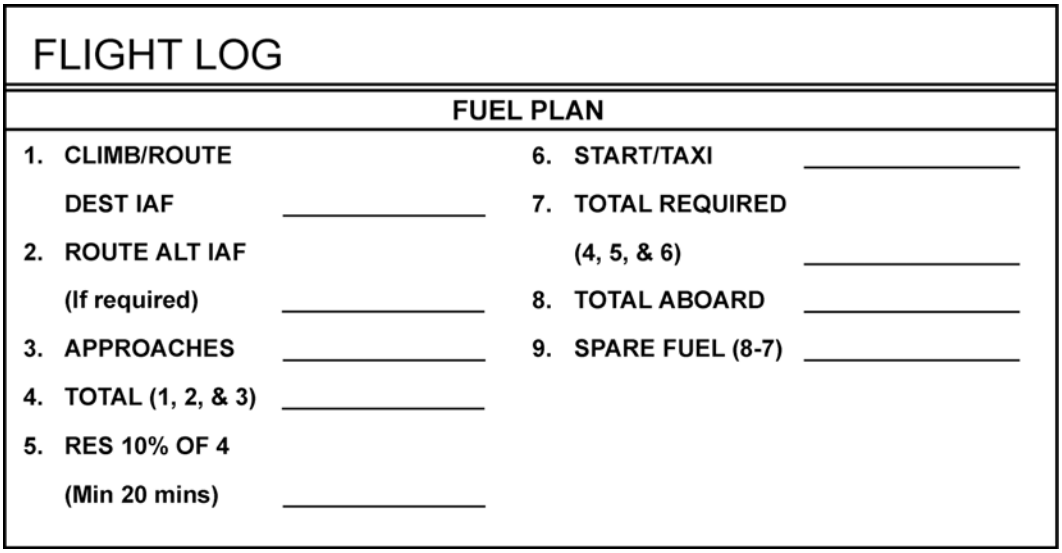

Figure 8-7 Fuel Plan Section

CLIMB/ROUTE DEST IAF – Total fuel burned from T/O to arrival at the IAF. This number is calculated on front of flight log.

ROUTE ALT IAF – Fuel required to go from your destination IAF to your alternate IAF at cruising altitude. Calculated in Profile I, Alternate Section.

APPROACHES – Cumulative fuel required for all approaches planned. For preflight planning, use 50 lbs of fuel for each planned approach at destination airfield.

TOTAL (1,2,&3) – The sum of lines 1,2, & 3.

RESERVE 10% OF LINE 4 (MIN. 20 MINS) –OPNAV 3710.7T required reserve fuel; either 10% of the sum listed in line 4 or enough fuel to fly 20 minutes at 10,000 ft, max endurance, whichever is greater. The T-6A computed fuel flying at max endurance, 10,000 ft for 20 minutes is 125 lbs. Notice this is above 10% of max fuel load (120 lb) so always use 125 lbs for reserve fuel in the T-6A.

START/TAXI – Fuel required for start and taxi; 50 lb for the T-6A.

TOTAL REQUIRED (4,5, & 6) – The sum of lines 4, 5, &6.

TOTAL ONBOARD – Total fuel prior to engine start. In the T-6A, we always plan for 1100 lbs onboard fuel, but we can over-wing fuel to 1200 lbs if needed.

SPARE FUEL – Line 8 minus line 7. This figure is the final fuel determinant for your "go" or "no go" decision making. If you have at least zero pounds of spare fuel, you can legally fly your route under the conditions expected in preflight planning. If your spare fuel is less than zero,

your flight as planned is not legal, and you must change your fuel load, route of flight, destination, alternate, altitude, etc. to improve your fuel plan.

807. EMERGENCY "BINGO" TO ALTERNATE SECTION

The Emergency "Bingo" to Alternate section summarizes the flight profiles to your alternate airfield and the information entered here is taken directly from the Alternate Section on front of flight log and Fuel Plan Section on back of flight log.

