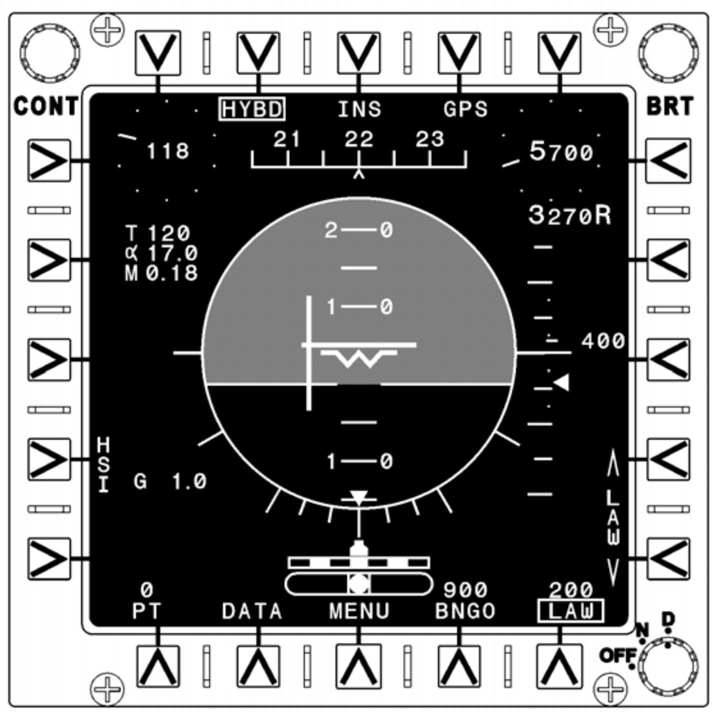
NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS **CNATRA P-1282 (REV. 2-02) PAT**

INSTRUMENT NAVIGATION
(INAV)



LESSON GUIDE

2002

T-45C FLIGHT SUPPORT LECTURE GUIDE

CHANGE SUMMARY PAGE

CHANGE NUMBER	DATE ENTERED	CHANGE DESCRIPTION	INITIALS

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FLIGHT SUPPORT LECTURE/LESSON GUIDE
LIST OF EFFECTIVE PAGES

EFFECTIVE PAGES	PAGE NUMBERS
FRONT MATTER	
Original	i thru iv
TSINav-01	
Original	1-i thru 1-ii
Original	1-1 thru 1-32
TSINav-02	
Original	2-i thru 2-ii
Original	2-1 thru 2-38
TSINav-03	
Original	3-i thru 3-ii
Original	3-1 thru 3-26
TSINav-04	
Original	4-i thru 4-ii
Original	4-1 thru 4-28
TSINav-05	
Original	5-i thru 5-ii
Original	5-1 thru 5-20
TSINav-06	
Original	6-i thru 6-ii
Original	6-1 thru 6-48
TSINav-07	
Original	7-i thru 7-ii
Original	7-1 thru 7-22
TSINav-08	
Original	8-i thru 8-ii
Original	8-1 thru 8-24
TSINav-09	
Original	9-i thru 9-ii
Original	9-1 thru 9-20
TSINav-10	
Original	10-i thru 10-ii
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EFFECTIVE PAGES	PAGE NUMBERS
TSINav-11	
Original	11-i thru 11-ii
Original	11-1 thru 11-32
ADVINav-03	
Original	3-i thru 3-iv
Original	3-1 thru 3-74

T-45C INAV IUT/ADV/TS
CROSS-REFERENCE

IUT	ADVANCED	TS
—	—	INav-01
INav-01	—	INav-02
—	INav-01	INav-03
—	INav-02	INav-04
—	—	INav-05
INav-02	—	INav-06
INav-03	—	INav-07
—	—	INav-08
INav-04 (1st part)	—	INav-09
INav-04 (2nd part)	—	INav-10
INav-05	—	INav-11
INav-06	INav-03	—
INav-07X	—	INav-12X

LECTURE GUIDE/LAB

COURSE/STAGE: T-45C TS Instrument Navigation

LESSON TITLE: Review of FLIP and FAA Publications

LESSON IDENTIFIER: T-45C TS INav-01

LEARNING ENVIRONMENT: Classroom

ALLOTTED LESSON TIME: 1.8 hr

STUDY RESOURCES:

* DoD FLIP (GP) General Planning
* DoD FLIP (AP/1) Area Planning, North and South America
* DoD FLIP (AP/1A) Special Use Airspace (NOTAL)
* DoD FLIP (Enroute) Flight Information Handbook (FIH)
* DoD FLIP (Enroute) IFR Supplement, United States
* DoD FLIP (Enroute) VFR Supplement, United States
* DoD FLIP IFR Enroute High Altitude - United States Charts
* FAA Aeronautical Information Manual (AIM)

LESSON PREPARATION:

Read:

* Read FLIP GP Chapter 3 - "FLIP Program"

EXAMINATION:

The objectives in this lesson will be tested in Instrument Navigation 12X.

(2-02) ORIGINAL

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LESSON OBJECTIVES

2.1.8.3.1
Recall the Department of Defense (DoD) flight information publications (FLIPs) and FAA documents required for flight planning

2.1.8.6
Recall information and application of the NOTAM system

2.1.8.3.1.1
Recall FLIP usage and application in instrument flight planning for tactical jet aircraft

2.1.8.3.1.2
Recall FLIP symbology, information, navigation detail and application in defining the air traffic instrument navigation system

HOW TO USE A LECTURE GUIDE/LAB

This is a Lecture Guide/Lab that you will complete in group session with an instructor. FLIP publications, charts, and AIM will be available.

MOTIVATION

To successfully complete a mission flight and comply with all the FAA and military procedures and regulations, you, as an instrument pilot, must have necessary information available for the planning, departure, en route, and terminal phases of your flight. The Department of Defense has developed a system of disseminating this information to you in an updated and organized form. This system is designated as the Department of Defense (DoD) flight information publications (FLIP) program.

OVERVIEW

Separate FLIP program packages are produced for each of four world geographic areas in common with the area of coverage chart on the back cover of all sections of the FLIP Planning publications. Format and content are standardized in each package to the maximum extent practicable, with due consideration given to unique area requirements. The discussions contained in this unit are related directly to United States coverage, which is contained within package number one - “North & South America.”

DoD FLIPs are published with effective dates which coincide with a schedule established by the internationally accepted Aeronautical Information Regulation and Control 00 (AIRAC) system. Under this arrangement, which is associated with the Notices to Airmen (NOTAM) system, changes announced in advance are effected on a 28-day basis. Note that in the following individual product descriptions of DoD FLIPs, the common AIRAC 4-week cycle (or increments thereof) is followed.

The FLIP program was designed using the concept that there are basically three separate phases of flight planning, en route operations, and terminal operations. No one document contains all the information which may be required for a flight. The FLIP Planning, supplements, Flight Information Handbook, en route and arrival charts, instrument approach procedures, and NOTAM files must be consulted prior to flight. In planning for international flights, reference should also be made to the USAF Foreign Clearance Guide.

PRESENTATION

The FLIP program consists of the following publications:

1. Planning
   a. General Planning (GP)
   b. Area Planning (AP/1)
      (1) Area Planning, Special Use Airspace (AP/1A)
      (2) Area Planning, Military Training Routes (AP/1B)
2. Enroute IFR/VFR Supplements, United States
3. Enroute Flight Information Handbook
4. Enroute IFR High/Low Altitude - United States Chart
5. Area Charts
6. Area Arrival Charts Depicting Terrain Data
7. (Terminal) High/Low Altitude United States
8. Civil Standard Instrument Departures/Standard Terminal Arrivals (CIV SIDs/STARs)
9. U.S. Air Force Foreign Clearance Guide

The publications of the FLIP program are updated with revisions, additions, and deletions between issues so that you always obtain current information.

This revision process is by means of:

1. Enroute Change Notices (ECNs)
2. Terminal Change Notices (TCNs)
3. Planning Change Notices (PCNs)
4. Urgent Change Notices (UCNs)
5. Defense Mapping Agency (DMA)
6. Aeronautical Chart Updating Manual (CHUM)

Pilots are kept current on temporary conditions affecting the status of en route and airport NAVAIDs and facilities, on proposed changes to FAA procedures, and on major military training exercises by:

1. Notices To Airmen (NOTAMs)

2. Special Notices

In addition to the FLIP publications, the following National Ocean Service (Department of Commerce) publications are approved by the DoD for use by military pilots and are normally available in most airport flight planning areas:

1. Sectional Aeronautical Charts

2. VFR Terminal Area Charts (Class B Airspace)

This section will briefly familiarize you with each publication in the DoD FLIP program and the U.S. Government flight publications (Department of Commerce) which together form a part of your tools of the trade. You should be particularly familiar with those publications applicable to flights in tactical jet aircraft.

IFR FLIGHTS IN TACTICAL JET TYPE-AIRCRAFT

For every IFR flight outside the local training area, you will carry four FLIP publications in jet-type aircraft.

1. FLIP (Enroute) IFR Supplement

2. FLIP (Enroute) Flight Information Handbook

3. FLIP High Altitude Enroute Charts

4. FLIP (Terminal) High Altitude Instrument Approach Procedures

Also recommended would be the Low Altitude Enroute Chart or Arrival Chart, if applicable, for your destination area and the CIV SIDs/STARs if you are going to a high density area.

Two other FLIP publications are applicable to tactical jet-type aircraft, but are used for preflight planning as a backup to en route and terminal publications; therefore, they are not carried aboard aircraft.

1. FLIP Planning (GP, AP/1, AP/1A, AP/1B as applicable)

2. U.S. Air Force Foreign Clearance Guide

You should apply two basic rules to the everyday use of these FLIP publications:

1. **Always** use current issues of the applicable publications. Approach procedures and/or airways do change.

2. **Always** obtain the latest FLIP program information by referencing all applicable Change Notices, Special Notices, and NOTAMs.

FLIP UPDATE SYSTEM

The FLIP program publications are maintained in a continual updated status between issues by several means:

1. Enroute Change Notices (ECNs)

2. Terminal Change Notices (TCNs)

3. Planning Change Notices (PCNs)

4. Urgent Change Notices (UCNs)

5. Special Notices

6. Notices to Airmen (NOTAMs)

Enroute Change Notices (ECNs)

Published on a scheduled basis, ECNs disseminate revisions, additions, and deletions to the current issues of en route charts, supplements, and the Flight Information Handbook.

Terminal Change Notices (TCNs)

Published on a scheduled basis, TCNs disseminate revisions to the current instrument approach procedure booklets, that is, a new instrument approach procedure to an airport to replace the current procedure.

Planning Change Notices (PCNs)

Published on a scheduled basis, PCNs disseminate revisions, additions, and deletions to the current issues of the four sections of the FLIP planning publications.

Urgent Change Notices (UCNs)

ECNs, TCNs, and PCNs are published on a scheduled basis. Safety of flight information requiring an unscheduled amendment to the en route charts, supplements, Flight Information Handbook, instrument flight procedures, and planning publications is disseminated in the form of an Urgent Change Notice (UCN).

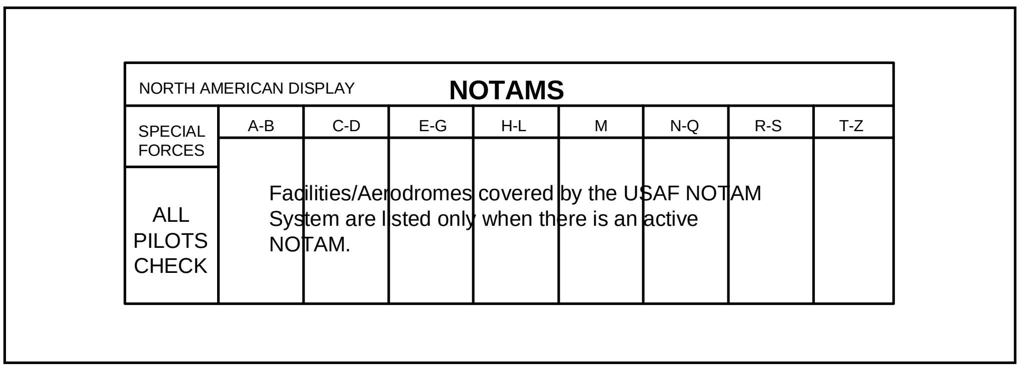
Special Notices

ECNs, TCNs, PCNs, and UCNs are the methods by which publications are actually revised between issues; however, pilots are kept current concerning new FLIP features, modification to the FLIP publications formats, proposed changes to FAA rules, major military training exercises, etc., by Special Notices. They are located on the inside front cover of the Planning Sections, supplements, and Flight Information Handbook.

Notices To Airmen (NOTAM)

Information limited to temporary conditions which may be hazardous to flight affecting navigational aids and terminal facilities is disseminated to pilots in a timely manner by teletype NOTAMs. There are two NOTAM systems - the DoD system and the FAA system.

1. DoD NOTAM System: covers USN, USMC, USAF, USCG, ANG, and most Army facilities, along with civil airports having an approved DoD Instrument Approach Procedure. These teletype notices will be displayed on a large white wall display in the flight planning area of Base Operations.



2. FAA NOTAM system: Covers FAA-operated facilities, that is, public use civil airports and some Army facilities. If your planned flight is to terminate at an airport not covered by the DoD system, request the dispatcher at Base Operations obtain the NOTAMs for you from a Flight Service Station (FSS).

   NOTE: The Dispatcher has a direct telephone line to the “TIE-IN” FSS serving that airport.

FLIP PLANNING

FLIP Planning is, by design, a publication medium for aeronautical information which has been operationally identified as not normally required for in-flight reference. As backup documents for en route and terminal operations, they contain a wide range of data with which you should be familiar. FLIP planning is used in flight planning areas for preparation of flights.

The scope of the planning documents is worldwide; however, not all sections are required for operations in any one theater. The planning publications for use in the United States are divided into four sections:

1. General Planning (GP)

2. Area Planning, North and South America (AP/1)

3. Area Planning, North and South America, Special Use Airspace (AP/1A)

4. Area Planning, North and South America, Military Training Routes (AP/1B)

NOTE: The appropriate FLIP Area Planning package for operations in other parts of the world can be determined from the reference map located on the back cover of each planning document.

NOTE: Changes within regularly scheduled issues of the planning publications are indicated by a vertical line in the left-hand column of the line/paragraph/section that has changed from the previous issue. Upon receipt of a new issue of a planning publication, these changes should be checked for new/changed information.

General Planning (GP)

General Planning (GP), Area Planning North and South America (AP/1), and FLIP (Enroute) Flight Information Handbook (FIH) form the rules and procedures for military pilots. Together, they are the equivalent of, and share much of the information from, the Aeronautical Information Manual (AIM) used by civil pilots. The GP section contains pertinent planning data and procedural information in support of its companion en route and terminal publications. Every effort is made to confine the content to those items of concern during the preflight planning phase, reducing the need for in-flight reference. You should take a copy of the GP section and follow through it while reading this section so as to be familiar with its contents.

Special Notices/FLIP Changes

Special Notices are located on the inside front cover as a convenient reference. Any significant changes to the DoD FLIP program will be amplified in this section.

Table Of Contents

The General Planning section is divided into chapters, with pages and major paragraphs numbered accordingly to provide easy reference.

Index For Aeronautical Information

Indicates the location by publication, or chapter in GP, of each subject of information in the FLIP program. Cross-references are provided to assist in the location of data.

Explanation of Terms

The Terms with their accompanying definitions are taken from the FAA Pilot/Controller Glossary, plus some ICAO and military terms. The source from which the term is taken is indicated.

FLIP Program

This chapter describes the DoD FLIP program, individual FLIP products, and related publications. Included is a chart indicating the availability of FLIP products by geographic area.

Flight Plans

Contains detailed instructions for completing all types of military and civil flight plans, including international flight plans.

Pilot Procedures

Contains standard pilot procedures while operating under both FAA and international (ICAO) rules. It is divided into preflight, departure, en route, and arrival phases of flight with some supplementary information. Contains an excellent section on the different NOTAM systems. <u>You should become thoroughly familiar with the contents of this section</u>. Periodically through the year you should review this section as a reminder of proper procedures.

International Civil Aviation Organization

The ICAO is an affiliate of the United Nations which establishes international rules and procedures for civil aviation. U.S. military pilots are expected to conform to these rules to the maximum extent practicable.

Operations and Firings Over The High Seas

Concerns procedures to be used by U.S. military aircraft conducting air operations or gunnery exercises within airspace over the high seas.

Aviation Weather Codes

Contains explanations of the Meteorological Aviation Report (METAR) codes used at all international stations including the U.S., Canada, Mexico, and Puerto Rico. Also contains an explanation of the Terminal Aerodrome Forecast (TAF) codes used at all U.S. and overseas stations. Some modifications have been made to the U.S. METAR and TAF to reflect the standard measuring system (i.e., feet, statute miles, etc.). See AIM (Chapter 7) for a full description.

Aircraft Codes

Identification codes for U.S. military aircraft.

LORAN/OMEGA Chart Coverage

Revisions/Quality Reports/Requisitions/Distribution/Schedules

A catchall chapter on how the FLIP system is kept current, how to obtain copies, and when to expect the next revision.

General Planning (GP) is published every 32 weeks with Planning Change Notices (PCNs) issued at the 16-week midpoint of the GP book cycle, and Urgent Change Notices (UCNs) issued as required.

North and South America Area Planning (AP/1)

AP/1 contains aeronautical data for North and South America and supplements the data in General Planning (GP), and select data in the en route supplements and Flight Information Handbook. You should take a copy of AP/1 and follow through it while reading this part of the unit.

AP/1 is revised every 24 weeks and is amended by two scheduled Planning Change Notices (PCNs) published 8 and 16 weeks after the effective date of AP/1. Since these PCNs are not cumulative, they must be retained until the new issue of the basic product is received.

Information applicable to the entire North and South American theater is published in Chapter 1. Information for each ICAO region in the theater is published in the subsequent chapters, using a separate chapter for each ICAO region. The remaining chapters provide miscellaneous data that is of interest to DoD aircrews.

The ICAO regional data is normally presented in three sections: A, B, and C. Section A contains supplementary data applicable to the entire ICAO region; Section B contains data for the Flight Information Regions (FIRs) and Upper Flight Information Regions (UIRs) within the ICAO region. Section C provides data for the nations with the ICAO regions. Occasionally, a Section D is added for other significant data. As we are primarily interested in U.S. procedures, turn to the United States section in Chapter 3.

Dimensional Units, Visual Flight Rules, Instrument Flight Rules, Altimeter Setting, Position Reporting, Vertical Separation

Each theater, ICAO region, FIR/UIR, and national listing always include these six entries. They may indicate “Standard” if they comply with ICAO standards.

Flight Planning

Has information on Quota Flow Control used primarily by the airlines to avoid excessive holding at their destination. This has an excellent section on United States Controlled Airspace including a complete list of all Class B and Class C areas, and pilot/equipment requirements for operations in that airspace.

Flight Hazards

Listed by state and areas within the state.

Route and Area Restrictions

Listed by state and/or area. Flight hazards and route and area restrictions are not found elsewhere in the FLIP system.

Supplementary Airport Remarks

Listed alphabetically by airport name as in the en route supplements. As the name implies, this contains supplementary information of a semipermanent nature too lengthy to be contained in the IFR or VFR Enroute Supplements.

Prior to any cross-country flight and before checking the NOTAM box on the DD-175, Flight Hazards, Route and Area Restrictions, and Supplementary Airport Remarks should be consulted.

Preferred IFR Routes

A system of preferred routes has been established to guide pilots in planning their route of flight, to minimize route changes during the operational phase of flight, and to aid in the efficient orderly management of air traffic, using federal airways. The preferred IFR routes are designed to serve the needs of airspace users and to provide for a systematic flow of air traffic in the major terminal and en route environments. Cooperation by all pilots in filing preferred routes will result in fewer traffic delays and will better provide for efficient departure, en route, and arrival air traffic service.

The preferred routes are divided into low and high altitude structures (the division, of course, is 18,000 ft). The high altitude list shows terminal to terminal routes; on some high altitude routes, low altitude airways are included as transitional routes.

VOR Receiver Checkpoints

A listing of facilities that are available for operational checks of airborne VOR equipment. Military bases normally designate a specific ground point for checking the accuracy of aircraft TACAN receivers. The tolerances for the ground check are similar to VOR within plus or minus 4 degrees of the designated radial and within one-half mile or 3 percent of the distance to the facility, whichever is greater. See GP paragraph 5-44 for additional information.

Chapter 4, Caribbean (CAR) Region

Chapter 5, South American (SAM) Region

Chapter 6, Air Defense Identification Zones

Those areas in North and South America that require pre-filing in order to enter, and strict compliance to entry and exit positioning.

NOTE: On the back cover, Boundaries of DoD Flight Information Planning

AREA PLANNING AP/1A SPECIAL USE AIRSPACE NORTH AND SOUTH AMERICA

AP/1A contains a listing of all prohibited, restricted, danger, warning, and alert areas listed by country. Military operations and known parachute jumping areas are also listed.

AP/1A is published every 48 weeks with PCNs at the 16- and 32-week intervals. UCNs are published as required.

This section is published primarily for preflight planning and much of the same information can be found in an abbreviated form on the FLIP en route charts.

AREA PLANNING AP/1B MILITARY PLANNING ROUTES NORTH AND SOUTH AMERICA

AP/1B contains information relative to military routes, including IFR Military Training Routes (IR), VFR Military Training Routes (VR), Slow-Speed, Low-Altitude Training Routes (SR), Refueling Tracks/Anchors/ VFR Helicopter Refueling Tracks (AR), and Avoidance Locations. Charts (8 charts on 4 sheets) containing graphic depictions of the IR, VR, SR, and AR route systems throughout the continental United States and Alaska are also included.

This information is unique to the United States and will only be found in the North and South America Planning package.

AP/1B is published every 8 weeks.

Again, GP, AP/1, AP/1A, and AP/1B comprise the planning documents and are used for reference but not normally carried in tactical aircraft. Now let us look at those documents that should be carried at all times or on all IFR flights.

FLIP (ENROUTE) FLIGHT INFORMATION HANDBOOK

This handbook contains aeronautical information required by DoD aircrews in flight, but which is not subject to frequent change. The handbook is designed for worldwide use in conjunction with DoD FLIP enroute supplements. Publication cycle is every 32 weeks, and if necessary, amended by Urgent Change Notices (UCNs) or NOTAMs.

Section A, Emergency Procedures

Contains both U.S. (FAA) and ICAO procedures. Need to check subheadings to ensure which procedure is being discussed. This section contains two-way radio failure procedures to follow, what to do if lost, if intercepted, and hand signals that can be used. Aircraft witnessing distress, body and paulin signals that can be used to signal aircraft from the ground are also found here.

Section B, National and International Flight Data and Procedures

This section supplements and complements the information found in GP, Chapter 5. Discussion of FAA air/ground communications, transponder codes, position reporting procedures as well as proper procedures for initial call up. Includes a partial listing of mandatory voice calls. Explains the use of Runway Condition Readings (RCRs). Shows graphic display of the Approach Lighting Systems in use, as well as Visual Glideslope Indication systems (VASI).

Section C, Meteorological Information

First part deals with procedures to follow and phone numbers to call (both commercial and autovon) for military pilots departing a location where military weather and NOTAM services are not available. Four maps are provided indicating the location and frequencies of METRO stations as well as which ones have weather RADAR. Information is provided on the FAA Weather Information Services available as well as airborne services. Pilot Weather Reports (PIREPs) format as well as turbulence and icing tables are provided.

Section D, Conversion Tables

Useful tables such as Fahrenheit/centigrade, barometric settings in inches vs. millibars, statute to nautical miles, etc.

Section E, Standard Time Signals

Autovon phone numbers for standard time signals, time zones of the world.

Section F, FLIP and NOTAM Abbreviations/Code

The listing provides a ready reference of abbreviations used in the flight information publications (FLIPs) and the DoD NOTAM system. Codes, e.g., POL, Lighting, and JASU, are listed elsewhere in the supplement legends. The abbreviations presented are intended to represent grammatical variations of the basic form. (Example - “trans” may mean ”transmit,” “transmitting,” "transmitted,” or ”transmits.”) This listing is the most complete in the FLIP system.

The ICAO NOTAM code is published to enable the coding of information regarding the establishment, condition or change of radio aids, aerodromes and lighting facilities, dangers to aircraft in flight, or search and rescue facilities. Encoding facilitates the dissemination of NOTAMs by reducing the transmission time over telecommunication channels and eliminating translation.

All NOTAM code groups contain a total of five letters. The first letter of the code group is always the letter Q to indicate that it is a code abbreviation for use in the composition of a NOTAM. The letter Q has been chosen to avoid conflict with any assigned radio call sign.

Back Cover, Interception Signals

If you are intercepted by U.S. or foreign aircraft [usually in, or near the edges of an Air Defense Identification Zone (ADIZ) or border], a series of standard signals to be used by the interceptor and intercepted aircraft have been devised, in case radio contact cannot be made.

FLIP (ENROUTE) SUPPLEMENTS

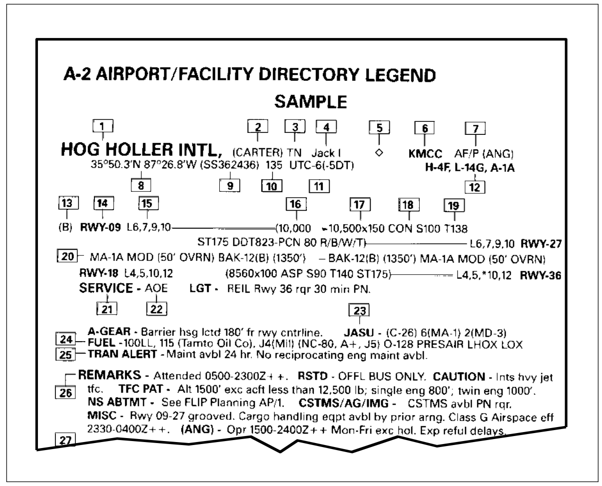
The FLIP (Enroute) Supplements consist of two books, divided, to provide separate IFR and VFR directories. Together, they form a complete directory of all airports available to military aircraft. The text on the front cover is printed in blue for the IFR Supplement and in brown for the VFR Supplement. This color code corresponds to that used for VFR and IFR aerodrome symbols on the Enroute High and Low Altitude Charts. The VFR Supplement is published every 24 weeks and the IFR Supplement is published every 8 weeks. (The effective date and time is always on a Thursday, at 0901Z so you have the effective issue for your weekend cross-country.)

You will be primarily concerned with the IFR Supplement; however, the VFR Supplement will be useful when planning emergency diverts for low-level ONav flights. The IFR Supplement is designed for preflight and in-flight reference and a current issue should be aboard your aircraft for every flight.

FLIP (Enroute) IFR Supplement

Section A: Airport/Facility Directory Legend

Beginning with a fictitious airport entry on page A-2 which contains typical airport data, the legend consists of several pages (starting on page A-4). The fictitious airport data has reference numbers, and the several pages of legend contain explanations of this referenced data.



All entries use the basic parameters as listed on page A-3.

Of particular note is the indication that "Low Altitude" (below 18,000 ft) frequencies are shown in light type and "High Altitude" frequencies are in bold type. Discrete frequencies, those that are not continuously monitored, are preceded by the small "d."

AIRPORT / FACILITY DIRECTORY LEGEND A-3

LEGEND

1. The following detailed legend is provided to assist users in becoming familiar with the format used in the Airport/Facility Directory. Information which is self-explanatory will not be covered in this legend.

a. All bearings, radials, courses, and tracks are magnetic.

b. All mileages are nautical miles (NM).

c. All times are Coordinated Universal Time (UTC).

d. All elevations are in feet above/below Mean Sea Level (MSL).

2. Section B contains an alphabetical listing of all: Airports (landplane and heliports) which meet one of the below listed criteria; Air Traffic Control Centers; Flight Information Centers; Communications Stations; and Radio Aids to Navigation.

a. Selection criteria for Airports and Facilities (must have at least one):

(1) A published DOD (High/Low Altitude) Instrument Approach Procedure and/or ASR/PAR RADAR approach minima.

(2) All airports located within Canada and Mexico which are portrayed on U.S. Enroute Charts for emergency use.

(3) Selected airports and heliports not meeting the above criteria when specifically requested by a U.S. military service.

Section B: Airport/Facility Directory

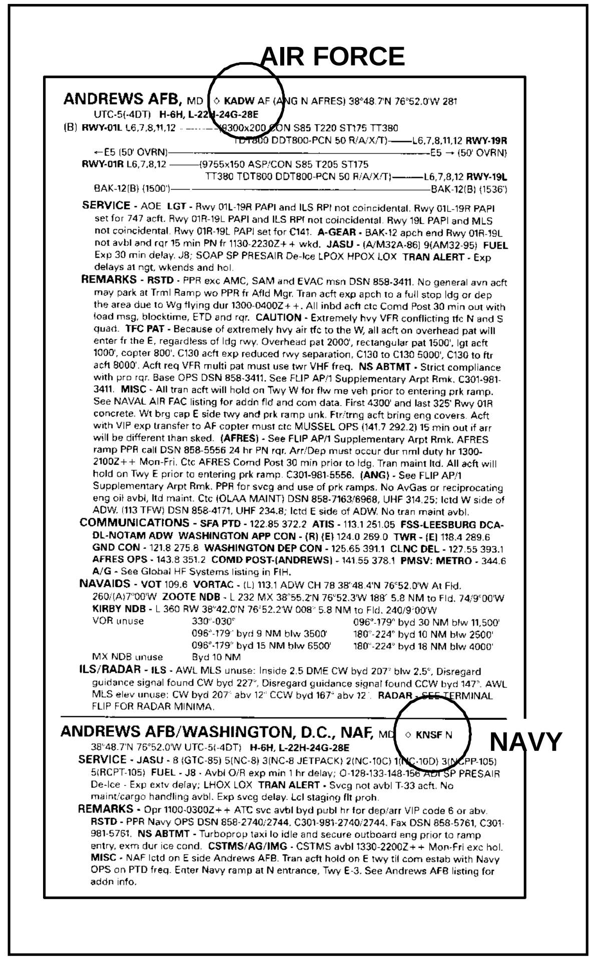
The directory contains an alphabetical listing of airports, Air Route Traffic Control Centers, NAVAIDs, and Flight Service Stations. There are certain entries with which you should be thoroughly familiar and warrant a review.

The section begins with a City/Airport Cross-Reference. As the listing of airports is by airport name, this listing provides a cross-reference when the city name is not part of the airport name.

Location Identifier - Airports and NAVAIDs have a 3-letter FAA location identifier or 4-letter ICAO location identifier. These are used for flight plans, charts, and clearances. When flying within the United States on a military flight plan, do not use the first letter of an ICAO identifier. This identifies the country, i.e., "K" for the United States.

NOTE: METAR weather codes will use the "K" identifier.

CAUTION: Joint use airports such as ATLANTA NAS and WASHINGTON NAF will have an identifier for the Air Force or civilian side of the airport and a separate identifier for the Navy side of the airport.



ANDREWS AFB, MD ◇ **KADW** AF (ANG N AFRES) 38°48.7'N 76°52.0'W 281
UTC-5(-4DT) **H-6H, L-22H-24G-28E**
(B) **RWY-01L** L6,7,8,11,12 —(9300x200 CON S85 T220 ST175 TT380 TDT800 DDT800-PCN 50 R/A/X/T)—L6,7,8,11,12 **RWY-19R**
←E5 (50' OVRN)—E5 → (50' OVRN)
RWY-01R L6,7,8,12 —(9755x150 ASP/CON S85 T205 ST175 TT380 TDT800 DDT800-PCN 50 R/A/X/T)—L6,7,8,12 **RWY-19L**
BAK-12(B) (1500')—BAK-12(B) (1536')

SERVICE - AOE **LGT** - Rwy 01L-19R PAPI and ILS RPI not coincidental. Rwy 01L-19R PAPI set for 747 acft. Rwy 01R-19L PAPI and ILS RPI not coincidental. Rwy 19L PAPI and MLS not coincidental. Rwy 01R-19L PAPI set for C141. **A-GEAR** - BAK-12 apch end Rwy 01R-19L not avbl and rqr 15 min PN fr 1130-2230Z++ wkd. **JASU** - (A/M32A-86) 9(AM32-95) **FUEL** Exp 30 min delay. J8; SOAP SP PRESAIR De-Ice LPOX HPOX LOX **TRAN ALERT** - Exp delays at ngt, wkends and hol.

REMARKS - **RSTD** - PPR exc AMC, SAM and EVAC msn DSN 858-3411. No general avn acft may park at Trml Ramp wo PPR fr Afld Mgr. Tran acft exp apch to a full stop ldg or dep the area due to Wg flying dur 1300-0400Z++. All inbd acft ctc Comd Post 30 min out with load msg, blocktime, ETD and rqr. **CAUTION** - Extremely hvy VFR conflicting tfc N and S quad. **TFC PAT** - Because of extremely hvy air tfc to the W, all acft on overhead pat will enter fr the E, regardless of ldg rwy. Overhead pat 2000', rectangular pat 1500', lgt acft 1000', copter 800'. C130 acft exp reduced rwy separation. C130 to C130 5000', C130 to ftr acft 8000'. Acft req VFR multi pat must use twr VHF freq. **NS ABTMT** - Strict compliance with pro rqr. Base OPS DSN 858-3411. See FLIP AP/1 Supplementary Arpt Rmk. C301-981-3411. **MISC** - All tran acft will hold on Twy W for flw me veh prior to entering prk ramp. See NAVAL AIR FAC listing for addn fld and com data. First 4300' and last 325' Rwy 01R concrete. Wt brg cap E side twy and prk ramp unk. Ftr/trng acft bring eng covers. Acft with VIP exp transfer to AF copter must ctc MUSSEL OPS (141.7 292.2) 15 min out if arr will be different than sked. **(AFRES)** - See FLIP AP/1 Supplementary Arpt Rmk. AFRES ramp PPR call DSN 858-5556 24 hr PN rqr. Arr/Dep must occur dur nml duty hr 1300-2100Z++ Mon-Fri. Ctc AFRES Comd Post 30 min prior to ldg. Tran maint ltd. All acft will hold on Twy E prior to entering prk ramp. C301-981-5556. **(ANG)** - See FLIP AP/1 Supplementary Arpt Rmk. PPR for svcg and use of prk ramps. No AvGas or reciprocating eng oil avbl, ltd maint. Ctc (OLAA MAINT) DSN 858-7163/6968, UHF 314.25; lctd W side of ADW. (113 TFW) DSN 858-4171, UHF 234.8; lctd E side of ADW. No tran maint avbl.

COMMUNICATIONS - **SFA PTD** - 122.85 372.2 **ATIS** - 113.1 251.05 **FSS-LEESBURG DCA-DL-NOTAM ADW WASHINGTON APP CON** - **(R) (E)** 124.0 269.0 **TWR** - **(E)** 118.4 289.6 **GND CON** - 121.8 275.8 **WASHINGTON DEP CON** - 125.65 391.1 **CLNC DEL** - 127.55 393.1 **AFRES OPS** - 143.8 351.2 **COMD POST-(ANDREWS)** - 141.55 378.1 **PMSV: METRO** - 344.6 **A/G** - See Global HF Systems listing in FIH.

NAVAIDS - **VOT** 109.6 **VORTAC** - (L) 113.1 ADW CH 78 38°48.4'N 76°52.0'W At Fld. 260/(A)7°00'W **ZOOTE NDB** - L 232 MX 38°55.2'N 76°52.3'W 188° 5.8 NM to Fld. 74/9°00'W **KIRBY NDB** - L 360 RW 38°42.0'N 76°52.2'W 008° 5.8 NM to Fld. 240/9°00'W

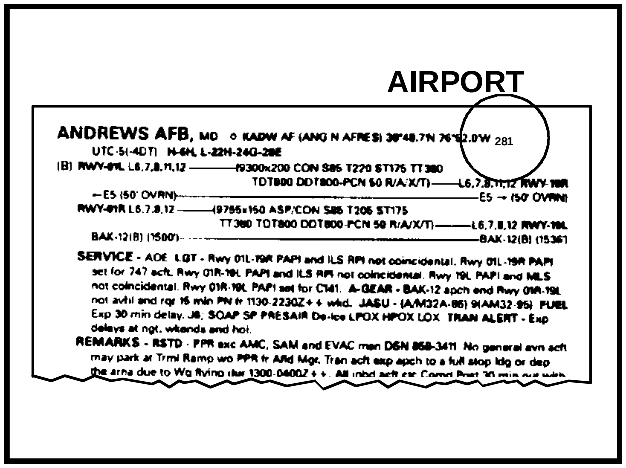
VOR unuse	330°-030°	096°-179° byd 30 NM blw 11,500'
	096°-179° byd 9 NM blw 3500'	180°-224° byd 10 NM blw 2500'
	096°-179° byd 15 NM blw 6500'	180°-224° byd 18 NM blw 4000'
MX NDB unuse	Byd 10 NM	

ILS/RADAR - **ILS** - AWL MLS unuse: Inside 2.5 DME CW byd 207° blw 2.5°, Disregard guidance signal found CW byd 227°, Disregard guidance signal found CCW byd 147°. AWL MLS elev unuse: CW byd 207° abv 12° CCW byd 167° abv 12°. **RADAR** - SEE TERMINAL FLIP FOR RADAR MINIMA.

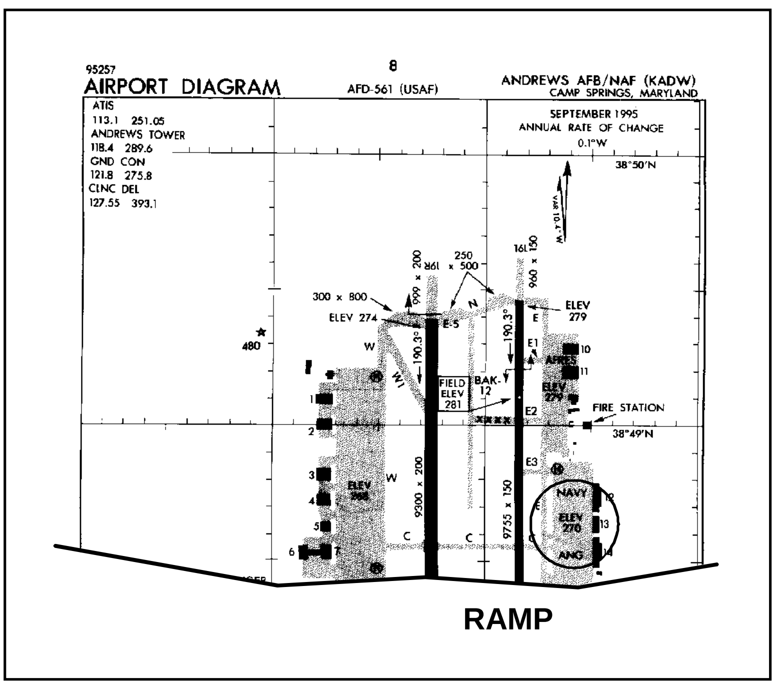
ANDREWS AFB/WASHINGTON, D.C., NAF, MD ◇ **KNSF** N
38°48.7'N 76°52.0'W UTC-5(-4DT) **H-6H, L-22H-24G-28E**

SERVICE - **JASU** - 8 (GTC-85) 5(NC-8) 3(NC-8 JETPACK) 2(NC-10C) 1(NC-10D) 3(NCPP-105) 5(RCPT-105) **FUEL** - **J8** - Avbl O/R exp min 1 hr delay; O-128-133-148-156 ADI SP PRESAIR De-Ice - Exp extv delay; LHOX LOX **TRAN ALERT** - Svcg not avbl T-33 acft. No maint/cargo handling avbl. Exp svcg delay. Lcl staging flt proh.

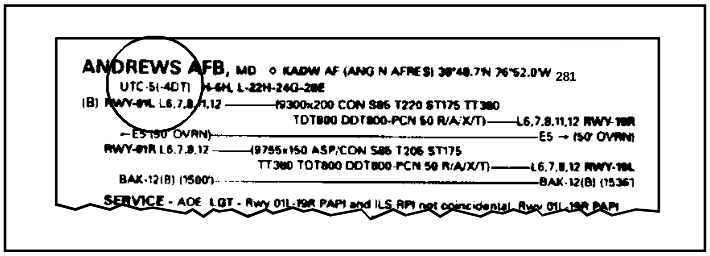
REMARKS - Opr 1100-0300Z++ ATC svc avbl byd publ hr for dep/arr VIP code 6 or abv. **RSTD** - PPR Navy OPS DSN 858-2740/2744, C301-981-2740/2744. Fax DSN 858-5761, C301-981-5761. **NS ABTMT** - Turboprop taxi lo idle and secure outboard eng prior to ramp entry, exm dur ice cond. **CSTMS/AG/IMG** - CSTMS avbl 1330-2200Z++ Mon-Fri exc hol. **MISC** - NAF lctd on E side Andrews AFB. Tran acft hold on E twy til com estab with Navy OPS on PTD freq. Enter Navy ramp at N entrance, Twy E-3. See Andrews AFB listing for addn info.



<u>Airport Elevation</u> - Airport elevation is the highest elevation on any usable landing surface of the airport. When determining if your altimeter is within operational limits of +/- 75 ft, you should use the ramp elevation off the airport diagram in the FLIP (Terminal) Instrument Approach Procedures booklet.

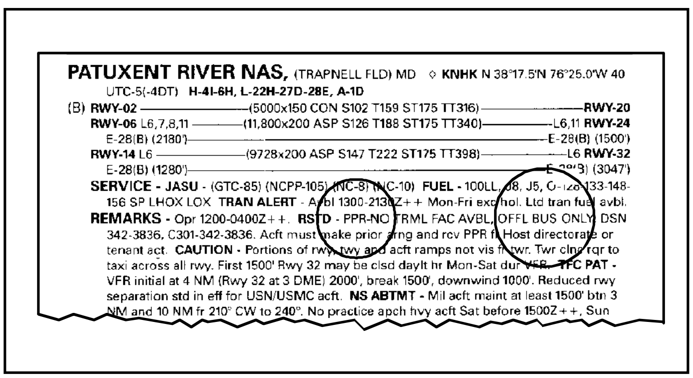


"Z" Time - The Estimated Time of Departure (ETD) entered on the flight plan (DD form 175) is in Universal Coordinated Time (UTC), or "Z" time. This "Z" time is determined by using either local Standard Time or local Daylight Saving Time. Daylight Saving Time is in effect from 0200 local time the first Sunday in April to 0200 local time the last Sunday in October.


ANDREWS AFB, MD ◇ KADW AF (ANG N AFRES) 38°48.7'N 76°52.0'W 281
UTC-5(-4DT) H-6H, L-22H-24G-28E
(B) RWY-01L L6,7,8,11,12 ——— (9300x200 CON S85 T220 ST175 TT380 TDT800 DDT800-PCN 50 R/A/X/T) ——— L6,7,8,11,12 RWY-19R
← E5 (50' OVRN) ——— E5 → (50' OVRN)
RWY-01R L6,7,8,12 ——— (9755x150 ASP/CON S85 T205 ST175 TT380 TDT800 DDT800-PCN 50 R/A/X/T) ——— L6,7,8,12 RWY-19L
BAK-12(B) (1500') ——— BAK-12(B) (1536')
SERVICE - AOE LGT - Rwy 01L-19R PAPI and ILS RPI not coincidental. Rwy 01L-19R PAPI

NOTE: A ++ symbol following published operating hours indicates a facility or service is in effect 1 hour earlier during periods of Daylight Saving Time.

Airport Restrictions - Among other things, airport restrictions may include:


PATUXENT RIVER NAS, (TRAPNELL FLD) MD ◇ KNHK N 38°17.5'N 76°25.0'W 40
UTC-5(-4DT) H-4I-6H, L-22H-27D-28E, A-1D
(B) RWY-02 ——— (5000x150 CON S102 T159 ST175 TT316) ——— RWY-20
RWY-06 L6,7,8,11 ——— (11,800x200 ASP S126 T188 ST175 TT340) ——— L6,11 RWY-24
E-28(B) (2180') ——— E-28(B) (1500')
RWY-14 L6 ——— (9728x200 ASP S147 T222 ST175 TT398) ——— L6 RWY-32
E-28(B) (1280') ——— E-28(B) (3047')
SERVICE - JASU - (GTC-85) (NCPP-105) (NC-8) (NC-10) FUEL - 100LL, J8, J5, O-128-133-148-156 SP LHOX LOX TRAN ALERT - Avbl 1300-2130Z++ Mon-Fri exc hol. Ltd tran fuel avbl.
REMARKS - Opr 1200-0400Z++. RSTD - PPR-NO TRML FAC AVBL, OFFL BUS ONLY. DSN 342-3836, C301-342-3836. Acft must make prior arng and rcv PPR fr Host directorate or tenant act. CAUTION - Portions of rwy, twy and acft ramps not vis fr twr. Twr clnc rqr to taxi across all rwy. First 1500' Rwy 32 may be clsd daylt hr Mon-Sat dur VFR. TFC PAT - VFR initial at 4 NM (Rwy 32 at 3 DME) 2000', break 1500', downwind 1000'. Reduced rwy separation std in eff for USN/USMC acft. NS ABTMT - Mil acft maint at least 1500' btn 3 NM and 10 NM fr 210° CW to 240°. No practice apch hvy acft Sat before 1500Z++, Sun

1. Prior Permission Required (PPR): To use this airport, you must call Base Operations on the autovon number listed, give your ETA, type of aircraft, name, and business to obtain a PPR number. In the "REMARKS" section of your flight plan (DD-175), enter the airport location identifier and the PPR number assigned to your aircraft. Without other restrictions, a PPR airport can be used as a fuel stop if you obtain a PPR number.

2. Official Business Only (OFFL BUS ONLY): This airport is closed to all military transient aircraft and cannot be used as a fuel stop. You must be going to the airport specifically to contact a person or group of persons on official government business. A cross-country flight requiring a fuel stop is not official business.

   USAF personnel require written orders to use these airports; however, Navy personnel do not.

EXCEPTIONS: OFFL BUS ONLY and PPR airports <u>can</u> be used anytime:

1. In an emergency; or

2. As a weather alternate on the DD-175

A PPR number is not required when listing the airport as a weather alternate.

<u>Communications</u> **-** Single Frequency Approach (SFA): A service provided to single-piloted jet aircraft at night or in instrument conditions which allows the use of a single UHF frequency throughout the approach to landing.

NOTE: For purposes of providing this service, ATC treats any tandem-seated aircraft as if it was single-piloted.

Pilot To Dispatcher: The dispatcher is located in the flight clearance center of Base Operations and is available to file or amend flight plans with ATC and can handle routine non-control communications with pilots. The call sign at Air Force installations is “OPERATIONS,” and the call sign at Naval Air Stations is “BASE OPS.”

EXAMPLES:
Andrews Operations
Navy Washington Base OPS

GRISSOM ARB, IN ◇ **KGUS** AFRES 40°38.9'N 86°09.1'W 812 UTC-5 **H-3H-4H, L-23B**
(B) **RWY-05** L6,7,8,9 ——(12,500x200 ASP S100 T200 ST175
TT450-PCN 100 R/D/X/T)——L6,7,8,9 **RWY-23**
SERVICE - LGT - Rwy 05-23 VASI RRP and ILS RPI not coincident. ACTIVATE-HIRL Rwy 05-23 133.7. **JASU -** (A/M32A-86) (MD-3) (AM32-95) (MA-1A) **FUEL -** J8, O-133-148-156 JOAP SP PRESAIR LPOX **TRAN ALERT -** Opr 1330-2130Z. No priority basis. Fuel not avbl wkend or hol.
REMARKS - Opr 1200-0400Z. **RSTD -** PPR 2130-1330Z, ctc Base OPS DSN 928-2254, C317-688-2254. All inbd PAX/cargo acft must ctc Comd Post no later than 30 min prior to ldg. **MISC -** See FLIP AP/1 Supplementary Arpt Rmk. Wx sec DSN 928-2203. Class G Airspace eff 0400-1200Z.
COMMUNICATIONS - SFA PTD - 372.2 **ATIS -** 271.8 **FSS TERRE HAUTE HUF-NOTAM HUF APP CON - (R) -** Opr 1200-0400Z dly, OT ctc CHICAGO CENTER 120.0 VFR svc. **(E)** 121.05 363.8 **TWR - (E)** 133.7 295.7 **GND CON -** 139.9 275.8 **DEP CON -** After 0400Z ctc CHICAGO CENTER 120.0. - 121.05 351.1 **CLNC DEL -** 324.3 **434 ARW COMD POST -** Call BRICKYARD, fone patch on 321.0 252.1 **PMSV: METRO -** 344.6
NAVAIDS - VORTACW - (T) 116.5 GUS CH 112 40°38.7'N 86°09.1'W At Fld. 810/(A)2°00'W No-NOTAM MP: VORTAC 1300-1500Z Tue. Unmto 0400-1200Z. **VHF/DF**
VORTAC unuse 195°-220° byd 15 NM
ILS/RADAR - ILS - No-NOTAM MP: Rwy 05-23 1100-1500Z Thu. **RADAR -** SEE TERMINAL FLIP FOR RADAR MINIMA.