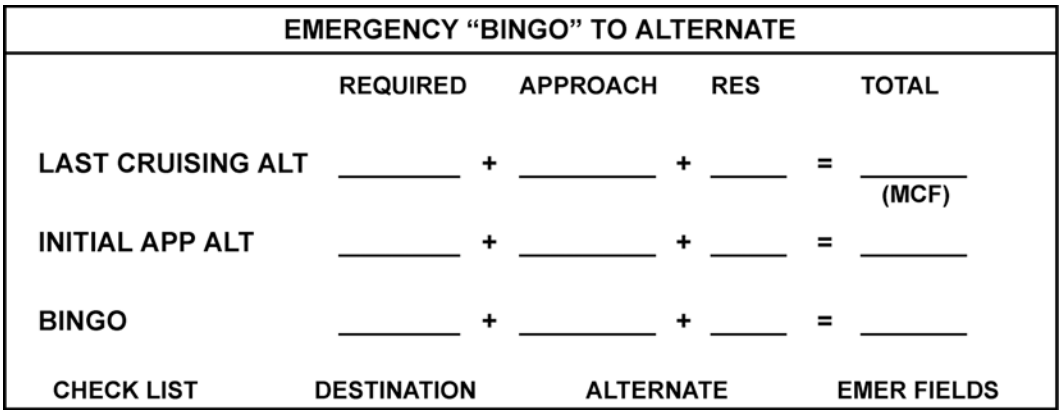

Figure 8-8 Emergency "Bingo" to Alternate Section

LAST CRUISING ALTITUDE – Numbers relating to Profile I. Required fuel is taken from front of flight log (Profile I). Approach and Reserve fuel are taken from Fuel Plan Section, lines 3 and 5.

INITIAL APP ALT – Numbers relating to Profile II. Required fuel is taken from front of flight log (Profile II). Approach and Reserve fuel are taken from Fuel Plan Section, lines 3 and 5.

BINGO - Numbers relating to Profile III, or "Bingo" profile. In REQUIRED column, enter Bingo altitude. In APPROACH column, enter BINGO IAS (always 240 kts TAS). In RES column, enter descent point. In TOTAL column, copy IFR Bingo fuel computed from BINGO chart.

808. CHECKLIST/DESTINATION/ALTERNATE SECTION

This section of the flight log contains useful information you should know about your destination, alternate, and enroute emergency fields. Most information can be found in the IFR Enroute Supplement and approach plates.

Choose emergency divert fields close to your route of flight. You are looking for airfields with at least 3000 ft of hard surface runway and a compatible approach for the T-6A. These airfields should be spread along your route of flight and should not include your destination or alternate airfields. Choose military fields with services compatible to your aircraft.

RWY LENGTH			
LIGHTING			ID
FUEL/JASU/LOX			CH
ATIS			PAGE NO.
METRO			
RAPCON			
PAR MINS			
TAC MINS			
ARR GEAR			
PUBS			
NOTAMS			
FUEL PACKET			
FLASHLIGHT WALLET, ETC.			

Figure 8-9 Checklist/Destination/Alternate Section

RWY LENGTH – Length and width of runway on which you plan to land.

LIGHTING – Airfield lighting, described in plain English. Convert codes from your FIH or approach plate.

FUEL/JASU/LOX – Services available, found in IFR Enroute Supplement. You may use J-4, J-5, J-8, Jet A, A-1, and Jet B for the T-6A. The JASU unit for the T-6A is the NC-5 or NC-8A at USN and USMC bases. We do not use LOX in the T-6A

ATIS – Appropriate ATIS, ASOS, or AWOS frequency

METRO – Frequency for the closest METRO/PMSV facility.

RAPCON – Approach Control frequencies for your destination, listed on front of flight log.

PAR/ASR MINS –PAR/ASR and associated minimums for predicted runway. Adjust for single-pilot absolute minimums.

TAC MINS – TACAN and associated minimums for predicted runway. Obviously we don't have a TACAN on the T-6A, but we do have a VOR. So…cross out the TAC, write in VOR, then enter published VOR and associated minimums for predicted runway.

ARR GEAR – Location of arresting gear, found in IFR Enroute Supplement and entered in clear and understandable terms.

PUBS, NOTAMS, FUEL PACKET, FLASHLIGHT, WALLET, ETC. – Preflight inventory. Simply place check marks in these blocks if you are satisfied that you have everything you need for flight.

ID – Emergency airfield 3-letter identifier

CH – VOR frequency serving emergency airfield

PAGE NO. – Page on which you can find emergency field in the IFR Enroute Supplement and approach plates.

809. T-6A PLANNING DATA

Total Fuel	1100 lbs
Start/Taxi/T/O	50 lbs
Penetration/Approach (20 minutes)	50 lbs
Reserve (20 min @ 10,000 feet)	125 lbs

CLIMB ALT	TIME	FUEL	DISTANCE
5000	2	20	5
10,000	4	40	10
15,000	6	60	15
20,000	8	80	20
25,000	10	100	25
30,000	15	130	50
31,000	16	135	55

CRUISE ALT	FUEL FLOW 240 TAS	FUEL FLOW 300 TAS
S/L	600	N/A
5000	525	N/A
10,000	450	N/A
15,000	375	550
20,000	325	475
25,000	300	425
31,000	275	350

T-6A BINGO CHART

DISTANCE TO BASE NM	FUEL REQUIRED POUNDS (1)	TIME REQUIRED MINUTES	CRUISE ALTITUDE FEET	DESCENT DIST NM (2)
50	224	15	10000	22
60	242	18	11000	24
70	259	21	12000	27
80	277	25	13000	29
90	294	28	14000	32
100	312	31	15000	34
110	314	33	18000	35
120	315	35	21000	37
130	317	37	25000	38
140	318	39	28000	40
150	320	41	31000	41
160	335	44	31000	49
170	349	47	31000	57
180	364	49	31000	65
190	378	52	31000	73
200	393	55	31000	81

STANDARD DAY, ZERO WIND, DEFOG OFF, GEAR AND FLAPS UP.

1. INCLUDES 105 POUNDS FUEL RESERVE
2. MAX RANGE DESCENT - CLEAN CONFIGURATION, POWER SET FOR 1500 FPM DESCENT AT 180 KIAS
3. ASSUME 240 KTS TAS FOR AIRSPEED

NOTE

All information is extracted from the performance data section found in the back of the T-6A NATOPS or PCL.

810. CONCLUSION

A flight log is a preflight planning document that helps you with fuel planning and route familiarization. A flight seldom progresses as it is planned. However, a flight log used in the proper context helps you make decisions affecting your fuel, distance, altitude, etc., so you arrive at your destination with minimum problems. Additionally, the fuel log is a valuable tool, if properly maintained, for extracting information requested by ATC during flight.

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CHAPTER NINE
EMERGENCY PROCEDURES

900. INTRODUCTION

As you learned in the T-6A Contact stage, emergencies never stop at merely reciting boldface or blindly following checklists. Every emergency must be considered in context; emergencies under IFR are no different. As you study your boldface and other emergency procedures in preparation for instrument sorties, take the time to think about how IFR flying (in both IMC and VMC) will change the way each emergency is handled. If an emergency procedure calls for you to execute a Precautionary Emergency Landing (PEL), and the PEL procedure directs you to intercept the Emergency Landing Pattern (ELP), where are you going to intercept? How are you going to navigate to that point of intercept? How soon are you going to want to land, and which airfield is best suited to handle your emergency? How and when are you going to coordinate with ATC?