Automatic Terminal Information Service (ATIS): The continuous broadcast of routine, but essential, non-control information, such as weather, altimeter, runway in use, etc. Absence of a ceiling and visibility indicates that weather of 5,000 ft ceiling and 5-mile visibility or better exists. The primary purpose of ATIS is to reduce frequency congestion on Ground Control and Approach Control frequencies.

DYESS AFB, TX ◇ **KDYS** AF 32°25.2'N 99°51.4'W 1789 UTC-6(-5DT) **H-2E-5B, L-13B-15C**
(B) **RWY-16** L6,7,8,12———(13,500x300 ASP/CON S155 T250 ST175 TT500-PCN 72 R/C/X/T)———L6,7,8,9 **RWY-34**
RWY-161 ———(3500x60 ASP AUW155/C130)———**RWY-341**
SERVICE - JASU - 1(MD-3) 1(MA-1A) 1(M32A-60A) 1(M32-86A) **FUEL** - J8, O-133-148-156 SOAP W SP PRESAIR LPOX LOX HPOX **TRAN ALERT** - Opr 1300-0500Z++.
REMARKS - RSTD - Exp termination of practice apch dur peak periods. Dur lcl trng, tran acft may be ltd to one full stop ldg DSN 461-2523. Use of assault strip rqr prior coord with Comd Post DSN 461-1970 or TACTICS DSN 461-2794. See FLIP AP/1 Supplementary Arpt Rmk. Inbd acft with distinguished visitor code 6 or abv ctc Base OPS 20 min prior to arr. **CAUTION** - Ints trng and formation flt of hvy acft in the immed vcnty. Extv VFR assault strip tfc W of Rwy 16-34. Ruf pavement on both ends of Rwy 16-34 may cause oscillations dur tkof and ldg rolls for acft with tricycle type ldg gear (i.e., B1, T38, KC135). **TFC PAT** - Rectangular 3000', overhead 3500'. **CSTMS/AG/IMG** - CSTMS avbl, ctc Base OPS 24 hr in advance DSN 461-2515/2258. **MISC** - First 1500' Rwy 16-34 non-grooved, middle 10,500' grooved 75' width. No tran launches/recoveries trns dur base acft surges. See FLIP AP/1 Supplementary Arpt Rmk. Base OPS DSN 461-2515/2258.
COMMUNICATIONS - SFA PTD - 372.2 **ATIS** - Opr 1200-0600Z++ Mon-Fri. 385.7 **FSS-FORT WORTH FTW-NOTAM FTW ABILENE APP/DEP CON - (R)** Class C Airspace (124.1 338.3 E) (126.5 322.3 W) **(E)** 121.3 **TWR - (E)** 133.0 295.7 236.6 **GND CON** - 119.35 275.8 **ACC COMD POST (RAYMOND 37)** - 311.0 321.0 349.4 **PMSV: METRO** - 344.6 (Call NOAH)
NAVAIDS - ... 32°25.1'N 99°51.4'W At Fld. 1782/(A)8°00'E No-NOTAM ... (H) 113.7 ABI CH 84 32°28.9'N ...

NOTE: The pilot statement "Have the Numbers" does not indicate receipt of ATIS. Inform Ground Control for taxi or Approach Control on arrival you have "Information Alpha, Bravo, etc." from the ATIS broadcast.

Tie-In Flight Service Station: A Tie-In Flight Service Station is tied-in by direct telephone line (DL) to the Base Operations Dispatcher. It provides services to the airport such as relaying flight plans to ARTCC, relaying clearances back to the airport, providing NOTAM services, etc. It may or may not be located at the airport. All Flight Service Stations monitor 255.4 and UHF/VHF guard frequencies; the call sign is "RADIO."

EXAMPLE: San Angelo Radio

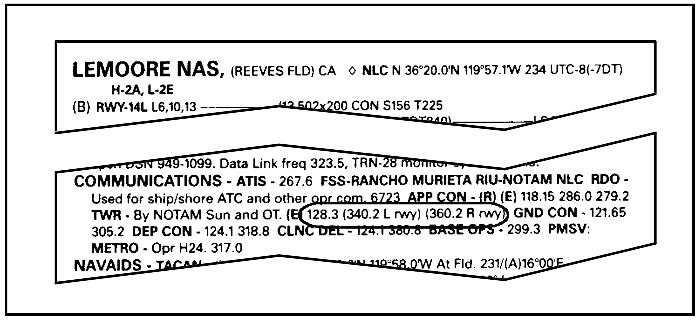
Approach Control: Approach Control facilities and their related function of Departure Control are responsible for coordinating with Air Route Traffic Control Centers and Airport Traffic Control Towers for the control of IFR traffic between the en route structure and the airport. Absence of a separate name indicates the same name as the airport. If not under ATC control, contact Approach Control on the designated frequency for practice approaches, Special VFR, etc.

In some high density areas, specific Approach Control frequencies will be footnoted for use according to the geographical sector in which your aircraft is located, not according to heading.

MERIDIAN NAS, (MC CAIN FLD) MS ◇ **KNMM** N 32°33.1'N 88°33.3'W 317 UTC-6(-5DT) **H-4H-5D, L-18E**
(B) **RWY-01L** L6,7,8,11 ———(8002x200 CON S173 T300 ST175 TT525)———L6,11 **RWY-19R**
←E5-1 (20' OVRN) E-28(B) (1750')———E-28(B) (1250') E5-1→ (20' OVRN)
RWY-01R L6,11 ———(8002x200 CON S147 T255 ST175 TT445)———L6,7,8,11 **RWY-19L**
←E5-1 (20' OVRN) E-28(B) (1250')———E-28(B) (1750') E5-1→ (20' OVRN)
RWY-10 L4 ———(6401x200 CON S47 T78 ST99 TT228)———L4 **RWY-28**
←E5-1 (20' OVRN) E-28(B) (1250')———E-28(B) (1250')
SERVICE - LGT - Portable OLS avbl Rwy 01L/R, 19L/R and 28. **A-GEAR** - E5-1 RATING-01L, 28-475 HW (DRY), 01R-410 HW (DRY), 19L-630 STD (DRY), 19R-425 STD (DRY). **JASU** - 2(NC-8A) (GTC-85) 1(NCPP-105) **FUEL** - Exp 1 hr reful delays. J5 O-156 SP LOX **TRAN ALERT** - Svc avbl 1300-0500Z++ Mon-Fri. Drag chute repack unavbl.
REMARKS - Opr 1300-0500Z++ Mon-Fri; clsd Sat, Sun and hol. **RSTD** - PPR all tran and NALO Msn ODO DSN 637-2470, C601-679-2470. PPR civ acft OFFL BUS. **CAUTION** - Rwy 19L, 19R have 1 percent down grad first 6000'. Wildlife in vcnty all rwy. Mat and twy S of hgr not vis fr twr. Ints stu jet trng dur fld opr hr. **TFC PAT** - Jet break 1400', pat alt 900'. Tran acft exp visual apch when wx 1900-3 SM or abv. Hi alt apch not nml avbl when Meridian-1 West active. VFR acft ctc Meridian APP CON within 25 NM. **MISC** - Ramp elev 283'. Exp arr/dep delay dur stu flying periods. Class G Airspace eff 0500-1300Z++ Mon-Fri exc hol.
COMMUNICATIONS - SFA ATIS - 273.2 **FSS-GREENWOOD GWO-NOTAM NMM APP CON - (R)** Opr 1300-0500Z++. **(E)** (119.2 374.9 E) (120.5 269.6 S) (120.95 276.4 W) (314.8 N) **MC CAIN TWR - (E)** 126.2 (340.2 L Rwy and Rwy 28) (360.2 R Rwy and Rwy 10) **MC CAIN GND CON** - 336.4 **DEP CON** - Opr 1300-0500Z++. (124.8 S) (343.7 E) **BASE OPS** - 352.2 **CLNC DEL** - 301.0 **PMSV: METRO** - PMSV avbl 1200-0500Z++. 312.4
NAVAIDS - TACAN - (L) NMM CH 56 32°34.7'N 88°32.7'W At Fld. 310/(A)1°00'E Opr dur fld opr hr only.
TACAN unrel 010°-085° byd 21 NM blw 3000'
ILS/RADAR - RADAR - SEE TERMINAL FLIP FOR RADAR MINIMA.

Airport Traffic Control Tower: At controlled airports, the tower has control responsibilities for traffic in its area. It coordinates with Approach/Departure Control for the safe and efficient flow of traffic into and out of that airspace area. Do not taxi onto or across an active runway without tower approval.

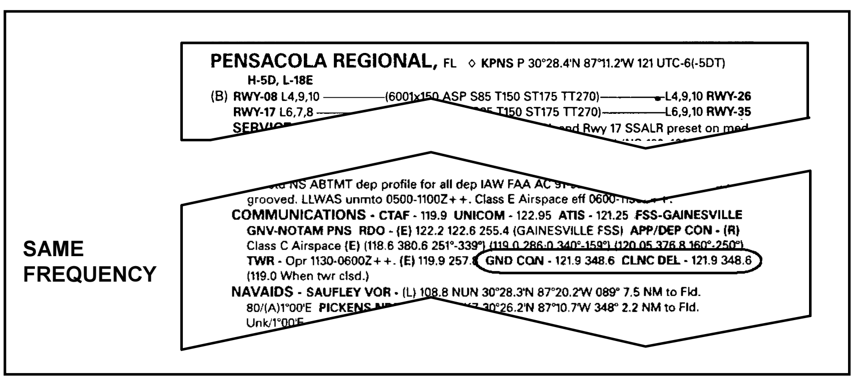
NOTE: At some airports, the tower frequencies may be footnoted for a special use such as for arrival or departure, or for use on a specific runway.



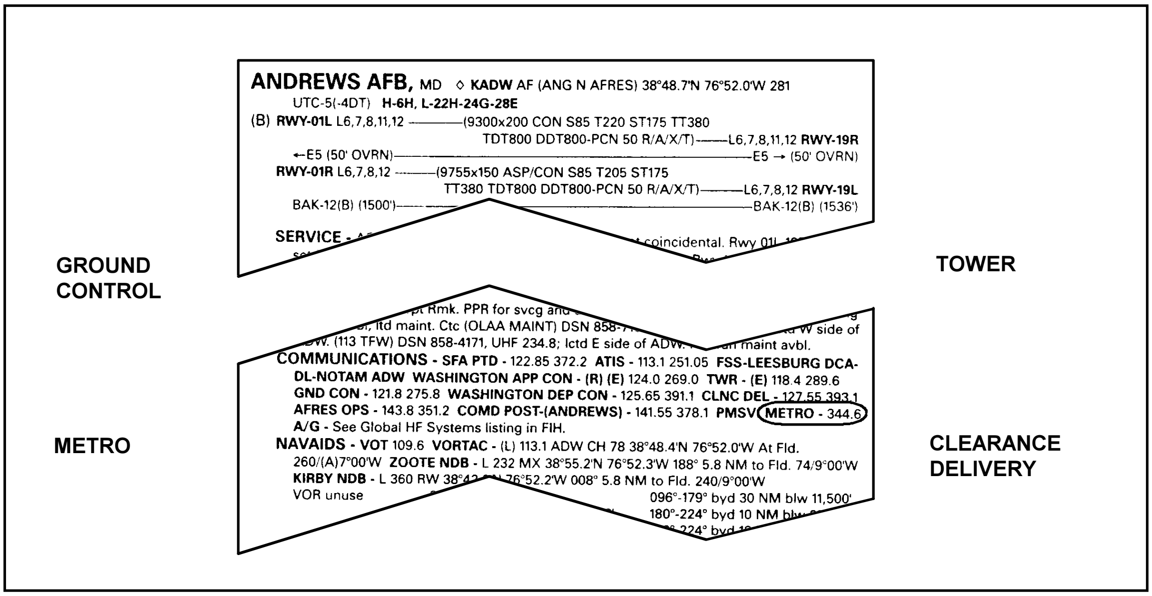
Ground Control: A control branch of the tower responsible for control of all traffic on the ground as the airport except on the active runway.

Clearance Delivery: A special non-control branch of the Tower set up to relay clearances to pilots. Its primary purpose is to relieve frequency congestion on Tower and Ground control frequencies. If available, it is the primary frequency for requesting your IFR clearance. If not available, use Ground Control to request your clearance.

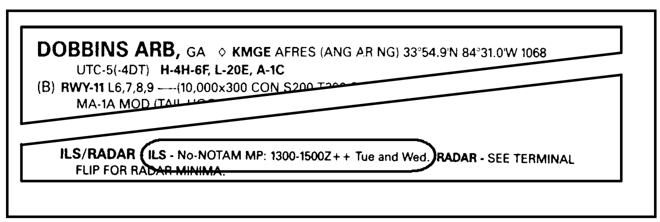
NOTE: Some airports may use the same frequency for both Ground Control and Clearance delivery; however, when calling for your clearance, call "—Clearance Delivery" to ensure the right personnel obtain your clearance.



Pilot-to-Forecaster: In the Weather Service Office at Base Operations, the forecaster has a radio. When flying in the local area, you can keep up with changes in weather conditions, obtain extensions to your IFR weather briefing (DD-175-1) void time, provide PIREPs, and various other services by calling the forecaster. The call sign is "METRO."

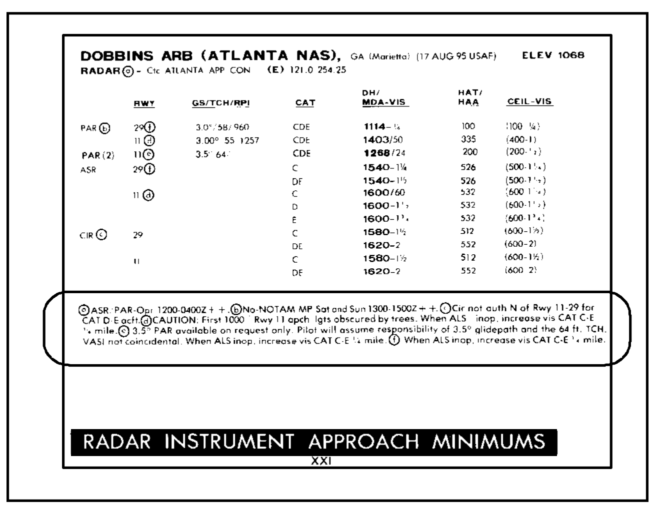


No NOTAM Preventative Maintenance: An airport may remove NAVAIDs and RADAR facilities from service for maintenance during published maintenance periods (MP) without issuing a NOTAM (assuming the weather is acceptable).



For non-precision NAVAIDs and ILS systems, this schedule will be in the NAVAID section of the airport entry in the IFR Supplement.

For RADAR facilities, this schedule will be under the airport name in the RADAR Instrument Approach Minimums section of the FLIP High or Low Altitude (Terminal) booklets.



Section C: Theater Flight Data and Procedures

This section contains:

1. Flight data and procedures for entering certain segments of the airspace.

2. Estimating procedures and penetration tolerances of time, distance, and altitude for penetrating ADIZ.

3. Coordinating activities which you could contact in flight for permission to enter a warning (W) area.

4. No NOTAM preventative procedures.

Back cover

The back cover of the IFR Supplement contains ICAO position reporting and Change of Flight Plan procedures.

The inside back cover of the IFR Supplement contains the FAA procedures for:

1. IFR and VFR position reports

2. Change of Flight Plan

3. Filing Flight Plans in Flight

I. POSITION REPORTS (FAA)

A. INSTRUMENT FLIGHT RULES (IFR) POSITION REPORT

1. Identification
2. Position
3. Time
4. Altitude/FL (include actual altitude/FL when operating on a "VFR Conditions on Top" clearance.)
5. Type of Flight Plan (not required in IFR position reports made direct to ARTCC). State "VFR Conditions on Top" if so cleared.
6. Next reporting point and ETA.
7. Name only of the next succeeding reporting point along the route of flight.
8. Remarks

If entering ADIZ give appropriate ADIZ position reports listed under ADIZ Procedures.

B. VISUAL FLIGHT RULES (VFR) POSITION REPORT

1. Identification
2. Position
3. Time
4. Altitude
5. VFR Flight Plan
6. Destination

If entering ADIZ give appropriate ADIZ position reports listed under ADIZ Procedures.

II. CHANGE OF FLIGHT PLAN

A. CHANGE OF ROUTE OR DESTINATION

1. Type of flight plan
2. Aircraft identification
3. Type of aircraft/TD Code
4. Estimated true airspeed
5. Original destination (if applicable)
6. Departure point
7. Position and time
8. New route and altitude/FL
9. New destination (if applicable)
10. ETE or ETA
11. Fuel endurance
12. Alternate (if required)
13. Station where original flight plan filed

B. CHANGE FROM VFR TO IFR ONLY

1. Aircraft identification and type
2. Position and time
3. Route, altitude, and destination
4. True air speed in knots
5. ETE from point of change to destination and hours of fuel remaining
6. Alternate airport
7. Name, rank, and honors code of VIP if aboard (only if destination is being changed)

C. CHANGE OF ETA BY MORE THAN 30 MIN

1. Aircraft identification
2. Position and time
3. "IFR (or VFR) to (destination)"
4. "New ETA and hours of fuel remaining"

III. FILING FLIGHT PLANS IN FLIGHT

1. Type of flight plan
2. Aircraft identification
3. Type of aircraft/TD code
4. Estimated true airspeed
5. Point of departure
6. Proposed departure time
7. Cruising altitude
8. Route of flight
9. Destination
10. ETE
11. Remarks
12. Fuel endurance
13. Alternate
14. Aircraft Unit of Assignment
15. Number of Persons on Board
16. Color of Aircraft
17. Destination Contact/Telephone Number (Optional)

NOTE: Request available NOTAM and weather information for new route and destinations.

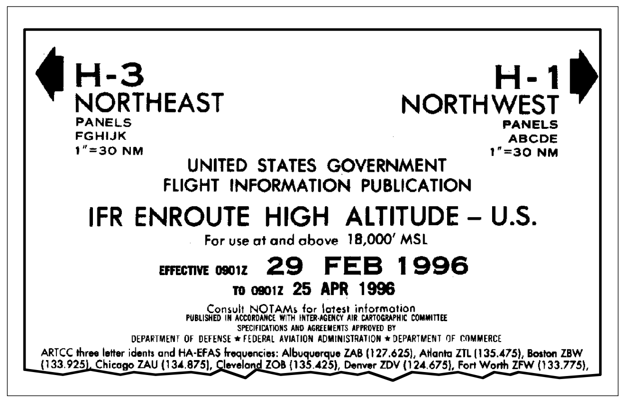
FLIP ENROUTE CHARTS

The FLIP enroute charts consist of:

1. Twenty-eight Low Altitude Charts, printed on 14 sheets, for use in the low altitude airways system - 1,200 ft AGL up to (but not including) 18,000 ft MSL.

2. Six High Altitude Charts printed on three sheets (one an enlarged overlay of the east coast) for use in the jet route system - 18,000 ft MSL through flight level 450.

The charts are issued every 56 days (eight weeks) effective date (always on a Thursday). These charts are designed for preflight and in-flight reference and a current set of applicable charts should be carried aboard your aircraft for every IFR flight.



Each en route chart contains a reference map for determining the correct area chart to use. Pilots using the high altitude airway system are encouraged to carry the low altitude chart, or arrival chart for their destination area in case the controller gives a low altitude holding fix. Each sheet contains a complete legend subdivided into categories of:

1. Airports

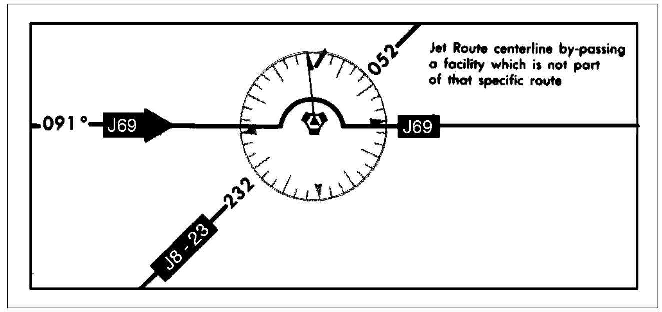
2. NAVAIDs and Communication Boxes

3. Air Traffic Services and Airspace Information

4. Special Use Airspace

ENROUTE HIGH ALTITUDE CHARTS

Application

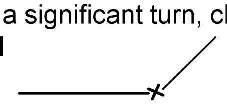
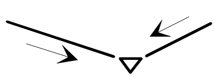


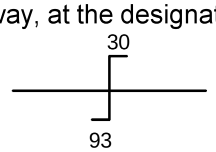
Jet routes, unlike low altitude airways, have no defined width. Their centerlines terminate at the outer edges of the NAVAID compass roses. A jet route extending through a compass rose around a NAVAID indicates the NAVAID is not part of that jet route. It is not used for navigation along the penetrating jet route and would not be indicated in the route-of-flight section of your flight plan unless you were filing "Direct" to that NAVAID. For a NAVAID to be part of a jet route segment, there must be a course depicted on <u>both sides</u> of the compass rose, or the route terminates at the compass rose.

NOTE: The compass rose is oriented to magnetic north of the NAVAID which may not be adjusted to the charted isogonic values.

To ensure all pilots fly the centerline of jet routes and achieve maximum navigational signal reception, three types of definite changeover points (COPs) are prescribed by FAR Part 95 where pilots should change VOR frequencies and/or TACAN channels and reset their course selectors to the inbound course for the next NAVAID along each route segment.

1. On a relatively straight leg, change halfway, which is the point of equal signal strength; or,

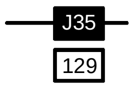
2. Where the route takes a significant turn, change at the point of turn, which is the DME position depicted by the symbol  or a dogleg at an intersection on the chart  ; or,

3. If the point of equal signal strength is not halfway, at the designated VORTAC changeover point along the route depicted on the chart by the symbol 

.

While proceeding on the en route portion of your flight, you will be directed to change Air Route Traffic Control Center (ARTCC) frequencies as you proceed from sector to sector and from Center to Center areas of responsibility. The boundaries for ARTCC areas of control responsibility are depicted on charts by the symbol: 

.

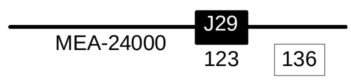
Distance boxes, 

, shown on Jet Routes, depict distances between NAVAIDs and/or between reporting points. Distances between fixes on “Direct” legs, or distances along only a portion of a Jet Route segment, can be measured by using a straight edge, marking off the distance, and applying the marked off distance to the convenient 250-nm scale at either the top or bottom of your particular chart. The scale is divided into 50-nm increments, with one increment subdivided into 5-nm increments. Some mileages are provided between other than reporting points, which are <u>NOT</u> in boxes.

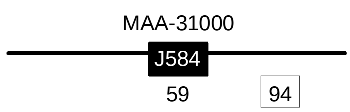
Many times, the paths of two or more jet routes will coincide on the chart with the J being printed only once:

You should file for the jet route which extends farthest along your planned profile of flight.

The High Altitude Charts depict the jet route system - 18,000 ft MSL through flight level 450, which is contained within Class A airspace; therefore, all MINIMUM EN ROUTE ALTITUDES (MEAs) are 18,000 ft MSL unless depicted as higher on a route segment.



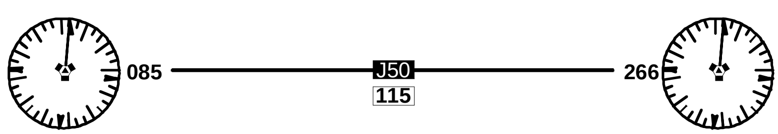
MAXIMUM AUTHORIZED ALTITUDE (MAA) is depicted on a route segment when lower than FL 450.



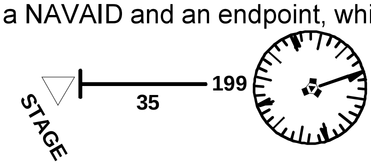
MAA assures adequate NAVAID signal reception for the entire route segment of a designated jet route, that is, it prevents co-channeling interference. Flights above the MAA must be filed as “DIRECT.”

A route “segment” may extend:

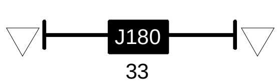
1. Between NAVAIDs



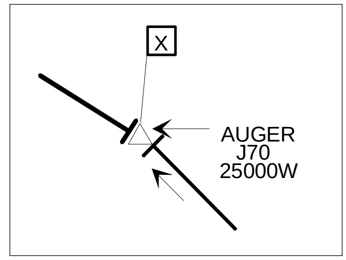
2. Between a NAVAID and an endpoint, which is a DME fix depicted by a vertical black line across the route



3. Between two endpoints



Unless designated by a MINIMUM CROSSING ALTITUDE (MCA), climbs and descents are commenced where the segment begins or ends with obstruction clearance based on standard climb rates.

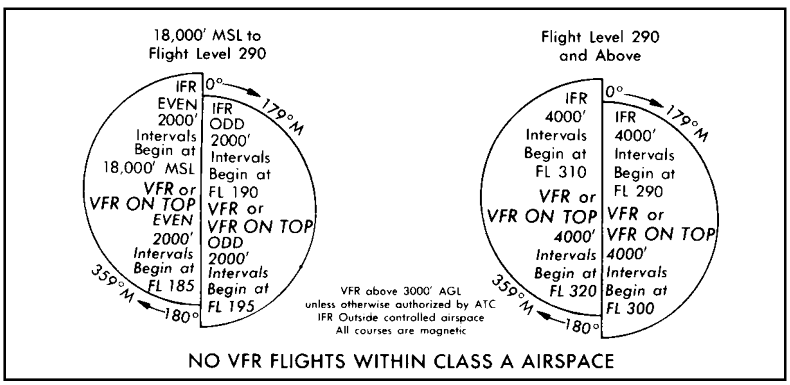


MINIMUM CROSSING ALTITUDE (MCA) is depicted at a fix by a flag box containing an "x." Depicted is the jet route number, crossing altitude, and a direction of flight.

It is the lowest mean sea level altitude at which a fix must be crossed when proceeding in the direction of a higher MEA. In the event of a radio failure when a higher altitude assignment has not been received, climb must be commenced in order to cross the fix at or above the crossing altitude and climb continued to the MEA for that segment.

CAUTION: Climb must be commenced early for obstruction clearance.

You should file at or above the highest MEA and at or below the lowest MAA along your planned route using the international cruising altitude rules legend.



For an IFR flight plan:

- ♦ Odd thousands East and Even thousands West to FL 290
- ♦ 4,000 ft intervals East beginning at FL 290
- ♦ 4,000 ft intervals West beginning at FL 310

NOTE: The legend depicts VFR altitudes above 18,000 ft MSL because they are ICAO rules and the U.S. is a provider state. As indicated in the legend; however, VFR operations are not allowed above 18,000 ft over the continental U.S.

Airspace depicted in WHITE signifies CONTROLLED AIRSPACE, and airspace depicted in BROWN shade signifies UNCONTROLLED AIRSPACE. The only uncontrolled airspace on the High Altitude Charts are Prohibited areas, some warning areas, and some restricted areas - which are of two types:

1. Restricted areas in white indicate "Joint Use" areas and controlled airspace. Permission to enter these areas can be obtained in the air directly from the appropriate ARTCC; and,

2. Restricted areas in brown shade indicate “Non-Joint Use” areas and uncontrolled airspace without communications support (No A/G). Permission to enter these areas must be obtained from the using agency (listed in AP/1A) prior to flight.

Pertinent information concerning special use airspace will be found on the outside panels of the respective charts.

NUMBER	EFFECTIVE ALTITUDE	TIMES USED, UTC			CONTROLLING AGENCY A/G CALL	PANEL LOCATION
		DAYS	HOURS	WEATHER		
R-3202A	To FL 180	Mon-Fri*1	1500-0700Z‡	VFR-IFR	ZLC CNTR/FSS	B
R-3203B	To 22000	By NOTAM	By NOTAM	VFR-IFR	ZLC CNTR/FSS	B
R-4001A	UNLTD	Cont*1	1200-0500Z‡	VFR-IFR	ZDC CNTR/FSS	I
R-4001B	By NOTAM	Intermittent	By NOTAM	VFR-IFR	ZDC CNTR/FSS	I
R-4201A	To 23000	Tue-Sat*1	1300-2100Z‡	VFR-IFR	ZMP CNTR/FSS	H
R-4207	To FL 450	Intermittent By NOTAM	Days	VFR-IFR	ZMP CNTR/FSS	H
R-4301	To 27000	Cont*1	1330-0600Z‡	VFR-IFR	ZMP CNTR/FSS	E
R-4305	To FL 450	Intermittent	By NOTAM	VFR-IFR	ZMP CNTR/FSS	G
R-5201	To 23000 To 20000	4/1-9/30 Cont 10/1-3/31*1	 Cont 1100-2300Z‡	VFR-IFR	ZBW CNTR/FSS	I
R-5203	To FL 500	By NOTAM	By NOTAM	VFR-IFR	ZOB CNTR/FSS	I
R-5502B	To 23000	Tue-Thu*1	1300-2200Z‡	VFR-IFR	ZOB CNTR/FSS	H
R-5701	To FL 200	Mon-Fri*1	1530-0759Z‡	VFR-IFR	ZSE CNTR/FSS	B
R-6402A&B	To FL 580	Cont	Cont	VFR-IFR	ZLC CNTR/FSS	C
R-6404A	To FL 580	Cont	Cont	VFR-IFR	ZLC CNTR/FSS	B,C
R-6404C	To FL 280	Cont	Cont	VFR-IFR	ZLC CNTR/FSS	B
R-6404D	To FL 250	By NOTAM	By NOTAM	VFR-IFR	ZLC CNTR/FSS	B,C
R-6405	To FL 580	Cont	Cont	VFR-IFR	ZLC CNTR/FSS	B
R-6406A	To FL 580	Cont	Cont	VFR-IFR	ZLC CNTR/FSS	B,C
R-6406B				VFR-IFR		C

NOTE: Only those special use areas that extend up to or above 18,000 ft MSL will be depicted on the FLIP IFR Enroute High Altitude Charts.

Magnetic variation is used in flight planning to align your flight computer to true North in order to obtain an accurate ground speed from the forecast true winds aloft. Variation is depicted every 4 degrees on the charts by North-South oriented thin SOLID GREEN LINES which are labeled along the top and/or bottom edges of the charts. You should interpolate for an approximate variation in a particular area.

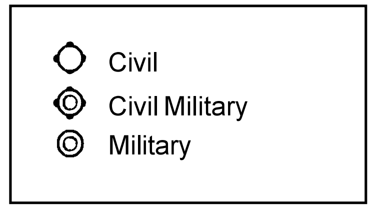
For flight information purposes, official time zones are depicted on the charts by North-South oriented DOTTED GREEN LINES.

Standard units of measurement used on the high altitude charts provide for direct application in the aircraft.

- Altitudes: MSL
- Mileage: Nautical
- Radials/Bearings: Magnetic
- Times: Universal Coordinated (Z)
- Days: Local

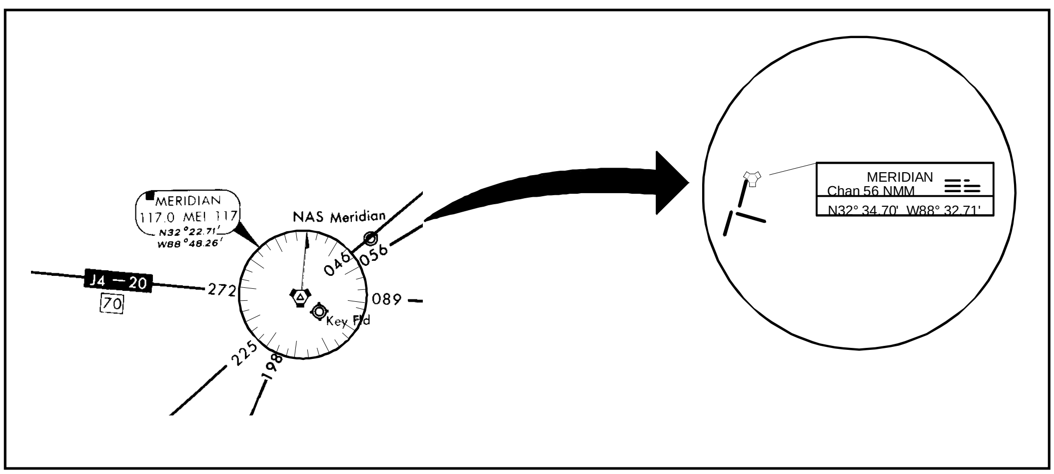
All United States Airports depicted on the high altitude charts have a minimum of 5,000 ft of hard surface runway. The VFR airports do not have an instrument approach procedure and are depicted in BROWN. Airports depicted in GREEN and BLUE have an instrument approach procedure; however, the DoD FLIP (Terminal) High Altitude Instrument Approach Procedure booklets contain approach procedures only for those airports depicted in BLUE.

The airport symbol indicates the type of airport. If the name of that airport is contained with parentheses, it is without military landing rights, i.e., you must have prior coordination to use that airport and you may be charged landing fees. In case of EMERGENCY, however, ALL depicted airfields are available. Airfields may be offset from their actual location to accommodate the location of NAVAIDs.

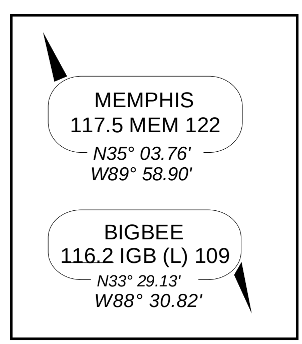


Those NAVAIDs with compass roses are en route NAVAIDs used to define the jet routes and are not necessarily associated with any airport. An airport may or may not utilize that NAVAID, and you should always refer to the appropriate approach procedure chart to determine the correct NAVAID for an approach.

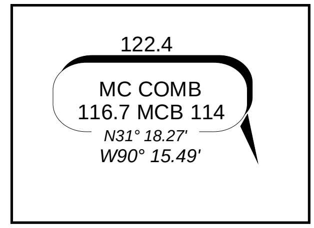
EXAMPLE: On the en route chart, MERIDIAN VORTAC, Channel 117 is used to define the jet routes; whereas, NAS Meridian uses TACAN Channel 56 for instrument approach procedures and it is not depicted on the en route chart.



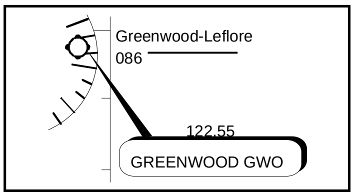
NAVAID communication boxes contain VOR, TACAN, and Radio Beacon data. Some VOR and Radio Beacon facilities have voice capability; however, if the frequency is underlined, this indicates NO VOICE. All TACAN facilities are without voice but are not underlined.



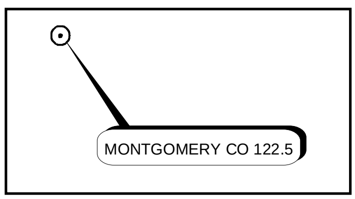
If the facility is bordered with a SHADOW BOX, this indicates that one of the "automated" Flight Service Stations (FSS) is collocated and has the same name as the NAVAID.



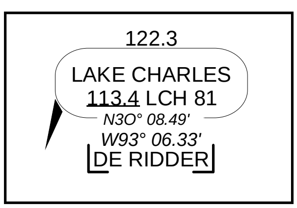
NOTE: Some FSS may not be associated with a NAVAID and are indicated at their location:



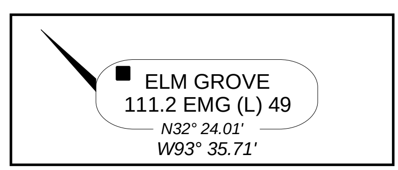
while others may just indicate the location of Remote Communication Outlets (RCO), i.e., remote antennae.



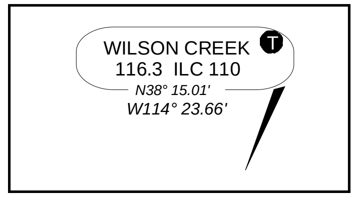
All FSS monitor 255.4, 122.2, other select discrete frequencies (that can be found in the IFR Supplement), and emergency 243.0 and 121.0. The FSS High Altitude VHF discrete frequencies are shown above the box. At facilities that are not FSS, frequencies positioned above the thin line NAVAID box are remote to the NAVAID site. If not indicated in a box below the NAVAID box, the FSS serving a general area can be determined by referring to the NAVAID name in the IFR Supplement.

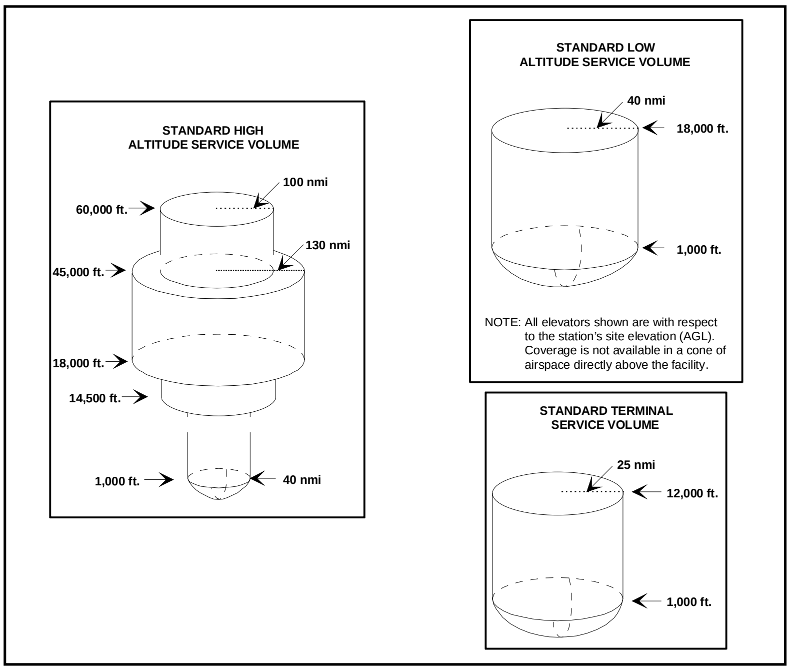


Those NAVAIDs that provide Hazardous In-flight Advisory Service (HIWAS) are indicated by a small black box in the upper left corner of the NAVAID box.



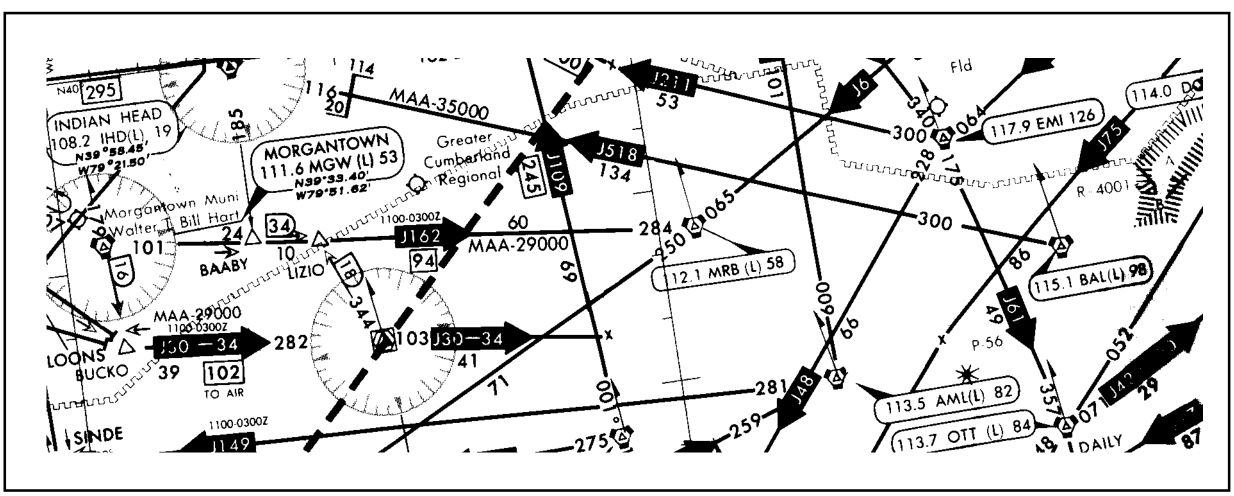
And those that provide Transcribed Weather Broadcasts (TWEB) are indicated by a “T” in a black circle in the upper right corner.





Most air navigation radio aids which provide positive course guidance have a designated standard service volume (SSV). The SSV defines the reception limits of unrestricted NAVAIDs which are usable for random/ unpublished route navigation. Standard service volume limitations do not apply to **published** IFR routes or procedures.

Preferred single-direction jet routes are established for an orderly and expeditious flow of traffic during peak traffic periods and/or in high density areas of the country. Those jet routes should be filed only for the indicated direction of flight during the effective hours indicated adjacent to the jet route identifier.



SUMMARY

This lesson has described the following Department of Defense (DoD) Flight Information Publications (FLIPs).

* General Planning (GP)
* Area Planning (AP/1)
  - Area Planning, Special Use Airspace (AP/1A)
  - Area Planning, Military Training Routes (AP/1B)
* Enroute IFR/VFR Supplements
* Enroute Flight Information Handbook
* Enroute High/Low Altitude Chart
* Area Charts
* Area Arrival Charts Depicting Terrain Data
* (Terminal) High/Low Altitude United States
* Civil Standard Instrument Departures/Standard Terminal Arrivals (CIV SIDs/STARs)
* U.S. Air Force Foreign Clearance Guide

CONCLUSION

In order to conduct a successful flight under Instrument Flight Rules (IFR) in instrument conditions, and comply with all the FAA and military procedures and regulations, you, as an instrument pilot, must utilize all the available information for planning, departure, en route, and terminal phases of your flight. The DoD FLIP system is designed to provide this information in a useful, logical, updated manner.

LECTURE GUIDE

COURSE/STAGE: T-45C TS Instrument Navigation

LESSON TITLE: Introduction to INav and Voice Procedures

LESSON IDENTIFIER: T-45C TS INav-02

LEARNING ENVIRONMENT: Classroom

ALLOTTED LESSON TIME: 1.0 hr

TRAINING AIDS:

* Figures
  Fig 1: ATC Facilities
  Fig 2: FAA Instrument Landing System (ILS)

STUDY RESOURCES:

* NATOPS General Flight and Operating Instructions Manual, OPNAVINST 3710.7
* NATOPS Instrument Flight Manual, NAVAIR 00-80T-112
* DoD FLIP, General Planning (GP), Chapter 5; Flight Information Handbook Section B; IFR Supplement (Back Cover)
* Air Traffic Control, FAA 7110.65C
* Aeronautical Information Manual (AIM)

(2-02) ORIGINAL

LESSON PREPARATION:

Read:

* Aeronautical Information Manual, Chapter 1, “Navigation Radio Aids” and Chapter 4, “Air Traffic Control”

REINFORCEMENT:

Read:

* Aeronautical Information Manual, Chapter 2, “Aeronautical Lighting and Other Airport Visual Aids” and Chapter 5, “Air Traffic Procedures”

EXAMINATION:

The objectives in this lesson will be tested in Instrument Navigation 12X.

LESSON OBJECTIVES

1.1.1.9
Recall location, types, uses, functions of Air Traffic Control Facilities

1.1.1.9.8
Recall responsibility of ATC for aircraft separation

2.7.5.3.2
Recall controlling agencies associated with radio instrument communications

1.1.1.9.2
Recall ground control responsibilities

1.1.1.9.3
Recall airport tower responsibilities

1.1.1.9.5.2
Recall departure control responsibilities

1.1.1.9.4
Recall air route traffic control center responsibilities

1.1.1.9.5.1
Recall approach control responsibilities

1.1.1.9.6
Recall services provided by flight service stations

2.7.6.1.1
Recall elements normally contained in an ATC clearance

2.7.5.1.1.2
Recall operating characteristics of the TACAN, VOR, VOR/DME

2.7.5.1.1.2.3
Recognize TACAN/VOR cone of confusion

2.7.4.2.1
Recall definition of 40 degree TACAN lock-on

2.1.10.1.1.1.1
Recall theory and operating characteristics of the global positioning system

2.1.10.1.1.1.2
Recall theory and operating characteristics of the inertial navigation system

2.9.4.6.5
Recall function and use of ILS ground equipment

2.9.4.6.5.1
Recall function of localizer transmitter

2.9.4.6.5.2
Recall function of glide slope transmitter

2.9.4.6.5.3
Recall function of ILS marker beacons

MOTIVATION

A fundamental responsibility of a naval aviator is to communicate clearly and concisely with controlling agencies. You must understand ATC instructions transmitted to you, and you must also be able to express yourself without ambiguity or error.

To do that you must understand the applicable ATC system design, its rules, its practices, and its normal communication procedures. Some ATC facilities you will work with are under military auspices, others under civilian.

Eventually, you can also expect to work with foreign ATC facilities, both military and civilian. Many foreign systems resemble ours; others are quite different. Regardless, you must understand the operating procedures applicable to your particular mission of the moment. However, for this lesson we will only concern ourselves with basic DoD/FAA procedures used by the U.S.

A competent aviator must also understand characteristics of the navigation facilities used to position his or her aircraft. That includes basic system design properties and limitations.

All true professionals possess a high degree of specialized knowledge and the ability to employ that knowledge for a specific purpose. A naval aviator must be able to perform his or her military mission with skill and alacrity. You are training to become a professional.

OVERVIEW

This lesson will enable you to conduct normal or emergency communication procedures with confidence and precision.

In this lesson we will be studying:

* Responsibilities of ATC facilities
* Clearances
* TACAN/VOR characteristics
* GPS/INS characteristics
* ILS characteristics

REFRESHER

This lesson builds on information presented previously. In particular, review:

* Your previous training experiences with radio communications
* Local course rules and controlling agencies

PRESENTATION

LESSON NOTES

Use Figure 1 throughout section I. Remember that you will be able to display the projected image at any time during the session.