This chapter addresses some common IFR emergency considerations, but it is by no means an exhaustive catalog of every contingency you might face. Good judgment, situational awareness, preflight preparation, and a thorough knowledge of flight regulations, procedures, and aircraft systems are your best assets in any emergency.

901. EMERGENCY FIELD SELECTION

A good aircrew always looks for suitable emergency landing fields before an emergency happens. Under IMC, factors determining field suitability include not only runway length and availability of maintenance services, but also approach availability and lighting. The enroute charts depict aerodromes with a DoD published approach in dark blue. The charts also give field elevation, runway length, and lighting information. To determine whether the approaches are compatible with your NAVAIDs, you should be familiar with the approach plates for suitable fields along your intended route of flight. If an emergency occurs, take the immediate action prescribed by NATOPS, and contact ATC with your situation and intentions. If necessary, ATC can assist in selection of and navigation to the nearest suitable field. Remember, performing accurate operations checks can lead to early detection of potentially large problems and help to keep them smaller and more manageable.

902. LOST COMMUNICATIONS

Refer to the FIH, Section A, for lost communication procedures. It is virtually impossible to provide regulations and procedures applicable to all possible situations associated with two-way radio communications failure; good judgment and Situational Awareness (SA) are among your best assets in this type of emergency.

Verify you have lost communications, squawk 7600, and comply with the FIH. In all circumstances, monitor all available communications frequencies, including voice-capable VORs, and make calls “in the blind.”

903. ICING

Refer to NATOPS icing discussions (Chapters 5 and 7). SOP prohibits filing into areas where icing conditions are forecast. Since instrument flight may involve prolonged operation through areas of visible moisture, you must note the OAT, particularly during climbs and descents, in order to avoid prolonged flight in icing conditions.

NOTE

Actual OAT is roughly 15º less than indicated OAT. Reference the T-6A NATOPS PCL to find an accurate, actual OAT.

The probe's anti-ice and windshield defogger are the only devices available to combat icing, and are of limited value in removing ice. Use them when entering visible moisture, before ice has a chance to accumulate. Fly over, under, or around any known icing conditions. If ice has formed despite all precautions, climb or descend to get out of the icing conditions. If you must land with ice on the aircraft, increase your airspeed as necessary during the approach to maintain positive control of the aircraft and consider a no flap landing.

904. AIRCRAFT EMERGENCIES UNDER IFR

Although NATOPS provides procedural guidance for specific emergency situations, it does not provide precise guidance for all situations. You must develop the ability to recognize and analyze emergency situations, and then determine a course of action that will ensure the safety of the crew and aircraft. Remember the golden rule: "**AVIATE, NAVIGATE, COMMUNICATE, CHECKLISTS**". Continue to perform your flying duties while executing the emergency procedures in a timely manner. Determine the nature of the emergency and the urgency with which you should land. Then devise a plan and execute it. Notify ATC by declaring an emergency and advise them of your intended action (requesting priority handling as necessary). The following factors will influence your decision: severity of the emergency weather conditions, fuel remaining, aircraft status and position, airfield proximity, approach availability, and terrain. If you are lost, state your last known position, time, and heading since that known position.

In an emergency requiring immediate action, your instructor may deviate from any rule or regulation as necessary to maintain safety of flight. If this emergency authority is exercised and will result in a deviation from an ATC clearance, you must notify ATC as soon as possible and get an amended clearance.

Emergencies are generally classified under one of two categories:

1. **Distress**: A condition of being threatened by serious and/or imminent danger and requiring immediate assistance.

2. **Urgency**: A condition of being concerned about safety and requiring timely (but not immediate) assistance, although the potential for a distress situation exists.

NOTE

If in radio contact with ATC, continue squawking the assigned transponder code. If unable to immediately establish two-way radio communications with ATC, squawk code 7700.