I. Responsibilities of ATC facilities **1.1.1.9, 1.1.1.9.8, 2.7.5.3.2**

Sg 1, fr 2
Lesson Organization

A. Ground control **1.1.1.9.2**

Sg 1, fr 4
Fig 1: *ATC Facilities*

? **What are some of the functions of ground control?**

ANSWER: Answers follow

1. Provides taxi instructions to and from active runway
2. Issues information
   a. Ramp service
   b. Hazardous ground conditions
   c. Fueling operations
3. Relays clearance
   a. Obtains and relays IFR clearance to aircraft if clearance delivery frequency is not available
   b. Provides airport advisory information in absence of automatic terminal information service (ATIS)

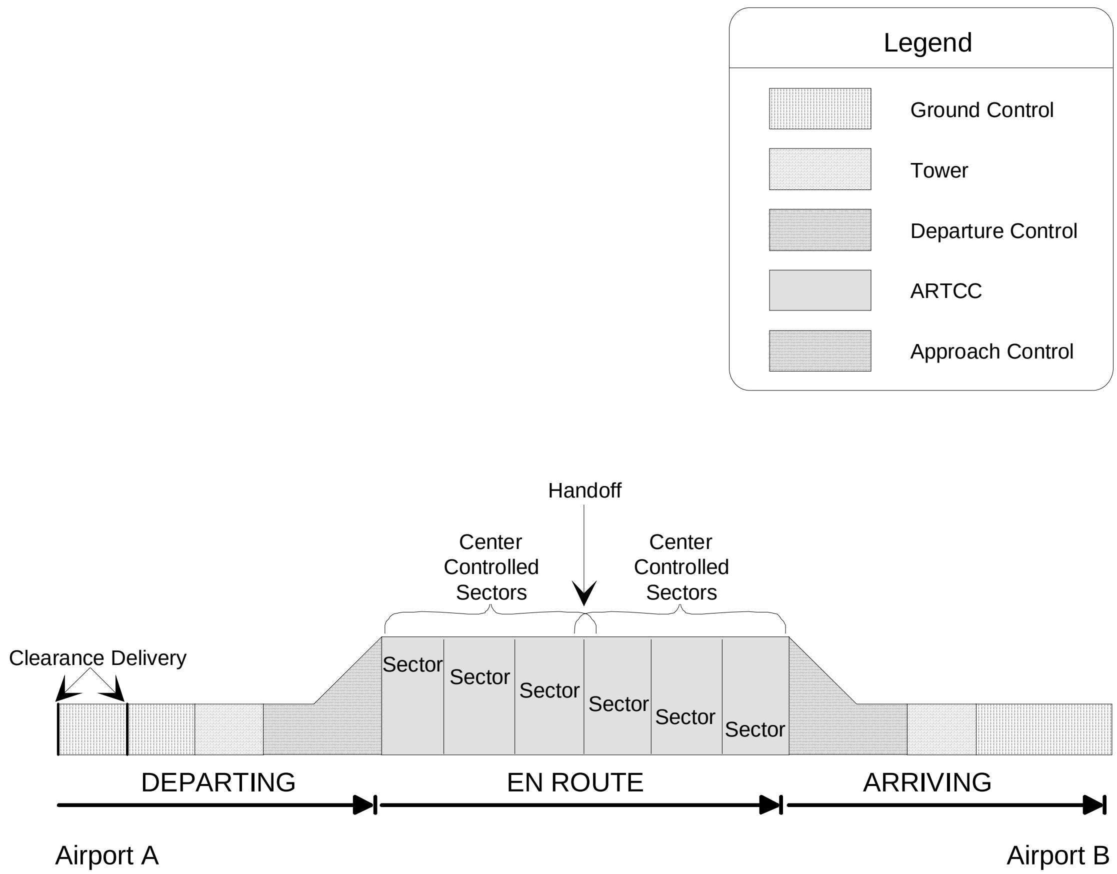


Figure 1: ATC FACILITIES

4. Provides ATIS (normally on a separate discrete frequency)

   a. Uses alphabetical code to identify information transmitted

      NOTE: A new recording is made: (1) upon receipt of any new official weather report regardless of whether there is/is not a change in values, (2) when runway braking action is worse than that which is included in the current ATIS broadcast, (3) when there is a change in any other pertinent data such as runway change, instrument approach in use, new or cancelled NOTAMs/SIGMETs/CWAs/PIREPs, etc.

   b. Eases congestion on Ground, Tower, and Approach frequencies

   c. Provides weather information

      (1) Ceiling

      (2) Visibility

      (3) Obstructions to visibility

         NOTE: If the ceiling/sky conditions are above 5,000 ft and the visibility is 5 statute miles (sm) or more, inclusion of the ceiling/ sky condition, visibility, and obstructions to vision in the ATIS message is optional.

      (4) Temperature (density altitude advisory, when appropriate)

      (5) Dew point

      (6) Magnetic surface wind direction/velocity

      (7) Altimeter

(8) Other pertinent weather information, i.e., lightning, cumulonimbus and towering cumulous which is always included

d. Provides other information on ATIS such as:

(1) Active special use areas

(2) Active runway and instrument/visual approaches in use

(3) Special instructions

B. Clearance Delivery

1. Separate frequency established at busy airports to relieve clutter on ground control

a. Considered to be an arm of "Tower"

b. Has no control function, used solely as the name implies for the delivery of IFR clearances

2. Pre-taxi clearance program set up at certain airports to receive clearance prior to taxiing

Pilots should file IFR Flight Plans at least 30 minutes prior to estimated time of departure to preclude possible delay in receiving departure clearance. A 30 minute delay is not unusual if the flight plan is filed when ready to depart

NOTE: Nonscheduled operations operating at FL 230 and above are requested by ATC to file IFR Flight Plans at least 4 hours prior to ETD.

a. Pilot participation may be mandatory

b. Participating pilots call Clearance Delivery (or Ground Control) not more than 10 minutes before proposed taxi time

c. IFR clearance (or delay information if clearance cannot be obtained) is issued at the time of this initial call-up

d. After the IFR clearance is received on clearance delivery frequency, pilots call Ground Control when ready for taxi instructions

C. Tower: an arm of Air Traffic Control (ATC) **1.1.1.9.3**

1. Controls runway traffic

   NOTE: Aircraft should remain on Ground Control until ready for takeoff.

2. Issues takeoff clearance

3. Controls all airborne traffic in control area

4. Provides airport advisory information to arriving flights in absence of ATIS

5. Issues landing clearance

D. Departure Control **1.1.1.9.5.2**

? **What is Departure Control's primary responsibility?**

ANSWER: Answer follows

1. Controls aircraft from Class D airspace to en route traffic control

2. Sequences and separates IFR and participating VFR aircraft

3. Provides radar service (including assistance for VFR traffic)

LESSON NOTES

The following section covering Basic Radar Service is excerpted from the Aeronautical Information Manual (AIM).

a. Basic Radar Service

(1) In addition to the use of radar for the control of IFR aircraft, all commissioned radar facilities provide the following basic radar services for VFR aircraft:

(a) Safety alerts

(b) Traffic advisories

(c) Limited radar vectoring (on a workload permitting basis)

(d) Sequencing at locations where procedures have been established for this purpose and/or when covered by a Letter of Agreement

NOTE: When the stage services were developed, two basic radar services (traffic advisories and limited vectoring) were identified as "Stage I." This definition became unnecessary and the term "Stage I" was eliminated from use. The term "Stage II" has been eliminated in conjunction with the airspace reclassification, and sequencing services to locations with local procedures and/or letters of agreement to provide this service have been included in basic services to VFR aircraft. These basic services will still be provided by all terminal radar facilities whether they include Class B, Class C, Class D or Class E airspace. "Stage III" services have been replaced with "Class B" and "TRSA" service where applicable.

E. Air Route Traffic Control Center (ARTCC) **1.1.1.9.4**

1. Issues route assignment (Air Traffic Control issues clearances, ARTCC coordinates route assignment)

2. Controls en route IFR flight

3. Verifies/assigns altitude

4. Provides traffic separation

5. Furnishes vectors (as do other entities, i.e., Departure Control)

6. Issues NOTAMs

7. Provides current weather information (as required)

    a. SIGMET

    b. Center Weather Advisory (CWA)

8. ARTCC IFR control starts at 1,200 ft AGL on airways. Most IFR traffic is under <u>direct</u> ARTCC radio control, or works through an FSS which relays information to or from the ARTCC. All traffic in Class A airspace, which starts at 18,000 ft MSL, is under Center's direct control

F. Approach Control **1.1.1.9.5.1**

1. Controls all IFR aircraft from hand-off by ARTCC control to hand-off for Tower control

2. Provides radar service to

    a. Separate and sequence all IFR traffic

    b. Assist VFR traffic

3. Provides arrival information to incoming traffic on initial contact

    a. Expected approach type

b. Runway to be used, if different from approach

c. Surface magnetic wind direction/velocity

d. Ceiling and visibility, if ceiling below 1,000 ft or highest circling minimums or visibility less than 3 sm

e. Altimeter setting

f. Known changes in weather

g. Pertinent airfield information

NOTE: Arrival information contained in the ATIS broadcast will be omitted if the pilot states the current ATIS (alphabetic letter) code on initial check-in.

h. Most military fields provide Single Frequency Approach (SFA)

G. Automated Flight Service Station (FSS) **1.1.1.9.6**

1. Does not perform ATC control functions; assists, advises, coordinates, relays and issues information

2. Most states have only one FSS. Only a few have two or more

3. Primary purpose is to provide services to the VFR civilian aviation community; however, military pilots can utilize many valuable services

4. All FSSs (255.4 UHF)

a. Provide pilot weather and NOTAM briefings (FSS does not “forecast”)

b. Receive and process IFR/VFR flight plans

c. Relay IFR clearances

d. Relay communications between ARTCC and aircraft when communication difficulties are encountered

e. Assist aircraft in lost and emergency situations (practice steering available on request)

NOTE: Most automated FSS have direction-finding (DF) steering capabilities.

f. Assist VFR search and rescue operations

(1) Initiated 30 minutes after filed ETA if VFR Flight Plan not closed

(2) If not found within one hour, ATC facilities are alerted as well as “Rescue Coordination Center” at Scott AFB, IL

(3) Two hours after ETA, full Search and Rescue (SAR) effort is initiated

g. Originate NOTAMs

h. Provide en route weather information

(1) Hazardous In-flight Weather Advisory Service (HIWAS)

(a) Continuous broadcast of weather advisories

(b) Broadcast on VOR frequencies

(2) FSS solicits Pilot Weather Reports (PIREPs)

(a) Encouraged for “real time” information, including both when weather is significantly <u>better</u> or <u>worse</u> than forecast

(b) Information should include:

(i) Location in relation to NAVAID

(ii) Type of aircraft

(iii) Altitude (particularly important for turbulence or icing reports)

(iv) Condition you are reporting

(v) If reporting cloud bases or tops, include amount and type of cloud cover (i.e., stratus, cumuliform, scattered, broken, overcast, etc.)

(3) Flight watch

(a) Enroute Flight Advisory Service (EFAS) provides in-flight weather advisories (civilian “Metro”)

(b) Contact flight watch with “(station name) Flight Watch,” your call sign and nearest VOR

(c) Low altitude frequency (122.0), high altitude frequencies vary but are in the VHF range

i Monitor NAVAIDs

j. Monitor aircraft on IR/VR routes

k. Advise U.S. Customs of trans-border flights

l. Take weather observations

m. Issue airport advisories

NOTE: When contacting an FSS, include present location and frequency to assist the operator in selecting the proper remote antenna.

PROGRESS CHECK

Question 1 — 1.1.1.9.2
What code identifies ATIS information and how often is the information (usually) updated?

ANSWER: Alphabetic (Alpha, Bravo, Charlie, etc.), when a new Aviation Weather Report is issued

Question 2 — 1.1.1.9.5.2
What is the primary purpose of TRSA?

ANSWER: Provide separation between all participating VFR and IFR aircraft operating within the TRSA

Question 3 — 1.1.1.9.4
Which portion of your IFR flight is directly controlled by ARTCC?

ANSWER: En route

II. Normal ATC clearance elements **2.7.6.1.1**

Sg 2, fr 2
Lesson Organization

? **What are the nine normal elements of an IFR clearance?**

ANSWER: Answers follow

A. Aircraft identification

B. Clearance limit

C. Departure instructions or SID

D. Route of flight

E. Altitude assignment

F. Departure frequency

G. IFF code

H. Any holding instructions

I. Other information as required

LESSON NOTES

The following example assumes that the aircraft has TACAN equipment only. Valdosta was a VOR/DME at the time this lesson was developed.

EXAMPLE:

CLEARANCE DELIVERY: “TALON45 is cleared to Navy Pensacola via direct Montgomery, Pecan, Valdosta, Tallahassee, then as filed. Maintain runway heading for vectors on course. Climb to and maintain one zero thousand. Expect flight level two seven zero ten minutes after takeoff. Contact Meridian Departure Control on two seven six point four. Squawk four seven one zero. Reason for change of flight plan is a line of severe thunderstorms in vicinity of Jacksonville. Read back.”

PILOT: “Meridian Clearance: TALON45 is unable Valdosta. Aircraft is TACAN-only; VOR inoperative for maintenance.”

NOTE: The pilot must reject portions of any clearance that he/she cannot comply with, and state reason(s).

PROGRESS CHECK

Question 4 — 2.7.6.1.1
List the nine elements normally contained in an ATC clearance.

ANSWER:
1. Aircraft identification
2. Clearance limit
3. Departure instructions or SID
4. Route of flight
5. Altitude assignment
6. Departure frequency
7. IFF code
8. Any holding instructions
9. Other information as required

III. Operating characteristics of TACAN and VOR **2.7.4.2.1, 2.7.5.1.1.2, 2.7.5.1.1.2.3**

Sg 8, fr 2
Lesson Organization

A. TACAN

Sg 8, fr 3
Operating Characteristics of TACAN and VOR

1. Unaffected by weather

2. 360 magnetic radials emitted from station

3. Operates in UHF band

a. 252 channels

(1) X-mode incorporates 126 channels

(2) Y-mode incorporates 126 channels

b. 1025-1150 MHz (1 MHz intervals)

4. Information provided

a. Continuous slant range distance from aircraft to station (DME) in nautical miles

b. Magnetic bearing from station

5. Limitations

a. Line of sight

b. DME to 399.9 nm

c. Standard Service Volume (SSV)

NOTE: SSV defines the interference free reception limits of unrestricted NAVAIDs which are usable for random/unpublished route navigation. Reception may be possible beyond (T), (L) and (H) reception ranges; however, interference from other stations on the same frequency may cause 40° off bearing lock-on.

NOTE: All elevations are with respect to the station's site elevation (AGL).

(1) T (Terminal): from 1,000 ft AGL up to and including 12,000 ft AGL at radial distances out to 25 nm (will not appear on high altitude charts)

(2) L (Low): from 1,000 ft AGL up to and including 18,000 ft AGL at radial distances out to 40 nm

(3) H (High)

(a) From 1,000 ft AGL up to and including 14,500 ft AGL at radial distances out to 40 nm

(b) From 14,500 ft AGL up to and including 60,000 ft AGL at radial distances out to 100 nm

(c) From 18,000 ft AGL up to and including 45,000 ft AGL at radial distances out to 130 nm

NOTE: Standard Service Volume limitations do not apply to published IFR routes or procedures. (i.e., some published routes may exceed these limitations, they have been flight tested and can be used with confidence).

6. Identified by aural 3-letter Morse code repeating every 35 seconds

7. Neither transmits nor receives voice communications

8. Cone of Confusion - A “cone of confusion” where TACAN azimuth information is not available, exists over TACAN stations. The “cone” varies from 60° to 110° wide. TACAN DME and I.D. signal will be received and station passage will be noted by minimum DME. Although narrow at low altitudes, this “cone” expands to about 18 nm across at 30,000 ft. Because of the size of the TACAN “cone of confusion,” TACAN holding patterns will always be established using DME

Sg 8, fr 4
VOR/TACAN
Cones of Confusion

B. VOR

1. Unaffected by weather

2. 360 radials emitted from station

3. Provides magnetic radial

4. Operates in the VHF band (108.0-117.95 MHz) - 59 available frequencies

5. Limitations

   a. Line of sight

   b. Standard Service Volume (SSV)

   NOTE: SSV defines the reception limits of unrestricted NAVAIDs which are usable for random/unpublished route navigation.

Sg 8, fr 5
VOR Frequency Overlaps

The reason why federal airways are limited to a maximum altitude of FL 450 is due to the service volume of VORs. The service volume is predicated on the limited number of available VOR frequencies for airway navigation (total of 59). Present FCC and FAA standards permit as many as 20 VORs to use the same frequency. The problem with this is that the usable range of VOR decreases with altitude due to overlapping signals from VORs using the same frequency.

c. From 18,000 ft AGL up to and including 45,000 ft AGL at radial distances out to 130 nm

NOTE: Standard Service Volume limitations do not apply to published IFR routes or procedures.

6. Identified by 3-letter aural Morse code identifier or recorded automatic voice alternating with Morse code identifier

7. Most can be used to transmit voice communications to aircraft as well as scheduled and/or urgent weather information

8. There is a negligible “cone of confusion” over a VOR antenna. Due to its size, station passage over a VOR is a recognized fix. Therefore, “over the station holding” can be conducted directly over a VOR station

LESSON NOTES

If you feel it necessary to again show the graphic depicting VOR/TACAN Cones of Confusion, call up Seg 8/frame 4.

C. VOR/DME

NOTE: The acronym VORTAC describes a facility in which a VOR and a TACAN station are collocated. Operating characteristics are the same as VOR/DME.

1. Same as VOR plus DME information

2. Both VOR frequency and TACAN channel must be tuned (T-45C)

3. Differences from TACAN

   a. Frequency band

      (1) TACAN: 1025-1150 MHz, UHF (252 channels, X and Y)

      (2) VOR/DME: 108.0-117.95 MHz, VHF (channel designator for DME only)

   b. Range data

      (1) TACAN: DME a component of system

      (2) VOR/DME: DME separate system providing range only

      NOTE: DME information for the T-45C can only be received on the TACAN. The aircraft's VOR receiver configuration does not include DME capability.

   c. Identifier

      (1) TACAN: Morse code only

      (2) VOR/DME: Morse code and possible voice

   d. Voice communications (receive only)

      (1) TACAN: none

(2) VOR/DME: possible, depending upon facilities

Sg 8, fr 6
TACAN 40 Degree Lock-on Error

e. Errors

(1) TACAN: locks on in increments of 40 degrees from actual bearing

(2) VOR/DME: N/A

Sg 9, fr 5
Lesson Organization

IV. GPS and INS theory and operating characteristics

A. GPS **2.1.10.1.1.1.1.**

Sg 9, fr 6
Global Positioning System (GPS)

1. THEORY: GPS is a 24+ satellite-based navigation, positioning, and time transfer system. GPS satellites transmit identity, calibration, and time signals. Aircraft use passive receivers to process that satellite data. Triangulation and sensed aircraft flight path angles are used to compute aircraft position. Altitude can also be extrapolated using GPS signals

   NOTE: The T-45C does not use GPS to generate cockpit altitude information. The T-45C GPS and INS are linked together in the Global Positioning System/Inertial Navigation Assembly (GINA).

2. GPS receivers process satellite signal time-delay measurements to determine satellite-to-aircraft range

3. U.S. GPS system is operated by DoD from Falcon AFS, CO and some overseas backup sites

4. GPS can serve an unlimited number of properly equipped users, worldwide

5. GPS signal strength is reduced somewhat by heavy weather, but not enough to interfere with data reception

6. The U.S. GPS was certified as having initial operational capability (IOC) in Dec 93. Was partially functional during Desert Storm (1991), and earlier

7. FAA has approved U.S. civil operators to use GPS as a primary navigation means in oceanic airspace and in some other designated remote airspace areas

8. GPS Standard Position Service (SPS) has 100 meters horizontal positioning accuracy with a probability of 95%

9. GPS Precise Positioning Service (PPS) is limited to authorized U.S. and allied military, federal government, and civil users who can satisfy specific U.S. security requirements. PPS requires use of government authorized crypto-keys. PPS is highly accurate, averaging 16 meters

10. Differential GPS is being considered by FAA for certification as a terminal precision approach system. At the time of this writing FAA had not approved any GPS system for precision approaches

    NOTE: Differential GPS systems transmit a GPS signal correction factor that is valid for a local area. Receiving aircraft process that factor along with their received GPS signals, which produces the level of accuracy necessary for precision approaches.

11. At least five GPS satellites are in view at any one time from any place on earth

12. Improved GPS satellites are being designed and planned for future launch

13. Receiver Autonomous Integrity Monitoring (RAIM) is a GPS means of determining when a satellite is providing corrupted information due to jamming or other reasons

    NOTE: RAIM usage requires additional satellite(s) to be in view, the exact number depends upon the particular GPS receiver capability and degree of RAIM capability to be utilized. The T-45C does not use RAIM.

14. A minimum of three GPS satellites are required for lat/long positioning; four for lat/long/altitude computations

    NOTE: T-45C requires four satellites for full system operability; does not compute GPS altitude.

15. GPS equipment used for IFR navigation must be approved by the FAA [also by DoD for military aircraft]

16. Aircraft using approved GPS for IFR navigation must also have an approved operational alternate means of navigation

17. FAA considers aircraft navigating with GPS to be Area Navigation (RNAV) capable; flight plans should be so annotated with the appropriate code following aircraft type

18. CNO and FAA have not yet (time of this writing) approved the T-45C for RNAV. CNO only allows (time of this writing) GPS to support visual navigation

Sg 9, fr 7
Inertial Navigation System (INS)

B. INS **2.1.10.1.1.1.2**

1. THEORY: An inertial navigation system determines aircraft position by sensing three-dimensional acceleration vectors, whenever the aircraft moves. Initial alignment establishes a “level” platform. Initial geographic (lat/long) position information must be supplied to the INS if it is to be used for navigation. The T-45C uses currently sensed GPS position or waypoint zero (WYPT-0) for that initial position alignment. Acceleration vectors are derived from two sources: ring laser gyroscopes, and three axis (xyz) accelerometer readings

   NOTE: The T-45C GPS and INS are linked together in the Global Positioning System/Inertial Navigation Assembly (GINA).

2. The T-45C INS uses GPS present position latitude and longitude, when performing initial position alignment. If a valid GPS signal is not available, the INS will use WYPT-0 position, but to make that happen, the pilot has to do one of the following:

    a. Select the restart (RST) option on the aircraft (ACFT) data page

       NOTE: This is the simplest and most preferred method.

    b. Select power (PWR) on the BIT page (either the weight-on-wheels or weight-off-wheels pages)

    c. Change WYPT-0 latitude (LAT) or longitude (LONG)

       NOTE: Pilot should assure that WYPT-0 coordinates correctly correspond to the actual aircraft position. If not, WYPT-0 LAT/LONG should be updated.

3. INS gyro systems are self-contained and not susceptible to enemy jamming or remote signal loss

4. The advent of laser gyros, which have replaced earlier mechanical gyros, has vastly improved INS reliability

5. The T-45C INS normally operates in close conjunction with the GPS: HYBD mode

6. The T-45C INS can operate independently from the GPS: INS mode

7. INS alignments using the SHIP option on the aircraft DATA page are designed for use aboard a <u>moving</u> ship. GPS is required

8. DGRO mode allows a pilot to enter a magnetic heading. That heading is automatically refined (corrected) as long as the system has a valid GPS satellite connection

   NOTE: If GPS is not available, the T-45C will continue to use the pilot-set heading, not attempting to refine it.

9. The T-45C does not directly "sense" magnetic heading. Instead, the GPS calculates true north, applies an earth-model algorithm to derive magnetic north, then, orients the INS

Sg 20, fr 8
Lesson Organization

V. Instrument Landing System (ILS) function and equipment

Fig 2: FAA
Instrument Landing System (ILS)

NOTE: The ILS approach system is made up of three functional component; guidance systems, range systems, and the visual systems. This lesson discusses each of the systems in detail.

Sg 20, fr 9
High ILS Approach Plate (Plan View)

A. ILS characteristics **2.9.4.6.5**

Sg 20, fr 10
Basic ILS Layout

1. T-45C is fully equipped and capable to fly ILS

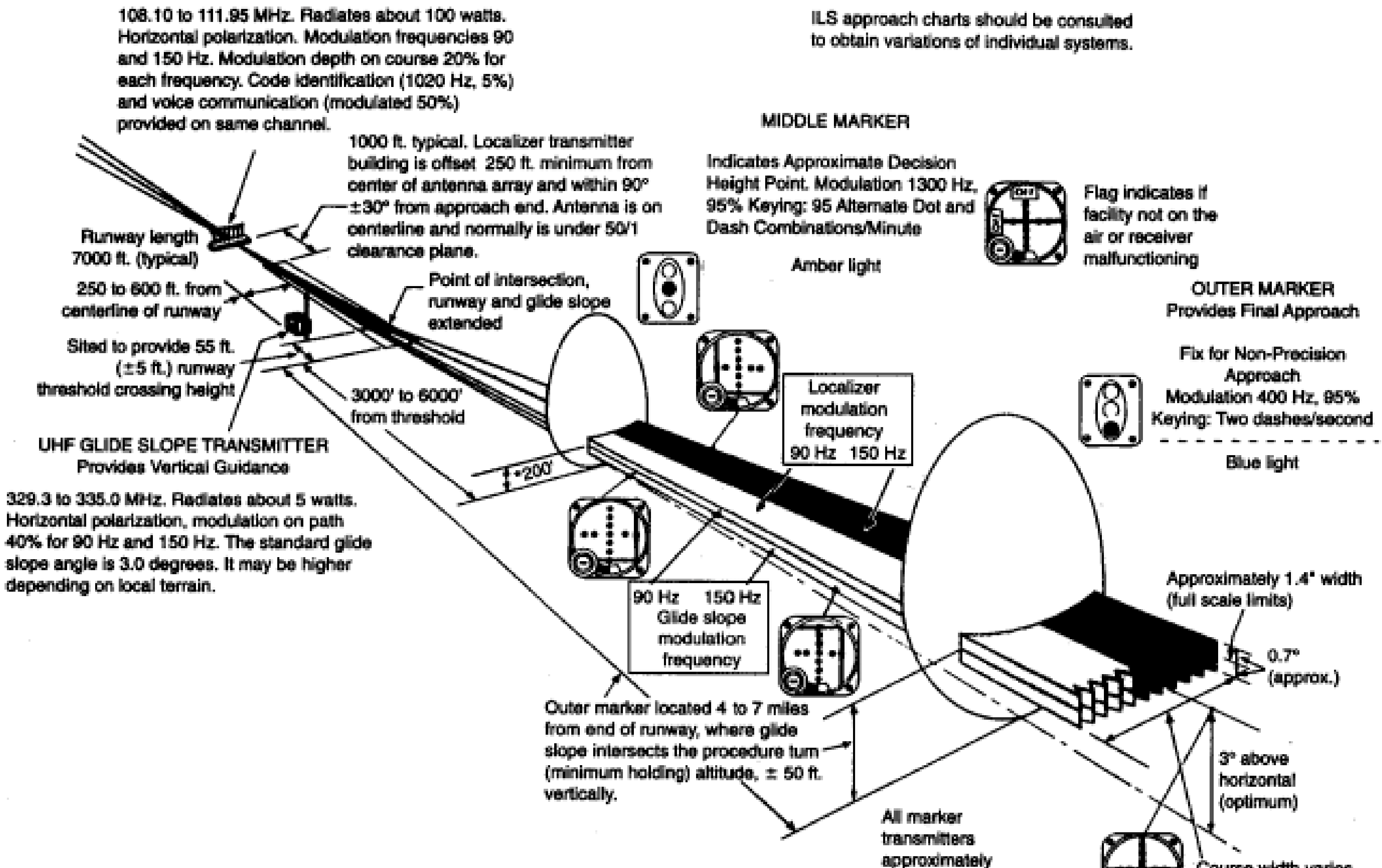
2. ILS provides cockpit indications for final approach course and glidepath

3. ILS (with glideslope) is categorized as a precision approach system

4. Some ILS installations also provide a back course localizer-only, non-precision approach capability

5. ILS localizer and glideslope beams may be distorted by vehicles or aircraft transiting close to an ILS runway. At civilian airports:

   a. Normal taxiway markings denote hold-short spots that assure non-blockage of associated Runway Safety Area, coincidental with the edge of the Obstacle Free Zone (OFZ)



RATE OF DESCENT CHART
(feet per minute)

Speed (knots)	Angle		
	2½°	2¾°	3°
90	400	440	475
110	485	535	585
130	575	630	690
150	665	730	795
160	707	778	849

NOTE:
Compass locators, rated at 25 watts output 190 to 535 kHz, are installed at many outer and some middle markers. A 400 Hz or a 1020 Hz tone, modulating the carrier about 95%, is keyed with the first two letters of the ILS identification on the outer locator and the last two letters on the middle locator. At some locations, simultaneous voice transmissions from the control tower are provided, with appropriate reduction in identification percentage.

* Figures marked with asterisk are typical. Actual figures vary with deviations in distances to markers, glide angles and localizer widths.

Figure 2: FAA INSTRUMENT LANDING SYSTEM (ILS)

Sg 20, fr 11
Hold-Short Markings

b. An ILS Critical Area taxiway marking may also be present. When ILS is operating, aircraft and vehicles may be directed to hold-short at that line, rather than at the normal hold-short line to assure noninterference with the ILS beams

B. Guidance Systems

NOTE: The guidance system of the ILS is made up of two parts, the localizer transmitter (azimuth information) and the glideslope transmitter (glidepath information).

1. Localizer: azimuth beacon transmitter **2.9.4.6.5.1**

a. Provides precise horizontal (course) guidance information to the runway centerline by way of a navigational beacon to localizer equipped aircraft within the sensing area of the localizer beacon signal

Sg 20, fr 12
ILS Localizer (Plan View)

b. Localizer frequency is identified by international Morse code consisting of a four letter identifier with the first letter of the sequence beginning with the letter "I" (..)

Sg 20, fr 13
ILS Localizer Beam Pattern (Plan View)

c. Transmitter operates on one of 48 channels specifically set aside for ILS/LOC

d. Frequency range of 108.10 to 111.95 MHz (lower end of the VOR frequency range)

Sg 20, fr 14
ILS Localizer Beam Pattern (Side View)

e. Beacon beam is 5 degrees wide as seen on cockpit instruments and is approximately 4 times as sensitive as conventional VOR or TACAN NAV signals

Sg 20, fr 15
ILS Localizer Beam Pattern (10 - 18 nm)

f. Beam is produced by two overlapping modulated frequencies

(1) Left side of inbound course is a 90 Hz signal and the right side is a 150 Hz signal

(2) Point of equal overlap is the center of the extended centerline of the runway indicating on course

Sg 20, fr 16
ILS Localizer Beam Pattern (0 - 10 nm)

g. Shielded localizer array (antenna) is normally located 1,000 ft beyond downwind end of the runway centerline

(1) Actual signal generated by transmitter from a building that is offset a minimum of 250 ft from center of antenna array

(2) Optimum signal strength and minimum possible signal interference dictate placement of transmitter

h. Primary approach path of a localizer approach is called “Front Course.” It provides course guidance for the glideslope descent path:

NOTE: Localizer front course beam is adjusted at the antenna array for a 700 ft width at the runway threshold. The beam as displayed on the a/c instruments has a width of 5 degrees allowing for 2 1/2 degrees left full deflection and 2 1/2 degrees right full deflection. A full deflection of the CDI at runway threshold would place the aircraft 350 ft left or right of the runway centerline while tracking on the localizer.

(1) 18 nm from the antenna

(2) Between 1,000 ft above the highest terrain along course line and 4,500 ft above antenna elevation site

(3) Signal acquisition and off-course indications are provided through angular areas of the operational service volume

(a) To 10 degrees either side of the course along a radius of 18 nm from the antenna

Sg 20, fr 17
Both Front and Back Course ILS Approaches

(b) To 35 degrees either side of the course along a radius of 10 nm from the antenna

NOTE: After the missed approach point, any localizer signal indication received should be disregarded unless it is designated part of the published missed approach procedure. Any signal that is not part of the procedure should be considered unreliable and disregarded. Some fields will have functional back course localizers (BC LOC) and are designated as such.

NOTE: Loss of the localizer information during the approach will render the approach procedure unusable. The approach should be terminated or another type of an approach should be selected, weather and ATC clearance permitting.

Sg 20, fr 18
Glideslope Transmitter

2. Glideslope: glideslope beam transmitter **2.9.4.6.5.2**

   a. Provides vertical guidance for equipped aircraft

   b. Upgrades a localizer non-precision approach to a precision ILS approach

   c. For ILS equipped aircraft it provides a precision approach option to fields with no PAR facility

   NOTE: The term “glideslope” is often confused with the term “glidepath.” These terms are not synonymous. It is important that you clearly understand the definition of these two terms.

   Glideslope: The vertical guidance provided an aircraft during approach and landing. The glideslope reference may be any of the following: an electronic signal (ILS or Microwave Landing

System [MLS]), visual ground aid (such as VASI) or glideslope information provided by ATC during a precision approach (PAR).

Glidepath: The portion of the glideslope signal that intersects the localizer on an ILS approach or the descent guidance provided by ATC when established on the Final Approach Course (FAC) during a PAR approach.

Sg 20, fr 19
Glideslope Lobes

d. The glideslope (highly directional shielded antenna) signal is radiated in the direction of the localizer front course

(1) Located 750 to 1,250 ft down the designated ILS runway from approach end

Sg 20, fr 20
Glideslope Lobe Size

(2) Beam width is 55 ft (+/- 5 ft) at runway threshold crossing height

(3) Building location is normally 250 to 600 ft from runway centerline

(4) Standard ILS glideslope is 2.5 to 3.0 degrees (may be higher or lower depending on local terrain)

Sg 20, fr 21
3-Degree Glideslope

(5) Glideslope utilizes two signal lobes projected one above the other. Upper lobe is modulated with 90 Hz and the lower lobe at 150 Hz at an equal signal strength

(6) Each lobe is approximately 0.7 degrees wide with a total beam width of approximately 1.4 degrees wide

(7) The point of equal signal modulation sets the center of the glideslope beam

NOTE: Glidepaths with no published Decision Altitude (DA)/Decision Height (DH) are usable to runway threshold; however, pilots of T-45C aircraft will execute a missed approach at the Middle Marker (MM) or 200 ft AGL whichever occurs first.

NOTE: ILS installations that share the same frequency can exist at each end of a given runway or at other runways on an airport but cannot be in operation at the same time. However, fields can have ILS approaches to different runways that do not share the same frequency and can operate simultaneously.

e. The glideslope transmitter operates on one of 40 dedicated ILS channels

(1) Transmits within the UHF frequency range of 329.15 and 335.00 MHz

(2) Dedicated glideslope UHF frequencies are paired with dedicated localizer VHF frequencies (108.10 to 111.95) and are automatically tuned upon selection of a localizer frequency

NOTE: A complete frequency list is contained in the Aeronautical Information Manual (AIM).

Sg 20, fr 22
ILS Frequencies

CAUTION: Pilots should be aware that a loss of glideslope signal may occur. This will generate a flashing CAUTION advisory to appear on the HUD and a flashing GLIDESLOPE advisory window to appear on all MFD displays. In addition, the glideslope needle will disappear on the HUD and ADI. Always disregard any glideslope indication when the aircraft is not on a published portion of an ILS approach at a published approach altitude where the glideslope interception is indicated and anticipated. These false signals are most prevalent in the area of back course localizer approaches.

CAUTION: Pilots should be aware that a vehicular traffic not subject to ATC may cause momentary deviation in ILS course or glideslope signals. Also, critical areas around the ILS equipment shielded antennas are not protected at uncontrolled airports or at airports with an operating control tower when weather or visibility conditions are above those requiring protective measures.

C. Range (position) Systems **2.9.4.6.5.3**

The following systems are commonly used to identify range (position) when flying an ILS/LOC approach

* Marker beacons

* Distance Measuring Equipment (DME)

* Cross Radial

* Compass Locator

The position of the aircraft on ILS/LOC approaches is very important due to the precise nature of the approach, lower minimums, and obstacle clearances associated with them. The pilot relies on this information to execute specific portions of the approach and for position in relation to the glidepath

1. Marker beacons

Sg 20, fr 23
Marker Beacons

a. Low power transmitters (75 watts)

b. Produces a signal in an elliptical pattern

Sg 20, fr 24
Marker Beacon Morse and Color Codes

(1) 1,000 ft above the antenna

(2) 2,400 ft in width and 4,200 ft in length

c. Elliptical pattern (fan pattern) placement is centered and perpendicular to the FAC

Sg 20, fr 25
COMM Panel

d. Normally, two marker beacons are associated with an ILS approach, Outer Marker (OM) and Middle Marker (MM). However, Category II and III ILS approaches may also have an Inner Marker (IM) associated with the approach

(1) Outer Marker

(a) Indicates aircraft, if at appropriate altitude, will intercept the glidepath

(b) Identified by a coded audio tone (three dashes) and flashing blue cockpit marker light

(2) Middle Marker

(a) Intersects the glidepath at approximately 200 ft AGL and identifies the approximate missed approach point for Category I approaches and Category “C” Navy aircraft

(b) indicates a position approximately 3,500 ft from the landing threshold and approximately 200 ft AGL above the touchdown zone

(c) Identification is a coded audio tone (dot dash dot dash) and flashing amber cockpit marker light

(3) Inner Marker

(a) Indicates a point that an aircraft flying a Category II or III ILS approach is at the designated decision height on glidepath between the MM and the touchdown zone

(b) Aircraft is approximately 100 ft AGL at IM if on glidepath and FAC

(c) Identified by a coded audio tone (four dots) and a flashing white cockpit marker beacon light

(4) Back Course

(a) A back course marker beacon (BC) normally indicates a LOC BC final approach fix where the approach glideslope is intercepted and the descent is commenced

(b) Identified by a coded audio tone (two dots) and a flashing white cockpit marker light

e. Marker beacon tones

(1) Marker beacons emit specific coded tones, at different pitches, which the pilot of an ILS/LOC equipped aircraft can monitor when on the final approach course

(2) In the T-45C, marker beacon tones may be monitored by placing the “MKR” switch on the communications control panel to the “ON” position

(3) MKR audio tone volume in the T-45C is preset and cannot be controlled by the RCVR volume control knob on the communication control panel

2. Distance measuring equipment (DME)

Sg 20, fr 26
ILS With DME

a. When DME is automatically coupled to the ILS frequency and specified in the approach procedure (T-45C does not have an automatic DME coupling capability); or when DME is shown on the ILS approach plate and the associated TACAN/VORTAC channel can be manually set; then, DME may be used:

(1) In lieu of the OM

(2) As a BC final approach fix (FAF)

(3) To establish other fixes on the localizer course

b. DME from a separate facility may be used within Terminal Instrument Procedures (TERPs) limitations:

(1) To provide arc (ARC) initial approach segments

(2) As a FAF for BC approaches

(3) As a substitute for the OM

NOTE: The DME of a separate facility is not, by FAA (AIM) definition, authorized for use inside the outer marker inbound on an ILS approach.

Sg 20, fr 27
Cross Radials

3. Cross-radials

a. May be generated by VOR or VORTAC/TACAN stations

b. No difference in the procedures used on ILS/ LOC approaches than any of the other types of approaches. However, a VOR cross-radial fix would require the VOR/ILS receiver to be tuned to a VOR frequency on final

NOTE: Tuning the receiver from the ILS frequency to a VOR frequency for cross-radial fix (FAF) identification <u>is not</u> an acceptable option.

c. If DME is associated with ILS/LOC approach, use that DME (in preference to cross-radials) as the best method to identify the aircraft position along the FAC

4. Compass locator

Although the T-45C is not equipped to use a compass locator, the following information is provided to give you a basic understanding of the system

a. Low power transmitter which emits an omnidirectional signal in the ADF range

b. Most often situated at MM or OM sites

c. Most transmitters have less than 25 watts of power and a range of at least 15 nm. Some locations have up to 400 watts, and are used as OM compass locators and may carry Terminal Weather Broadcast (TWEB) information

d. If used as a Locator Outer Marker (LOM) the beacon will transmit the first two letters of the localizer identifier. If used as the Middle Marker (MM), the beacon will transmit the last two letters of the localizer identifier

Sg 7, fr 2
Review Menu

SUMMARY

This lesson has focused on the following topics:

* Responsibilities of ATC facilities
* Clearances
* TACAN/VOR characteristics
* GPS/INS characteristics
* ILS characteristics

CONCLUSION

Clear and concise communications between pilots and controlling/advising agencies are vital for safe flight. Having just reviewed many U.S. military and civilian ATC procedures and clearance formats, plus TACAN/VOR, GPS/INS, and ILS characteristics, you are better prepared to safely operate the T-45C. Stay current with ATC procedures and equipment capabilities, as both are prone to change over time.

LESSON GUIDE

COURSE/STAGE: T-45C TS & ADV Instrument Navigation

LESSON TITLE: Use and Operation of TACAN, VOR, VOR/DME

LESSON IDENTIFIER: T-45C TS INav-03; ADV INav-01

LEARNING ENVIRONMENT: CAI

ALLOTTED LESSON TIME: 0.8 hr

TRAINING AIDS:

* Figures:
  - Fig 1: Operating Characteristics of TACAN and VOR
  - Fig 2: Standard Service Volume (SSV)
  - Fig 3: VOR Frequency Overlap
  - Fig 4: Cones of Confusion
  - Fig 5: HSI Display
  - Fig 6: Communication Control Panel
  - Fig 7: TACAN Control Panel
  - Fig 8: HSI Display/TACAN Operation
  - Fig 9: VOR/ILS Control Panel
  - Fig 10: HSI Display/VOR Operation
  - Fig 11: HUD Navigation Symbols

STUDY RESOURCES:

* NATOPS Instrument Flight Manual, NAVAIR 00-80T-112
* T-45C NATOPS Flight Manual, A1-T45AC-NFM-000
* T-45C Instrument FTI

(2-02) ORIGINAL

LESSON PREPARATION:

Before taking this lesson, you should read:

- NATOPS Instrument Flight Manual, NAVAIR 00-80T-112
  * Paragraphs 20.1 -- 20.2.2.1
  * Paragraphs 21.1 -- 20.2.3.1
- T-45C NATOPS Flight Manual, A1-T45AC-NFM-000, Part VII
  * 21.3.6, TACAN (Tactical Air Navigation) System
  * 21.3.7, VOR/ILS System

REINFORCEMENT: N/A

LESSON OBJECTIVES

2.7.5.1.1.2
Recall operating characteristics of the TACAN, VOR, VOR/DME

2.7.5.1.1.1
Recall the function and use of TACAN, VOR, VOR/DME controls and indicators

2.7.5.1.1.1.2
Recall procedure for tuning/identifying TACAN, VOR, VOR/DME stations

2.7.5.1.1.2.3
Recognize TACAN/VOR cone of confusion

2.7.4.2.1
Recall definition of 40 degree TACAN lock-on

2.7.5.1.1
Recall procedures for mission cockpit management

MOTIVATION

Precise flying is critical in Naval aviation. Whether you're navigating cross-country or back to the carrier, knowing the operating characteristics of your aircraft's navigational equipment will help you to complete your mission successfully.

OVERVIEW

After this lesson you will know how to use equipment controls to receive and use navigation information for TACAN, VOR, and VOR/DME.

This lesson consists of:

* Operating characteristics of TACAN and VOR
* TACAN
* VOR
* VOR/DME
* HUD Navigation Display
* Cockpit Management

REFRESHER

Recall your T-34 training in navigation systems.

PRESENTATION

Sg 11, fr 3-5
Fig 1: *Operating Characteristics of TACAN and VOR*

I. Operating characteristics of TACAN and VOR **2.7.5.1.1.2**

NOTE: This section is provided to give you additional information on the Operating Characteristics Table.

A. TACAN

1. Unaffected by weather

2. 360 magnetic radials emitted from station

3. Operates in UHF (L band)

a. 252 channels

(1) X-mode incorporates 126 channels

(2) Y-mode incorporates 126 channels

b. 1025-1150 MHz (1 MHz intervals)

NOTE: Frequency not necessarily tied to channel number, tune by channel, not frequency.

4. Information provided

a. Continuous slant range distance from aircraft to station (DME) in nautical miles

b. Magnetic bearing from station

5. Limitations

a. Line of sight

b. DME to 999 nm (display limitation)

c. Standard Service Volume (SSV)

Fig 2: *Standard Service Volume (SSV)*

NOTE: SSV defines the interference free reception limits of unrestricted NAVAIDs which are usable for random/unpublished route navigation. Reception may be possible beyond (T), (L) and (H) reception ranges; however, interference from other stations on the same frequency may cause adjacent channel interference.

NOTE: All elevations are with respect to the stations site elevation (AGL).

OPERATING CHARACTERISTIC	TACAN	VOR
Affected by weather	No	No
Emits 360 radials about station	Yes	Yes
Voice communications	None	Transmits voice
Limited by line-of-sight	Yes	Yes
Operates in	UHF 252 channels (X and Y)	VHF 108.0-117.95 MHz
Provides	Magnetic bearing Slant range	Magnetic bearing
Identified by 3-letter Morse Code	Yes--every 35 seconds	Yes--and/or recorded voice

Figure 1: OPERATING CHARACTERISTICS OF TACAN AND VOR

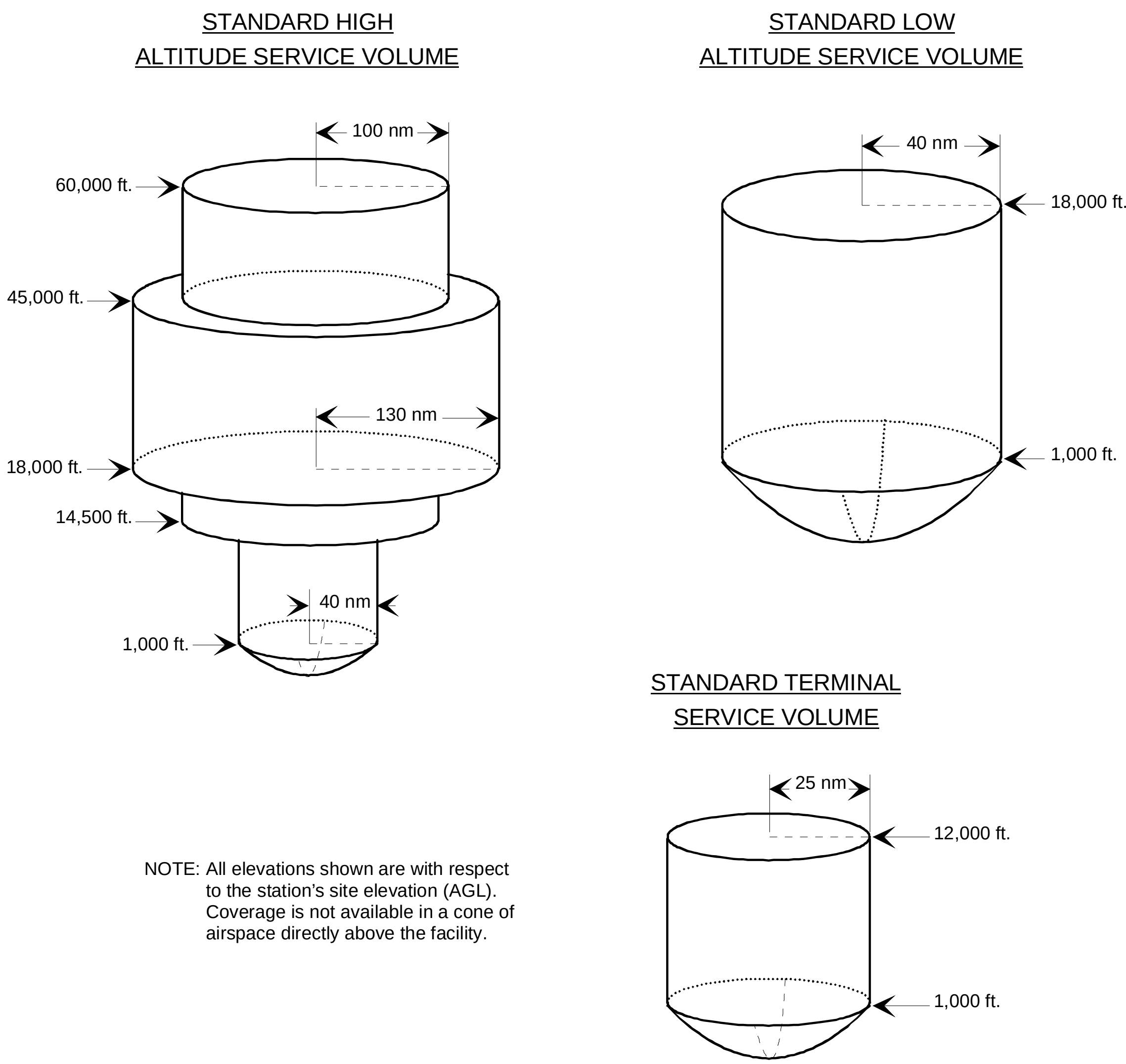


Figure 2: STANDARD SERVICE VOLUME (SSV)

(1) T (Terminal): from 1,000 ft AGL up to and including 12,000 ft AGL at radial distances out to 25 nm (will not appear on high altitude charts)

(2) L (Low): from 1,000 ft AGL up to and including 18,000 ft AGL at radial distances out to 40 nm

(3) H (High)

(a) From 1,000 ft AGL up to and including 14,500 ft AGL at radial distances out to 40 nm

(b) From 14,500 ft AGL up to and including 60,000 ft AGL at radial distances out to 100 nm

(c) From 18,000 ft AGL up to and including 45,000 ft AGL at radial distances out to 130 nm

NOTE: Standard Service Volume limitations do not apply to published IFR routes or procedures. (i.e., some published routes may exceed these limitations, they have been flight tested and can be used with confidence.)