If possible, remain or gain VMC while executing the appropriate emergency procedures. Notify ATC of the nature of your emergency and your intended action. It is your instructor's decision to continue the flight or land as soon as possible. When communicating with ATC, consider your terminology. ATC will probably be unfamiliar with the term PEL, however, they will certainly understand the request for a "precautionary approach" or an "emergency landing."

In a situation that requires a PEL under IMC, you may not be able to intercept the ELP, at a point sooner than short final. Determine your present position relative to the nearest IAF compatible with the navigational equipment installed on your aircraft. Do not hesitate to declare an emergency if priority handling would expedite your approach and landing. Use good headwork when requesting an approach; radar vectors to FAC are expeditious but not always available. SA is essential to good headwork and the expeditious handling of any emergency.

Examples of emergency approach requests are:

1. *"Pensacola Approach, KATT 603, holding at CHAPE, indicating low oil pressure, declaring an emergency. Request immediate clearance for the RNAV 1 approach into Navy Sherman."*

2. *"Pensacola Approach, BUCK 303, approximately five miles west of PENSI, experiencing fuel fumes in the cockpit, declaring an emergency. Request radar vectors for an ILS 17 approach at Pensacola Regional Airport."*

Other considerations may include:

1. Requesting a crash crew or ambulance to be standing by.

2. Maintaining airspeed and/or altitude until closer to the FAF or runway, especially in the case of low fuel or impending engine failure.

3. Ejecting if you cannot reach or navigate to a suitable landing surface.

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APPENDIX A
GLOSSARY

This list is not intended to be all-inclusive. Refer to the current version of the JPATS, AIM, GP and the 7110.65 ATC Manual.

AIRPORT SURVEILLANCE RADAR (ASR) APPROACH - Radar providing position of aircraft by azimuth and range data but without elevation data. It is designed for a maximum range of 60 miles. Used for terminal approach control. Also used for surveillance approaches. The ASR approach is conducted in accordance with directions issued by a controller referring only to the surveillance display. Also see GCA.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC) - A facility established to provide traffic control service to IFR flights operating within controlled airspace and principally during the enroute phase of flight.

ATC CLEARANCE - Authorization by ATC facilities for an aircraft to proceed under specified traffic conditions within controlled airspace.

ALTITUDE RESTRICTION - An altitude or altitudes, stated in the order flown, which are to be maintained until reaching a specific point or time. Altitude restrictions may be issued by ATC due to traffic, terrain, or other airspace considerations.

APPROACH CONTROL FACILITY - A terminal ATC facility that provides approach control service in a terminal area.

NOTE

Approach control service is provided by an Approach Control facility for arriving and departing aircraft. At some airports not serviced by an Approach Control facility, the Air Route Traffic Control Center provides limited Approach control service.)

AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS) - The continuous broadcast of recorded non-control information in selected terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information.

CEILING - The height above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken", "overcast", or "obscuration."

CIRCLE-TO-LAND MANEUVER - A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible or is not desirable.

CLEARANCE LIMIT - The fix to which an aircraft is cleared.

COMPULSORY REPORTING POINTS - Reporting points, which must be reported to ATC when not in radar contact. They are designated on aeronautical charts by solid triangles or filed in a flight plan as fixes selected to define direct routes. These points are geographical locations, which are defined by navigation aids/fixes. Pilots should discontinue position reporting over compulsory reporting points when informed by ATC that their aircraft is in "radar contact."

COURSE - A magnetic direction to fly in relation to a radio navigational facility. Note that a course is not only a magnetic direction over the ground. If flying inbound on a radial, the course is the reciprocal of the radial. If flying outbound, the course is the same as the radial.

DECISION HEIGHT (DH) - With respect to the operation of the aircraft means the height at which a decision must be made, using an ILS or PAR instrument approach, either to continue the approach or to execute a missed approach.

DEPARTURE CONTROL - ATC service provided to departing aircraft.

DEPARTURE PROCEDURES (DPs) - A DP is a preplanned, coded IFR departure route. It provides the following advantages:

1. Graphic portrayal of departure route.

2. Reduces time delay and radio communications required to issue clearances.

3. Provides approved ATC departure route clearance in the event of radio failure.

DIRECT - Straight line flight between two NAVAIDs, fixes, points, or any combination thereof. When used by pilots in describing off-airway routes, points defining direct route segments become compulsory reporting points unless the aircraft is under radar contact.

DME FIX - A geographical position determined by reference to a NAVAID. It is defined by a specified distance in NM and a radial in degrees magnetic from that aid. EXAMPLE: A point 10 NM west of the NSE VORTAC on the 270° radial would be written as: NSE 270010.

EMERGENCY SAFE ALTITUDE - An altitude expressed in 100-foot increments providing 1000 feet of clearance (2000 feet in designated mountainous areas) over all obstructions/terrain within 100 miles.

EMERGENCY FUEL - A declaration made by the pilot to inform ATC that the aircraft fuel status is dangerously low. The pilot is requesting priority handling and cannot accept any delays for the approach.

ESTABLISHED ON COURSE - When the aircraft position is within five radials of the selected course and the aircraft's movement is in the same direction as the selected course. A shallow intercept to course will be defined as aircraft heading within 30° of the desired course.

EXPECTED FURTHER CLEARANCE (EFC) (TIME) - The time aircrew can expect to receive clearance beyond a clearance limit.

FINAL APPROACH SEGMENT - The segment of an instrument approach between the FAF and the MAP.

FINAL APPROACH FIX (FAF) - The fix from or over which final approach (IFR) to an airport is executed.

FIX - A geographical position determined by reference to one or more radio NAVAIDs. A fix can be defined as the actual location of the NAVAID, a distance and radial from a NAVAID, or the crossing point of two different radials from two different NAVAIDs.

FLIGHT PLAN - Specified information provided to ATC facilities, relative to the intended flight of an aircraft.

FLIGHT SERVICE STATION (FSS) - A facility operated by the FAA to provide flight assistance service. (Their call sign is "_____ Radio", EXAMPLE. "Anniston Radio")

GROUND CONTROLLED APPROACH (GCA)/ RADAR APPROACHES (RA) - A radar approach system whereby a controller interprets a radar display, transmitting approach instructions to the pilot by radio, to place the aircraft in position for landing. The approach may use ASR providing course and range information, or PAR providing course, range, and glideslope information. Usage of the term "GCA" by aircrews is discouraged. Aircrews should specifically request a "PAR" or Surveillance approach.

HEADING - The direction the longitudinal axis of the aircraft is pointed, usually expressed in degrees magnetic.

HEIGHT ABOVE AIRPORT (HAA) - The height of the MDA above the published airport elevation. Published in conjunction with circling minimums.

HEIGHT ABOVE TOUCHDOWN (HAT) - The height of the DH or MDA above the highest runway elevation in the touchdown zone (first 3000 feet of the runway). HAT is published on instrument approach charts in conjunction with all straight-in minimums.

INITIAL APPROACH FIX (IAF) - The fix depicted on an IAP chart that identifies the beginning of the initial approach segment.

INITIAL APPROACH SEGMENT - The part of an instrument approach between the IAF and the intermediate or FAF or point.

INITIAL CONTACT - The first radio call you make to a given facility or the first call to a different controller.

INSTRUMENT DEPARTURE PROCEDURE (DP) - A preplanned instrument flight rule (IFR) ATC departure procedure printed for aircrew use in graphic and/or textual form. DPs provide transition from the terminal to the appropriate enroute structure.

INSTRUMENT METEOROLOGICAL CONDITIONS (IMC) - Weather conditions (visibility, ceiling and cloud clearance) below the minimums for flight under visual flight rules (VFR).

INTERMEDIATE APPROACH SEGMENT - The part of an IAP from the first arrival at the first navigational facility or predetermined fix, to the beginning of the final approach.