6. Identified by aural 3-letter Morse code repeating every 35 seconds

7. Neither transmits nor receives voice communications

8. Cone of Confusion - A “cone of confusion” where TACAN azimuth information is not available, exists over TACAN stations. The “cone” varies from 60° to 110° wide. TACAN DME and I.D. signal will be received and station passage will be noted by minimum DME. Although narrow at low altitudes, this “cone” expands to about 18 nm across at 30,000 ft. Because of the size of the TACAN “cone of confusion”, TACAN holding patterns will always be established using DME

B. VOR

1. Unaffected by weather

2. 360 radials emitted from station

3. Provides magnetic radial

4. Operates in the VHF band (108.0-117.95 MHz) - 59 available frequencies

5. Limitations

   a. Line of sight

   b. Standard Service Volume (SSV)

      NOTE: SSV defines the reception limits of unrestricted NAVAIDs which are usable for random/unpublished route navigation.

      The reason why federal airways are limited to a maximum altitude of FL 450 is due to the service volume of VORs. The service volume is predicated on the limited number of available VOR frequencies for airway navigation (total of 59). Present FCC and FAA standards permit as many as 20 VORs to use the same frequency. The problem with this is that the usable range of VOR decreases with altitude due to overlapping signals from VORs using the same frequency.

Fig 3: VOR Frequency Overlap

   c. From 18,000 ft AGL up to and including 45,000 ft AGL at radial distances out to 130 nm

      NOTE: Standard Service Volume limitations do not apply to published IFR routes or procedures.

6. Identified by 3-letter aural Morse code identifier or recorded automatic voice alternating with Morse code identifier

7. Most can be used to transmit voice communications to aircraft as well as scheduled and/or urgent weather information. An example is Hazardous In-flight Weather Advisory Service/HIWAS, a program for broadcasting hazardous weather information (Significant Meteorological Information, Center Weather Advisories, Airman's Meteorological Information, Severe Weather Forecast Alerts, and urgent Pilot Weather Reports) on a continuous basis over selected VORs

Fig 4: Cones of Confusion

8. There is a negligible "cone of confusion" over a VOR antenna. Due to its size, station passage over a VOR is a recognized fix. Therefore, "over the station holding" can be conducted directly over a VOR station

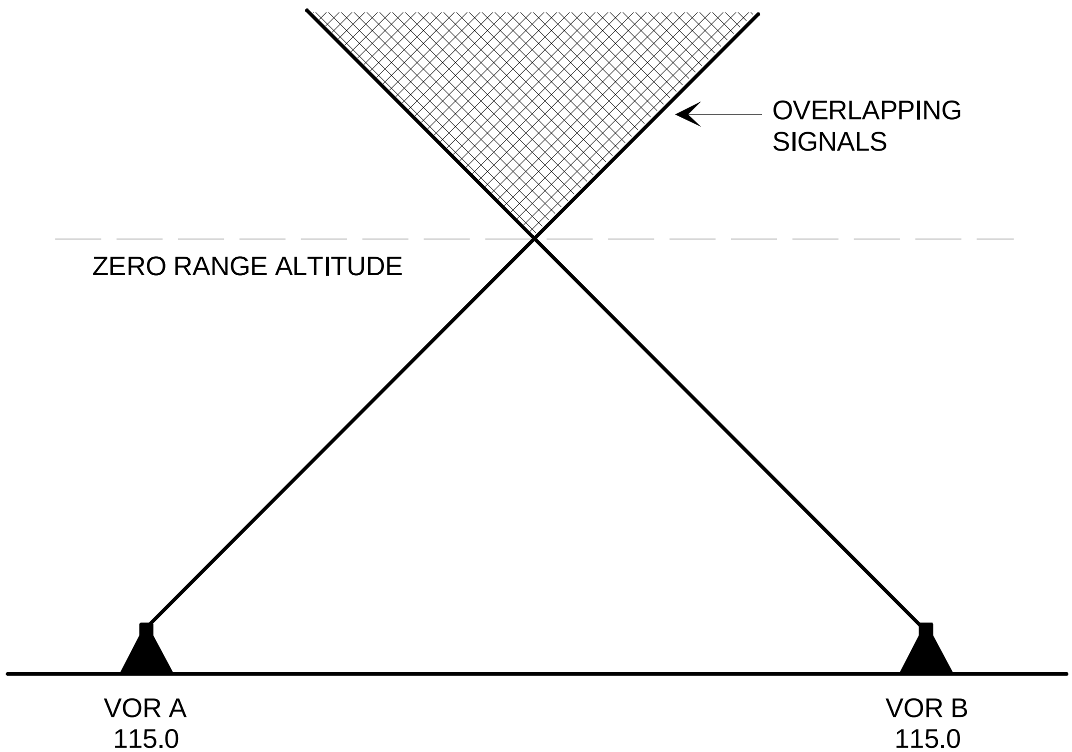


Figure 3: VOR FREQUENCY OVERLAP

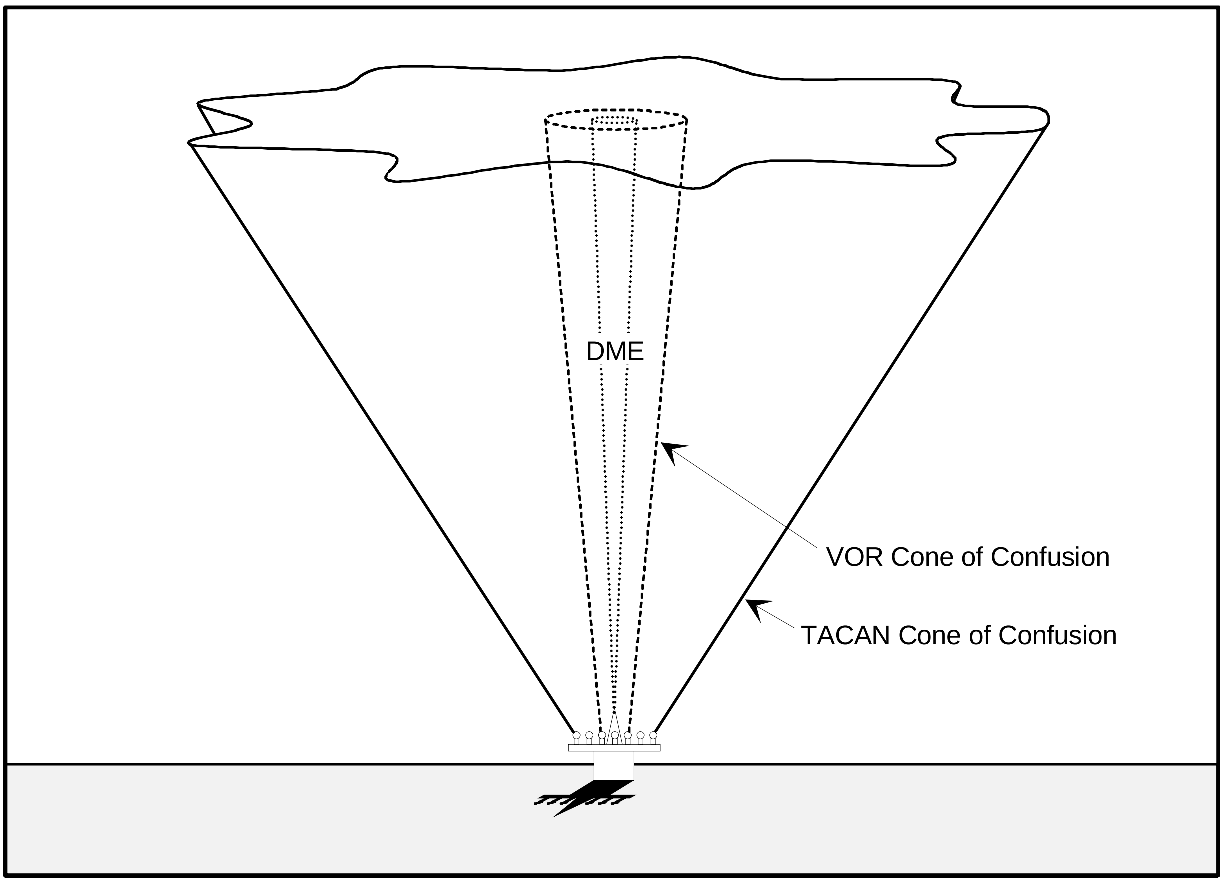


Figure 4: CONES OF CONFUSION

C. VOR/DME

NOTE: The acronym VORTAC describes a facility in which a VOR and a TACAN station are collocated. Operating characteristics are the same as VOR/DME.

1. Same as VOR plus DME information

2. Differences from TACAN

    a. Frequency band

        (1) TACAN: 1025-1150 MHz, UHF (252 channels, X and Y)

        (2) VOR/DME: 108.0-117.95 MHz, VHF (channel designator for DME only)

    b. Range data

        (1) TACAN: DME a component of system

        (2) VOR/DME: DME separate system providing range only

        NOTE: DME information for the T-45C can only be received on the TACAN. The aircraft VOR receiver configuration does not include DME capability.

    c. Identifier

        (1) TACAN: Morse code only

        (2) VOR/DME: Morse code and possibly voice

    d. Voice communications (receive only)

        (1) TACAN: none

        (2) VOR/DME: possible, depending upon facilities

    e. Errors

        (1) TACAN: locks on in increments of 40 degrees from actual azimuth

        (2) VOR/DME: N/A

Fig 5: *HSI Display*

Fig 6: *Communication Control Panel*

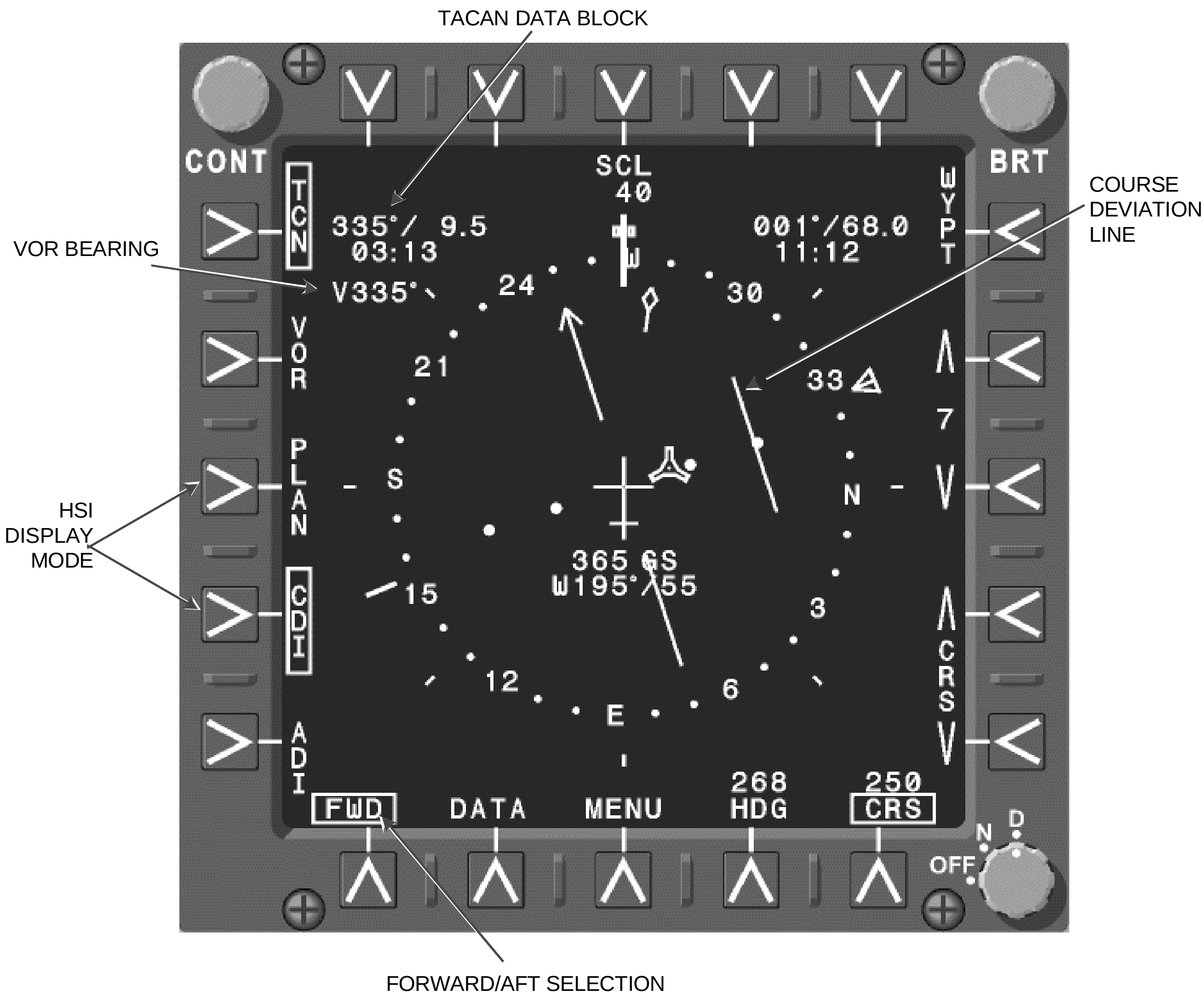


Figure 5: HSI DISPLAY

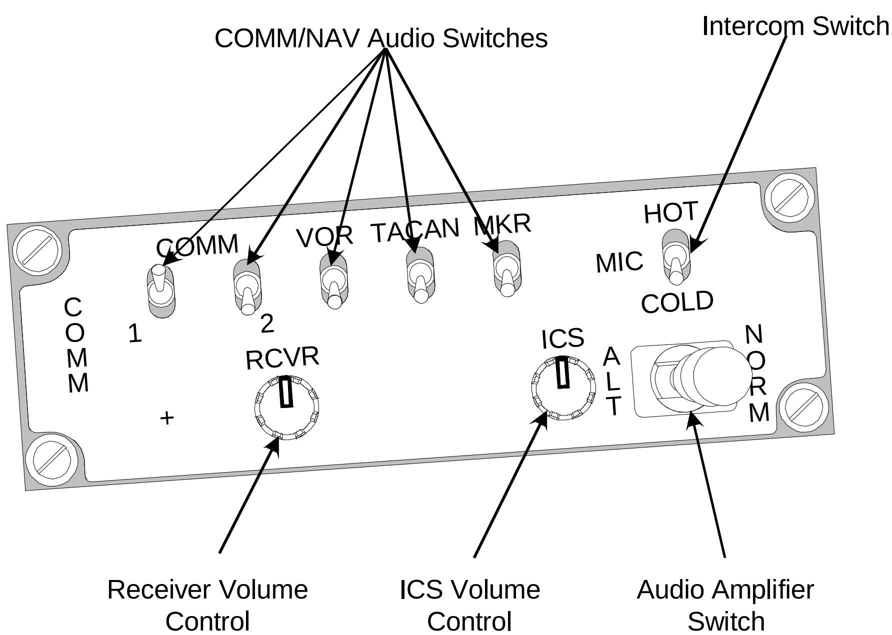


Figure 6: COMMUNICATION CONTROL PANEL

Sg 12, fr 15
Fig 7: TACAN Control Panel

II. TACAN

A. Location and use of TACAN equipment controls and indicators for tuning/identifying **2.7.5.1.1.1**

1. FWD/AFT option on HSI display selects and identifies which cockpit controls the HSI display format, and VOR/ILS and TACAN selection

2. Communication control panel: TACAN toggle switch provides routing and volume control of Morse code identifier through intercommunication system (ICS) to pilot's headset

3. TACAN control panel

   a. Power switch controls power to system. Allow 5-second warmup

   b. Option select switch

      (1) Position X or Y allows selection of a TACAN channel for bearing and DME information for that X or Y mode only

      (2) Position XA/A permits 2-5 aircraft to receive DME only from selected airborne aircraft

      NOTE: The XA/A is commonly referred to as the air-to-air mode.

      (3) Position Y allows selection of a "Y" TACAN channel for bearing and DME information

   c. Test button initiates system BIT

      (1) Select TACAN steering

      (2) Set course to 180 on HSI display

      (3) Press and hold TEST button for a minimum of 5 seconds

      (4) A passed BIT shows these HSI indications:

         (a) TACAN bearing pointer and digital bearing at 180 +/- 2.5

         (b) Range is 0 +/- 1 nm

         (c) CDI course deviation line centered

   d. Volume control knob varies audio signal level

   e. Channel selector used to select desired channel

   f. Channel display window displays TACAN channel in use

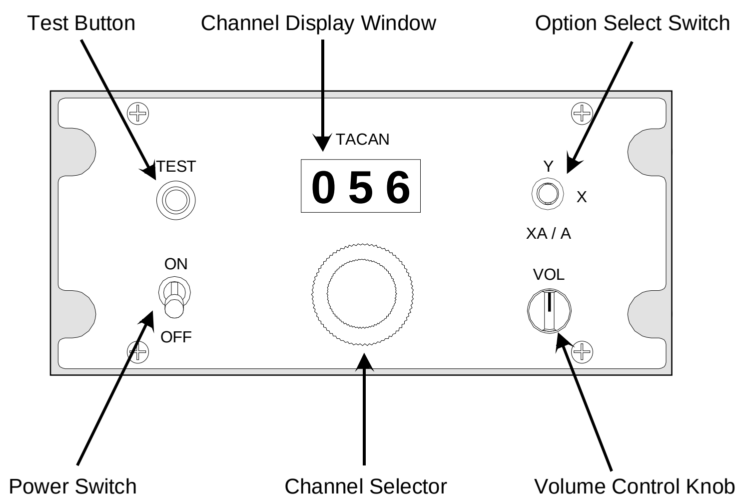


Figure 7: TACAN CONTROL PANEL

4. Horizontal situation indicator (HSI)

    a. TACAN range counter

        (1) Indicates line-of-sight (slant range) distance: maximum 999 (display limitation)

        (2) TACAN data removed from display

            (a) System power off

            (b) Invalid or absent signal

    b. TACAN bearing pointer (TACAN relative bearing pointer) indicates magnetic bearing to a tuned and valid TACAN station

    c. CDI course line indicates up to 10 degrees of deviation left or right from selected course

B. Tuning/identifying

1. Correct information **2.7.5.1.1.1.2**

    a. Find channel on approach plates/charts

    b. Verify navigation control (FWD/AFT) in your cockpit

    c. Select TACAN steering (only if navigating by TACAN)

    d. Verify TACAN control panel is on, and volume is turned all the way up. Select channel on TACAN control panel

    e. Select TACAN on communication control panel to route TACAN identification signal to your headset

    f. Verify 3-letter Morse code identifier of selected station

Fig 8: *HSI Display/TACAN Operation*

C. HSI indications

1. TACAN bearing pointer indicates magnetic bearing to station

2. TACAN data block indicates digital bearing, range and time to go

3. Course line indicates deviation from selected course

D. Erroneous information

1. Cone of confusion **2.7.5.1.1.2.3**

    a. HSI

DISPLAYS FOR TACAN OPERATION

RECEIVER OUTPUTS TO DISPLAY	TACAN MODES [1]			
	DISPLAY	OPERATE	FAIL	OFF [2]
RANGE	HSI	Range, TACAN symbol and Time-To-Go displayed	Range blank; TACAN symbol and Time-To-Go removed	Range blank; TACAN symbol and Time-To-Go removed
	HUD	Range and Time-To-Go displayed	Range and Time-To-Go removed	Range and Time-To-Go removed
BEARING TO STATION	HSI	Bearing Pointer and Digital Bearing displayed	Bearing Pointer, Digital Bearing, Planimetric or center portion of Courseline removed	Bearing Pointer, Digital Bearing, Planimetric or center portion of Courseline removed
	HUD	Course Steering Arrow and Deviation Scale displayed Command Steering Marker displayed [3]	Course Steering Arrow and Deviation Scale removed Command Steering Marker removed [3]	Course Steering Arrow and Deviation Scale removed Command Steering Marker removed [3]
COURSE LINE	HSI	Displayed	Planimetric or center portion of CDI Courseline removed	Planimetric or center portion of CDI Courseline removed
	HUD	Course Steering Arrow and Deviation Scale displayed	Course Steering Arrow and Deviation Scale removed	Course Steering Arrow and Deviation Scale removed
TACAN SIGNAL VALID:	HSI & HUD	All TACAN data displayed on HSI and HUD	All TACAN data removed on HSI and HUD	All TACAN data removed on HSI and HUD
NOT VALID:	HSI & HUD	TACAN Bearing pointer rotates counter-clockwise; all other TACAN data removed from HSI and HUD		

NOTES:
1. TACAN steering selected
2. OFF refers to the TACAN receiver/transmitter turned off.
3. Course not selected on HSI display

Figure 8: HSI DISPLAY/TACAN OPERATION

(1) TACAN pointer hunts or rotates

(2) Courseline removed from display

b. DME and identifier signal not affected

2. 40° off bearing TACAN pointer lock-on error: locking on to multiples of 40° from the desired radial due to inherent operating functions of the older crystal controlled receivers. Solid state electronics in the T-45C should preclude this problem from occurring. **2.7.4.2.1**

NOTE: Rechanneling the receiver and tuning back to the original station may remedy the error.

3. Failure to lock on

a. Misalignment of equipment

b. Worn aircraft control box

NOTE: Rechanneling the receiver and tuning from the opposite direction back to the original station may remedy the error.

4. Co-channel interference: receiving signals (DME, azimuth, identifier) from more than one TACAN station due to the relationship between aircraft's high altitude and station locations

III. VOR

A. Location and use of VOR equipment controls and indicators for tuning/ identifying **2.7.5.1.1.1**

1. FWD/AFT option on HSI display selects and identifies which cockpit controls the HSI display format, and VOR/ILS and TACAN selection

Fig 5: HSI Display

2. Communication control panel: VOR toggle switch provides routing of Morse code and possible recorded information through inter-communication system (ICS) to pilot's headset

Fig 6: Communication Control Panel (See page 12)

3. VOR/ILS Control Panel

Fig 9: VOR/ILS Control Panel

a. Power selector controls power to system and initiates system BIT when in TEST position

(1) Select VOR steering on HSI display

(2) Set course (CRS) to 000 on HSI display

(3) Set and hold the power/frequency knob in the TEST position on the VOR/ILS control panel

(4) If the VOR is receiving a valid VOR signal a good BIT check results in the following HSI indications

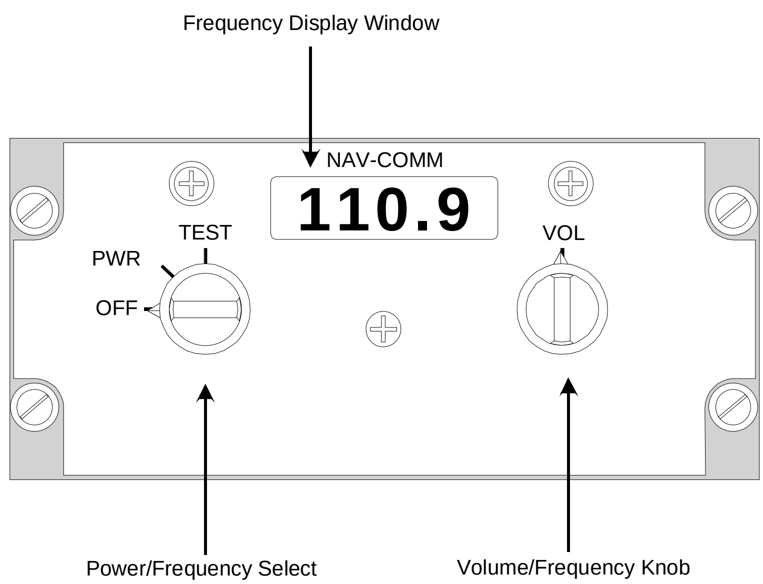


Figure 9: VOR/ILS CONTROL PANEL

(a) VOR bearing pointer indicates 315 + 3 degrees

(b) Course deviation line moves to + 2 dots maximum

(c) Marker beacon lights on

(5) If the VOR is not receiving a valid VOR signal only the marker beacon lights will illuminate

b. Frequency selector adjusts frequency from 108.00 to 117.95 MHz

(1) Left inner knob used to select frequencies in 1 MHz steps

(2) Right inner knob used to select frequencies in 50 kHz steps

c. Frequency display window displays tuned frequency

d. Volume control knob varies audio signal level

4. HSI

a. VOR pointer (VOR relative bearing pointer) indicates magnetic bearing to tuned VOR station

b. VOR information removed from displays

(1) System power off

(2) Invalid or absent signal

c. Course deviation line indicates up to 10 degrees of deviation from selected VOR course

B. Tuning/identifying

Sg 17, fr 17
Fig 10: *HSI Display/VOR Operation*

1. Correct information **2.7.5.1.1.1.2**

a. Find frequency on approach plates/charts

b. Ensure navigation control (FWD/AFT) in your cockpit

c. Select VOR steering (only if navigating by VOR)

d. Verify VOR/ILS control panel is on, volume is turned all the way up, and select frequency on the VOR/ILS control panel

e. Select VOR on communication control panel to route VOR identification signal to your headset

f. Verify 3-letter Morse code identifier and/or recorded voice of selected station

DISPLAYS FOR VOR OPERATION

RECEIVER OUTPUTS TO DISPLAY	VOR MODES [1]			
	DISPLAY	OPERATE	FAIL	OFF
BEARING TO STATION	HSI	VOR Bearing Pointer and Digital Bearing displayed	VOR Bearing Pointer and Digital Bearing removed	VOR Bearing Pointer and Digital Bearing removed
	HUD	Command Heading Marker displayed	Command Heading Marker displayed	Command Heading Marker displayed
CDI COURSE LINE	HSI	CDI Courseline displays deviation	Center portion of CDI Courseline removed	Center portion of CDI Courseline removed
	HUD	Command Steering Marker shows VOR Bearing	Command Heading Marker removed	Command Heading Marker removed
VOR SIGNAL VALID:		VOR Bearing Pointer, Digital Bearing and Command Heading Marker displayed	VOR Bearing Pointer, Digital Bearing and Command Heading Marker displayed	VOR Bearing Pointer, Digital Bearing and Command Heading Marker displayed
NOT VALID:		VOR Bearing Pointer, Digital Bearing and Command Heading Marker removed	VOR Bearing Pointer, Digital Bearing and Command Heading Marker removed	VOR Bearing Pointer, Digital Bearing and Command Heading Marker removed

NOTES: 1. VOR steering and course selected

Figure 10: HSI DISPLAY/VOR OPERATION

C. HSI indications

1. VOR bearing pointer indicates magnetic bearing to station

2. CDI course deviation line indicates deviation from selected course

D. Erroneous information: cone of confusion **2.7.5.1.1.2.3**

1. HSI VOR data removed from display

2. Identifier signal not affected

IV. VOR/DME

A. Location and use of VOR/DME equipment controls and indicators for tuning/identifying **2.7.5.1.1.1**

1. FWD/AFT option on HSI display selects and identifies which cockpit controls the HSI display format, and VOR/ILS and TACAN selection

Sg 17, fr 18
Fig 5: HSI Display

2. Select VOR Steering

3. Communication control panel: VOR and TACAN toggle switches provide routing of Morse code information through intercommunication system (ICS) to pilot's headset

Fig 6: Communication Control Panel (See page 12)

4. VOR/ILS control panel: same as VOR controls and indicators (ref. III.A.3)

Fig 9: VOR/ILS Control Panel (See page 19)

5. TACAN control panel: same as TACAN controls and indicators (ref. II.A.3)

Fig 7: TACAN Control Panel (See page 14)

6. HSI

a. Includes VOR controls and indicators (ref. III.A.4)

b. Includes TACAN range counter information (ref. II.A.4)

NOTE: Bearing in TACAN data block is blank if station is not a VORTAC.

B. Tuning/identifying

1. This procedure begins just as TACAN and VOR:

a. Find VOR station frequency and TACAN station channel (or VORTAC frequency/channel) on approach plates/charts

b. Ensure VOR steering selected

c. Verify VOR/ILS control panel is on with volume turned up and select frequency for bearing information

d. Verify TACAN control panel is on with volume turned up and select channel for DME information

e. Position communication panel VOR toggle switch ON. Verify the 3-letter Morse code and/or recorded voice identifier of selected station

f. Position communication panel TACAN toggle switch ON and verify 3-letter Morse code of selected station

C. HSI

1. VOR bearing pointer indicates magnetic bearing to station

2. TACAN data block displays distance

3. CDI course deviation line indicates deviation from selected VOR course

D. Erroneous information: cone of confusion **2.7.5.1.1.2.3**

1. HSI indications

a. VOR bearing pointer removed from display

b. CDI course deviation line removed from display

2. Identifier signal not affected

Sg 15, fr 2
Fig 11: HUD Navigation Symbols

V. HUD Navigation Display

A. Current selected steering mode with distance and time to go, when appropriate for the selected steering source, are displayed

B. Steering mode acronyms are:

1. TCN -- TACAN steering

2. W## -- Waypoint steering and waypoint number

3. O## -- Waypoint Offset steering and waypoint number

4. VOR -- VOR steering

5. ILS -- ILS only steering

6. TILS -- TACAN and ILS steering

7. WILS -- Waypoint and ILS steering

8. OILS -- Waypoint Offset and ILS steering

Figure 11: HUD NAVIGATION SYMBOLS

C. Distance shown in tenths of a mile from 0.0 to 99.9 nm and one mile increments for distance greater than 99.9 nm

D. Time to go based on the current ground speed

E. Course steering arrow and deviation scale displayed when VOR, TACAN, waypoint, or waypoint offset steering is selected and course (CRS selected on the HSI)

   1. Course steering arrow indicates the difference between the aircraft ground track and the course setting

   2. Deviation scale commensurate with the HSI CDI display

      a. Each dot in the deviation scale represents 5 degrees of course deviation with VOR or TACAN steering selected

      b. Each dot in deviation scale represents 2 nm gear up or 0.15 nm gear down cross track deviation with waypoint or waypoint offset steering selected

      c. Deviation scale removed when deviation from selected course is

         (1) Within 1 degree with TACAN steering selected

         (2) Within 0.4 nm gear up, 0.03 nm with gear down with waypoint or waypoint offset steering selected

F. ILS needles displayed when ILS signal is received and ILS steering selected

   1. Needles referenced to velocity vector and the scaling is the same as the scaling on the ADI display

   2. Needles flash when glideslope and/or localizer needle display limits are reached

G. The command steering marker

   1. Only displayed when the course steering arrow is not displayed

   2. The command steering marker located based on the selected steering reference

      a. ILS or no steering selected -- heading value entered on the HSI

      b. VOR steering selected -- VOR bearing

      c. TACAN, Waypoint, Waypoint Offset steering selected -- great circle steering to selected navigation point

d. When the command steering marker is limited, it slides slightly past the heading scale on the side that represents the shortest turn to the command steering

VI. Cockpit management **2.7.5.1.1**

Sg 13, fr 2

A. Stay ahead of the aircraft through careful advanced planning while flying (especially when faced with heavy workloads)

B. Ensure COMM/NAV equipment is tuned to the proper frequencies and TACAN/VOR stations are identified before using them

C. Suggested sequence for setting up your navigation equipment (your procedures may differ):

1. Determine frequency or channel and station ID
2. Ensure you have NAV control in your cockpit
3. Tune and identify station
4. Set desired course in course set window on HSI
5. Tune and identify backup navigation aid

D. Select a backup navigation aid

E. “Think ahead” in your flight and anticipate the navigation aids you will need

SUMMARY

This lesson has covered the following topics:

* Operating characteristics of TACAN and VOR
* TACAN
* VOR
* VOR/DME
* HUD Navigation Display
* Cockpit Management

CONCLUSION

The safe and precise conduct of a flight depends on your thorough knowledge of navigational equipment, its limitations and uses. You must be able to recognize possibly erroneous navigational information either to correct the problem or to obtain an alternate solution.

LESSON GUIDE

COURSE/STAGE: T-45C TS & ADV Instrument Navigation

LESSON TITLE: Components and Characteristics of the Instrument Landing System (ILS)

LESSON IDENTIFIER: T-45C TS INav-04; ADV INav-02

LEARNING ENVIRONMENT: CAI

ALLOTTED LESSON TIME: 0.8 hr

TRAINING AIDS:

* Figures
  - Fig 1: FAA Instrument Landing System (ILS)
  - Fig 2: Localizer Transmitter Signal Aquisition Limits
  - Fig 3: Marker Beacon Code/Color Identification Table
  - Fig 4: Instrument Runway Lighting
  - Fig 5: ILS Controls and Instruments
  - Fig 6: ILS Navigation Instruments
  - Fig 7: Marker Beacon Test and Illumination Controls
  - Fig 8: ILS Critical Area Taxiway Position Markings

STUDY RESOURCES:

* NATOPS Instrument Flight Manual, NAVAIR 00-80T-112
* T-45C NATOPS Flight Manual, A1-T45AC-NFM-000

(2-02) ORIGINAL

LESSON PREPARATION:

Read:

* Chapter 23, NATOPS Instrument Flight Manual, NAVAIR 00-80T-112
* Part VII, 21.3.7, “VOR/ILS System,” T-45C NATOPS Flight Manual, A1-T45AC-NFM-000

REINFORCEMENT: N/A

LESSON OBJECTIVES

2.9.4.6.5
Recall function and use of ILS ground equipment

2.9.4.6.5.1
Recall function of localizer transmitter

2.9.4.6.5.2
Recall function of glideslope transmitter

2.9.4.6.5.3
Recall function and use of ILS marker beacons

2.9.4.6.5.4
Recall range (position) systems used during ILS/LOC approaches

2.9.5.5.1
Recall configuration and operating characteristics of visual information system

2.9.4.6.3
Recall function and use of ILS controls and indicators

2.9.4.6.2.1
Recall procedures for using ILS equipment

1.8.1.9.11.3
Recall indications and procedures for ILS component failure

MOTIVATION

Learning ILS and then practicing in the simulator and aircraft are important because you will be flying ILS-type approaches regularly at the ship when you get to the fleet.

The ILS precision approach system provides azimuth and glideslope information that enables precision landings under low ceiling and visibility conditions. Your understanding of the instrument indications generated in the aircraft from ILS ground equipment is vital to your execution of the smooth and immediate course corrections required on a precision approach. This lesson will review the function and use of ILS ground equipment as well as identify ILS instruments and controls within the aircraft.

OVERVIEW

At the end of this lesson, you will know the functions of ILS ground equipment, the instrument indications generated by ILS localizer and glideslope signals, and aircraft position in relation to the localizer and glideslope beams.

This lesson covers the:

* ILS guidance information
* ILS range information
* ILS visual information
* ILS controls and instruments

REFRESHER

Recall:

* Components of an ILS approach ground equipment

PRESENTATION

Instrument Landing System (ILS)

NOTE: The ILS information approach system is made up of three functional components; the guidance systems, range systems, and the visual systems. This lesson discusses each of the systems in detail.

I. Guidance Systems **2.9.4.6.5, 2.9.4.6.5.1, 2.9.4.6.5.2**

NOTE: The guidance system of the ILS is made up of two parts, the localizer transmitter (azimuth information) and the glideslope transmitter (glidepath information).

A. Localizer - azimuth beacon transmitter

Sg 1, fr 3
Fig 1: *FAA Instrument Landing System (ILS)*

1. The localizer is the first half of the ILS guidance system

2. Provides precise horizontal (course) guidance information to the runway centerline by way of a localized navigational beacon to localizer equipped aircraft within the sensing area of the localizer beacon signal

3. Localizer frequency is identified by international Morse code consisting of a four letter identifier with the first letter of the sequence beginning with the letter “I” (..)

Sg 1, fr 4
Fig 2: *Localizer Transmitter Signal Acquisition Limits*

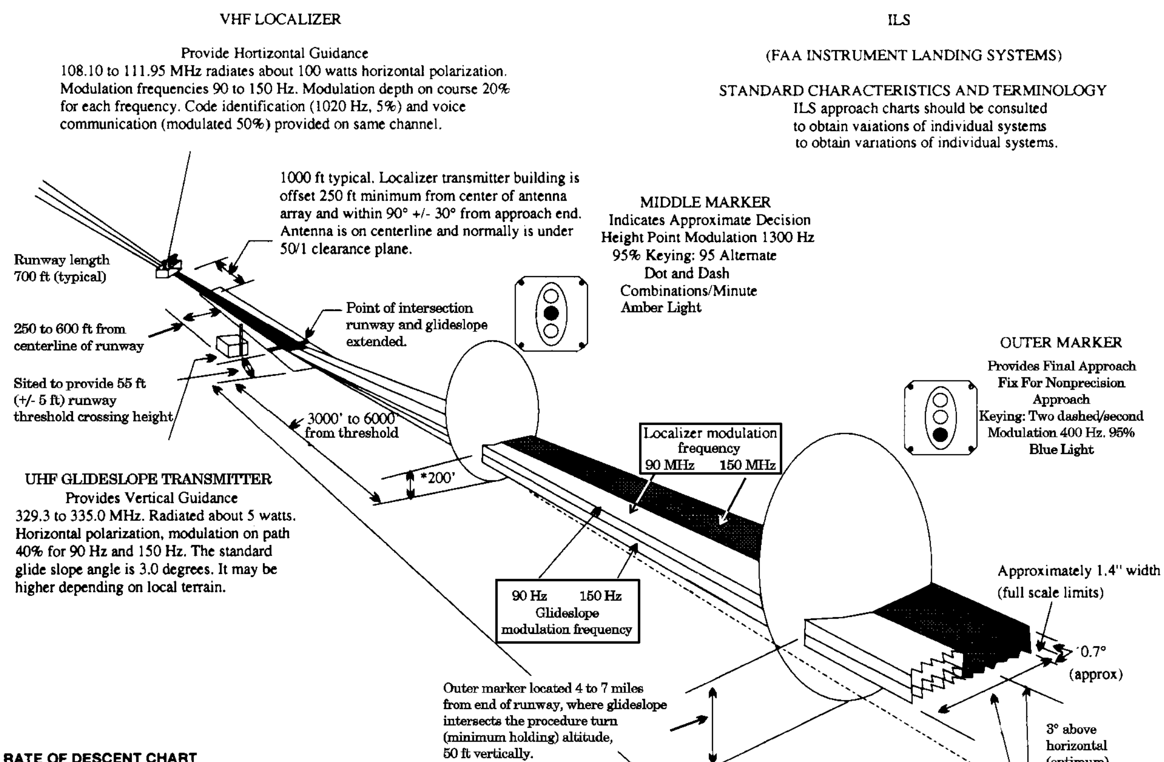
4. Transmitter operates on one of 40 channels specifically set aside for ILS/LOC

5. Frequency range of 108.10 to 111.95 MHz (lower end of the VOR frequency range)

6. Beacon beam is 5 degrees wide as seen on cockpit instruments and is approximately 4 times as sensitive as conventional VOR or TACAN NAV signals

7. Beam is produced by two overlapping modulated frequencies

   a. Left side of inbound course is a 90 Hz signal and the right side is a 150 Hz signal



RATE OF DESCENT CHART
(feet per minute)

Speed (Knots)	Angle 2.5°	2.75°	3°
90	400	440	475
110	485	535	585
130	575	630	690
150	665	730	795
160	707	778	849

Compass locators, rated at 25 watts output 190 to 535 KHz, are installed at many outer and some middle markers. A 400 Hz or a 1020 Hz tone, modulating the carrier about 95%, is keyed with the first two letters of the ILS identification on the outer locator and the last two letters on the middle locator. At some locations, simultaneous voice transmissions from the control tower are provided, with appropriate reduction in identification percentage.

* Figures marked with asterisk are typical. Actual figures vary with deviations in distances to markers, glide angles and localizer widths.

Figure 1: FAA INSTRUMENT LANDING SYSTEM (ILS)

TOP VIEW

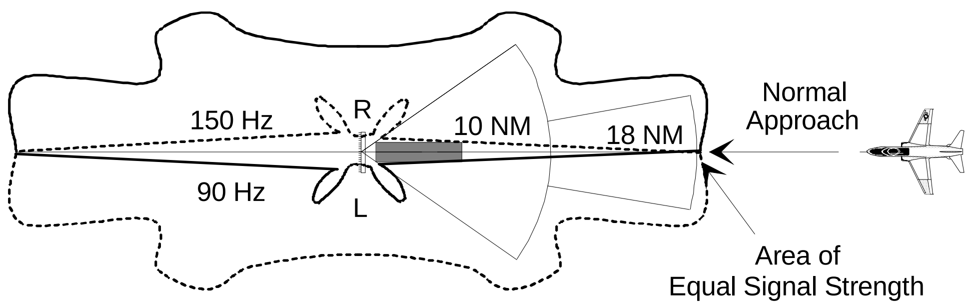


Figure 2: LOCALIZER TRANSMITTER SIGNAL ACQUISITION LIMITS

b. Point of equal overlap is the center of the extended centerline of the runway indicating on course

Sg 1, fr 5
Shielded Localizer Array (antenna)

8. Shielded localizer array (antenna) is normally located 1,000 ft beyond downwind end of the runway centerline

   a. Actual signal generated by transmitter from a building that is offset a minimum of 250 ft from center of antenna array

   b. Optimum signal strength and minimum possible signal interference dictate placement of transmitter

9. Primary approach of a localizer is called “Front Course”

   NOTE: Localizer front course beam is adjusted at the antenna array for a 700 ft width at the runway threshold. The beam as displayed on the a/c instruments has a width of 5 degrees allowing for 2-1/2 degrees left full deflection and 2-1/2 degrees right full deflection. A full deflection of the CDI at runway threshold would place the aircraft 350 ft left or right of the runway centerline while tracking on the localizer.

Sg 1, fr 6
Localizer course guidance

   a. The localizer provides course guidance for descent path:

      (1) 18 nm from the antenna

      (2) 1,000 ft above the highest terrain along course line

      (3) 4,500 ft above antenna elevation site

      (4) Signal acquisition and off-course indications are provided through angular areas of the operational service volume:

         (a) To 10 degrees either side of the course along a radius of 18 nm from the antenna

         (b) To 35 degrees either side of the course along a radius of 10 nm from the antenna

      NOTE: After the missed approach point, any localizer signal indication received should be disregarded unless it is designated part of the published missed approach procedure. Any signal that is not part of the procedure should be considered unreliable and disregarded. Some fields will have functional back course localizers (BAC LOC) and are designated as such.

      NOTE: Loss of the localizer information during the approach will render the approach procedure unusable. The approach should be terminated or another type of an approach should be selected, weather permitting.

B. Glideslope - glideslope beam transmitter

Sg 2, fr 2
Fig 1: *FAA Instrument Landing System (ILS)*

1. Glideslope is the second half of the ILS approach guidance equipment

   a. Provides vertical guidance when approach is equipped

   b. Reclassifies the localizer non-precision approach to precision ILS approach

   c. When aircraft is ILS equipped, provides option of precision approach to a field with no PAR facility

   NOTE: Glideslope is often confused with the term "Glidepath." These terms are not synonymous. It is important that you clearly understand the definition of these two terms.

Sg 2, fr 3
Glideslope/Glidepath

   Glideslope: "The vertical reference provided an aircraft during approach and landing. The glideslope reference may be any of the following: an electronic signal (ILS or MLS), visual ground aid (such as VASI) or glideslope information provided by ATC during a surveillance approach."

   Glidepath: "That portion of the glideslope reference signal that intersects the localizer on an ILS approach or is provided by ATC when established on the FAC during a PAR approach."

   d. The glideslope (highly directional shielded antenna) signal is radiated in the direction of the localizer front course

Sg 2, fr 4-5
Glideslope Antenna

      (1) Located 750 to 1,250 ft down the designated ILS runway

      (2) Beam width is 55 ft (+/- 5 ft) at runway threshold crossing height

      (3) Building location is normally located 250 to 600 ft from runway centerline

      (4) Standard ILS glideslope is normally 2.5 to 3.0 degrees (may be higher depending on local terrain)

      (5) Glideslope utilizes two signal lobes projected one above the other. Upper lobe is modulated with 90 Hz and the lower lobe at 150 Hz at an equal signal strength

Sg 2, fr 6-7
Glideslope Signal Lobes

      (6) Each lobe is approximately 0.7 degrees wide with a total beam width of approximately 1.4 degrees wide

      (7) The point of equal signal modulation sets the center of the glideslope beam

Sg 2, fr 8-9
Runway Threshold/DH

NOTE: Glidepaths with no published DH are usable to runway threshold. Pilots of T-45C aircraft will execute a missed approach at the MM or 200 ft AGL whichever occurs first.

NOTE: ILS installations that share the same frequency can exist at each end of a given runway or at other runways on an airport but cannot be in operation at the same time. However, fields can have ILS approaches to different runways that do not share the same frequency and can operate simultaneously.

Sg 2, fr 10
Glideslope Transmitter Frequencies

e. The glideslope transmitter operates on one of 40 dedicated ILS channels

(1) Generates within the UHF frequency range of 329.15 and 335.00 MHz

(2) Dedicated glideslope UHF frequencies are paired with dedicated localizer VHF frequencies and are automatically tuned upon selection of a localizer frequency

Sg 2, fr 11
False Glideslope Signals and Deviations

CAUTION: Pilots should be aware that false glideslope signals may exist. This can cause the glideslope advisory window to disappear and glideslope and localizer needles to appear. Always disregard any glideslope indication when the aircraft is not on a published portion of an ILS approach at a published approach altitude where the glideslope interception is indicated and anticipated.

CAUTION: Pilots should be aware that vehicular traffic not subject to ATC may cause momentary deviation in ILS course or glideslope signals. Also, critical areas around the ILS equipment shielded antennas are not protected at uncontrolled airports or at airports with an operating control tower when weather or visibility conditions are above those requiring protective measures.

II. Range (position) Systems **2.9.4.6.5.4**

Sg 3, fr 2
ILS Range Information

Sg 3, fr 3-5
ILS Position Location

The following systems are commonly used to identify range (position) when flying an ILS/LOC approach

* Marker beacons
* Distance Measuring Equipment (DME)
* Cross-Radial
* Compass Locator

The position of the aircraft on ILS/LOC approaches is very important due to the precise nature of the approach, lower minimums, and obstacle clearances associated with them. The pilot relies on this information to execute specific portions of the approach and for position in relation to the glidepath

A. Marker beacons **2.9.4.6.5.3**

Sg 3, fr 6-7
***Fig 1**: FAA Instrument Landing System (ILS)*

1. Low power transmitters (2 watts - 75 MHz)

2. Produces a signal in an elliptical pattern

   a. 1,000 ft above the antenna

   b. 2,400 ft in width and 4,200 ft in length

3. Elliptical pattern (fan pattern) placement is centered and perpendicular to the FAC

4. Normally, two marker beacons are associated with an ILS approach, Outer Marker (OM) and Middle Marker (MM). However, Category II and III ILS approaches may also have an Inner Marker (IM) associated with the approach

   a. Outer Marker (OM)

      (1) Indicates aircraft, if at appropriate altitude, will intercept the glidepath

      (2) Identified by a coded audio tone (three dashes) and flashing blue cockpit marker light

   b. Middle Marker (MM)

      (1) Intersects the glidepath at approximately 200-ft AGL and identifies the approximate missed approach point for Category I approaches and Category “C” Navy aircraft

(2) indicates a position approximately 3,500 ft from the landing threshold and approximately 200 ft AGL above the touchdown zone

(3) Identification is a coded audio tone (dot dash dot dash) and flashing amber cockpit marker light

c. Inner Marker (IM)

(1) Indicates a point that an aircraft flying a Category II or III ILS approach is at the designated decision height (DH) on glidepath between the MM and the touchdown zone

(2) Aircraft is approximately 100 ft AGL at IM if on glidepath and FAC

(3) Identified by a coded audio tone (four dots) and a flashing white cockpit marker beacon light

Sg 3, fr 8
Back Course LOC (FAF)

d. Back Course (BC)

(1) A BC marker beacon normally indicates a LOC BC final approach fix (FAF) where the approach glideslope is intercepted and the descent is commenced

(2) Identified by a coded audio tone (two dots) and a flashing white cockpit marker light

Sg 3, fr 9
Fig 3: *Marker Beacon Code/Color Identification Table*

5. Marker beacon tones

a. Marker beacons emit specific coded tones, at different pitches, which the pilot of an ILS/LOC equipped aircraft can monitor when on the final approach course

b. In the T-45C, marker beacon tones may be monitored by placing the “MKR” switch on the communications control panel to the “ON” position

c. MKR audio tone volume in the T-45C is preset and cannot be controlled by the RCVR volume control knob on the communication control panel

Sg 3, fr 15
DME

B. Distance measuring equipment (DME)

1. When DME is specified in the approach procedure, DME may be used:

a. In lieu of the OM

b. As a BC final approach fix (FAF)

c. To establish other fixes on the localizer course

MARKER	CODE	LIGHT
OM	— — —	BLUE
MM	● — ● —	AMBER
IM	● ● ● ●	WHITE
BC	● ● ● ●	WHITE

Figure 3: MARKER BEACON CODE/COLOR IDENTIFICATION TABLE

Sg 3, fr 16
DME (TERPs)

2. DME from a separate facility may be used within Terminal Instrument Procedures (TERPs) limitations:

    a. To provide ARC initial approach segments

    b. As a FAF for BC approaches

    c. As a substitute for the OM

    NOTE: The DME of a separate facility is not, by FAA (AIM) definition, authorized for use inside the outer marker inbound on an ILS approach.

Sg 3, fr 18
Cross-Radials

C. Cross-Radials

1. May be generated by VOR or TACAN stations

2. No difference in the procedures used on ILS/LOC approaches than any of the other types of approaches. However, the cross-radial generated from a VOR station would require the ILS to be off tuned on final

    NOTE: Off-tuning the ILS frequency for VOR cross-radial fix identification after final is not an acceptable option. TACAN cross-radial identification poses no problem.

3. If DME is associated with ILS/LOC approach, use the DME as the method to identify the aircraft position along the FAC

Sg 3, fr 21-22
Compass Locator

D. Compass Locator

Although the T-45C is not equipped to use a compass locator, the following information is provided to give you a basic understanding of the system

1. Low power transmitter which emits an omnidirectional signal in the ADF range

2. Most often situated at MM or OM sites

3. Most transmitters have less than 25 watts of power and a range of at least 15 nm. Some locations have up to 400 watts, and are used as OM compass locators and may carry Terminal Weather Broadcast (TWEB) information

4. If used as a Locator Outer Marker (LOM), the beacon will transmit the first two letters of the localizer identifier. If used as the Middle Marker (MM), the beacon will transmit the last two letters of the localizer identifier

III. Visual Information System **2.9.5.5.1**

* Approach lights
* Runway centerline lights
* Touchdown zone lights
* Runway lights

Sg 4, fr 2-5
Fig 4: Instrument Runway Lighting

A. Approach Lighting System (ALS)

Sg 4, fr 6-7
Approach Lighting System

1. Provides main visual system used to transition from instrument flight to visual flight for landing

2. Precision approaches, such as the ILS approach, require the configuration of the ALS to start at the landing threshold and to extend into the approach area for a distance of 2,400 to 3,000 ft

3. Non-precision approach runway lights would only run 1,400 to 1,500 ft from runway threshold

4. Some ALS use sequenced lights running toward the runway at high speed (twice a second). These lights are Runway Alignment Indicator Lights (RAILs) more commonly referred to as “rabbit lights”

NOTE: The example of approach lighting systems provided in this lesson is not unique. Examples of each configuration and publication identification code can be found in the Flight Information Handbook. Additionally, the code identifying the type of ALS for an approach to a given runway is provided on the bottom right corner of the instrument approach plate in the airfield layout box.

Sg 4, fr 8
Flight Information Handbook, FLIP Approach Plates

B. Runway Centerline Lights (RCLs) and Touchdown Zone Lights (TDZLs)

Sg 4, fr 9-10
RCLs, TDZLs

1. RCLs and TDZLs are a category of lighting known as “in-runway lights”

2. RCLs

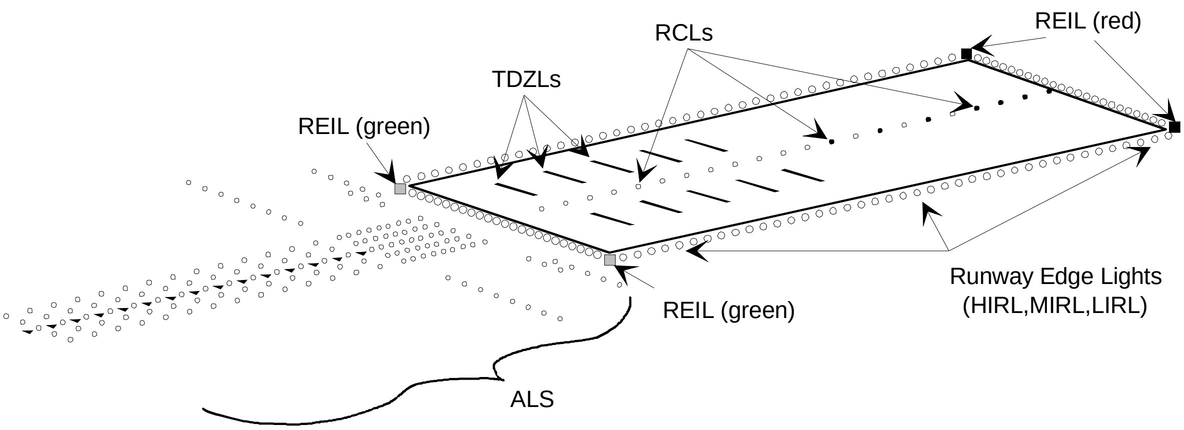
   a. Inset flush into the runway

   b. Spaced at 50-ft intervals beginning 75 ft from the landing threshold and extending within 75 ft of the opposite end

   c. White until the last 3,000 ft of runway. From 3,000 ft to 1,000 ft from end of runway, the lights alternate red and white. The last 1,000 ft they are all red

5. TDZLs

   a. Incorporate two rows of transverse light bars disposed symmetrically about the runway centerline in the runway touchdown zone



ALS	Precision Instrument Runway Nonprecision Instrument Runway	2,400'-3,000' 1,400'-1,500'
RCLs	White to Last 3,000' Red and White Next 2,000' Red Last 1,000'	
Runway Edge Lights	White Until Last 2,000' Amber Last 2,000'	

Figure 4: INSTRUMENT RUNWAY LIGHTING

b. Spaced at 100 ft intervals

c. System starts 100 ft from landing threshold and extends to 3,000 ft from the threshold or the midpoint of the runway, whichever is less

C. Runway Lights

Sg 4, fr 11-12
Runway Lights

* Runway End Identifier Lights (REILs)

* Runway Edge Light System

1. Runway End Identifier Lights (REILs)

a. Provides rapid and positive ID of the approach end of a runway

b. Consists of a pair of synchronized flashing lights laterally located on each side of the runway threshold

c. May be either omnidirectional or unidirectional facing the approach area

2. Runway Edge Light System

Sg 4, fr 13-14
Runway Edge Light System

a. Identifies a runway:

(1) Surrounded by a large concentration of other lighting

(2) That lacks contrast with surrounding terrain

(3) During reduced visibility

b. Physical characteristics:

(1) Normally white except for instrument runways where amber lights replace the white edge lights for the last 2,000 ft of the runway or half the runway length, whichever is less. This forms a caution zone for landing aircraft

(2) Lights shine green outward from the runway approach end to identify threshold

(3) Lights shine red from end of the runway toward departure end to indicate the end of runway to departing aircraft

c. Classification is according to intensity or brightness

Sg 4, fr 15-16
HIRLs, MIRLs, LIRLs

(1) High Intensity Runway Lighting (HIRL)

(2) Medium Intensity Runway Lighting (MIRL)

(3) Low Intensity Runway Lighting (LIRL)

HIRLs and MIRLs are variable in intensity whereas LIRLs normally have only one intensity setting

Pilots may request approach control to vary intensity of the lights to help identify runway when ground lights make it difficult to pick out. Some airports have lights controlled from the air by the pilot by keying his VHF radio

IV. ILS Controls and Instruments **2.9.4.6.3, 2.9.4.6.2.1**

A. Controls

Sg 5, fr 2-6
Fig 5: *ILS Controls & Instruments*

1. Communication Control Panel

2. TACAN Control Panel

3. VOR Control Panel

B. Instruments

Fig 6: *ILS Navigation Instruments*

1. ADI

2. HSI

3. Marker Beacon Lights

C. Procedure

Sg 5, fr 7-11
ILS Controls and Instruments

1. Controls:

a. Check HSI FWD/AFT option on the HSI display, and COMM1 and COMM 2 are selected for the desired cockpit (FWD or AFT)

b. Tune ILS approach frequencies on VOR Control Panel

(1) ILS operates on odd decimal frequencies (108.10 to 111.95)

(2) VOR operates on even frequencies (108.0 to 111.85 and all 112.00 to 117.95)

c. Select VOR to the ON position on Communication Control Panel for localizer audio identifier signal

NOTE: Remember an ILS/LOC frequency always has a four letter identifier beginning with the letter “I”

d. Adjust volume by twisting the RCVR knob on the Communication Control Panel

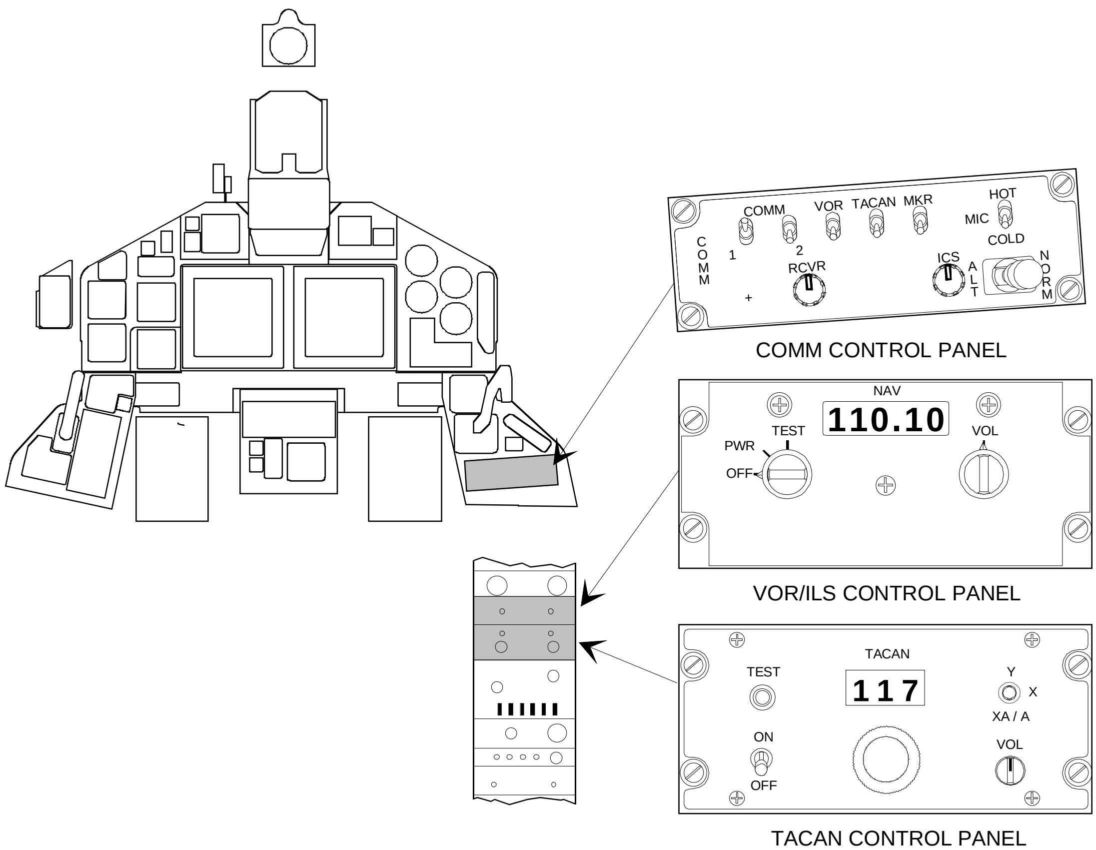


Figure 5: ILS CONTROLS & INSTRUMENTS

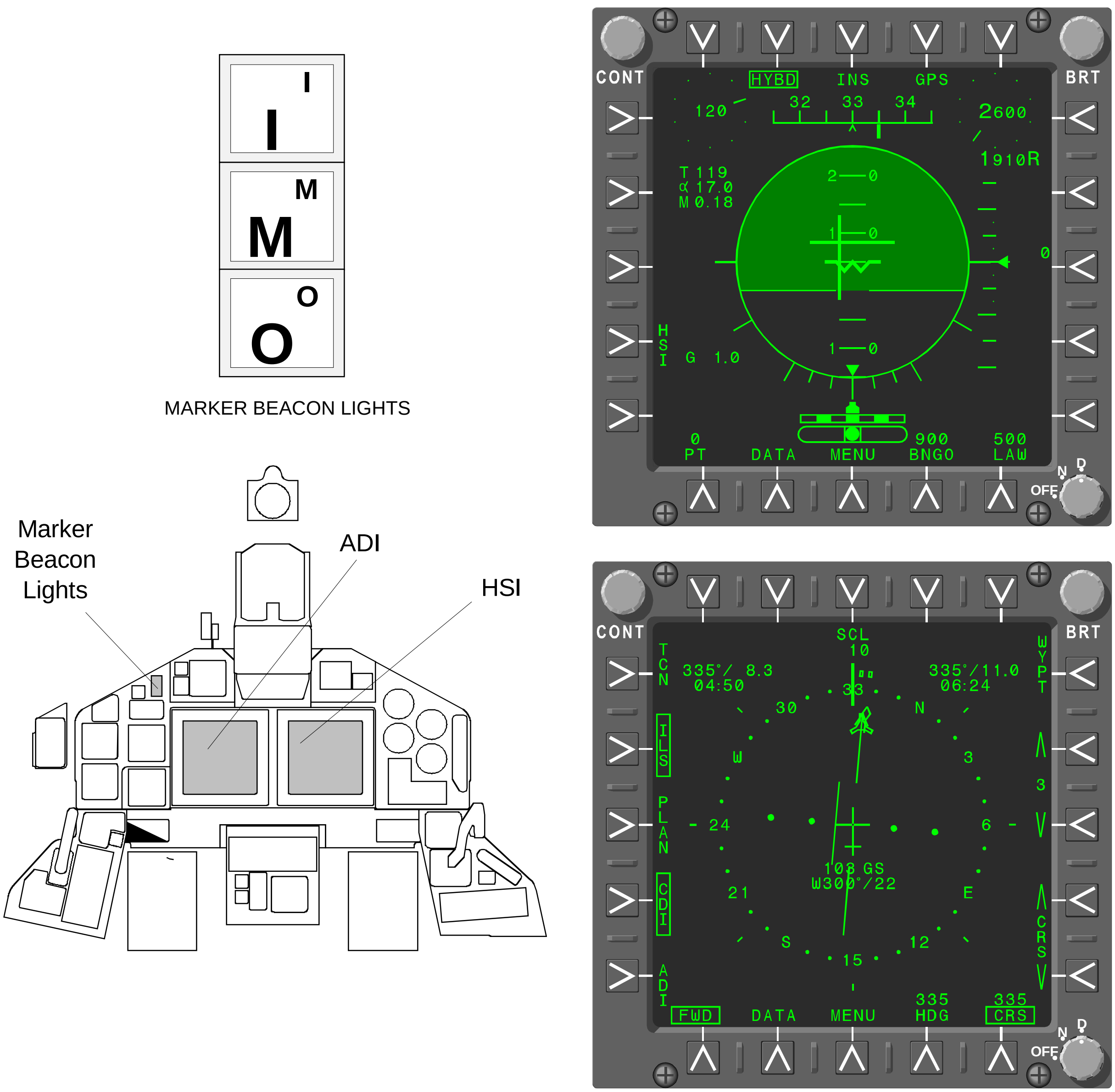


Figure 6: ILS NAVIGATION INSTRUMENTS

2. Instruments

Sg 5, fr 12
ILS Needles (ADI)

a. ADI

(1) Localizer steering needle displays ILS localizer deviation

(2) Glideslope steering needle displays glidepath deviation

b. HSI

Sg 5, fr 13-14
ILS indicator needles, HSI and HUD

(1) ILS steering can only be selected in CDI mode

(2) When only ILS steering is selected on the HSI, the CDI indicates aircraft deviation from the ILS localizer

(3) The ILS CDI localizer deviation is relative to the course line arrow head regardless of the course entered in CRS

NOTE: Good pilot technique includes setting the published ILS course in CRS to avoid confusion.

(4) Whenever another steering option, TCN, WYPT, or WO/S is selected in addition to ILS steering, the course line displays TCN, WYPT, or WO/S deviation, not ILS localizer deviation

c. HUD

(1) The selected navigation steering mode is displayed

(a) TILS - TACAN and ILS steering

(b) TCN - TACAN steering

(c) W## - Waypoint/AUTO steering

(d) O## - Waypoint Offset steering

(e) VOR - VOR steering

(f) ILS - ILS steering

(g) WILS - Waypoint and ILS steering

(h) OILS - Waypoint Offset and ILS steering

(2) Distance and time-to-go to selected steering point displayed adjacent to selected navigation steering mode

NOTE: Distance and time-to-go not shown with ILS or VOR steering.

(3) Situation steering arrow and course deviation dots only appear when TACAN, Waypoint, or Waypoint Offset steering is selected either separately or in conjunction with ILS steering

(4) ILS deviation needles indicate aircraft position relative to the localizer and glideslope in the same manner as the ILS steering needles on the ADI

d. Instrument interpretation

(1) When ILS steering needles centered on ADI aircraft symbol, the aircraft is on course and on glidepath

(2) When the CDI course line is centered on the HSI, the aircraft is centered on the localizer course

(3) Deviation from glidepath are signaled on the ADI and HUD, deviation from localizer approach course is signaled on the ADI, HUD and HSI CDI course line (only ILS steering selected)

(4) Correction to glidepath deviations are made by small power and/or attitude adjustments

(5) Correction to localizer deviations are made by heading changes of 5 degrees or less

(6) Glideslope and localizer deviation corrections become smaller as the distance from the field decreases due to the decreasing width of the glidepath and localizer signals

(7) The glideslope and localizer steering needles flash when limited

(8) ILS course deviation on the HSI is relative to the localizer beam width, if the localizer beam width is 5 degrees, each dot on the HSI display represents 1.25 degrees of deviation

Sg 5, fr 15
ILS Advisories

e. ILS advisories **1.8.1.9.11.3**

(1) GLIDESLOPE advisory window displayed and glideslope steering needle removed from ADI and HUD when glideslope signal not received

(a) Remove advisory window by pressing REJ push-button

(b) May continue with a localizer approach if glideslope lost above MDA

(2) LOCALIZER advisory window displayed and all steering needles, and HSI center CDI courseline removed when localizer signal not received

(a) Remove advisory window by pressing REJ push-button

(b) Must execute missed approach

(3) ILS advisory window displayed and all steering needles, and HSI center CDI courseline removed when no localizer or glideslope signal is received

(a) Remove advisory window by pressing REJ push-button

(b) Must execute missed approach

f. Marker Beacon Lights

Sg 5, fr 16-18
Fig 7: *Marker Beacon Test and Illumination Controls*

(1) Located on the front instrument panel in both cockpits

(2) Lights flash blue, amber, and white as aircraft passes over corresponding marker beacon transmitter

(3) VOR transmitter does not have to be selected ON

(4) Lights are considered advisory

(5) WARN/CAUT switch dims the marker beacon lights when momentarily pressed

(6) Each marker beacon transmitter emits a unique modulated frequency which is amplified by the marker beacon receiver and then routed to pilot's headset as an aural tone. Volume cannot be adjusted

(7) Testing the lights by placing the MASTER TEST SWITCH to LIGHT TEST or by placing the VOR/ILS control panel to TEST

Pilots should be aware of the following warnings associated with the ILS approach system

Sg 5, fr 19
Fig 8: *ILS Critical Area Taxiway Position Markings*

CAUTION: Vehicles and aircraft passing in close proximity to the LOC and GS antennas can cause deviation in the projection of the localizer and glideslope information. Should you observe sudden or intermittent changes in course information displayed on the ADI and HSI once established on the FAC and not due to heading deviations, inform ATC immediately and take appropriate action.

CAUTION: Do not taxi beyond the ILS Critical Area Hold Short markers on the taxiways when the instrument runway is active for ILS approaches without tower/ground control clearance. Positioning your aircraft beyond the markers during an approach could disrupt and affect the reliability of the ILS guidance beacons.

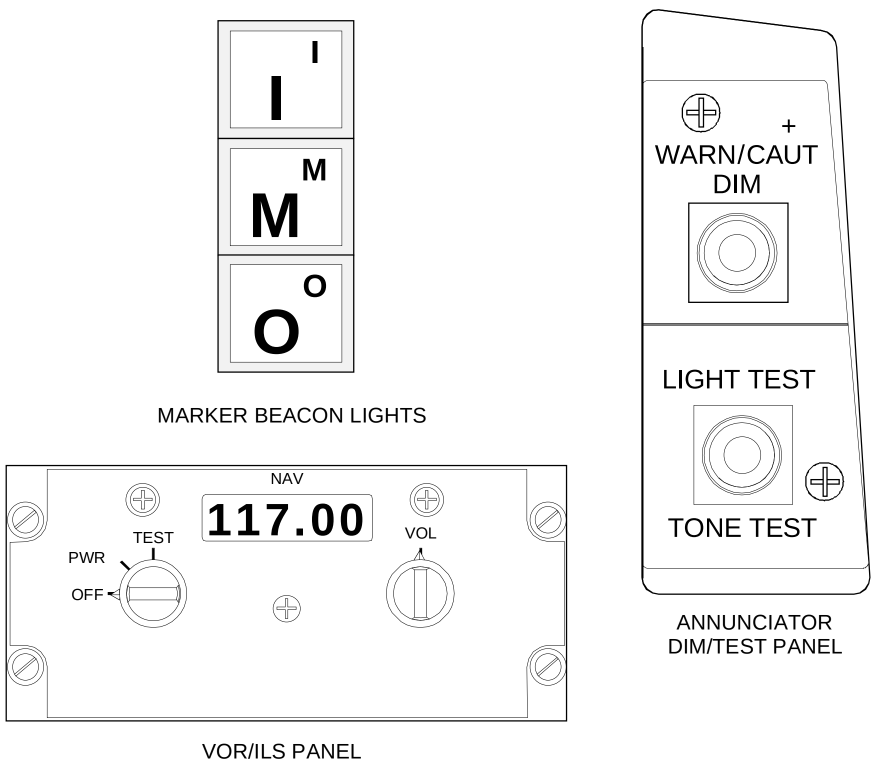


Figure 7: MARKER BEACON TEST AND ILLUMINATION CONTROLS

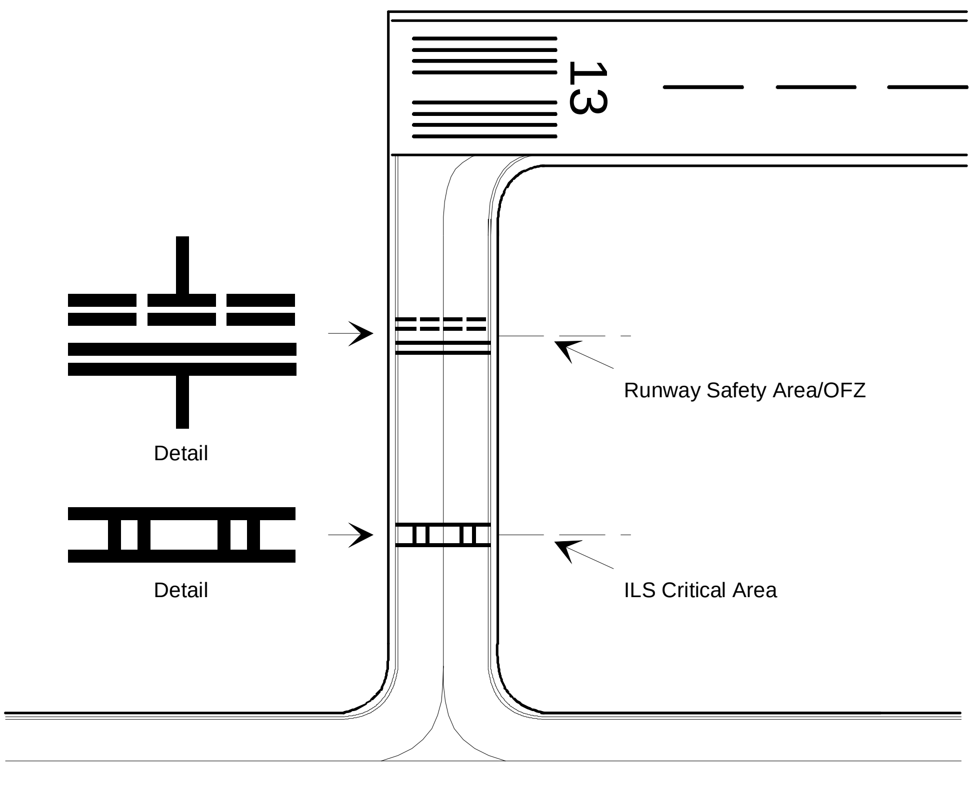


Figure 8: ILS CRITICAL AREA TAXIWAY POSITION MARKINGS

At fields where no authority exists, such as a tower or ground control, remain behind the critical area hold short line if an approach is known to be in progress.

CAUTION: Invalid (phantom) glideslope signals can be inadvertently projected in the area of the glideslope beam and in an area behind the antenna (back course).

Do not accept a glideslope indication as valid when you are not on a published portion of the approach and at an altitude and position where you anticipate intercepting the glideslope.

REVIEW QUESTIONS

1. The ILS system is made up of three parts. Those parts are the________ systems, the _________ systems, and the _________ systems.

2. The _________ system is made up of _______ elements, the ___________ and the ___________ transmitters. The __________ provides azimuth information, ________ guidance and the __________ provides glideslope information, ________ guidance.

3. The localizer provides course guidance to 35 degrees out to _______ nm and to 10 degrees out to ________nm . The addition of a _________ to a localizer approach reclassifies the approach from a __________ to a ___________ approach.

4. The standard ILS __________ beam angle is _______ to _______ degrees.

5. The definition of “glidepath” is that portion of the ________ reference signal that intersects the localizer on an _________ approach or is provided by ________ when established on the FAC of a PAR approach.

6. The ________ system is a component of the ILS/LOC approach system and is used to determine “position” along the FAC. The systems are the following: _________, _________, __________, and ___________.

7. The _________ are the most common and are _______ _______ transmitters that produce an _________ pattern that is placed so that it is __________ to and centered on the FAC of an ILS/LOC approach.

8. The _______ is the _________ associated with the DH of a single-piloted Navy aircraft and is placed so that it crosses the FAC glidepath at approximately 200 ft AGL.

9. The ______ is associated with a blue _____ _____ light in the cockpit. The ______ is associated with ______ and the _______ is associated with a white light indication in the cockpit.

10. To monitor the tone associated with the _______ ________, toggle the switch on the communication control panel to MKR. The aural tone volume ________ (can/cannot) be controlled with the RCVR knob. The lights associated with the ______ _______ can be dimmed by momentarily placing the MASTER/CAUT switch on the Annunciator DIM/ TEST Panel to DIM.

11. DME may be used in place of the _______ _______ . DME, if coupled to the ILS will be tuned _________ to one of ________ UHF frequencies when the ILS frequency is initially set up.

12. Cross-radial fixes from a ______ are not ________ in the T45C because that would require the pilot to _______ the primary navigation indication when on the FAC.

13. The ________ _________ is a low power navigation beacon used as the OM or MM and operates in the ______ frequency range. This NAVAID is not available in the T-45C.

14. Sequenced running lights are known also as ________ lights. These lights are associated with the ________ _______ system.

15. Runway centerline lights and touchdown zone lights are in a category of lights known as __-______ lights. Centerline lights are white until the last _______ ft of runway and ______ & ______ to _______ ft from the end of the runway and ________ for the last ________ ft.

16. REILs are installed at ends of runways to provide _______ and _______ identification of the _________ end of a particular runway.

17. Runway edge lights are normally white except on runways that are designated "___________" runways where ________ lights replace the white lights for the last ________ ft of the runway or half the runway length, whichever is less, to form a __________ zone.

18. The ________ and ________ are variable in intensity which may be increased or decreased at the pilot's request to the controlling agency or, at some airports, by keying his _______ radio.

19. ILS/LOC frequencies are tuned on the _______ control panel. ILS/LOC frequencies can be identified by those ending with _______ decimals between 108.10 and 111.95. The coded identifier is a ______ letter identifier beginning with the letter "__".

20. The FWD/AFT option on the HSI display selects and identifies which cockpit controls the __________ display and the ____ and ______ control panels. The COMM transfer switches select and identify which cockpit has control of the _________ and _________.

21. To receive DME on an ILS approach where the DME feature is not coupled with the ILS VHF frequency, the pilot will have to tune the _______ on the ________ ______ ________ .

22. If an ILS approach frequency is tuned, the HSI has been selected for ILS, and the aircraft is outside the sensing range of the beams produced by the shielded antennas, the HSI CDI will be _________.

23. Marker beacon lights are checked by placing the _______ _______ ______ or _______ to ________.

SUMMARY

This lesson has focused on the following topics:

* ILS guidance information
* ILS range information
* ILS visual information
* ILS controls and instruments

CONCLUSION

You must understand the operations of ground and airborne ILS components and recognize their indications in the aircraft to execute safe and correct ILS approaches.

ANSWER KEY

1. guidance, range, visual

2. guidance, two
localizer, glideslope
localizer, course
glideslope, vertical

3. 10, 18, glideslope, non-precision, precision

4. glideslop, 2-1/2 to 3

5. glideslope, ILS, ATC

6. range, Marker Beacon, distance measuring equipment (DME), cross-radial, compass locator

7. marker beacons, low power, elliptical, perpendicular

8. middle marker, beacon

9. outer marker, flashing marker, middle marker, yellow, inner marker

10. Marker Beacons, cannot, Marker Beacons

11. outer marker, automatically, 40

12. VOR, possible (or acceptable), off tune

13. compass locator, ADF

14. rabbit, approach lighting

15. in runway, 3,000, red & white, 1,000, red, 1,000

16. rapid, positive, approach

17. instrument, amber, 2,000, caution

18. HIRLs, MIRLs, VHF

19. VOR, ODD, four, I

20. HSI (NAV), VOR, TACAN, COMM1, COMM2

21. frequency, TACAN control panel

22. removed

23. master test switch, VOR/ILS, test

LESSON GUIDE

COURSE/STAGE: T-45C TS Instrument Navigation

LESSON TITLE: TACAN/VOR Navigation and Holding Procedures

LESSON IDENTIFIER: T-45C TS INav-05

LEARNING ENVIRONMENT: CAI

ALLOTTED LESSON TIME: 0.8 hr

TRAINING AIDS:

* Figures:
  Fig 1: Lead Point Identifier
  Fig 2: Radial Width List
  Fig 3: Holding Pattern Entry Diagram

STUDY RESOURCES:

* NATOPS Instrument Flight Manual, NAVAIR 00-80T-112, 1984
* T-45C NATOPS Flight Manual, A1-T45AC-NFM-000
* T-45C Instrument FTI

LESSON PREPARATION:

N/A

(2-02) ORIGINAL

REINFORCEMENT: N/A

EXAMINATION:

The objectives in this lesson will be tested in Instrument Navigation 12X.

LESSON OBJECTIVES

2.7.7.3.3.2
Recall VOR navigation procedures

2.7.7.3.3.1
Recall TACAN navigation procedures

2.7.5.1.8.2
Recall navigational procedures to compensate for wind drift

2.7.5.1.6.1.1
Recall entry procedures for TACAN/VOR/VOR DME holding

2.7.5.2.4.1.2
Recall wind correction procedures for holding

MOTIVATION

Instrument navigation around the ship is critical when you consider that you are separated from other aircraft by only 1 minute and 1,000 ft when you commence your approach from holding. Your thorough knowledge of the aircraft's navigation equipment and the procedures for using that equipment is paramount given that a mistake of only a few feet or a few seconds may result in disaster. Once proficient with the material in this lesson, you will aviate more precisely and adjust more adeptly to changes in routing and clearances.

OVERVIEW

After this lesson, you will know TACAN and VOR navigation procedures and proper techniques for entry into and maintenance of holding patterns.

This lesson consists of:

* Navigation procedures
    - VOR/TACAN intercepts
    - TACAN
    - Wind corrections (crabbing)
* Holding
    - Entry determination
    - Entry procedures
    - Maintaining

REFRESHER

* The T-45C HSI takes the place of the RMI, CDI, and RNAV remote display indicators of the T-34C.
* Because the T-45C cruises about three times as fast as the T-34C, you have a third of the time to anticipate changes.
* Lead point calculation (LPC) is the distance, in nautical miles or radials, that you must start (lead) a turn in advance of intercepting a new course, radial, or arc. Your lead point calculation must recognize both the aircraft's speed and distance from the station. Distance between radials decreases proportionally as you head towards the VOR/ TACAN station and increases proportionally as you head away from the station.
* The T-45C requires more distance to turn than does the T-34C.
* Holding is performed at max endurance airspeed.

PRESENTATION

I. Navigation procedures

A. VOR/TACAN intercepts **2.7.7.3.3.2, 2.7.7.3.3.1**

NOTE: The following intercept procedures apply to either the VOR, TACAN, or WYPT, whichever is selected.

1. Proceeding direct to station (inbound radial)

a. Tune and identify station

b. Turn aircraft in shortest direction to place head of bearing pointer under HSI lubber line (heading index)

c. Center the CDI

d. Note wind drift, if any (ground track marker)

e. Crab as necessary to keep CDI centered

COMMON ERROR: Not correcting for wind drift and homing instead of proceeding direct to the station.

2. 30-degree inbound radial intercept

a. Tune and identify station

b. Set desired course in course selection window

c. Look from desired course to head of the bearing pointer used and 30 degrees beyond to determine intercept heading

d. Turn aircraft to the intercept heading

e. Maintain intercept heading until lead point is reached

f. Complete intercept

COMMON ERROR: Looking from the head of the bearing pointer to the desired course and 30 degrees beyond (instead of looking from the course to the bearing pointer and 30 degrees beyond).

3. Double angle off the bow inbound method

   a. Tune and identify station

   b. Set desired course in course selection window

   c. Look from desired course to the head of the bearing pointer selected and an equal number of degrees beyond to determine intercept heading (max 45 degrees)

   d. Turn aircraft to the intercept heading

   e. Maintain intercept heading until lead point is reached

   f. Complete intercept

   COMMON ERROR: Looking from the head of the bearing pointer to the desired course and an equal number of degrees beyond to determine the intercept heading.

4. Radial intercept immediately after passage

   a. Set desired course in course selection window

   b. After station passage, turn to parallel desired course

   c. Look from tail of the bearing pointer used to desired course and an equal number of degrees beyond desired course, but not more than 45 degrees

d. Turn aircraft to the intercept heading

e. Maintain intercept heading until lead point is reached

f. Complete intercept

5. 45-degree outbound radial intercept

a. Tune and identify station

b. Set desired course in course selection window

c. Look from tail of the bearing pointer used to desired course and 45 degrees beyond to determine intercept heading

d. Turn aircraft to the intercept heading

e. Maintain intercept heading until lead point is reached

f. Complete intercept

COMMON ERROR: Looking from the desired course to the tail of the bearing pointer and 45 degrees beyond to determine the intercept heading.

B. TACAN **2.7.7.3.3.1**

Fig 1: *Lead Point Identifier*

1. Lead point calculations (LPC)

a. Approximately 1 percent of ground speed for a 90-degree intercept

NOTE: When ground speed is not available, approximate this value using KTAS adjusted for wind and altitude.

b. Use a reasonable distance lead point for intercepts of less than 90 degrees

2. Intercepting and maintaining a TACAN arc around a station

   NOTE: The distance between radials at 60 nm from the station is 1 nm and decreases/increases proportionally to/from the station.

   a. Chord method (usually used when greater than 12 miles DME from station)

      (1) Tune and identify station

      (2) Determine direction to turn

      (3) Determine desired lead point

      NOTE: Add lead when tracking to the station; subtract lead when tracking from the station.

      (4) Monitor bearing pointer and DME to determine roll-out

      COMMON ERROR: Not monitoring DME and rolling out at the wrong time and on the wrong DME arc.

      (5) Fly a straight short leg, allowing head of bearing pointer to reposition between 5 and 10 degrees behind wingtip position

      (6) Turn aircraft to reposition bearing pointer from behind to between 5 and 10 degrees ahead of wingtip position

      (7) Continue sequence of alternating ahead/behind wingtip until you turn inbound or outbound on your new radial

   b. AOB method (usually used when within 12 miles DME of station)

      (1) Tune and identify station

***Fig 2:** Radial Width List*

<u>For a 90° intercept:</u>

Lead point (nm) = 1% of ground speed

Lead point (radials) = $\dfrac{60}{\text{DME of arc}}$ **X 1% of ground speed**

Approximate ground speed if not known by correcting TAS with headwind component.

Figure 1: LEAD POINT IDENTIFIER

Formula to compute number of radials crossed
in each mile at a given distance from a station:

$$\textbf{Radials/mile} = \frac{\textbf{60}}{\textbf{DME from station}}$$

DISTANCE FROM STATION	# RADIALS CROSSED IN 1 nm
60 nm.	1
30 nm.	2
20 nm.	3
15 nm.	4
10 nm.	6
5 nm.	12

Figure 2: RADIAL WIDTH LIST

(2) Determine direction to turn

(3) Determine desired lead point

(4) Initiate 90-degree intercept when DME equals radius of arc plus or minus desired lead

NOTE: Add lead when you're tracking to the station; subtract lead when you're tracking from the station.

(5) Adjust AOB to maintain proper distance by keeping bearing pointer on wingtip position

NOTE: You may combine the AOB and chord methods to maintain the arc and aircraft control. The two methods are normally distinguished according to DME limits; however, outside of 12 DME, the AOB required to maintain an arc will probably be too small to hold accurately.

COMMON ERROR: Not monitoring DME and rolling out at the wrong time and on the wrong DME arc.

3. Intercepting a radial from an arc

a. Set desired course in course selection window

b. Determine lead point - divide DME of arc into 60 and multiply the product by 1 percent of ground speed.

$$\frac{60}{\text{Arc DME}} \text{ X } 1\% \text{ GS} = \text{LPC}$$

$$=$$

$\frac{60}{15} = 4$ radials;

$250 \times 1\% = 2.5$ ground speed;

$4 \times 2.5 = 10$ radial lead

c. When lead point is reached, turn to intercept selected course

NOTE: The CDI may not have started to move at lead point because it is not active until you are within 10 degrees of the course.

d. Track inbound on radial

4. Performing a ground speed check

NOTE: For a reliable ground speed check, the DME from the station should be greater than aircraft altitude in thousands of feet.

EXAMPLE: Altitude is 30,000 ft (FL 300), so DME should be 30 nm or greater.

a. Start timing when DME indicator displays a whole number

b. After predetermined time (in minutes), check and note DME

c. Determine distance flown and multiply that number by multiplier corresponding to time flown

EXAMPLE: Your distance flown is 6 on the DME indicator. The elapsed time is 1 minute, so 6 times 60 equals 360. Ground speed is 360 kts (6 nm/min times 60 min/hr equals 360 nm/hr).

NOTE: Track either inbound or outbound on a given radial when making a ground speed check.

NOTE: Every 1/10 nm equals 6 kts.

NOTE: Checking ground speed for more than 1 minute increases the accuracy of this method.

5. Proceeding direct between TACAN fixes (point-to-point)

a. Tune and identify station if not already done

b. Visualize HSI as compass rose with station at center

c. Picture fix having greater distance from station on its radial at outside edge of compass card

d. Visualize second fix at proportional distance from center of compass card on its radial

e. Connect two fixes with an imaginary line

f. Move line to center of compass card parallel to original line and read course to the new fix off compass card

g. Turn to new course (plus wind correction if known); top of imaginary line where it crosses compass card

h. Update course and make corrections periodically to point-to-point heading

C. Wind correction (crabbing) **2.7.5.1.8.2**

NOTE: Tailwinds and headwinds affect ground speed only.

1. Used to maintain radial/bearing via tracking into wind (maintaining a constant track over the ground)

2. Crab angle (heading differential)

   a. Correct: aircraft maintains desired course

   b. Insufficient: aircraft continues to drift with wind

   c. Too large: aircraft crosses radial

3. Procedure

   a. Confirm drift due to crosswind by referencing CDI

   b. Compensate by turning aircraft back to reintercept desired radial

c. Maintain crab angle to keep CDI centered

NOTE: Use ground track marker on HSI page to assist with determining and maintaining proper crab.

COMMON ERROR: Making too small a correction to return to the radial.

II. Holding

Fig 3: Holding Pattern Entry Diagram

A. Entry determination: referencing the HSI

NOTE: The following procedures govern a standard (right-hand) holding pattern. For a nonstandard (left-hand) pattern, the directions are reversed.

1. Visualize a straight line on HSI from aircraft heading to bottom of instrument

2. Visualize a straight line on HSI from 70 degrees to right of aircraft heading to 110 degrees left of aircraft heading

   COMMON ERROR: Forgetting to reverse the layout of entry patterns on the HSI for nonstandard holding.

   COMMON ERROR: Not using heading for arrival at fix in relation to holding radial to determine type of entry.

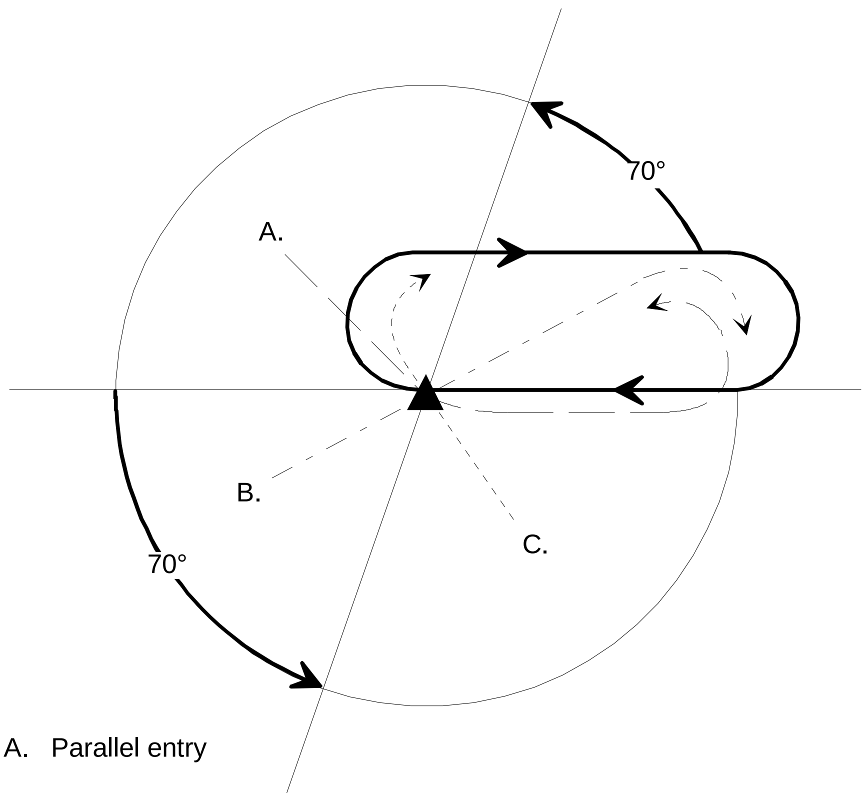
3. Determine entry type by angular difference between holding radial and heading as it crosses holding fix

   a. Parallel entry--perform parallel if holding radial is within 110 degrees left of heading

   b. Teardrop entry--perform if holding radial is within 70 degrees right of heading

   c. Direct entry--perform if holding radial is outside an area of 110 degrees to the left and 70 degrees to the right of heading

      COMMON ERROR: Determining the type of entry from your initial heading <u>to</u> the fix and not your heading <u>at</u> the fix. (Also dependent on holding radial and direction to hold from the fix.)



A. Parallel entry

B. Teardrop entry

C. Direct entry

Figure 3: HOLDING PATTERN ENTRY DIAGRAM

B. Entry procedures TACAN, VOR, VOR/DME **2.7.5.1.6.1.1**

1. Parallel

   a. Cross holding fix

   b. Turn in shortest direction to parallel holding radial

   c. After desired time or DME is reached, turn in direction of holding side of pattern

      COMMON ERROR: Turning in the wrong direction after paralleling course. Even though this is a standard pattern that requires you to make right-hand turns, you will first make a left-hand turn.

   d. Return to holding fix or intercept the holding course inbound

      NOTE: Do not correct for wind until established on the inbound course.

      COMMON ERROR: Do not make large corrections in heading while close to the station (holding fix). You should already be at wings level.

   e. After fix passage, turn right into holding pattern, and begin timing for outbound leg when wings level and bearing pointer on or past wingtip

2. Teardrop

   a. Cross holding fix

   b. Proceed outbound on heading 30 degrees from reciprocal of holding course

   c. After desired time or DME reached, turn in direction of holding pattern to intercept holding course

3. Direct

    a. Turn in direction of holding

    b. Fly the pattern

C. Maintaining

1. Distance: TACAN and VOR/DME

    a. As published

    b. As specified by controller

    c. As requested by pilot

2. Timing: non-DME

    a. Inbound leg (length)

        (1) 1 minute maximum: at or below 14,000 ft MSL

        (2) 1-1/2 minutes maximum: above 14,000 ft MSL: 1-1/2 minutes maximum

        NOTE: Timing is based on <u>inbound</u> leg. Outbound leg is adjusted as required.

    b. Outbound leg (whichever occurs last)

        (1) Wings level

        (2) Abeam fix

        COMMON ERROR: Failing to start/stop timing abeam station or after first turn inbound to determine wind effects.

3. Airspeeds

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

Altitude (MSL)	Airspeed (KIAS)
MHA - 6,000 ft	200
6,001 ft - 14,000 ft	230
14,001 ft and above	265

   b. The following are exceptions to the maximum holding airspeeds:

      (1) Holding patterns from 6,001 ft to 14,000 ft may be restricted to a maximum airspeed of 210 KIAS; this nonstandard pattern will be depicted by an icon

      (2) Holding patterns may be restricted to a maximum airspeed of 175 KIAS; this nonstandard pattern will be depicted by an icon; holding patterns restricted to 175 KIAS will generally be found on instrument approach procedures applicable to Category A and B aircraft only

      (3) Holding patterns at USAF airfields only--310 KIAS maximum, unless otherwise depicted

      (4) Holding patterns at Navy fields only--230 KIAS maximum, unless otherwise depicted

   NOTE: Normally, holding airspeed is based on maximum endurance. Airspeed is adjusted for altitude. A max endurance airspeed would be appropriate when conserving fuel.

4. Wind correction **2.7.5.2.4.1.2**

   a. Crosswind correction

      (1) Used while in holding pattern

(2) Apply wind correction crab angle on outbound leg that is 2 to 3 times the angle that holds the aircraft on course inbound

(3) Use ground track marker on HSI to assist in determining and maintaining proper crab.