INTERSECTION - An intersection is a point defined by a combination of two or more radials from two or more NAVAIDs. An intersection may also be defined as a radial and DME. Intersections may be used to indicate fixed positions along the airways.

JET ROUTES - A high altitude route system extending from 18,000 feet MSL to FL 450, inclusive. The routes are predicated by high altitude NAVAID.

MANDATORY ALTITUDE (INSTRUMENT APPROACH) - The MSL altitude vertical to a geographic location, which an aircraft must maintain during a portion of an instrument approach. The requirement for such may be created by airspace separation criteria or airspace separation criteria in conjunction with obstruction clearance criteria. A mandatory altitude will be depicted as an underlined number with a line above it.

MANEUVERING AIRSPACE - Airspace used at an IAF to allow an aircraft to maneuver for a favorable alignment with the initial approach course.

MAXIMUM ALTITUDE (INSTRUMENT APPROACH) - The MSL altitude vertical to a geographic location above which an aircraft may not be flown during an instrument approach until after passing the location. The requirement for a maximum altitude may be created by airspace separation criteria. On the approach plate, a maximum altitude will be depicted as a number with a line above it.

MINIMUM CROSSING ALTITUDE (MCA) - The lowest altitudes at certain fixes at which an aircraft must cross when proceeding in the direction of a higher Minimum Enroute IFR Altitude.

MINIMUM DESCENT ALTITUDE (MDA) - The lowest altitude, expressed in feet above MSL, to which descent is authorized on final approach or during circling-to-land maneuvering in execution of a standard IAP where no electronic glideslope is provided.

MINIMUM ENROUTE ALTITUDE (MEA) - The altitude established between NAVAIDs or reporting points on airways, air routes, or advisory routes, which will meet obstruction clearance requirements, and which will also assure acceptable navigational signal coverage.

MINIMUM FUEL - Indicates an aircraft's fuel supply has reached a state where, upon reaching the destination, it can accept little or no delay. This is not an emergency situation but merely indicates an emergency situation is possible should any undue delay occur. The pilot is not to expect priority handling unless specifically requested or declares "emergency fuel."

MINIMUM OBSTRUCTION CLEARANCE ALTITUDE (MOCA) - The specified altitude in effect between radio fixes on VOR airways, off-airway routes or route segments, which meets obstruction clearance requirements for the entire route segment and which assures acceptable navigational signal coverage only within 25 SM/22 NM, of a VOR.

MINIMUM RECEPTION ALTITUDE (MRA) - The lowest altitude required to receive adequate signals to determine specific VOR/VORTAC/TACAN fixes.

MINIMUM SAFE ALTITUDE (MSA) - An altitude expressed in 100-foot increments providing 1000 feet of clearance over all obstructions/terrain within 25 NM of the NAVAID on which the instrument approach chart is centered. These altitudes will be identified as minimum sector altitudes or emergency safe altitudes.

MINIMUM SECTOR ALTITUDE - Altitude that provides 1000 feet of obstacle clearance within 25 NM of a NAVAID. It is designated for sectors of at least 90º and found on the plan view of IAPs. These altitudes are for emergency use only and do not assure acceptable NAVAID sector coverage.

MINIMUM VECTORING ALTITUDE (MVA) - The lowest altitude, (expressed as an MSL altitude) an aircraft will be vectored by a radar controller. This altitude assures communications radar coverage and meets obstruction clearance criteria. It may be lower than the MEA.

MISSED APPROACH - A maneuver conducted by a pilot when an instrument approach cannot be completed to a landing.

MISSED APPROACH POINT (MAP) - A point on an instrument approach at which missed approach procedures shall be executed if required visual reference does not exist.

NAVAID - An electronic device that provides position data to aircraft in flight. NAVAIDs are normally located at fixed positions on the ground. The NAVAIDs most commonly used by the T-6A are VOR and VORTAC.

NON-PRECISION APPROACH - A standard IAP in which no electronic glideslope is provided (e.g., VOR, TACAN or ASR approaches).

PRECISION APPROACH RADAR (PAR) - A standard IAP in which an electronic glideslope is provided. In this type of approach, the pilot is provided with course and altitude information. A PAR approach is a precision approach. (See GCA.)

PUBLISHED ROUTE - A route for which an IFR altitude has been established and published (e.g., federal airways, jet routes, area navigation routes, specified direct (feeder) routes).

PROCEDURE TURN (PT) - A maneuver used to reverse direction to establish an aircraft on the intermediate approach segment or FAC of an instrument approach. The outbound course, direction of turn, distance within which the turn must be completed, and minimum altitude are specified in the procedure. However, the point at which the turn may be commenced, and the type and rate of turn, are left to the discretion of the pilot.

RADAR BEACON - A radar system in which the object to be detected is fitted with cooperative equipment in the form of a radio receiver/transmitter (transponder). Radio pulses transmitted from the searching transmitter/receiver (interrogator) site are received in the cooperative equipment and used to trigger a distinctive transmission from the transponder. This latter transmission, rather than a reflected signal, is then received back at the transmitter/receiver site.

RADAR ENVIRONMENT - An area in which radar service may be provided.

RADAR IDENTIFICATION - The process of ascertaining that a radar target is the radar return from a particular aircraft.

RADAR VECTOR - A heading issued to an aircraft to provide navigational guidance by radar.

RADIAL - A radial is a magnetic bearing extending from a VOR, VORTAC, or TACAN.

RADIO MAGNETIC INDICATOR (RMI) - A navigation instrument that indicates both magnetic heading and magnetic bearing to a selected radio navigation facility.

REPORTING POINT - A specified geographic location in relation to which the position of an aircraft can be reported.

RUNWAY VISUAL RANGE (RVR) - The horizontal distance a pilot will see down the runway from the approach end. RVR is determined with electronic instruments and is reported in hundreds of feet. RVR, in contrast to prevailing or runway visibility, is based on what a pilot in a moving aircraft should see looking down the runway. RVR is horizontal visual range (NOT slant range).

SHORT RANGE CLEARANCE - A clearance issued to a departing IFR flight which authorizes IFR flight to a specific fix short of the destination while ATC facilities are coordinating and obtaining the complete clearance.

STANDARD TERMINAL ARRIVAL (STAR) - A preplanned instrument flight rule (IFR) ATC arrival procedure published for pilot use in graphic and/or textual form. STARs provide transition from the enroute structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area.

STATION - A radio navigational aid (see NAVAID).

STEPDOWN FIX - A fix permitting additional descent while on a segment of an instrument approach. The fix identifies a point at which a controlling obstacle has been safely overflown.

STRAIGHT-IN APPROACH - IFR - An instrument approach wherein final approach is begun without first having executed a procedure turn. This type of approach is not necessarily completed with a straight-in landing or made to straight-in landing minimums.

STRAIGHT-IN LANDING - A landing made on a runway aligned within 30º of the FAC following completion of an instrument approach.

TRACK - The actual flight path of an aircraft over the surface of the earth.

TRANSPONDER - The airborne radar beacon receiver/transmitter portion of the ATC Radar Beacon System. (See Radar Beacon.)

VICTOR AIRWAYS - A route system established in the form of a corridor on controlled airspace. The routes are predicated solely on VOR/VORTAC NAVAIDs. Victor airways include airspace at least 1200 feet above the surface (sometimes higher) up to but not including 18,000 feet MSL.

VISUAL DESCENT POINT (VDP) - A defined point on the FAC of a non-precision straight-in approach procedure from which normal descent from the MDA to the runway touchdown point may be commenced, provided the approach threshold of that runway, or approach lights, or other markings identifiable with the approach end of that runway are clearly visible to the pilot.

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