(4) Use SRT in pattern

b. Headwinds and tailwinds

(1) Affect only timed holding patterns

(2) Adjust outbound time for correct inbound time

NOTE: Headwinds and tailwinds affect only non-DME holding patterns.

COMMON ERROR: Failing to keep track of time inbound and outbound.

COMMON ERROR: Failing to make wind corrections large or soon enough prior to turns.

NOTE: Turns should not exceed standard rate or 30 degrees whichever occurs first.

SUMMARY

This lesson has covered:

* Navigation procedures
    - VOR/TACAN intercepts
    - TACAN
    - Wind corrections (crabbing)
* Holding
    - Entry determination
    - Entry procedures
    - Maintaining

CONCLUSION

This lesson provided you with techniques to ease your instrument navigation workload. In addition, the navigation procedures addressed are established methods for navigating and maneuvering in the air traffic control system.

NOTES

LECTURE GUIDE

COURSE/STAGE: T-45C TS Instrument Navigation

LESSON TITLE: Departure and Terminal Procedures

LESSON IDENTIFIER: T-45C TS INav-06

LEARNING ENVIRONMENT: Classroom

ALLOTTED LESSON TIME: 1.0 hr

TRAINING AIDS:

* Figures
  - Fig 1: DD-175 Fuel Plan—Alternate Required
  - Fig 2: DD-175 Fuel Plan—Alternate Not Required
  - Fig 3: Instrument Ratings
  - Fig 4: DD-175 Standard Instrument Departure (SID)
  - Fig 5: DD-175 Radar Departure
  - Fig 6: VFR - Climb on Course
  - Fig 7: Dallas-Love Field (HI) (Pilot NAV)
  - Fig 8: Dallas-Love Field (HI) (Vector)
  - Fig 9: Single Frequency Approach (SFA-UHF)
  - Fig 10: Circling Approach
  - Fig 11: Circling Area Limits
  - Fig 12: Radar Vectored or Cleared Direct
  - Fig 13: Minimum Vectoring Altitude
  - Fig 14: Visual Descent Point

(2-02) ORIGINAL

STUDY RESOURCES:

* NATOPS General Flight and Operating Instructions Manual, OPNAVINST 3710.7
* NATOPS Instrument Flight Manual, NAVAIR 00-80T-112
* Aeronautical Information Manual, FAA (current issue)
* FLIP (Terminal) High Altitude, United States, SW, SE, NW, NE

LESSON PREPARATION:

Read:

* Chapter 9, "Aeronautical Charts and Related Publications," Aeronautical Information Manual, FAA (current issue)
* FLIP (Inside cover) (Terminal) Publication
* FLIP General Planning (GP), Chapter 3 "FLIP Program," Chapter 5, "Pilot Procedures"

REINFORCEMENT:

Read:

* Pilot/Controller Glossary, Aeronautical Information Manual, FAA (current issue)

EXAMINATION:

The objectives in this lesson will be tested in Instrument Navigation 12X.

LESSON OBJECTIVES

1.1.1.8.2
Recall fuel requirements for filing DD-175

2.5.12.2
Recall takeoff minimums as defined in OPNAVINST 3710.7

2.6.6.1
Recall procedures for performing an instrument departure

2.6.6.4
Recall procedures for a standard instrument departure

2.7.6.1.2
Recall proper response to ATC clearance

2.9.4.1.2.3
Recall standard terminal arrival (STAR) procedures

2.9.4.1.1
Recall criteria which influence type of instrument approach

2.9.4.2.3
Recall communication procedures for approach

2.9.4.1.2
Recall procedures for performing an en route descent

1.9.1.3.1.1
Recall procedures and reasons for performing flight under IFR to a visual approach

1.9.1.3.1.2
Recall procedures/reasons for performing IFR approach to a contact approach

2.9.5.4.1
Recall procedures/reasons for performing a circling approach

2.9.4.5.2.4
Recall factors associated with performing radar vectors and approaches

2.9.4.9.2
Recall constraints and guidelines for performing a missed approach

2.9.4.5.1.2
Recall procedures/constraints associated with performing instrument approaches

2.9.6.1
Recall instrument postflight requirements and procedures

MOTIVATION

The time to first study a high altitude approach plate is in the planning room, not in the aircraft. Inadequate preparation for your departure and arrival may result in potentially dangerous situations for you, plus an increased workload for the controllers. Preflight preparation will enable you to receive maximum training during the flight.

OVERVIEW

This lesson provides you with the procedures, requirements, and criteria to prepare for departure and arrival. The underlying principle of this lesson is thorough preflight preparation. Understanding and attending to preparation will take most of the uncertainties out of your flight.

In this lesson we will be studying:

* Fuel requirements for filing DD-175
* Departure point minimums for takeoff
* Types of IFR departures
    - Standard Instrument Departure
    - RADAR
    - VFR climb on course
* Standard instrument departure (SID)
* Published approaches
    - Criteria determining type of approach
    - Differences between high and low altitude approaches
* Other approaches
    - Visual approach
    - Contact approach
    - Circling approach
    - Circling area limit
* Closing a flight plan
* Log Book entries

REFRESHER

Recall:

* ATC procedures and phraseology required to communicate with any ATC facility in the United States

PRESENTATION

I. Fuel requirements for filing DD-175 **1.1.1.8.2**

Sg 1, fr 1
Lesson Organization

A. Alternate required

1. Route: fly to destination initial approach fix (IAF) and then to alternate IAF (i.e., plan from destination IAF to alternate IAF at filed cruising altitude)

2. Fuel for <u>one</u> approach, start, taxi and takeoff

Sg 1, fr 2
***Figure 1**: DD-175 Fuel Plan - Alternate Required*

3. Fuel reserve: 10% of planned requirements or 20 minutes of flight computed at 10,000 ft MSL maximum endurance operation (whichever is greater)

B. Alternate not required

NOTE: CNATRA requires filing an alternate on <u>all</u> cross-country flights.

1. Route: fly to destination IAF, plus fuel for one approach

2. Fuel reserve: 10% of planned requirements or 20 minutes of flight computed at 10,000 ft MSL maximum endurance operation (whichever is greater)

Sg 1, fr 3
***Figure 2:** DD-175 Fuel Plan - Alternate Not Required*

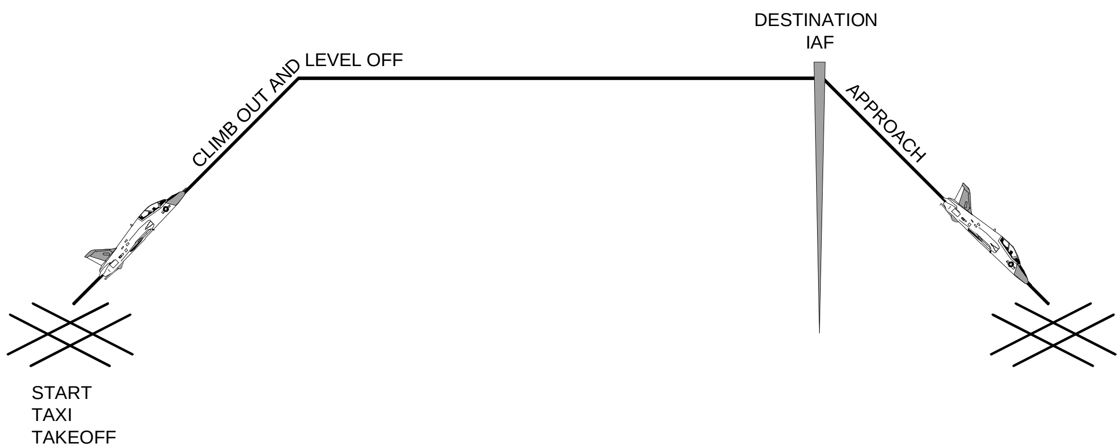
NOTE: When computing fuel reserves, include any known or expected delay in your “time en route.” If the route or altitude assigned by ATC renders the planned fuel reserves inadequate, you must inform ATC of the circumstances and if you're unable to obtain a satisfactory altitude or routing, alter the destination accordingly.

FUEL PLAN

1.	CLIMB/ROUTE DEST IAF	1500	6.	START/TAXI	200
2.	ROUTE ALT IAF (If required)	500	7.	TOTAL REQUIRED (4,5,&6)	2750
3.	APPROACHES	250	8.	TOTAL ABOARD (JP-8)	2938
4.	TOTAL (1,2,&3)	2250			
5.	RES 10% of 4 (Min 20 mins)	300	9.	SPARE FUEL (8-7)	188

EMERGENCY "BINGO" TO ALTERNATE

Figure 1: DD-175 FUEL PLAN—ALTERNATE REQUIRED



FUEL PLAN

1.	CLIMB/ROUTE DEST IAF	1500	6.	START/TAXI	200
2.	ROUTE ALT IAF (If required)		7.	TOTAL REQUIRED (4,5,&6)	2250
3.	APPROACHES	250	8.	TOTAL ABOARD	2938
4.	TOTAL (1,2,&3)	1750	9.	SPARE FUEL (8-7)	688
5.	RES 10% of 4 (Min 20 mins)	300			

EMERGENCY "BINGO" TO ALTERNATE

Figure 2: DD-175 FUEL PLAN—ALTERNATE NOT REQUIRED

PROGRESS CHECK

Question 1 — 1.1.1.8.2
In all cases, what are the minimum reserve fuel requirements?

ANSWER: 10% of planned requirements or 20 minutes of flight computed at 10,000 ft MSL based on maximum endurance operation, whichever is greater.

Sg 2, fr 1
Lesson Organization

Sg 2, fr 2
Figure 3:
Instrument Ratings

II. Departure point weather minimums for takeoff depend on the instrument rating of the pilot-in-command **2.5.12.2**

A. Special instrument rating

1. No takeoff ceiling or visibility limits apply

2. Takeoff dependent upon

a. Judgment of pilot

b. Urgency of flight

NOTE: Good judgement dictates an adequate departure alternate be available.

B. Standard instrument rating

1. Published non-precision minimums, but not less than:

a. Ceiling: 300 ft

b. Visibility: 1 sm

NOTE: If lowest nonprecision minimums were 400/1 1/2 this would be the criteria, not 300/1.

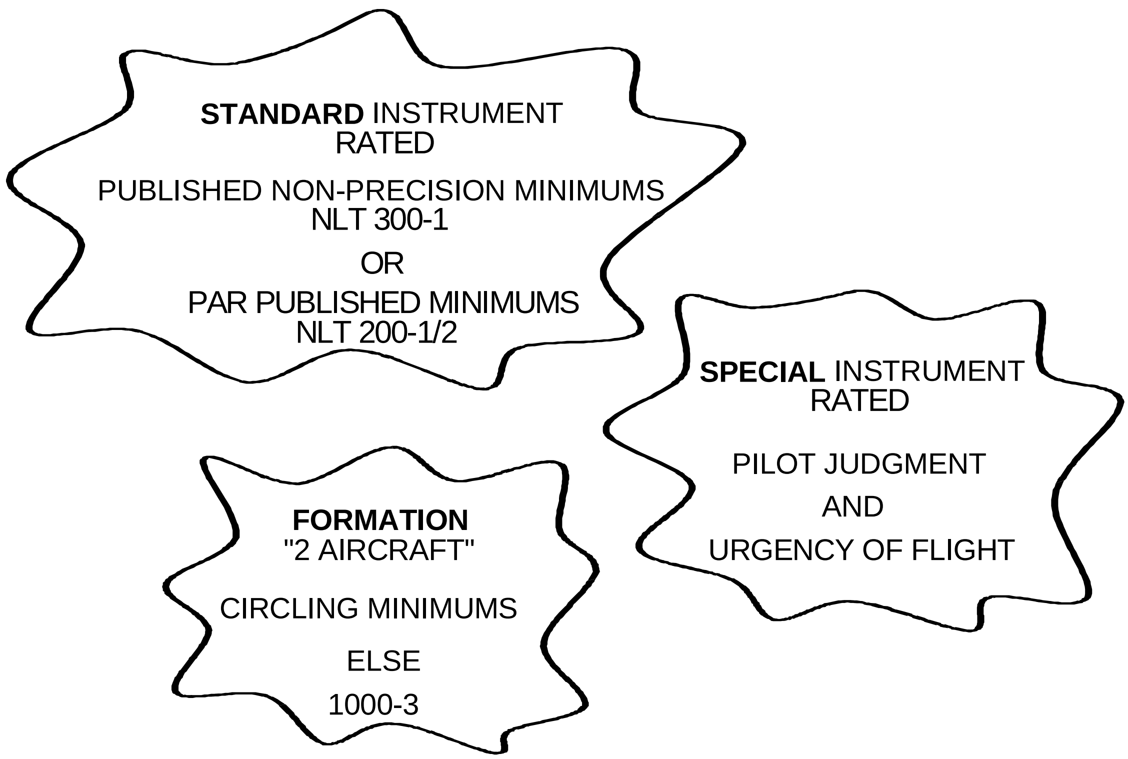


Figure 3: INSTRUMENT RATINGS

EXCEPTION: When a precision approach compatible with installed and operable aircraft equipment is available, and published minimums are less than 300/1, takeoff is authorized provided the weather is at least equal to the precision approach minimums for the landing runway in use. In no case when the weather is less than a 200-ft ceiling and 1/2 sm visibility/2,400 ft runway visual range (RVR).

C. Formations

1. Independent of instrument ratings

2. Restricted to two aircraft of "similar" performance (lead aircraft on downwind side of runway)

3. Weather must be equal to, or above, published circling minimums for runway in use (if circling approach not authorized for runway in use, formation takeoff minimums revert to basic VFR of 1000/3)

PROGRESS CHECK

Question 2 — 2.5.12.2
When is takeoff permitted with a ceiling of less than 300 ft and visibility of less than 1 sm for a standard instrument rated pilot?

ANSWER: When a precision approach is available to the runway in use with minimums of not less than 200-1/2.

III. Types of IFR Departures **2.6.6.1**

Sg 3, fr 1
Lesson Organization

A. There are three basic types of IFR departures from military airports:

1. Standard Instrument Departure (SID)

2. Radar Departure

3. VFR Climb on Course

B. Standard Instrument Departure (SID)

Sg 3, fr 2
Figure 4:
DD-175 Standard Instrument Departure (SID)

1. Enter the name of the coded identifier of the SID as the first entry in the route of flight section of the DD-175

2. Enter a dot (•)

3. Enter the SID transition point which will establish you on your route

4. This type of entry is the same for both “Pilot Nav” and “Vector” SIDs

C. Radar Departure

Sg 3, fr 3
Figure 5:
DD-175 Radar Departure

1. This type of departure is used where there is no published SID, or pilot desires to proceed directly to first point on route of flight

2. Enter the NAVAID or intersection that will establish you on your route as the first entry in the “ROUTE-OF-FLIGHT” section of the DD-175

3. Enter “REQUEST RADAR DEPARTURE” in the “REMARKS” section

NOTE: You are only requesting flight advisory service from ATC. You are not requesting VECTORS, but they can be provided if desired.

STANDARD INSTRUMENT DEPARTURE (SID)

ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	WAGES 3 • AVE		

Figure 4: DD-175 STANDARD INSTRUMENT DEPARTURE (SID)

RADAR DEPARTURE:

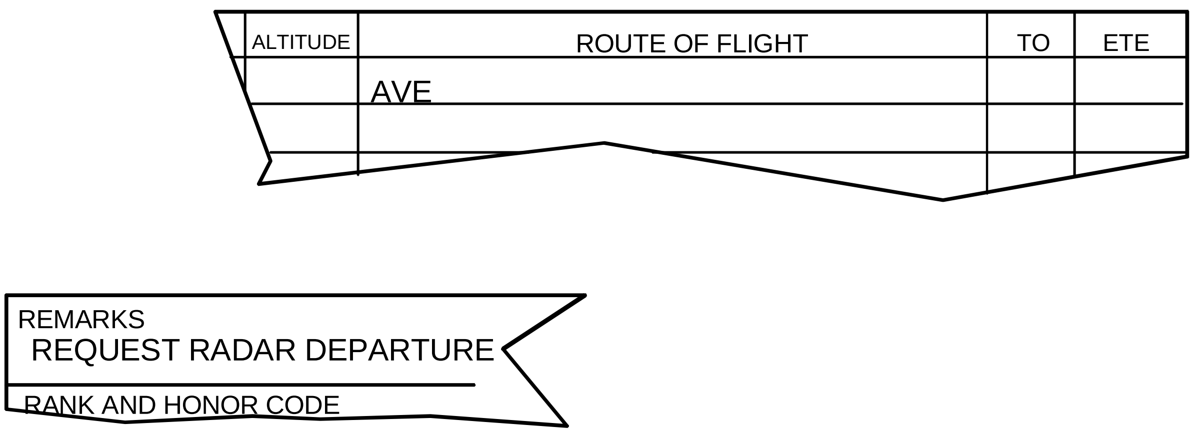


Figure 5: DD-175 RADAR DEPARTURE

Sg 3, fr 4
Figure 6:
DD-175 - VFR Climb On Course

D. VFR Climb on Course

1. Enter the NAVAID or intersection which will establish you on your route as the first entry in the "ROUTE-OF-FLIGHT" section

2. ATC will issue instructions as to when to contact ARTCC for your IFR clearance

3. Enter "REQUEST VFR CLIMB ON COURSE" in the "REMARKS" section

CAUTION: Remain below CLASS A airspace and fly VFR cruising altitudes until issued an IFR clearance.

Sg 4, fr 1
Lesson Organization

IV. Standard Instrument Departure (SID) **2.6.6.4**

A. General

1. This information is located in the DOD FLIP (Terminal) Instrument Approach Procedure booklet

2. Use is not mandatory by OPNAV, but use is encouraged

3. Use can be made mandatory by a local airport, but a pilot can reject SID if safety of flight dictates

4. Pilot responsibility is to ensure all climb and crossing restrictions can be met

VFR CLIMB ON COURSE:

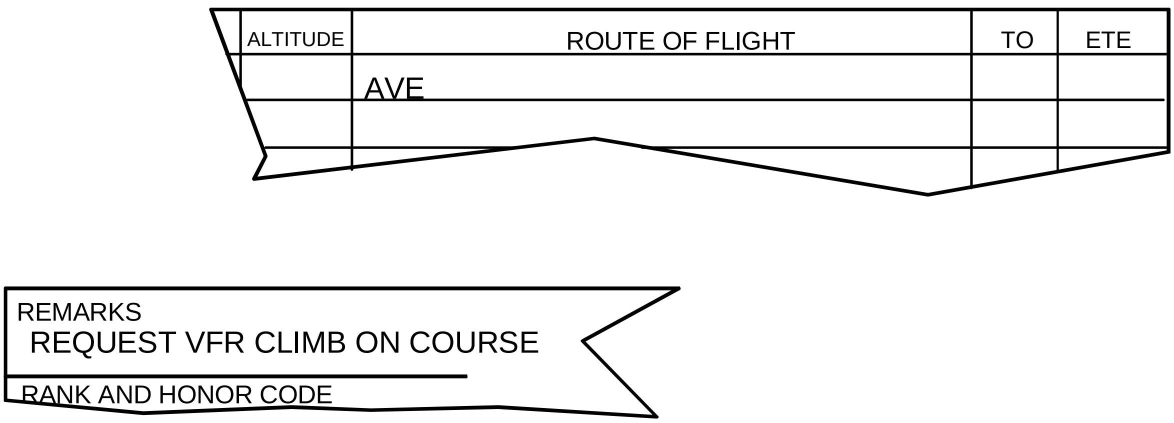


Figure 6: VFR CLIMB ON COURSE

B. Purpose: provides airspace management and simplifies clearance delivery procedures

1. Expedites traffic from high density airport environment into en route structure with less impact on controllers

    a. There may be several SIDs from an airfield and several transitions from each SID

    b. There may be several aircraft on any one SID at same time, subject to the aircraft separation requirements of ATC

2. Ensures adequate horizontal and vertical separation of aircraft via

    a. Prepublished or preselected routes

    b. Radar monitoring of position

    c. Traffic advisories

3. Provides terrain clearance for aircraft operating in instrument conditions when aircraft climbs above the minimum vectoring altitude for that airport

4. Provides transitions from takeoff to en route structure

LESSON NOTES

Be sure your students are aware of the differences between pilot nav and vector SIDs.

C. Types

1. Pilot nav

a. Departure plate describes aircraft's vertical and horizontal flight path

(1) Top of departure plate: pictorial description

(2) Bottom section of departure plate: textual description

b. Requires minimum controller time

(1) Initial vectoring may be required

(2) Controller only monitors departing aircraft

(3) Minimal communication with pilot

c. Provides published instructions

(1) You will normally receive SID as part of your clearance

(2) You may be given an initial vector instruction to join the SID

(3) You will normally receive no further departure instructions

d. Sorts aircraft by initial route for efficiency

(1) Leave departure (heavy line) route at assigned transition points

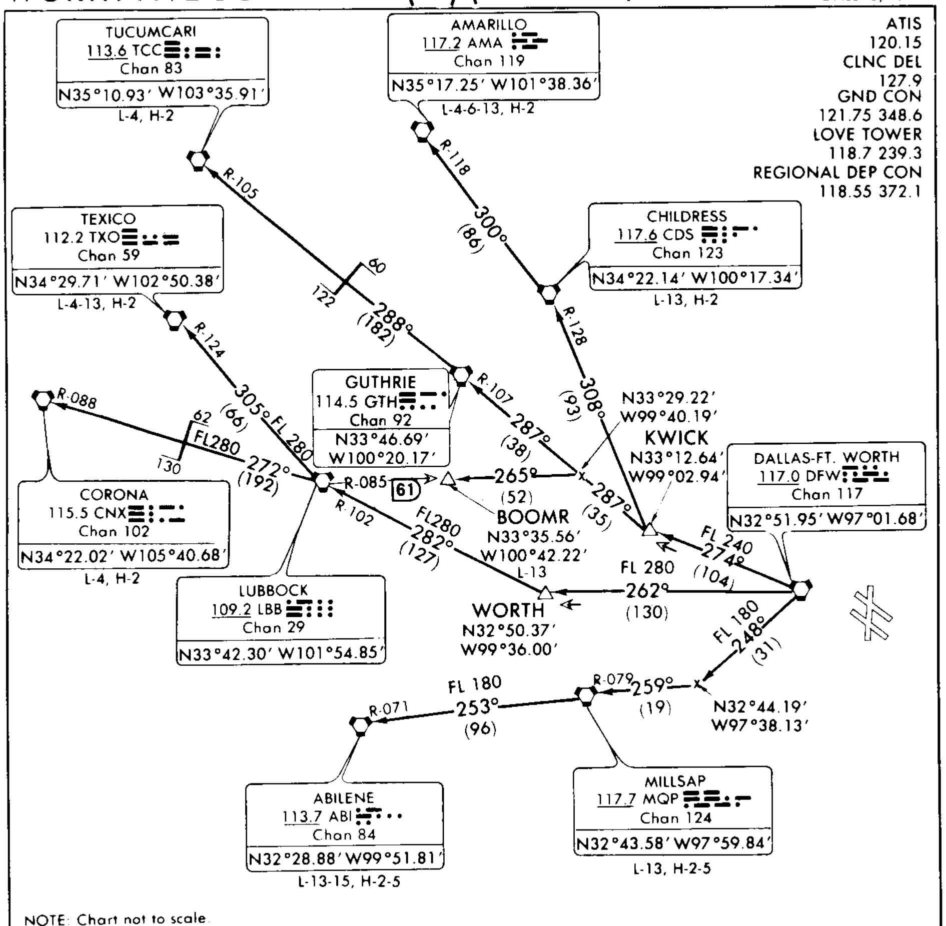
(2) Depart transitions (lighter line) at assigned route

Sg 4, fr 2-3
Figure 7:
Dallas-Love Field (HI) (PILOT NAV)

(WORTH5.DFW) 92289 SH-106 (FAA)

WORTH FIVE DEPARTURE (HI) (PILOT NAV)

DALLAS-LOVE FIELD
DALLAS, TEXAS



DEPARTURE ROUTE DESCRIPTION

Fly assigned heading and altitude for vector to appropriate route. Expect filed altitude 10 minutes after departure.

ABILENE TRANSITION (WORTH5.ABI): From over DFW VORTAC via DFW R-248 and MQP R-079 to MQP VORTAC, then via MQP R-253 and ABI R-071 to ABI VORTAC.

AMARILLO TRANSITION (WORTH5.AMA): From over DFW VORTAC via DFW R-274 and CDS R-128 to CDS VORTAC, then CDS R-300 and AMA R-118 to AMA VORTAC.

BOOMR TRANSITION (WORTH5.BOOMR): From over DFW VORTAC via DFW R-274, GTH R-107 and LBB R-085 to BOOMR INT.

(Continued on next page)

WORTH FIVE DEPARTURE (HI) (PILOT NAV) DALLAS, TEXAS
(WORTH5.DFW) 65 DALLAS-LOVE FIELD

Figure 7: DALLAS-LOVE FIELD (HI) (PILOT NAV)

2. Vector

NOTE: At fields that do not have a “published” SID you can request radar departure and receive the same services as a “VECTOR” SID.

a. Provides navigational guidance by ground radar to filed/assigned route or fix

(1) Top of departure plate: pictorial description

(2) Bottom section of departure plate: textual description

b. Requires departure control to provide instructions

(1) Altitudes

(2) Turns

(3) Courses

(4) DME

(5) Traffic separation

c. Increases controller time

(1) Controller must continuously monitor radar to make judgments based on radar information

(2) Requires increased communication

(a) Controller provides you with flight profile information for navigation to route or fix

Sg 4, fr 4-5
Figure 8:
Dallas-Love Field (HI) (VECTOR)

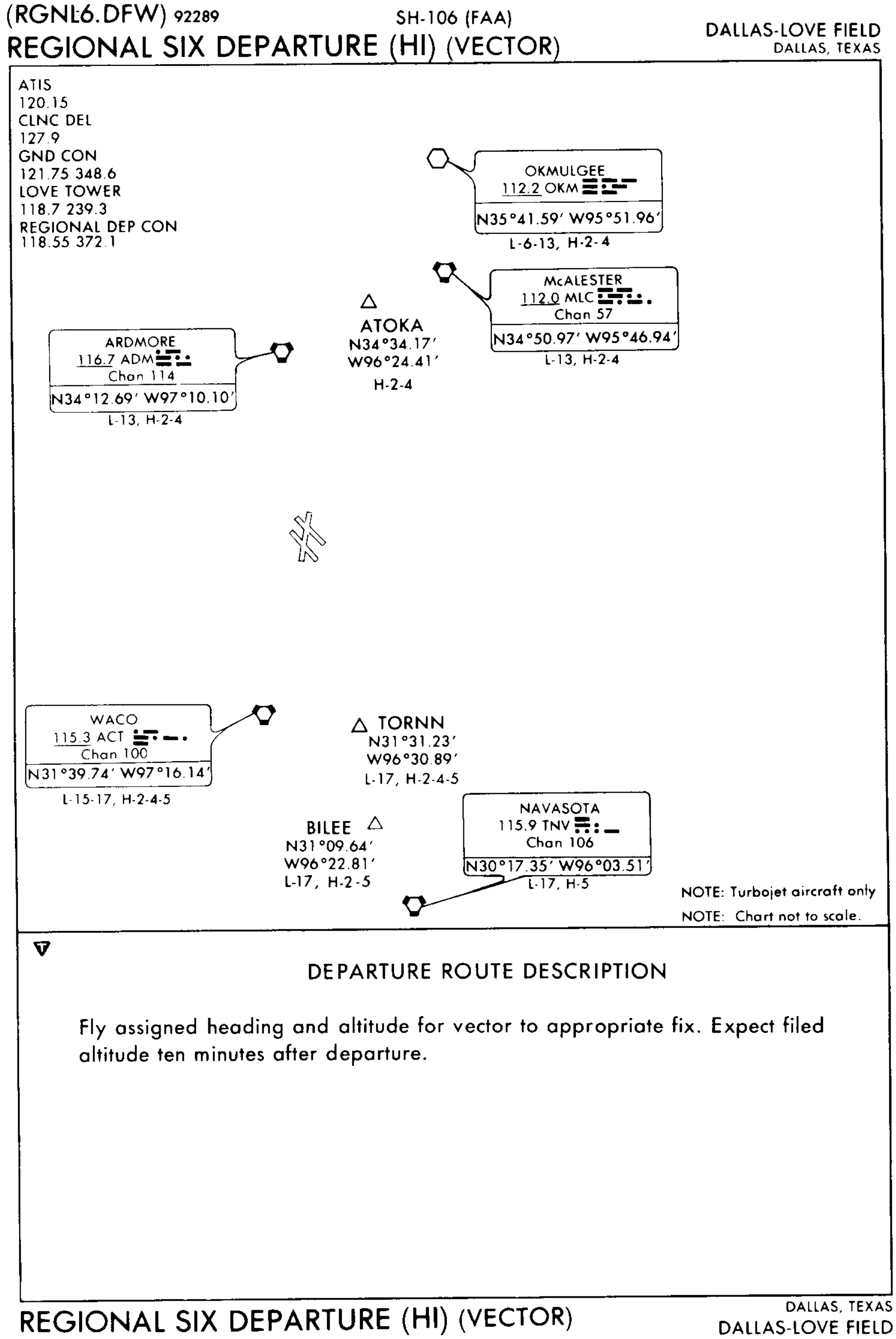


Figure 8: DALLAS-LOVE FIELD (HI) (VECTOR)

(b) You must repeat headings, altitudes, and altimeter settings and acknowledge all radio calls in the order received. Always include your call sign in acknowledging

NOTE: You must comply promptly with instructions.

d. Allows controller flexibility to deal with changing flight conditions

(1) Weather

(2) Air traffic

(3) Temporary restrictions such as inoperable NAVAIDs

D. Changes to clearance **2.7.6.1.2**

1. Amendments to initial clearance will be issued any time ATC deems such action necessary to avoid possible conflict between aircraft

a. If you accept a SID as part of your clearance, comply with all specified routings, altitudes, and specific restrictions. SIDs must be followed regardless of weather conditions, unless a deviation is approved by ATC

b. Consider SID canceled if aircraft is vectored or cleared off SID-specified course, unless ATC adds "expect to resume SID" or otherwise indicates deviation is temporary

c. If an altitude to maintain is <u>changed or restated</u>, either prior to or after departure, you can climb immediately to that altitude unless ATC states that altitude restrictions remain in effect. In this event they would only be changing your ultimate altitude. The SID path-over-the-ground must still be followed even though a climb to higher altitude has commenced

2. Cancellation

   a. Departure control must indicate portion of SID routing that still applies

   b. Departure control must restate altitude restrictions

3. Scenarios

LESSON NOTES

For the following scenarios, consider asking students to role-play the dialogue between departure control and pilot.

a. Departure control vectors you around severe weather but does not cancel SID

EXAMPLE:

DEPARTURE CONTROL: “TALON 45: turn left to zero niner zero for vectors around weather. Expect to resume the SID when clear of weather.”

PILOT: “TALON 45, left zero niner zero for vectors.”

b. Shortly after departure, SID is canceled and you are vectored to where en route phase of flight will resume

EXAMPLE:

DEPARTURE CONTROL: “TALON 45: turn left to two seven zero for vectors to TRADR.”

PILOT: “TALON 45, left to two seven zero.”

c. Because SID is cancelled, controller must now provide assigned altitudes

EXAMPLE:

DEPARTURE CONTROL: "TALON 45: cross one three DME at one two thousand and four four DME at one three thousand."

PILOT: "TALON 45, cross one three DME at one two thousand and four four DME at one three thousand."

E. STAR **2.9.4.1.2.3**

1. A STAR is a pre-planned instrument flight rule (IFR) air traffic control arrival procedure published for pilot use in graphical and/or textual form. STARs provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area. Its purpose is to simplify clearance delivery procedures.

2. Until the military fully distributes STAR publications, STARs will be issued to military pilots only when requested in the flight plan or orally by the pilot. Still, some of the "preferred" routes in the A/P-1A contain STARs. Use of STARs requires pilot possession of at least the APPROVED textual description. As with any ATC clearance or portion thereof, it is the responsibility of each pilot to accept or refuse an issued STAR. Pilots should notify ATC if they do not wish to use a STAR by placing "NO STAR" in the remarks section of the flight plan or by the less desirable method of orally stating the same to ATC. Remember, this option may result in terminal delays and holding.

Sg 5, fr 1
Lesson Organization

V. Approaches

A. Published approaches

1. Criteria determining type of approach **2.9.4.1.1**

? **What are some factors that affect your choice of an approach?**

ANSWER: Answers follow

a. Duty runway

b. Weather

c. Navigational equipment on aircraft

d. Type of approaches available at destination

e. Minimums for approach

2. Minimums for approach

a. Single-Piloted Aircraft - Published minimums for the type of approach, but not less than 200 ft ceiling and not less than 1/2 mile visibility, or 2,400 ft RVR if available

NOTE: Once commenced, if the airfield goes below minimums, pilots may, at their discretion, continue the approach to the approved published minimums for the type of approach being conducted.

EXCEPTION: Single-piloted aircraft can commence practice approaches at <u>en route</u> airports regardless of reported weather, even if below minimums, and descend to published MDA or single-piloted decision height (DH) if fuel is planned for, and available for these approaches. However, if the place where you execute practice approaches is below minimums it <u>cannot</u> be your destination or alternate.

b. Formations - Restricted to two aircraft in instrument conditions and the reported weather must be at least published circling minimums to commence the approach. Once commenced, the leader may, at their discretion, continue the approach in formation to the minimums prescribed for the type aircraft being flown. If a circling approach is not authorized for the runway in use, basic VFR minimums of 1,000 ft and 3 sm apply for an approach

3. Approach clearances **2.9.4.2.3**

a. "Cleared for approach" - Execute any published approach procedure to the airfield but state your intentions

b. "Cleared for TACAN approach" - Execute any published TACAN approach procedure to the airfield but state your intentions.

c. "Cleared for straight-in TACAN approach" - Execute any published TACAN approach procedure to the active runway which has straight-in minimums authorized, but state your intentions

d. "Cleared for Hi-TACAN runway 24 approach" - Execute the published TACAN approach procedure for Runway 24 and land straight-in on Runway 24

e. "Cleared for Hi-TACAN runway 24 approach, circle to land Runway 6" - Execute the published TACAN approach procedure for Runway 24, obtain the runway environment, and visually circle and land on Runway 6 (landing minimums to the adjacent runway will be higher than to the primary runway)

f. "Cleared for ILS runway 7 left approach, side-step to runway 7 right" - Pilots are expected to commence the side-step maneuver as soon as possible after the runway or runway environment is in sight (landing minimums to the adjacent runway will be higher than the minimums to the primary runway, but will normally be lower than the published circling minimums)

g. First aircraft estimated over the IAF will be the first to receive approach clearance

(1) Succeeding aircraft will be cleared on basis of their estimated or actual times over the IAF

(2) In lieu of an en route descent, pilot is expected to execute the entire IAP unless visual contact is made and a visual or contact approach is requested and approved, or if the pilot cancels his IFR flight plan

(a) It is solely the pilot's prerogative to cancel his IFR clearance

(b) Retention of the IFR clearance does not afford priority over VFR traffic, i.e., pilot of arriving IFR aircraft may have to adjust his flight path as necessary to enter traffic pattern in sequence with arriving VFR traffic

h. After receiving a revised clearance, or an approach clearance, prior to the final approach descent, all military pilots will report the newly assigned/designated altitude when they report vacating the previously assigned altitude/flight level

B. En route Descent **2.9.4.1.2**

1. Definition - A descent from an en route altitude to the final approach of an established procedure without execution of the entire instrument approach procedure prescribed in the FLIP (Terminal) publications

2. Type of final approach to be flown (PAR, ASR, ILS etc.) should be understood by both the pilot and controller prior to commencing the descent

3. Clearance **2.7.6.1.2**

a. Pilot request: “Request en route descent to (destination airport)”

b. Can be initiated by the controller

(1) Controller must advise pilot of intentions

(2) Pilot can refuse en route descent in favor of full published approach

(3) Controller cannot authorize if other than normal vectoring delays are anticipated

(4) Once commenced controller cannot terminate unless

(a) Consent of the pilot

(b) RADAR outage

(c) Other emergency situations

4. Prior to issuance of a descent clearance below the highest initial approach fix altitude established for any high altitude instrument procedure for the destination airport (i.e., that point that the "approach" is considered to commence), the controller will inform the pilot:

   a. The type of final approach to expect

   b. RADAR vectors will be provided to the final course

   c. Current weather whenever the ceiling is below either 1,000 ft (1,500 ft for Air Force controllers) or the highest circling minimum (whichever is greater) or when the visibility is less than 3 miles

Sg 5 fr 2
Fig 9: *Single Frequency Approach (SFA - UHF)*

C. Single Frequency Approach (SFA - UHF) **2.9.4.2.3**

1. Provided to single piloted jet aircraft on an IFR flight plan during the hours of darkness or when the aircraft is in instrument weather conditions

2. The abbreviation "SFA" will be shown after the heading "COMMUNICATIONS" in the FLIP IFR En route Supplement when procedures have been implemented at that station. For those military fields that do not indicate "SFA" check the RADAR section of the FLIP (Terminal) for that airfield. If they have numerous UHF frequencies available you can request SFA in the remarks section of the DD-175

3. Pilots receiving this service will not be required to change frequency from beginning of penetration to touchdown, except that pilots conducting an en route descent are required to change frequency when control is transferred from the Air Route Traffic Center to the Terminal Facility

4. Controllers may discontinue the service to all pilots who cancel IFR Flight Plans during daylight hours and to those pilots in level flight who cancel IFR Flight Plans at night

PROGRESS CHECK

Question 3 - 2.9.4.1.1
What are the absolute minimums for a single-piloted aircraft executing a precision approach

ANSWER: 200-ft ceiling and 1/2-sm visibility

D. Approach Modifications

1. Purposes

a. Authorized by ATC to reduce pilot/controller workload

b. Expedite traffic by shortening flight paths to airport

NOTE: Authorization to conduct a visual/ contact approach is an IFR authorization and does not alter IFR flight plan cancellation responsibility.

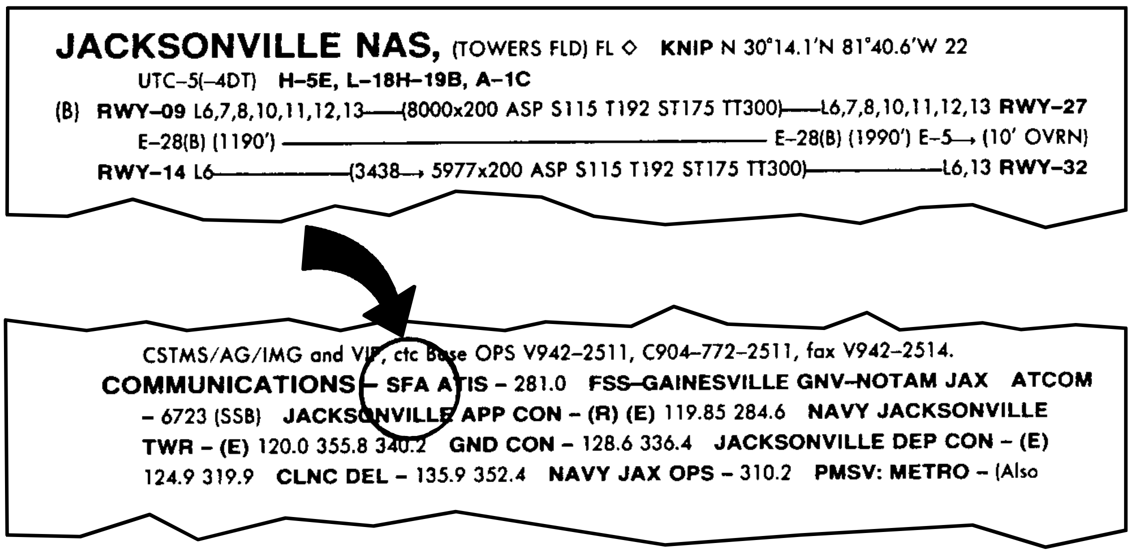
c. Provide for landing on other than instrument runway due to crosswinds, etc.

d. Radar service is automatically terminated, without advising the pilot, when the aircraft is instructed to change to advisory or tower frequency

2. Visual Approach **1.9.1.3.1.1**

a. Definition: An approach conducted on an instrument flight rules (IFR) flight plan which authorizes the pilot to proceed visually and clear of clouds to the airport

(1) The pilot must, at all times, have either the airport or the preceding aircraft in sight


JACKSONVILLE NAS, (TOWERS FLD) FL ◇ KNIP N 30°14.1′N 81°40.6′W 22
UTC–5(–4DT) H–5E, L–18H–19B, A–1C
(B) RWY–09 L6,7,8,10,11,12,13——(8000x200 ASP S115 T192 ST175 TT300)——L6,7,8,10,11,12,13 RWY–27
E–28(B) (1190′) —————— E–28(B) (1990′) E–5→ (10′ OVRN)
RWY–14 L6——————(3438→ 5977x200 ASP S115 T192 ST175 TT300)——————L6,13 RWY–32

CSTMS/AG/IMG and VIP, ctc Base OPS V942–2511, C904–772–2511, fax V942–2514.
COMMUNICATIONS – SFA ATIS – 281.0 FSS–GAINESVILLE GNV–NOTAM JAX ATCOM – 6723 (SSB) JACKSONVILLE APP CON – (R) (E) 119.85 284.6 NAVY JACKSONVILLE TWR – (E) 120.0 355.8 340.2 GND CON – 128.6 336.4 JACKSONVILLE DEP CON – (E) 124.9 319.9 CLNC DEL – 135.9 352.4 NAVY JAX OPS – 310.2 PMSV: METRO – (Also

Figure 9: SINGLE FREQUENCY APPROACH (SFA-UHF)

(2) This approach must be authorized and under the control of the appropriate air traffic control facility

(a) Visual approaches can be requested by the pilot, initiated by ATC, or rejected by the pilot in favor of the full instrument approach

(b) Pilot assumes traffic separation and obstruction clearance responsibility

(3) Reported weather at the airport must be ceiling at or above 1,000 ft and visibility at 3 sm or greater. Compliance with basic VFR minimums in FAR Part 91 is not required

b. VFR traffic may be present on parallel or crossing runways in which case ATC will advise the pilot. This may be accomplished through the use of ATIS

c. A visual approach is an IAP but has no missed approach segment. If a go around is necessary for any reason aircraft operating at controlled airports will be issued an appropriate advisory/ clearance/instruction by the tower

3. Contact Approach **1.9.1.3.1.2**

a. Definition - An approach wherein an aircraft on an IFR flight plan, having an air traffic authorization, operating clear of clouds with at least 1 statute mile flight visibility and a reasonable expectation of continuing to the destination airport in those conditions, may deviate from the instrument approach procedure and proceed to the destination airport by visual reference to the surface

(1) This approach will <u>only</u> be authorized when requested by the pilot. ATC cannot initiate this approach

(2) The reported ground visibility at the destination airport must be at least 1 sm

b. The destination airport must have a standard or special instrument approach procedure

c. Approved separation is applied between aircraft and other IFR or special VFR aircraft

d. A contact approach is an approach procedure that may be used by the pilot (with prior authorization from ATC) in lieu of conducting a standard or special IAP to the airport. It is not intended for use by a pilot on an IFR flight clearance to operate to an airport not having an authorized IAP

e. The contact approach is not intended for an aircraft to conduct an instrument approach to one airport and then, when "in the clear," to discontinue that approach and proceed to another airport

f. In the execution of a contact approach, the pilot assumes the responsibility for obstruction clearance

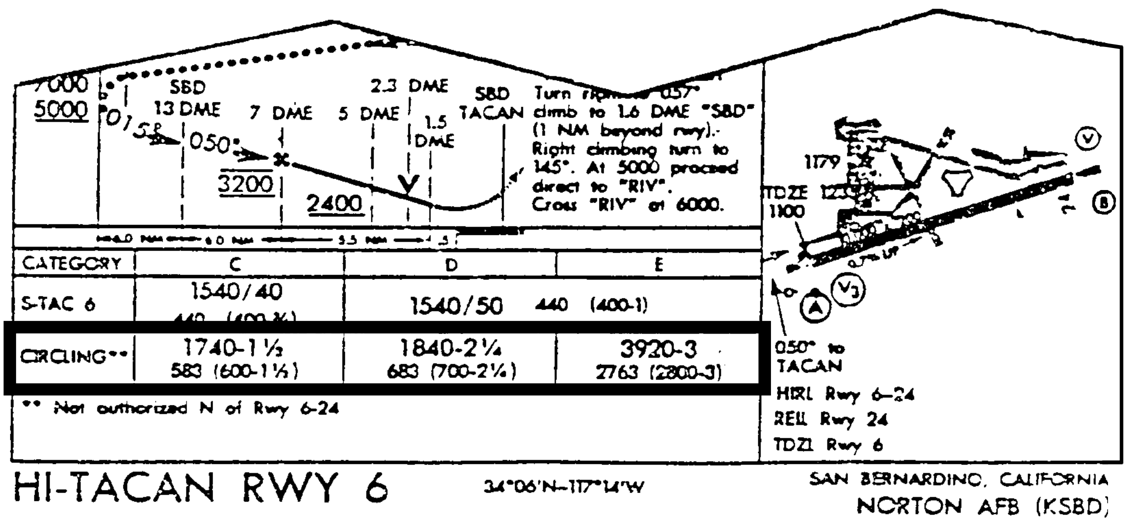
g. If RADAR service is being received, it will automatically terminate when the pilot is told to contact the tower

Sg 5 fr 3
Figure 10:
Circling Approach

4. Circling Approach **2.9.5.4.1**

a. Use the circling minimums on the approach procedure, or path-over-the-ground, for which you were cleared

EXAMPLE: “Cleared for the High TACAN runway six approach, circle to land runway two four.”



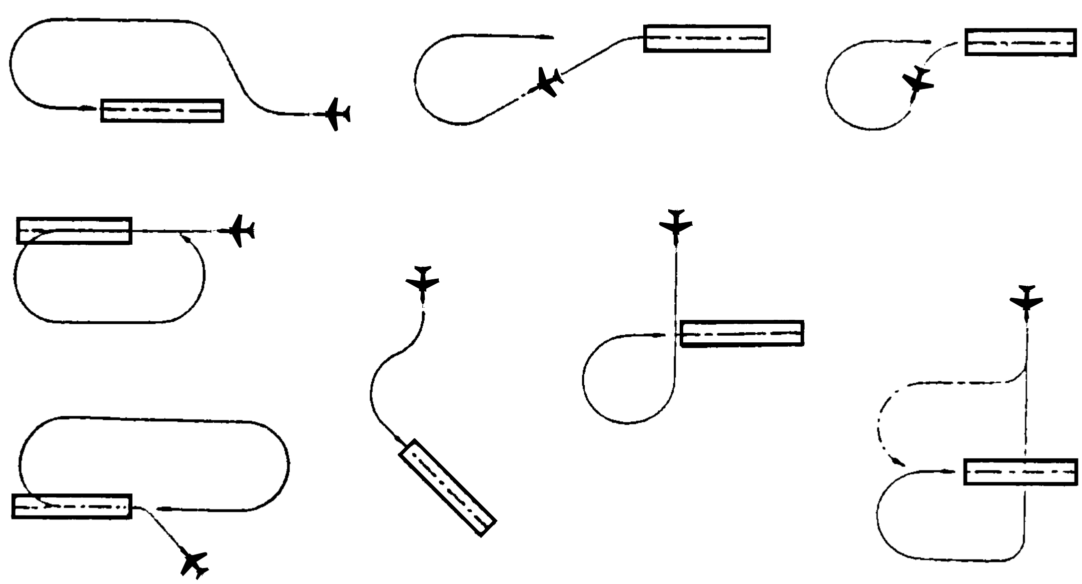


Figure 10: CIRCLING APPROACH

Sg 5, fr 5 p4
Figure 11:
Circling Area Limits

b. With the runway environment in sight state your intentions to Approach Control and visually circle to land on the intended runway by any method

EXCEPTION: 1. A circling maneuver is specified by Approach Control; or, 2. There is a circling restriction on the Approach Procedure Chart, e.g., "Maneuvering East of Rwy 16L - 34R centerline not authorized"

c. Maintain the circling MDA until in a position from which to make a safe landing on the intended runway

d. Do <u>not</u> descend below the MDA to remain clear of clouds

e. Circling Area Limits

(1) Maneuver the shortest path to the base of downwind leg, as appropriate, considering existing weather conditions. There is no restriction from passing over the airport or other runways.

(2) It should be recognized that circling maneuvers may be made while VFR or other flying is in progress at the airport. Standard left turns or specific instruction from the controller for maneuvering must be considered when circling to land.

(3) At airports without a control tower, it may be desirable to fly over the airport to observe wind and turn indicators and other traffic which may be on the runway or flying in the vicinity of the airport.

f. If loss of visual reference to the surface occurs, execute a missed approach procedure for the original approach as specified on the approach plate or as specified by Approach Control

CIRCLING APPROACH AREA RADII

Approach Category	Radius (Miles)
A	1.3
B	1.5
C	1.7
D	2.3
E	4.5

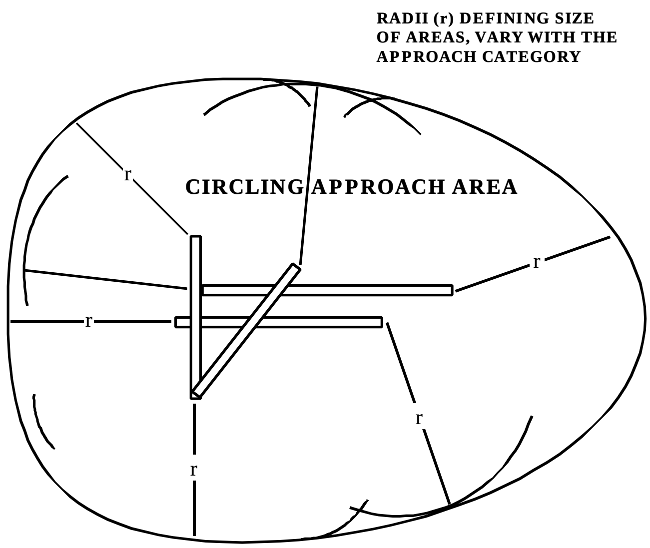


Figure 11: CIRCLING AREA LIMITS

Sg 5 fr 6
Figure 12:
Radar Vectored or Cleared Direct

CAUTION: If being RADAR vectored or cleared "Direct" to an Initial Approach Fix, you will normally be assigned an altitude to maintain which will be close to published IAF altitude. If subsequently cleared for an approach prior to reaching the IAF, you cannot leave the assigned altitude until you are established on a segment of the published instrument approach procedure.

NOTE: It is the pilot's prerogative to request anything deemed necessary to best accomplish a more suitable course alignment, such as an offset entry, a turn in holding, or a 360° turn.

Sg 5, fr 7
Figure 13:
Minimum Vectoring Altitude

5. Minimum Vectoring Altitude **2.9.4.5.2.4**

   a. Definition - The lowest MSL altitude at which an IFR aircraft will be vectored by a radar controller, except as otherwise authorized for RADAR approaches, departures and missed approaches

   b. MVA charts are prepared by air traffic facilities at locations where there are numerous different minimum IFR altitudes

      (1) Charts depicting minimum vectoring altitudes are normally available only to the controllers and not to pilots

   c. MVA considerations:

      (1) MVA can be below MINIMUM SAFE (SECTOR) ALTITUDE

      (2) MVA can be below EMERGENCY SAFE ALTITUDE

      (3) MVA may provide only 1,000 ft obstruction clearance in designated mountainous areas

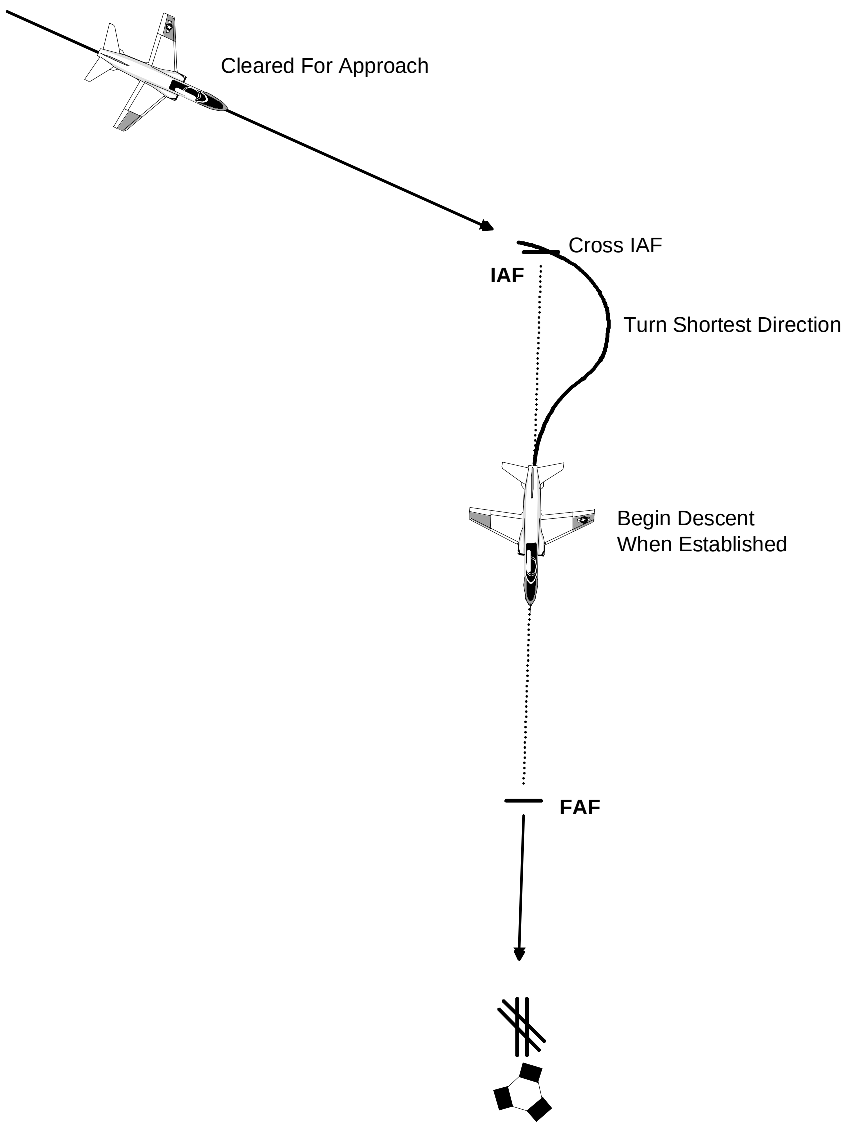


Figure 12: RADAR VECTORED OR CLEARED DIRECT

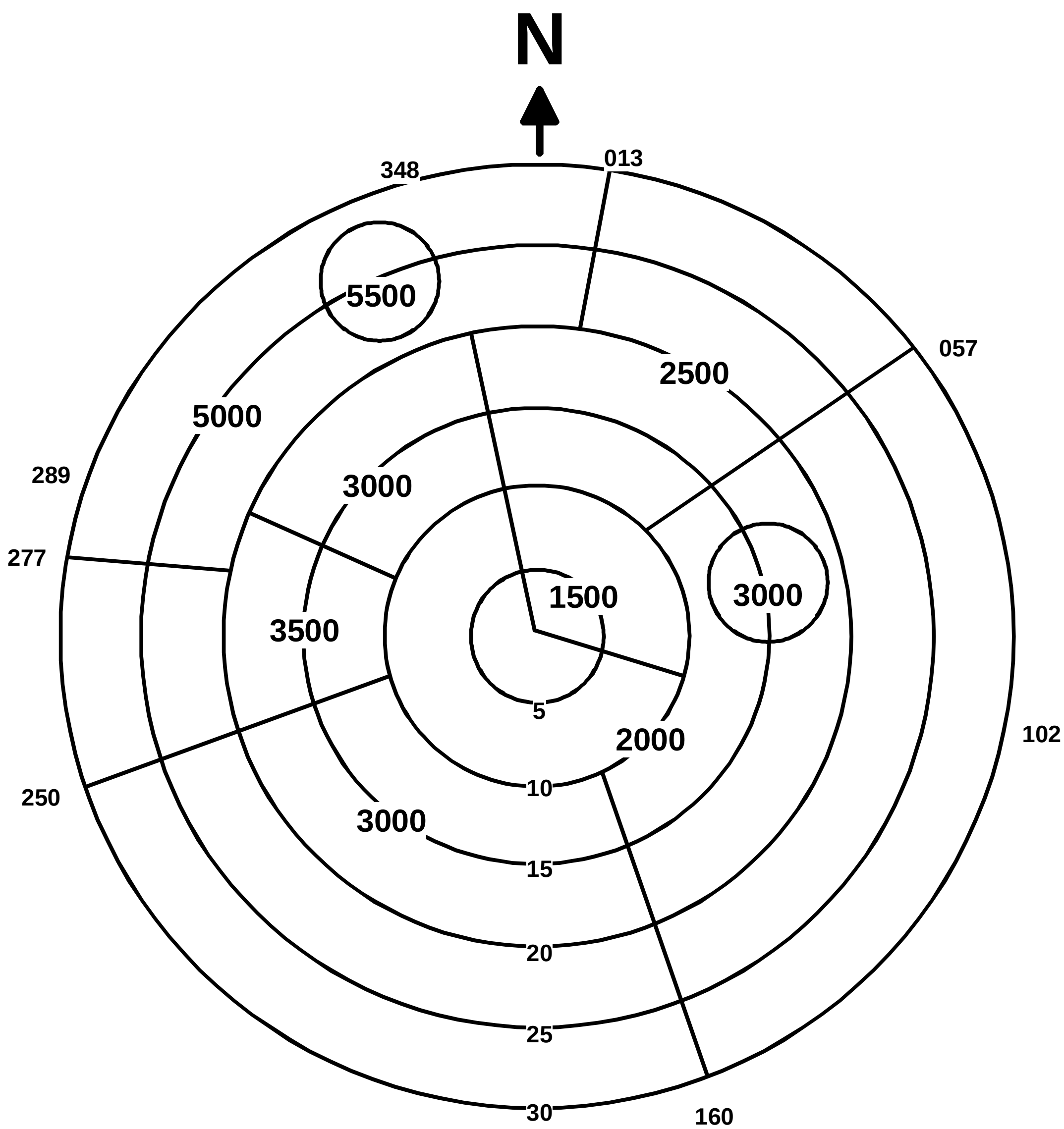


Figure 13: MINIMUM VECTORING ALTITUDE

6. NORDO Missed Approach to Alternate **2.9.4.9.2**

   a. If marginal weather conditions exist at destination (and possibly low on fuel after a long flight) file a flight plan or DRAFT with the controller in case of missed approach prior to commencing the approach

   b. In case of lost communications during the approach and subsequently you take a missed approach due to weather conditions

      (1) Squawk 7600

      (2) Follow the published missed approach instructions to ensure adequate obstructions clearance

      (3) Proceed to alternate IAF as filed and commence an approach

      CAUTION: A filed flight plan, or DRAFT, before commencing an approach at destination constitutes a ROUTE clearance in event of NORDO; however, it does not constitute an altitude clearance since you have not received an ATC clearance.

   c. Altitude to Alternate

      (1) The <u>expected</u> altitude if given one after filing a DRAFT; otherwise,

      (2) Your option of

         (a) The highest of the two EMERGENCY SAFE ALTITUDES depicted on the destination and alternate approach procedure charts if fields are within 200 nm of each other or,

         (b) At flight level equivalent to 18,000 ft MSL

Sg 5 fr 8
Figure 14:
Visual Descent Point

(i) Destination altimeter 29.92 inches or higher; fly Flight Level 180

(ii) Destination Altimeter less than 29.92 inches; fly Flight Level 190

7. Visual Descent Point

   a. The Visual Descent Point (VDP) is a defined point on the final approach course for a nonprecision straight-in approach procedure from which a normal descent from the MDA to the runway touchdown point may be commenced, provided reference to the runway has been obtained

      (1) The VDP will normally be identified by DME on VOR, TACAN, and LOC procedures

      (2) The VDP is identified on the profile view of the approach chart by the symbol V

      (3) VDPs are advisory in nature but are useful when proceeding to an unfamiliar field. They are intended to provide additional guidance where implemented

      (4) No special technique is required to fly a procedure with a VDP

      (5) The pilot should not descend below the MDA prior to reaching the VDP and acquiring the necessary visual reference

      (6) Pilots not equipped to receive the VDP should fly the approach procedure as though no VDP had been provided

8. Landing Criteria from an IFR Approach **2.9.4.5.1.2**

   a. Landing minimums and criteria for continuing an instrument approach below the DH/DA or MDA are different for the civil and military pilot.

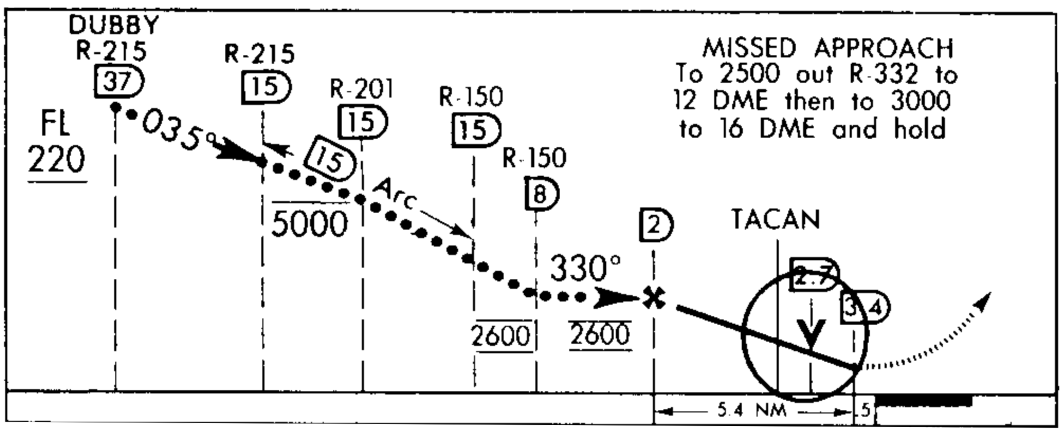


Figure 14: VISUAL DESCENT POINT

Criteria for operating below the DH/DA or MDA for civilian pilots is clearly stated in FAR 91.175(c)(3), landing criteria for Navy pilots is stated in OPNAV 3710.7 para 5.3.3.4, but it is not stated as definitively. Criteria for the Navy pilot continuing an approach to a landing is stated as:

> “Pilots shall not descend below the prescribed MDA or continue an approach below the DH unless they have the runway environment in sight, and, in their judgement, a safe landing can be executed, either straight-in or from a circling approach, whichever is specified in their clearance.”

Although we are not civilian pilots, we may gain some insights into instrument approach techniques by looking at the civilian rules which are more specific than OPNAV 3710.7

b. Criteria for the civil pilot continuing an approach is stated in FAR part 91.175 as:

(1) “Where a DH/DA or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA or continue an approach below the authorized DH unless:

(a) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and for operations conducted under part 121 or part 135 unless that descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing;

(b) The flight visibility is not less than the visibility prescribed in the standard instrument approach being used; and

(c) Except for Category II or Category III approach where any necessary visual reference requirements are specified by the Administrator, at least one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:

(i) The approach light system, except that the pilot may not descend below 100 ft above the touchdown zone elevation using the approach lights as a reference unless the red side row bars are also distinctly visible and identifiable

(ii) The threshold

(iii) The threshold markings

(iv) The threshold lights

(v) The runway end identifier lights

(vi) The visual approach slope indicator

(vii) The touchdown zone or the touchdown zone markings

(viii) The touchdown zone lights

(ix) The runway, or runway markings

(x) The runway lights

(2) No pilot operating an aircraft, except a military aircraft of the United States, may land that aircraft when the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used."

Sg 6, fr 1
Lesson Organization

VI. Closing Flight Plan **2.9.6.1**

A. It is the responsibility of the pilot-in-command/formation leader to ensure that the proper agency is notified of flight termination

1. Canceling an IFR flight plan in flight does <u>not</u> close out your military flight plan

2. For safety, and accountability of its aircraft, the Navy requires verbal closing of flight plans on the ground through

a. Ground Control or, if not available,

b. Control Tower or,

c. Base Operations, i.e., turn in DD-175 at duty desk

3. At nonmilitary installations, the pilot shall close the flight plan with flight service through any means available

a. Local call to flight service

b. Collect, long distance telephone service may be used if required with a flight service station (FSS) (Identify yourself as a pilot)

c. When appropriate communication links are known or suspected not to exist at point of intended landing, a predicted landing time in lieu of the actual landing shall be reported to an appropriate aeronautical facility while airborne

4. "Closing" your flight plan will ensure a proper arrival report will be sent to ATC and your aircraft will be accounted for

VII. Log Book Entries

Sg 7, fr 1
Lesson Organization

A. Approach

1. Log only the approach executed to a missed approach or landing

   EXAMPLE: For a TACAN approach to a PAR final approach, you would log only the PAR approach.

2. If actual instrument conditions are encountered at less than 1,000 ft AGL, you would log an ACTUAL approach

3. In a student-instructor relationship and in actual instrument conditions, both the student and instructor will log the ACTUAL approach

4. If the airport is operating under VMC, you would log a SIMULATED approach

5. In a formation approach, only the formation leader will log the approach

6. Only the pilot physically controlling the aircraft will log a landing

B. Instrument Time

1. In actual instrument conditions, both pilots in an aircraft will log ACTUAL instrument time

2. Only the pilot physically controlling the aircraft will log SIMULATED instrument time

3. If a student is under the instrument "hood" and actual instrument conditions exist outside the aircraft, the student will log ACTUAL instrument time

PROGRESS CHECK

Question 4 — 1.9.1.3.1.1
What are the criteria for a visual approach?

ANSWER: 1,000-ft ceiling visibility of 3 sm, with the field and/or preceding aircraft in sight

Question 5 — 1.9.1.3.1.2
What are the criteria for a contact approach?

ANSWER: Operating clear of the clouds with at least 1-sm visibility at the pilots request

SUMMARY

Sg 8, fr 1
Review Menu

This lesson has focused on the following topics:

* Fuel requirements for filing DD-175
* Departure point minimums for takeoff
* Types of IFR departures
  - Standard Instrument Departure
  - RADAR
  - VFR climb on course
* Standard instrument departure (SID)
* Published approaches
  - Criteria determining type of approach
  - Differences between high and low altitude approaches
* Other approaches
  - Visual approach
  - Contact approach
  - Circling approach
* Closing a flight plan
* Log Book entries

CONCLUSION

As your flight planning experience continues to grow you will become more efficient at arranging the details of your flight. Determining what type of approach to use at destination or what departure minimums apply to your takeoff is critical. The more you examine these details, the better prepared you will be for the unexpected.

NOTES

LESSON GUIDE

COURSE/STAGE: T-45C TS Instrument Navigation

LESSON TITLE: Interpretation of High Altitude Instrument Approach Plates

LESSON IDENTIFIER: T-45C TS INav-07

LEARNING ENVIRONMENT: CAI

ALLOTTED LESSON TIME: 0.8 hr

TRAINING AIDS:

* Figures
  Fig 1: Basic Penetration Patterns
  Fig 2: Altitude Restrictions (Profile View)
  Fig 3: Precision Approach Path Indicator (PAPI)
  Fig 4: Full-page Airport Diagram-Memphis NAS
  Fig 5: HI-VOR/DME or TACAN RWY 27R Billings Logan INTL
  Fig 6: HI-VOR RWY 19 Pensacola NAS
  Fig 7: HI-ILS/DME RWY 10R Portland INTL
  Fig 8: HI-ILS or TACAN RWY 23 Fairchild AFB

STUDY RESOURCES:

* NATOPS Instrument Flight Manual, NAVAIR 00-80T-112
* DoD FLIP (Terminal) High Altitude United States Instrument Approach Plate Booklet

LESSON PREPARATION:

Review:
* Roman numeral preface pages from a DoD FLIP (Terminal) High Altitude United States Approach Plate Booklet

(2-02) ORIGINAL

REINFORCEMENT:

Review:

* Chapter 29, NATOPS Instrument Flight Manual, NAVAIR 00-80T-112

EXAMINATION:

The objectives in this lesson will be tested in Instrument Navigation 12X.

LESSON OBJECTIVES

2.1.8.3.1.1
Recall FLIP usage and application in instrument flight planning for tactical jet aircraft

2.9.5.5.2
Interpret visual information system indications provided for approach and landing

2.9.4.2.1
Interpret TACAN/VOR DME approach plates

2.9.4.3.1
Interpret VOR approach plates

2.9.4.6.1
Interpret ILS approach plates

MOTIVATION

As you know, takeoff and departure, as well as approach and landing, are the busiest and most critical segments of your flight. By having a thorough knowledge of the information provided in the FLIP (Terminal) High Altitude United States, both the Standard Instrument Departure (SID) and the Approach Plates, you can devote more time to flying the aircraft and less to interpreting the plates in the air. Careful study of the SID and Approach Plates available during preflight planning will greatly simplify the process once airborne. Of course, you must also interpret the information presented in the FLIP (Terminal) correctly, since misinterpreting the data can have serious consequences.

This lesson will provide you with the organization and content of the FLIP (Terminal) High Altitude United States.

OVERVIEW

After this lesson you will be better able to utilize the FLIP (Terminal) High Altitude - United States and accurately interpret the information contained therein.

In this lesson you will be studying:

* Features common to high altitude instrument approach plates
    - Planview and profile symbols and elements
    - Airport diagrams/sketches
    - Instrument approach minima section
    - Final Approach Fix (FAF) to Missed Approach Plate (MAP) details
* Elements specific to types of high altitude approaches
    - HI-TACAN and VOR/DME
    - VOR
    - ILS
    - GPS
* A practical exercise setting up radios, navigation aids, and instruments for an IFR arrival at a destination Air Force Base

REFRESHER

* Recall your experience using low altitude plates during your primary training, plus tuning and identifying navigation radio aids.

PRESENTATION

I. Features common to high altitude instrument approach plates **2.1.8.3.1.1**

A. Planview and profile symbols and elements

1. Overhead and cross-sectional view of approach path

a. Penetration track

(1) Begins at initial approach fix (IAF) to the final approach fix (FAF)

(2) Depicted by a bold dotted line

(3) Accent lines across the track refer to altitude restrictions depicted in profile view

NOTE: Four basic penetration patterns are used to allow a pilot to lose altitude while proceeding from the IAF to the final approach course.

Sg 2, fr 4-6

Fig 1: *Basic Penetration Patterns*

(a) Straight-in

(b) Offset

(c) Arcing

(d) Teardrop

b. Procedure track

(1) Begins at FAF to the Missed Approach Point (MAP)

(2) Depicted by a thick solid line

CAUTION: Approach procedures are not to be varied, even if in VMC, unless clearance has been received for a contact approach, a visual approach, or you cancel IFR.

c. Missed approach route

Sg 2, fr 4-6

(1) Printed instructions in profile view box

(a) Headings

(b) Altitudes

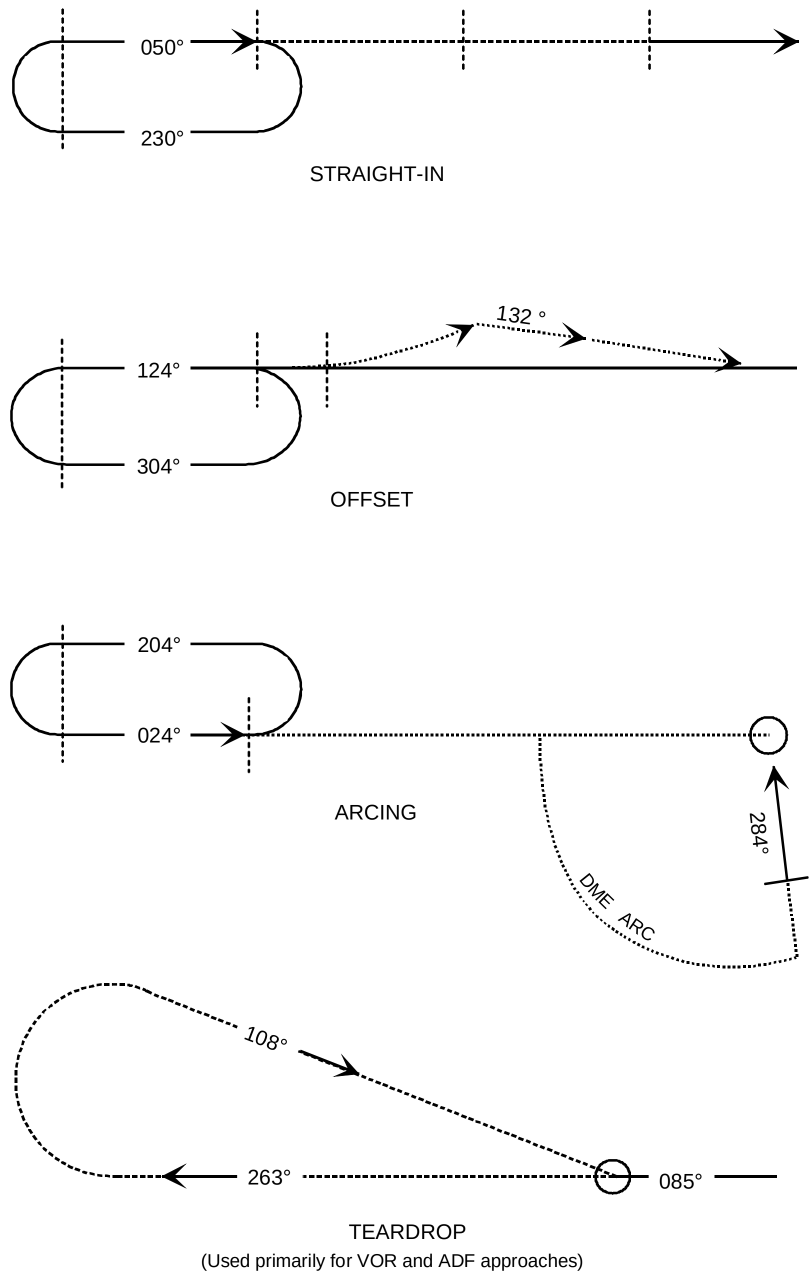


Figure 1: BASIC PENETRATION PATTERNS

(c) Holding instructions

(d) Distance limitations

(2) Pictorial representation of track: vertically spaced dashed line

(a) Begins at MAP

(b) Indicates radials/bearings

(c) Holding

Sg 2, fr 8

Fig 2: *Altitude Restrictions (Profile View)*

2. Altitude restrictions

NOTE: Altitude restrictions are depicted prior to the specified fix in the direction of flight in the profile view.

a. Mandatory altitude

(1) Numeric value with a line above and below number

(2) You must fly this section of the approach at this altitude

b. Minimum altitude

(1) Numeric value with a line below it

(2) You must fly this section of the approach at or above this altitude

c. Maximum altitude

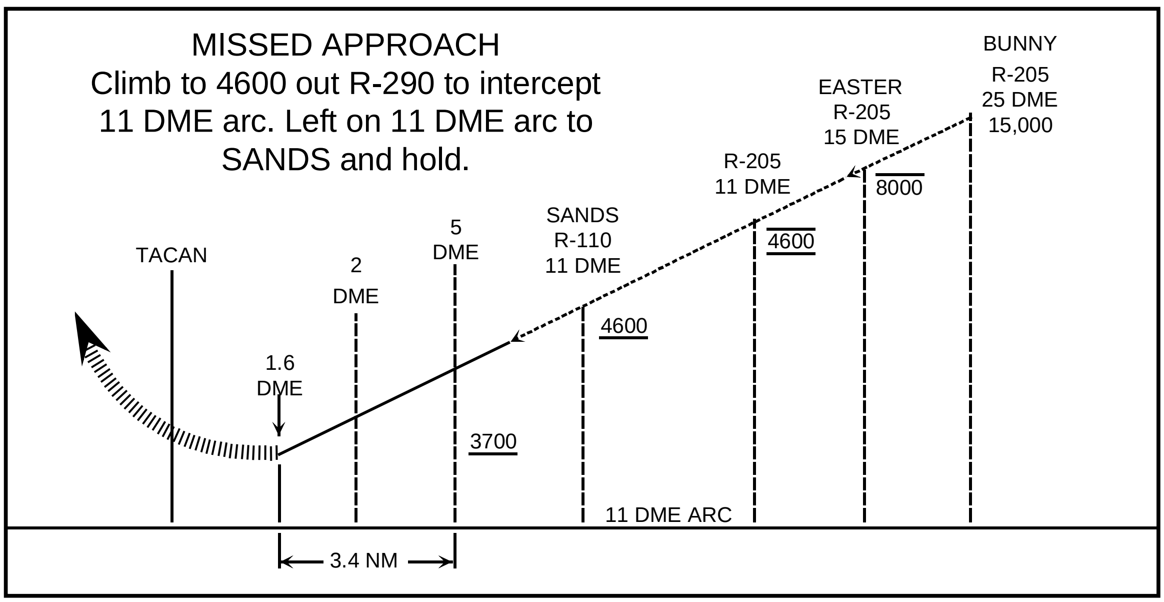
(1) Numeric value with a line above it

(2) You must fly this section of the approach at or below this altitude

d. Recommended altitude

(1) Numeric value without lines

(2) Recommended, but not required, that you fly at this altitude



ALTITUDES

$\overline{\underline{4600}}$	MANDATORY ALTITUDE
$\underline{4600}$	MINIMUM ALTITUDE
$\overline{8000}$	MAXIMUM ALTITUDE
15,000	RECOMMENDED ALTITUDE

Figure 2: ALTITUDE RESTRICTIONS (Profile View)

Sg 2, fr 16
Holding Patterns

3. Holding patterns

NOTE: Holding procedures and plate depiction standards for DoD GPS approaches have not (at this time) been specifically stated.

a. Arrival holding pattern

(1) Use until you are cleared to proceed beyond IAF onto approach

(2) Thin solid line with notations indicates inbound/ outbound headings and direction of pattern (clockwise or counterclockwise)

(3) Provides DME limits for TACAN, VORTAC, and VOR/DME approach, otherwise standard holding limits apply (separate VOR and TACAN holding may be depicted on the same plate)

(4) Entry diagram found in upper right corner of planview

(a) Use for transitioning from route or feeder facility to arrival holding pattern

(b) Same pattern as depicted on planview

(c) Headings given on diagram are inbound headings to the IAF

NOTE: "Holding in lieu of procedure turn" pattern not used on high altitude approach plates.

Sg 2, fr 18-20, p3
Missed Approach Holding

b. Missed approach holding pattern

(1) Use after executing a missed approach

(2) Dashed line with notations indicates inbound/ outbound headings and direction of pattern (clockwise or counterclockwise)

(3) Limits will be specified only if pattern nonstandard, or DME fixes may be shown

4. Concentric rings on planview

Sg 2, fr 24

a. 20-mile radius circle around navigation facility: features encircled by bold print line are to scale

b. Feeder and high altitude facilities--NAVAIDs

(1) Orientation to approach pattern

(a) Distance/course to IAF

(b) May show bearing/distance to transitional or holding fixes

(2) Usually not to scale

(3) Orientation of one remote NAVAID to another

5. Types of NAVAIDs

Sg 2, fr 29

a. Azimuth information only

(1) VHF omni-range (VOR)

(2) Localizer

(3) Non-directional and marker beacons

b. Bearing and distance information

(1) Tactical air navigation (TACAN)

(2) VOR combined with distance measuring equipment (VOR/DME)

(3) VOR combined with TACAN (VORTAC)

6. Obstacles and spot elevations

Sg 2, fr 33

a. Obstacles--man-made obstructions

(1) Single: inverted V with elevation in feet

(2) Group: two overlapping inverted Vs with elevation in feet

(3) Highest: large inverted V with elevation in feet

b. Spot elevation--natural obstructions

(1) Indicated by a dot with elevation in feet

(2) Highest: bold dot with elevation in feet

NOTE: Elevations for obstacles and elevation points are given in feet mean sea level (MSL).

Sg 2, fr 44

7. Airport communications frequencies and radar coverage information

a. Radio frequencies both UHF and VHF frequencies given, additional applicable frequencies also found in IFR supplement

(1) Approach control

(2) Tower

(3) Ground control

(4) Clearance delivery

(5) Automatic terminal information service (ATIS)

b. Type(s) of radar coverage available at airport

(1) ASR--bearing and distance

(2) PAR--bearing, distance, and glideslope

Sg 2, fr 51-53
MSA & ESA

8. Safe altitudes minimum and emergency:

a. Minimum safe given for radius of 25 nm from approach NAVAID (may be divided into sectors of at least 90° with different altitudes)

b. Emergency safe given for radius of 100 nm from approach NAVAID. This provides 1,000 ft obstruction clearance, and in FAA designated mountainous areas, it will provide 2,000 ft obstruction clearance

B. Airport diagrams/sketches **2.9.5.5.2**

1. Sketch on approach plate

a. Oriented to magnetic North

b. Runway dimensions

c. Location/type of arresting gear/barriers

d. Field elevation/touchdown zone elevation (TDZE) - first 3,000 ft of straight-in instrument runway, starting at the threshold

e. Location of airport tower/rotating beacon - When control tower and rotating beacon are co-located, beacon symbol will be used and further identified as TWR

f. Position/height of obstacles - Positional accuracy within ± 600 ft unless otherwise noted on the chart

g. Position of airport NAVAID

h. Type of runway/approach lighting available

(1) Approach light symbols/pictorials are shown in the Flight Information Handbook

(2) Visual Glideslope Indicators

(a) Visual Approach Slope Indicator (VASI) V

i. Both sides of runway

ii. Visible 5 miles daytime, 15-20 miles at night

iii. WHITE over WHITE -- Too high
RED over WHITE -- On glideslope
RED over RED -- Too low

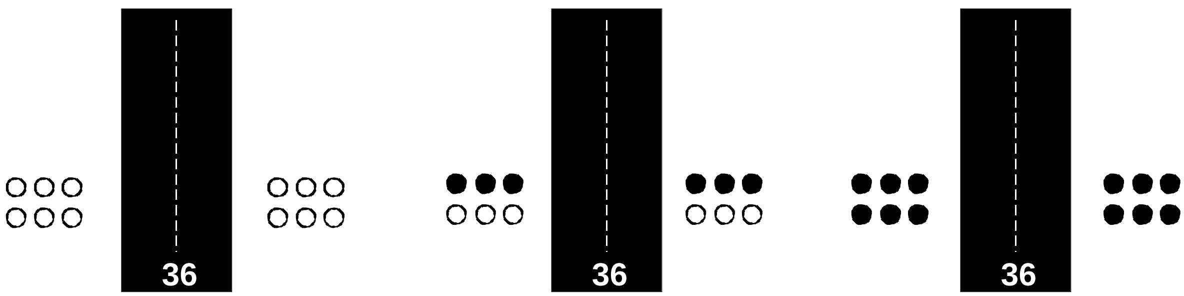
(b) Precision Approach Path Indicator (PAPI) P

i. New international system replacing VASI

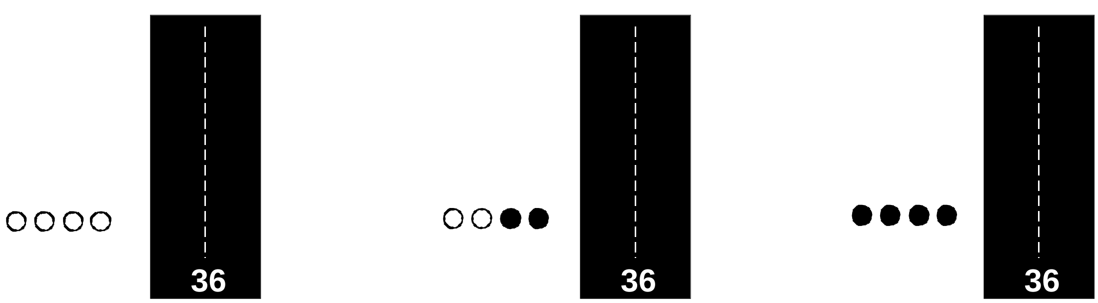
ii. Bar of four lights, usually on left side of runway

iii. 4 WHITE lights -- Too high
2 WHITE, 2 RED lights -- On glideslope
4 RED lights -- Too low

Fig 3: *Precision Approach Path Indicator (PAPI)*



VISUAL APPROACH SLOPE INDICATOR
VASI V



PRECISION APPROACH PATH INDICATOR
PAPI P

Figure 3: PRECISION APPROACH PATH INDICATOR (PAPI)

2. Full-page airport diagram

   a. Scope - Airport diagrams are specifically designed to assist in the movement of ground traffic at locations with complex runway/taxiway configurations and provide information for updating Computer Based Navigation Systems (i.e., INS) aboard aircraft. Airport diagrams are not intended to be used for approach and landing or departure operations

   b. Runway dimensions, elevations, and gradient (if greater than 0.3 degrees up or down)

   c. Airport diagram scales are variable

   d. Runway heading to the nearest tenth of a degree

   e. Dimension of runway overruns

   f. Runway identification number

   g. Location of arresting gear, barriers, and displaced thresholds

   h. Position and identification of taxiways, ramps, and parking areas

   i. Type of runway surface

   j. Closed runways/taxiways

   k. Location/identification of buildings, control tower, airport beacon, and other structures

   l. True/magnetic north orientation, date, and annual rate of change - True/magnetic North orientation may vary from diagram to diagram, i.e., North may <u>not</u> be at the top of the page

   m. Location/elevation of obstructions

   n. Geographical coordinate grid - Coordinate values are shown in 1 or 1/2 minute increments. They are further broken down into 6 second ticks, within each 1-minute increments

   o. Runway weight-bearing capacity

Fig 4: *Full-page Airport Diagram - Memphis NAS*

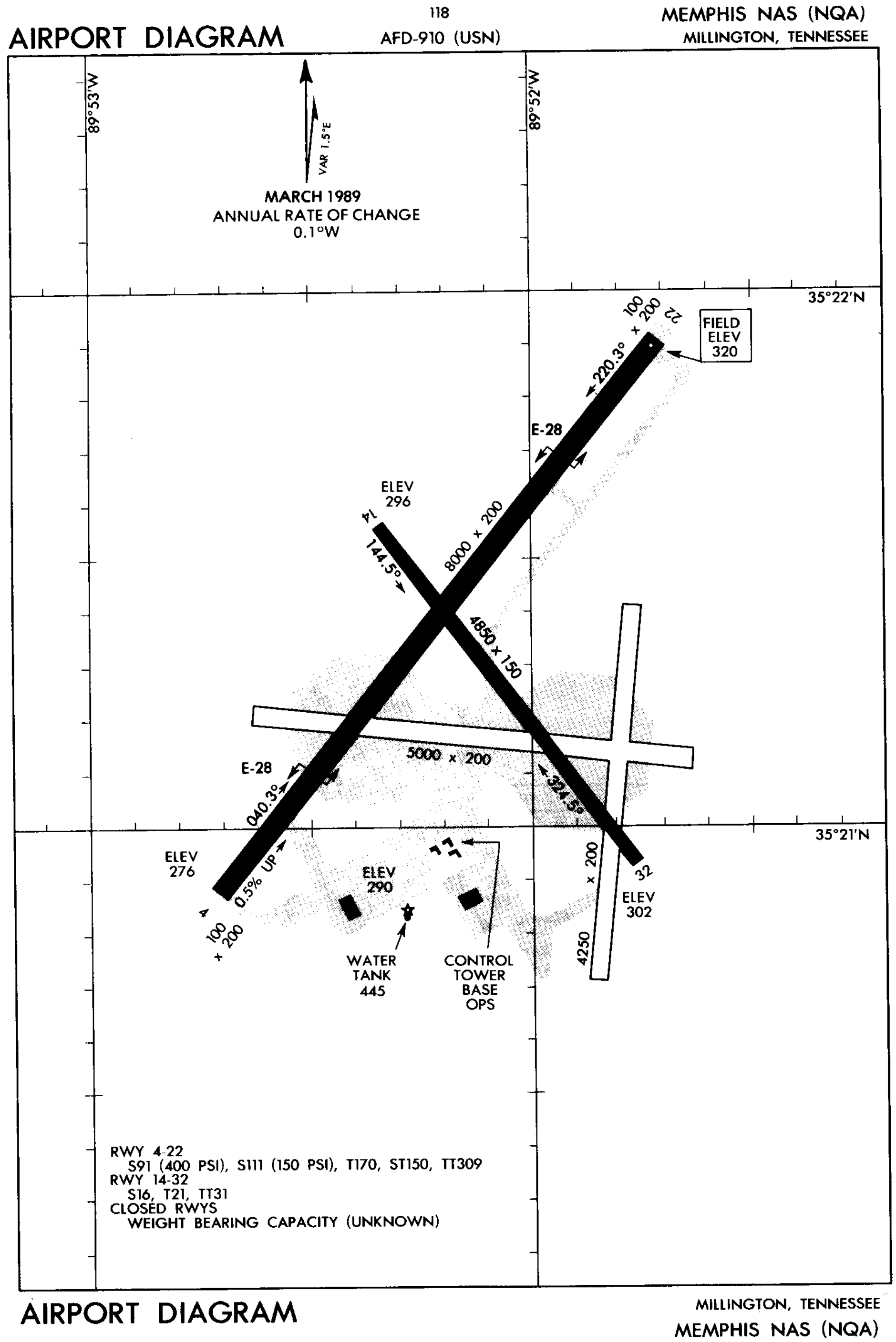


Figure 4: FULL-PAGE AIRPORT DIAGRAM - MEMPHIS NAS

C. Instrument approach minimums

1. Type of approach

   a. Straight-in/circling

   b. Precision/nonprecision

2. Aircraft category

   a. Criteria established for six categories: A,B,C,D,E, and copter

   b. Generally, only categories C, D, and E are listed in high altitude terminal approach plates (T-45C falls under C). Occasionally category B is listed

3. Ceiling and visibility requirements - criteria used for IFR destination and alternate filing purposes. Also establishes takeoff criteria

   a. Ceiling in feet above ground level (AGL)

   b. Prevailing visibility in statute miles (sm)

   c. Runway visual range (RVR) in hundreds of feet (if airport is so equipped)

4. Decision height/altitude (DH/DA)/minimum descent altitude (MDA)

   a. DH/DA applies to precision approaches

   b. MDA applies to nonprecision approaches

   c. Altitudes of DH/DA and MDA are given in feet mean sea level (MSL) and height above touchdown zone (HAT) or height above airport (HAA) for circling approach. HAT and HAA are AGL altitudes

      NOTE: DH is being changed to DA to conform to ICAO standards where "H" is AGL and "A" is MSL

5. Glideslope angle information for PAR approaches

   COMMON ERROR: Not looking up asterisks/symbols that pertain to modifications of minimums.

   NOTE: Use rate-of-climb/descent table on inside back cover.

Sg 4, fr 2-5
Instrument Approach Minimums

Sg 5, fr 4-5
FAF to MAP

D. FAF to MAP table - used on nonprecision approaches when DME unavailable and radio facility not located at field

1. Gives distance from FAF to MAP in nm

2. Gives time to traverse distance at a given ground speed in minutes and seconds

   COMMON ERROR: Not reading cautions and warnings on approach plate.

   COMMON ERROR: Missing some details by not studying/ reviewing plate thoroughly.

Sg 6, fr 3
High Altitude Approach Plates

II. Elements specific to types of high altitude approach plates **2.1.8.3.1.1**

A. HI-TACAN and VOR/DME **2.9.4.2.1**

Sg 6, fr 4-7
Fig 5: *HI-VOR/DME or TACAN RWY 27R Billings Logan INTL*

1. Bearing and distance information

2. DME used to determine

   a. Limits of crossing altitude restrictions

   b. Arc

   c. FAF

   d. Missed approach point (MAP)

3. Bold "V" in profile view marks visual descent point

Sg 6, fr 9
VOR

B. VOR **2.9.4.3.1**

Sg 6, fr 10-11a
Fig 6: *HI-VOR RWY 19 Pensacola NAS*

1. Bearing information only

2. Penetration turn altitude listed in profile section

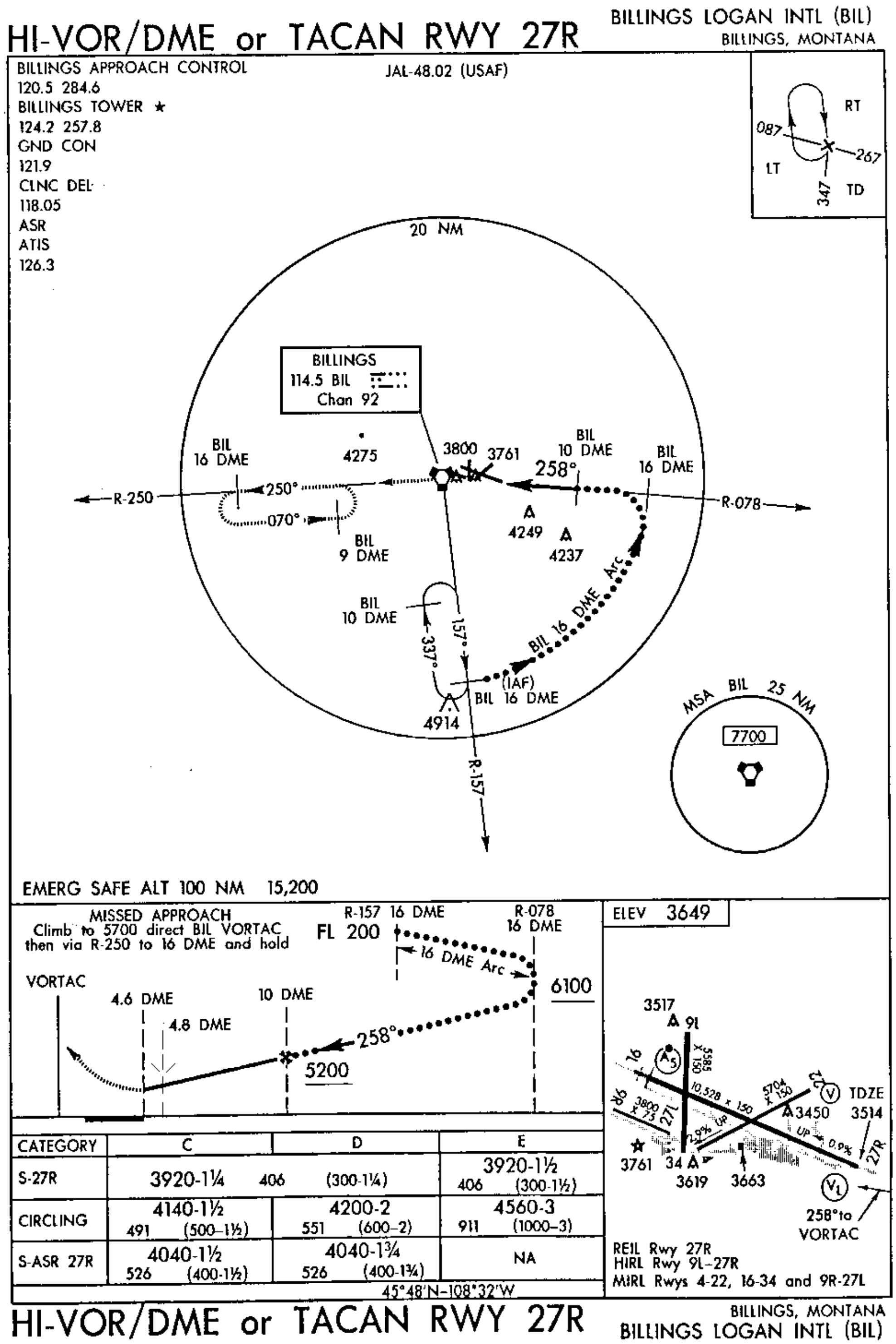
a. If not published, start turn after one-half total altitude between IAF and FAF

Sg 6, fr12
VOR Station Passages

3. MAP determined by:

   a. Station passage, VOR at field

   b. Timing, VOR not at field



CATEGORY	C	D	E
S-27R	3920-1¼ 406 (300-1¼)		3920-1½ 406 (300-1½)
CIRCLING	4140-1½ 491 (500-1½)	4200-2 551 (600-2)	4560-3 911 (1000-3)
S-ASR 27R	4040-1½ 526 (400-1½)	4040-1¾ 526 (400-1¾)	NA

Figure 5: HI-VOR DME OR TACAN RWY 27R BILLINGS LOGAN INTL

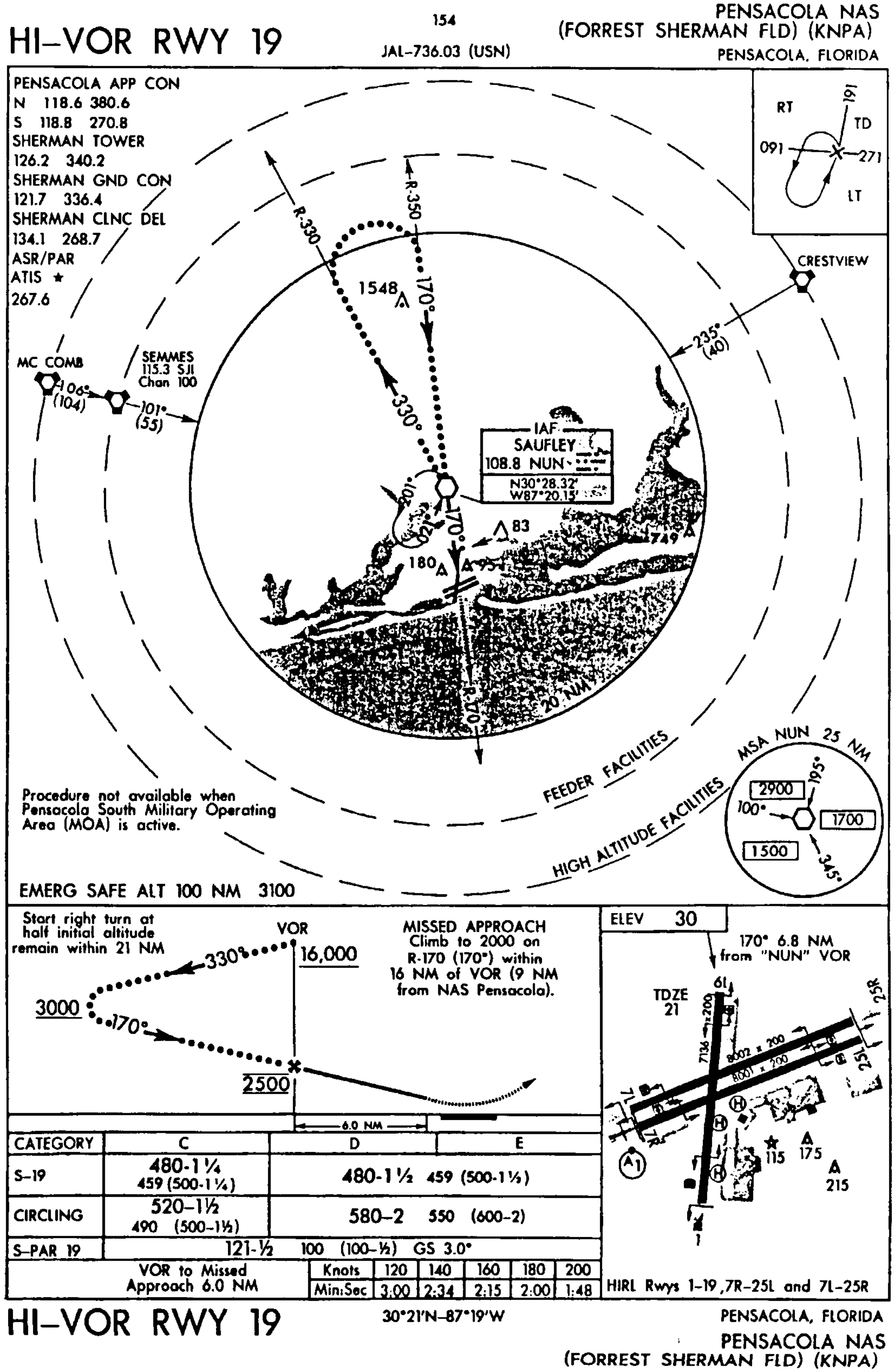


Figure 6: HI-VOR RWY 19 PENSACOLA NAS

C. ILS **2.9.4.6.1**

1. Localizer depicted on planview
2. Lead radials (LR-231) identify turn point to intercept ILS final approach course
3. Glideslope depicted on profile view
4. Glideslope angle and TCH depicted on profile view
5. Glideslope intercept altitude depicted on profile view
6. Localizer intercept altitude
7. MAP determined by decision height (DH)

D. GPS

1. New type of approach aid
2. Non-precision for basic GPS
3. Precision for differential-type GPS

III. Practical exercise **2.1.8.3.1.1, 2.9.5.5.2, 2.9.4.2.1, 2.9.4.3.1, 2.9.4.6.1**

A. Setting up VOR

B. Setting up TACAN

C. Setting up MFD

D. Setting up UHF/VHF radio

E. Setting up COMM panel

F. Using and interpreting FLIP approach plate

Sg 6, fr 13
ILS

Sg 6, fr 14-16

Fig 7: *HI-ILS/DME RWY 10R Portland INTL*

Sg 6, fr 25-29
ILS Glideslope

Sg 6, fr 34h
GPS

INav 7 (SIM) MFD
HSI Simulation Intro

Practical Exercise Fair Child AFB

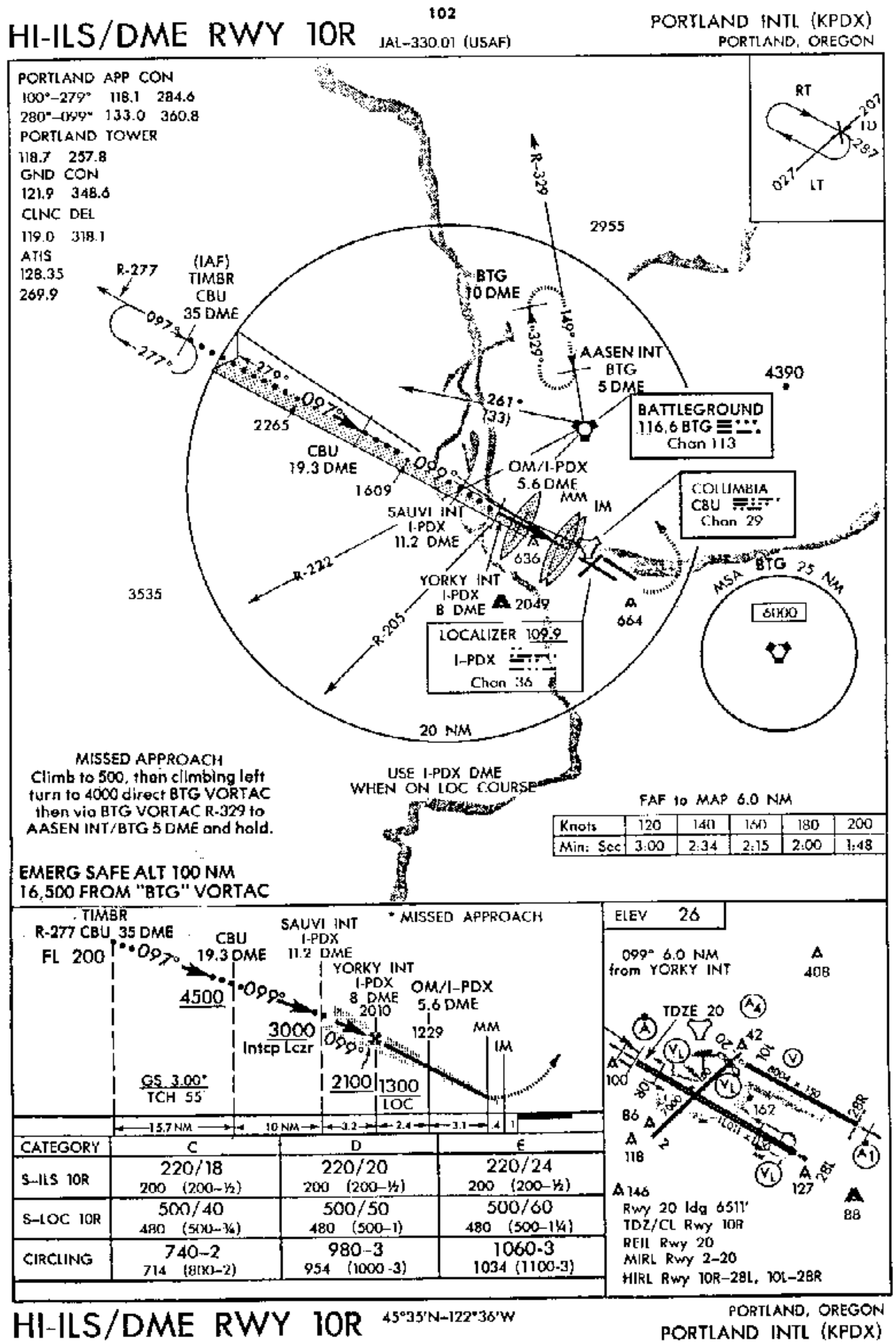


Figure 7: HI-ILS/DME RWY 10R PORTLAND INTL

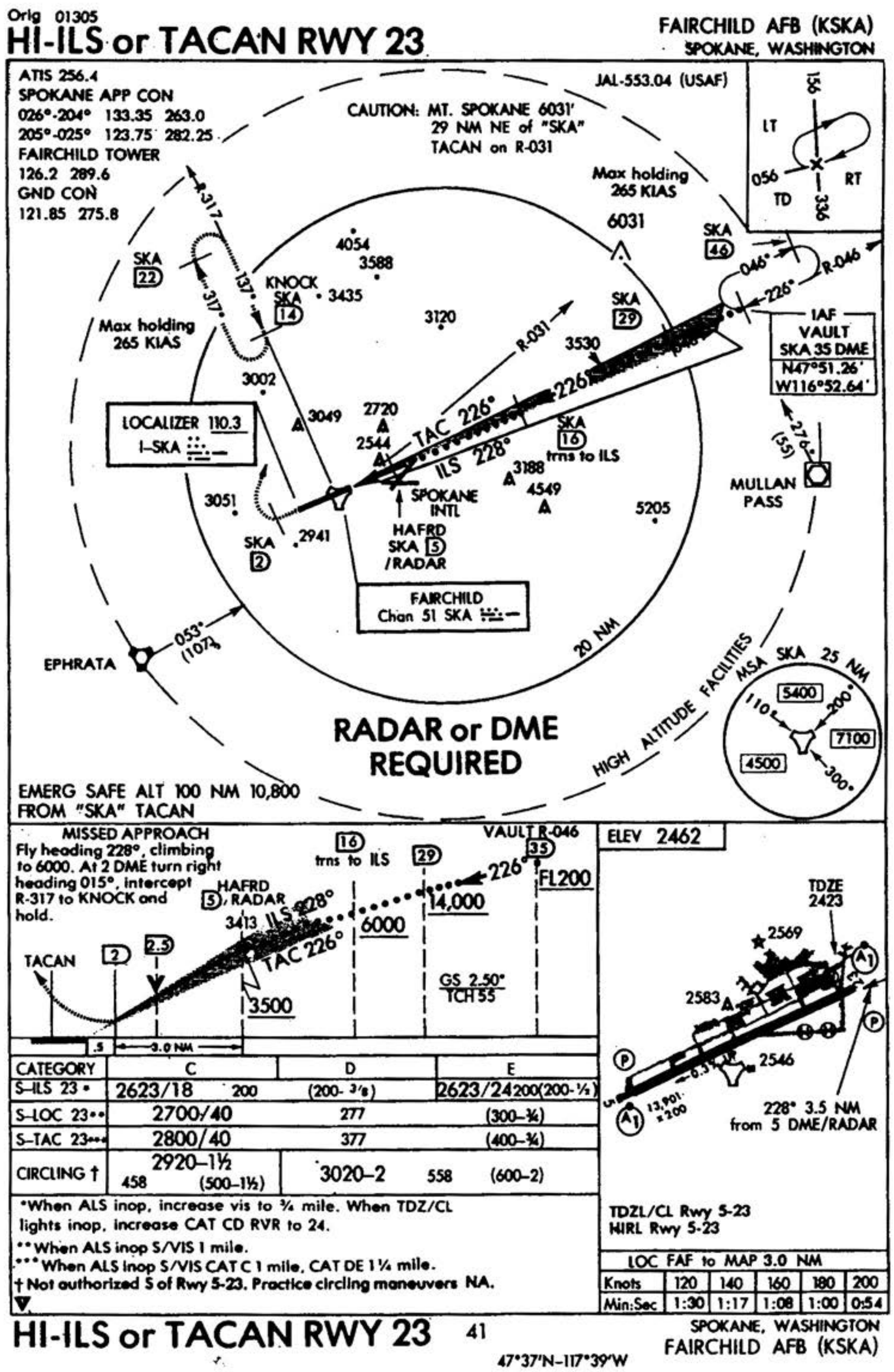


Figure 8: HI-ILS OR TACAN RWY 23 FAIRCHILD AFB

SUMMARY

This lesson has focused on the following topics:

* Features common to high altitude instrument approach plates
    - Planview and profile symbols and elements
    - Airport diagrams/sketches
    - Instrument approach minima section
    - Final Approach Fix (FAF) to Missed Approach (MAP) details
* Elements specific to types of high altitude approaches
    - HI-TACAN and VOR/DME
    - VOR
    - ILS
    - GPS
* A practical exercise setting up radios and instruments for arrival at a destination Air Force Base

CONCLUSION

Having reviewed the content and organization of high altitude approach plates, and having performed a practical exercise, you are now better prepared to plan and execute precise instrument approaches.

LESSON GUIDE (LAB)

COURSE/STAGE: T-45C TS Instrument Navigation

LESSON TITLE: Fuel, Weather, and Alternate Airfield Planning

LESSON IDENTIFIER: T-45C TS INav-08

LEARNING ENVIRONMENT: Classroom

ALLOTTED TIME: 1.2 hr

FIGURES:

Fig 1: IFR Filing Criteria
Fig 2: Destination/Alternate Weather Examples -- Situation 1
Fig 3: Destination/Alternate Weather Examples -- Situation 2
Fig 4: Computing Ground Speed with Crab Angle Less Than 10 Degrees (2 parts)
Fig 5: Computing Ground Speed with Crab Angle 10 Degrees or Greater (3 parts)
Fig 6: Point-to-Point
Fig 7: NAS New Orleans Approach
Fig 8: NAS Pensacola Approach
Fig 9: Point-to-Point Solution (2 parts)

TRAINING AIDS:

* CR-2/3 Navigation Computer

STUDY RESOURCES:

* NATOPS General Flight and Operating Instructions Manual, OPNAVINST 3710.7
* T-45C NATOPS Flight Manual, A1-T45AC-NFM-000
* CR-2/3 Navigation Computer Workbook

(2-02) ORIGINAL

LESSON PREPARATION:

Read:

* Sections 4.6.3 and 4.6.4 in NATOPS General Flight and Operation Instructions Manual, OPNAVINST 3710.7 (Series)

Bring to Class:

* TRAWING ONE In-Flight Guide
* Personal circular navigation computer
* FLIP publications

REINFORCEMENT:

Review as necessary:

* CR-2/3 Navigation Computer Workbook

EXAMINATION:

The objectives in this lesson will be tested in Instrument Navigation 12X.

LESSON OBJECTIVES

1.1.1.1
Determine weather criteria for flight

2.1.8.2
Determine alternate routes/airfields

2.1.8.1
Determine fuel requirements for route of flight

2.1.10
Recall use and function of the circular navigation (flight) computer

HOW TO USE A WORKBOOK

1. This is a workbook/lab that you will complete in group session with an instructor. You will bring FLIP publications and the TW-1 In-Flight Guide.

2. The lesson contains information accompanied by exercises and/or questions to measure your understanding of the subject matter. Answers are provided in the back of the workbook to allow you to monitor your progress through the lesson.

MOTIVATION

During preflight planning, you must know the weather and fuel requirements. When airborne, you must be prepared to execute contingency plans in the event that conditions change.

OVERVIEW

The more experience you have flying, the more evident it becomes that proper planning and preparation play a major role in the safe and effective accomplishment of your mission.

As you prepare for an IFR mission, you must consider, in your preflight planning, the types of approaches and weather minimums associated with your aircraft's compatible NAVAIDs for both destination and alternate airfields.

Another critical aspect in preparing for your flight is fuel planning. Your fuel plan must include provisions for departure to destination and destination to an alternate, plus your required reserve.

When you have completed this lesson, you will be able to use the appropriate criteria for determining weather minimums and fuel requirements for your destination and alternate airfields.

This lesson consists of:

* Weather minimums
* Alternate routes/airfields
* Fuel requirements for route of flight
* Navigation computer
    - Point-to-point

REFRESHER

Be prepared to combine your knowledge of regulations and your meteorological data interpretation skills in order to solve flight planning problems. In particular, recall:

* METAR code used in Terminal Aerodrome Forecast printouts
* OPNAVINST 3710.7 regulations from both your T-34 training and T-45C FRR lessons

PRESENTATION

DETERMINING WEATHER MINIMUMS AND ALTERNATE ROUTES/AIRFIELDS 1.1.1.1, 2.1.8.2

As part of your flight planning activities, you need to prepare yourself to make early and rapid decisions in the event that emergency situations arise or weather conditions change while you are in flight. To be prepared, you should examine the forecast weather conditions at your proposed destination and possible alternate and use the OPNAVINST 3710.7 (series) weather criteria governing your selection of a destination and alternate to develop a plan of action.

To file your IFR flight plan, you must ascertain that the actual and the forecast weather meet the minimums required for flight.

Existing Weather

The plan you file must be based on the existing weather at the point of departure at the time of clearance and the existing and forecast weather for the entire route of flight.

Forecast Weather

You obtain this information by reviewing the Flight Weather Briefing (DD Form 175-1) and Terminal Aerodrome Forecasts (TAF) for both your destination and probable alternate. Remember to consider forecast surface winds so that you may employ your best judgment to determine the runway in use on arrival. (See OPNAVINST 3710.7, para 4.6.3.2.)

Your destination forecast is based on the Terminal Aerodrome Forecast at civilian and military airfields. From these reports you can determine the forecast ceiling and visibility for your ETA +/- 1 hour. This teletype information will aid in planning for an IFR flight, identifying the type of approach required, determining if an alternate is required, and selecting the best alternate, if one is required. (A reminder, CNATRA requires an alternate on all Training Command cross-country flights.)

Both your destination and alternate weather terminal forecast periods extend from one hour before your estimated time of arrival (ETA) at each airfield until one hour after ETA. Since your ETA will be different at your destination and your alternate, you will have different time blocks for examining your forecast weather. For example, if your ETA at your destination is 0900, your weather forecast period is from 0800 to 1000. If your ETA at your alternate is 0930, you will use a weather forecast period of 0830 to 1030. The DD form 175-1 provided by the forecaster on the day of flight is the final arbiter of the forecast weather.

PROGRESS CHECK

Question 1 — 1.1.1.1
You need to check existing weather for the time of your clearance at your point of departure and for your _____.

ANSWER:

Question 2 — 1.1.1.1
Your forecast weather is for what period of time?

ANSWER:

Filing Criteria Rules for Minimums

The rationale for planning your flight according to stringent weather minimums is to ascertain that the meteorological conditions at your destination meet the weather minimum criteria. OPNAVINST 3710.7 series dictates the weather criteria to determine whether or not you may file for a destination and whether or not you must select an alternate. If an alternate is required, these criteria aid you in choosing one that is satisfactory.

These weather criteria describe the ceiling in feet AGL and the visibility in sm. For example, minimums of 3,000-3 mean that your ceiling is 3,000 ft and your visibility is 3 sm.

Refer to the following chart (Figure 1) from OPNAVINST 3710.7 to review the criteria for filing an IFR flight plan.

Remember to comply with the following IFR filing criteria:

* Observe your absolute minimums of 200-1/2 for single-piloted aircraft.

  NOTE: The T-45C is considered "single-piloted" by the FAA beause of its tandem seating, regardless of how many pilots are in the aircraft.

* Use minimums for instrument approach to the probable duty runway based on forecast surface winds.

* Use lowest minimums for any published approach to that probable duty runway you are qualified for and your aircraft is equipped to make.

COMMON ERROR: Don't confuse your pilot minimums with approach minimums. Remember that all Naval aviators in a single-piloted aircraft must observe the absolute minimums of 200-1/2 regardless of the published approach minimums, i.e., published minimums may be 100-1/4, your minimums are 200-1/2.

COMMON ERROR: Your planning minimums on the card below relate destination and alternate weather. After you are airborne, your minimums are 200-1/2 or better, depending on published minimums.

DESTINATION WEATHER ETA plus and minus one (1) hour	ALTERNATE WEATHER ETA plus and minus one (1) hour		
0-0 up to but not including published minimums	3,000-3 or better		
Published minimums up to but not including 3000-3 (single-piloted absolute minimums 200-1/2)	NON-PRECISION	PRECISION	
		ILS	PAR
	* Published minimums plus 300-1	Published minimums plus 200-1/2	* Published minimums plus 200-1/2
3,000-3 or better	No alternate required		
*In the case of single-piloted or other aircraft with only one operable UHF/VHF transceiver, radar approach minimums may not be used as the basis for selection of an alternate airfield.			

Figure 1: IFR FILING CRITERIA

PROGRESS CHECK

Question 3 — 1.1.1.1
What are your absolute minimums in a single-piloted aircraft?

ANSWER:

CHOOSING ALTERNATE AIRFIELDS

For each flight, you must determine whether or not an alternate is required. To make this determination, refer to the forecast weather at your destination and the OPNAVINST 3710.7 criteria.

NOTE: CNATRA requires an alternate for all IFR flights.

Planning for an Alternate

If your destination weather does not meet minimal criteria, you are required to select an appropriate alternate in your flight preparation so that you will have a safe alternate in case you need one. First, carefully apply OPNAVINST 3710.7 weather minimum rules to your destination weather.

1. If the ceiling and visibility are between 0-0 and published minimums (NLT 200-1/2), you require an alternate that must be 3,000-3 or better at ETA +/- 1 hour.

2. If the ceiling and visibility are between published minimums up to but not including 3,000-3, you again require an alternate. The weather for a non-precision approach at your alternate must be the non-precision's published minimums plus 300-1. The weather for a precision approach at your alternate must be the precision's published minimums plus 200-1/2. (For a single-piloted aircraft, this will be ILS only; PAR does not qualify.)

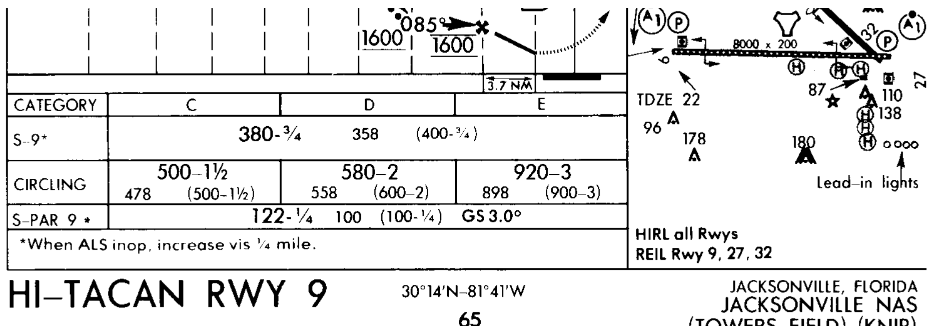
Examine the following two situations, each depicting one of the above rules.

First, let's look at Situation 1, in which your destination forecast is below published minimums.

SITUATION 1- DESTINATION FORECASTING BELOW PUBLISHED MINIMUMS:

Assume NAS Jacksonville is forecasting weather of a 100-ft ceiling and 1/2-sm visibility during the period one hour before until one hour after your planned ETA, with surface winds 090 degrees at 5 kts. You can see from Example A that the published minimums for a PAR runway 9 approach are 100-1/4.

When evaluating your destination weather, you can use the lowest minimums for any approach you are equipped to make; therefore, if available, you should look first at ILS or PAR minimums.



Example A

After evaluating the IFR filing criteria (Example B) and approach plate (Example A), fill in the following information:

- Forecast weather for NAS Jacksonville is __________.
- Your absolute single-piloted minimums are __________.
- Your suitable alternate airfield must have forecast weather of __________ ceiling and ___________ miles visibility.

IFR Filing Criteria

DESTINATION WEATHER ETA plus and minus one (1) hour	ALTERNATE WEATHER ETA plus and minus one (1) hour		
0-0 up to but not including published minimums	3,000-3 or better		
Published minimums up to but not including 3000-3 (single-piloted absolute minimums 200-1/2)	NON-PRECISION	PRECISION	
		ILS	PAR
	* Published minimums plus 300-1	Published minimums plus 200-1/2	* Published minimums plus 200-1/2
3,000-3 or better	No alternate required		

*In the case of single-piloted or other aircraft with only one operable UHF/VHF transceiver, radar approach minimums may not be used as the basis for selection of an alternate airfield.

Example B

As you have noted, NAS Jacksonville is forecasting weather of 100-1/2, which is above published minimums for a precision approach (100-1/4) at this airfield, however, below the single-piloted minimums of 200-1/2. For this situation, you must select a suitable alternate having forecast weather of 3,000-3 or better during the period of one hour before to one hour after your ETA at alternate.

Figure 2: DESTINATION/ALTERNATE WEATHER EXAMPLES -- SITUATION 1

Next, study Situation 2, in which your destination forecast is above published minimums but below 3,000-3.

NOTE: When planning for an alternate with more than one published approach to the probable duty runway, use the lowest of the approach minimums for which you qualify.

Naturally, you will not want to select just any aerodrome as your alternate. Exercising foresight and judgment, choose an alternate suitable for your aircraft and mission requirement. Do you have sufficient fuel to fly to the alternate given some delays? Does your alternate have NAVAIDs that are operable and are compatible with your equipment? Also, are radar facilities available should you experience NAVAID equipment failure? Is your alternate far enough away from your destination to be unaffected by the same weather systems? Get in the habit of raising and answering these kinds of questions as part of your flight planning for an alternate airfield.

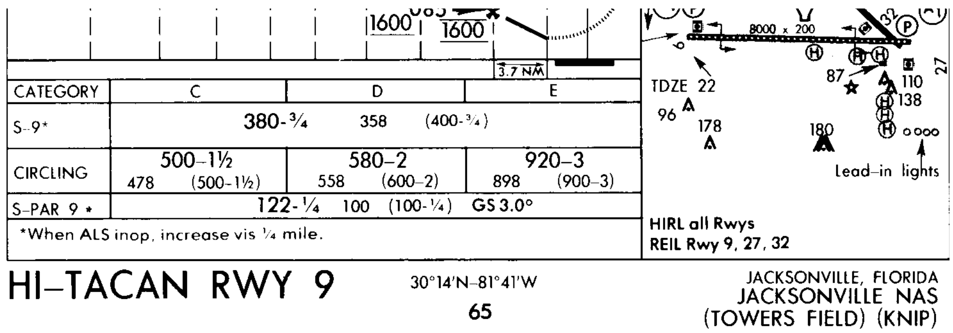
After choosing an alternate, you must determine the most suitable approach to your alternate considering crosswinds and T-45C requirements. Remember that although the maximum crosswind for the aircraft is 20 kts (15 kts on a wet runway), your maximum crosswind as a student pilot is 10 kts. This may require that you utilize a circling approach with higher minimums.

Next, calculate that you have an adequate fuel supply to your alternate plus your required reserve of 300 pounds.

Finally, it is critical that you check NOTAMs to make sure that your alternate is available during the time that you may need it. Your “best” alternate is best only if it is open, and runways may be closed for a variety of reasons.

SITUATION 2 - DESTINATION FORECASTING
ABOVE PUBLISHED MINIMUMS BUT BELOW 3,000-3:

Assume you are single-piloted and NAS Pensacola is forecasting weather of 300 ft and 1 sm for the period one hour before until one hour after your planned ETA with surface winds of 090 degrees at 5 kts. The forecast weather is above the published PAR minimums of 100-1/4 but below 3,000-3; therefore, you must plan an alternate destination. You have selected NAS Jacksonville as your alternate with forecast winds of 090 degrees at 5 kts. Due to a mechanical failure, you do not have the option of using an ILS approach; however, TACAN and VOR/DME are available.



Example C

Even though the PAR minimums are 100-1/4 and your absolute minimums of 200-1/2 are within the forecast range of 300-1, you need to examine the criteria for available non-precision and precision approaches at your alternate airfield. The ILS criteria do not apply in this situation for two reasons: 1) ILS is not available at NAS Jacksonville, 2) your ILS equipment is inoperable. You need to examine the criteria for available non-precision and precision approaches at your alternate airfield.

Also remember that should there be more than onepublished approach to the probable duty runway at your alternate, you would use the non-precision approach with the lowest minimums for planning purposes. In this situation your most suitable approach for planning purposes is HI-TACAN RWY 9 with minimums of 400-3/4. Therefore, NAS Jacksonville must have forecast weather of 700-1 3/4 (400-3/4 plus 300-1) to be an acceptable alternate.

IFR Filing Criteria

DESTINATION WEATHER ETA plus and minus one (1) hour	ALTERNATE WEATHER ETA plus and minus one (1) hour		
0-0 up to but not including published minimums	3,000-3 or better		
Published minimums up to but not including 3000-3 (single-piloted absolute minimums 200-1/2)	NON-PRECISION	PRECISION	
		ILS	PAR
	* Published minimums plus 300-1	Published minimums plus 200-1/2	* Published minimums plus 200-1/2
3,000-3 or better	No alternate required		

*In the case of single-piloted or other aircraft with only one operable UHF/VHF transceiver, radar approach minimums may not be used as the basis for selection of an alternate airfield.

Example D

Figure 3: DESTINATION/ALTERNATE WEATHER EXAMPLES -- SITUATION 2

PROGRESS CHECK

Question 4 — 2.1.8.2
For planning purposes, if your destination weather is at or above published minimums but below 3,000-3, forecast weather must be __________ , for a non-precision approach at your alternate.

ANSWER:

EXCEPTIONS TO BASIC FILING CRITERIA

For reasons of safety, previous editions of OPNAVINST 3710.7 added two requirements to the basic filing criteria to provide for the exceptional event that you 1) experience total radio failure when flying IFR to a "radar only" airfield or one without a TACAN, VOR, or ILS approach, or 2) you must execute a missed approach with radio failure at your destination and proceed at minimum en route altitude to an alternate that does not have a published TACAN, VOR, or ILS approach.

The current edition of OPNAVINST 3710.7 does not include these requirements, but good headwork and safety considerations would indicate these "rules" should be adhered to.

* Regardless of weather conditions, if you are filing to a destination without aircraft compatible NAVAIDs, a suitable alternate must have a published approach that you can fly without the use of two-way radio communications.

* If the alternate does not have a published approach compatible with your aircraft equipment, the forecast weather must allow for descent and landing in visual meteorological conditions (VMC) from the lowest minimum en route altitude.

PROGRESS CHECK

Question 5 — 2.1.8.2
Do OPNAVINST 3710.7 filing minimums apply after a missed approach at your destination?

ANSWER:

DETERMINING FUEL REQUIREMENTS FOR ROUTE OF FLIGHT 2.1.8.1

To determine the fuel requirements for each stage of flight, apply OPNAVINST 3710.7 minimum fuel criteria. These criteria ensure that you will have sufficient usable fuel (and a margin for safety) to execute your flight plan. The following excerpt from OPNAVINST 3710.7, paragraph 4.6.4, fully states the minimum fuel requirements for naval aircraft.

MINIMUM FUEL REQUIREMENTS

FUEL PLANNING. All aircraft shall carry sufficient usable fuel, considering all meteorological factors and mission requirements, to ensure:

(1) If alternate is not required, fly from takeoff to destination airfield IAF plus an approach plus a reserve of ten percent of planned fuel requirements.

(2) If alternate is required, fly from takeoff to the approach fix serving destination and thence to an alternate airfield plus a reserve of ten percent planned fuel requirements.

(3) In no case shall the planned fuel reserve after final landing at destination or alternate airfield, if one is required, be less than that needed for 20 minutes flight, computed for turbine powered, fixed wing aircraft based on maximum endurance operation at 10,000 ft.

(4) Minimum fuel reserve requirements are contained in the appropriate NATOPS manual.

T-45 NATOPS Performance Data, Section XI

The NATOPS performance data section provides charts to compute your fuel data. For convenience, this information is consolidated in the Trawing One In-Flight Guide.

NAVIGATION COMPUTER

Introduction 2.1.10

The circular navigation computer has been designed to aid pilots in the solution of problems involving flight, and primarily to compute time enroute and fuel required for a flight. The Navy uses various makes and models, primarily the CR-2, 3 or 4 or the APN-91, but whether it be Jeppesen, Telex, Allegheny, or one of several other makes, they are all either identical or similar in design. You have already been exposed to this type of computer during the Schools Command and Primary phases of training.

Calculator Side

You should be fairly familiar with the calculator side, basically it's a circular slide rule that can be used for time/distance/fuel computations (see your primary CR-2 workbook for review) but there is one more item that it can be used for that has not been introduced up to now.

WIND SIDE

The primary use of the Wind Side of the Air Navigation Computer is to calculate the forecast ground speed, which of course is utilized to determine time enroute and fuel required for each leg of the flight.

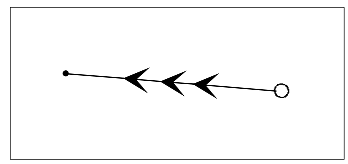
Another important use is a point-to-point calculation to determine a course and distance from destination Initial Approach Fix (IAF) to the alternate Initial Approach Fix.

To solve these problems on any model of the circular computer consists of a simple arrangement for setting up vector triangles.

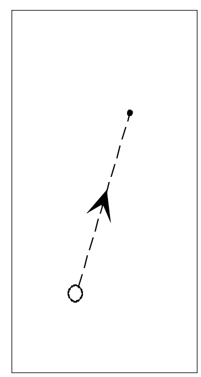
The Wind Triangle

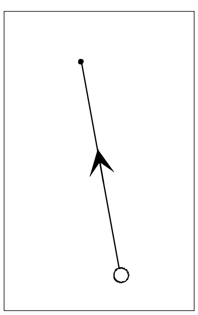
The wind triangle consists of:

The Wind Vector, made up of wind direction and velocity. Plotted on the wind side starting at the grommet in the direction of the wind, its length represents the velocity. On a plotting board it would be a solid line with three arrowheads.



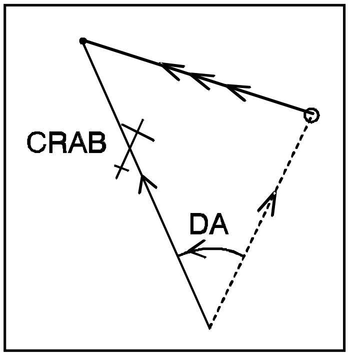
The "AIR" vector, comprised of the TRUE heading (TH) and the TRUE airspeed (TAS). The air vector always ends at the beginning of the wind vector (the grommet on the computer) and represents the path assuming no wind. On a plotting board it would be depicted as a dashed line, with a single arrowhead.





The "GROUND" vector is made up of COURSE (CUS) and GROUND SPEED (GS) and represents the path of the aircraft caused by the wind. Its origin is the same as the air vector, and ends at the head of the wind vector (or wind dot). On a plotting board it would be depicted as a solid line, with a single arrowhead.

You will note that the ground and air vectors have a common point of origin and the angle between the two, from TH/TAS to CUS/GS is the DRIFT ANGLE. The angle from CUS/GS to TH/TAS is CRAB ANGLE.

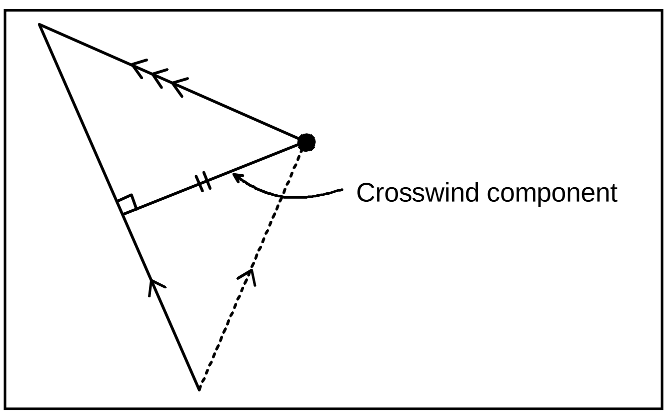


As a side note: a course (CUS) is predicted path over the ground. TRACK is your actual path over the ground.

Drift angle is important because it represents the angle at which the aircraft will drift away from the desired course if you don't put any correction into the wind.

The crab angle is the correction that must be used into the wind to maintain a desired course. Crab angle corrects for drift angle.

Due to the limited size of the navigation computer, only a portion of the wind triangle is plotted on the wind side as a graphic display. The rest is solved trigonometrically. Without going much into the higher mathematics of the computer, what we are setting up is top part of the wind triangle on the grid face.



By definition, the sine of an acute angle in the right triangle is equal to the side opposite the angle divided by the hypotenuse (side opposite the right angle). Therefore:

$$\text{SINE of the Drift Angle} = \frac{\text{Crosswind Component}}{\text{True Air Speed}}$$

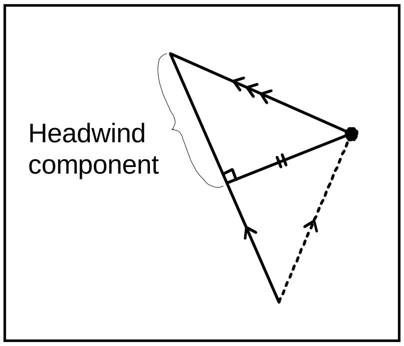
If we rearrange the equation:

$$\text{True Air Speed} = \frac{\text{Crosswind Component}}{\text{Sine of the Drift Angle}}$$

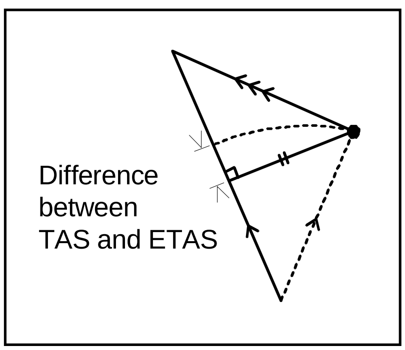
The computer puts the crosswind component on the outside scale of the wind side, and the sine, which you read as an angle, on the white middle scale which gives you the drift angle.

Effective True Airspeed

That portion of the wind triangle on the computer above or below the midline represents the headwind or tailwind component respectively that has to be added or subtracted to/from the TAS to solve for ground speed.



Now, as we are adding or subtracting this component from the TAS we in essence have to swing the length of the TAS line to the CUS/GS to subtract to get ground speed.



When the drift angle is less than 10 degrees, you get an error of less than 1/2 of 1% (.005) but with a drift angle greater than 10 degrees the error climbs to 1 1/2% or greater so we have to compensate for it in some way. We use the "Cosign" of the drift angle. The designers of the Air Navigation Computer have provided a handy "Cosign" scale just to the left of the TAS index. To find the "Effective True Airspeed" find the drift angle, to the left of the TAS index, on the black cosign scale and directly above read the "Effective True Airspeed". Use <u>this</u> ETAS with headwind or tailwind to get the effective ground speed for that particular leg. The drift angle correction needs only to be used <u>if the drift angle is 10 degrees or greater</u>.

Groundspeed

There are two types of winds associated with flying operations, TRUE and MAGNETIC. The surface winds you receive from Approach/Departure Control and Airport Traffic Control Towers are MAGNETIC winds, which coincide with the magnetic direction of runways. The en route winds you receive from the forecaster are TRUE winds, and are taken from the teletype Winds Aloft Forecast (FD).

You will be primarily working with the FLIP Enroute High Altitude Charts which depict radials (courses) in degrees magnetic. These are the radials you set in the course selector of the HSI. You will fly a magnetic heading on your HSI to make good the course, or track-over-the-ground, you have selected. Therefore, in flight planning, if you are faced with TRUE WINDS and MAGNETIC COURSES, it is obvious something has to be done to make them compatible.

The circular computer solves this by providing a magnetic-true conversion scale on either side of the True Course (TC) index. From the FLIP Enroute Charts, you obtain your desired Magnetic Course and also the Magnetic Variation in the area. By setting the Magnetic Course on the "Degree Scale" over the Variation (East or West), the wind dot is automatically aligned to use the True Winds Aloft which you received from the forecaster. You use this method for each leg to compute groundspeeds for each leg of flight.

NOTE: Lines of Magnetic Variation are depicted at 4 degree intervals. You should interpolate between lines to obtain the approximate variation in your area of flight or an alternate method would be to look at a field diagram in the area of flight.

Examples:

1. **Computing ground speed with crab angle less than 10 degrees** - You obtain the following information to complete one leg of flight on the Jet Flight Log:

GIVEN:
WIND: 240°/50KTS
TAS: 340KTAS
MAG CUS: 110°
VAR: 16°E

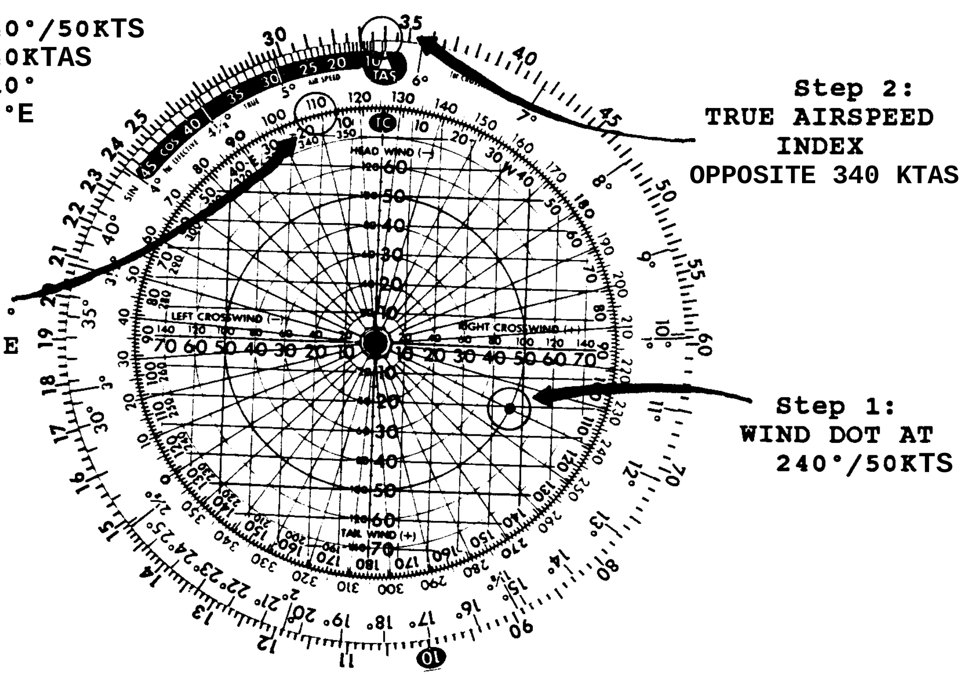


Figure 4 (Part 1): COMPUTING GROUND SPEED WITH CRAB ANGLE LESS THAN 10 DEGREES

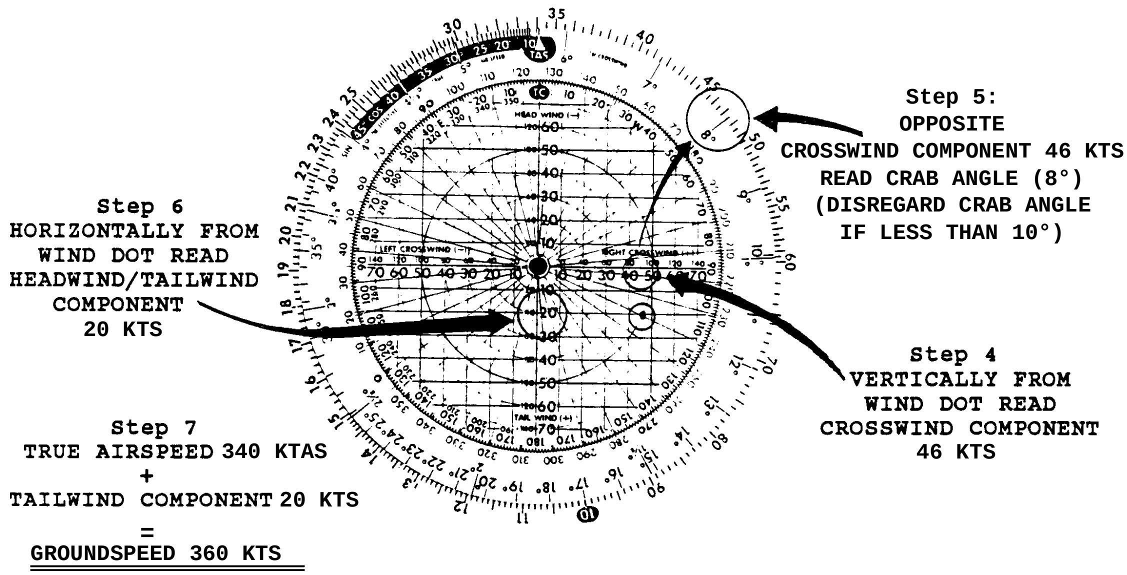
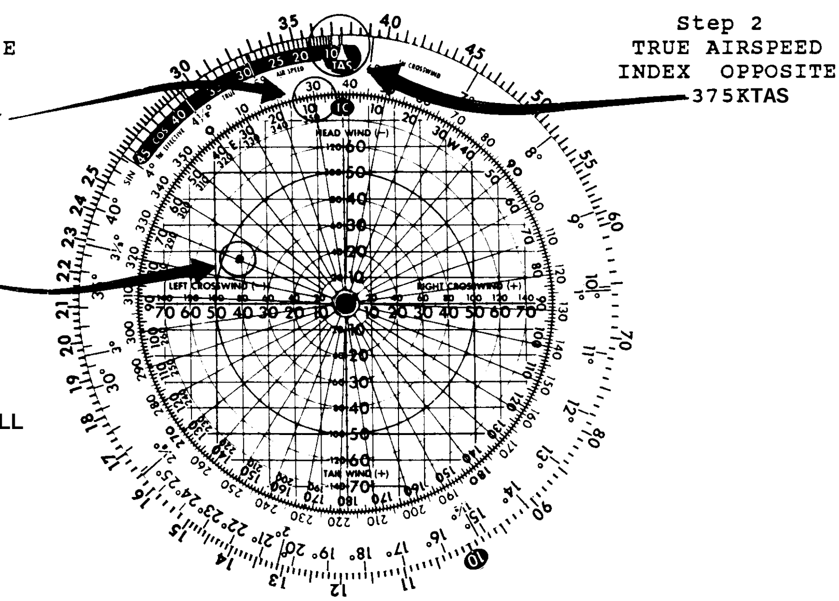


Figure 4 (Part 2): COMPUTING GROUND SPEED WITH CRAB ANGLE LESS THAN 10 DEGREES

2. **Computing groundspeed with crab angle 10 degrees or greater** - You obtain the following information to complete one leg of flight on the Jet Flight Log:

GIVEN:
WIND 330°/90KTS
TRUE AIRSPEED 375KTAS
MAGNETIC COURSE 030°
VARIATION 8°E



NOTE: USE THE SMALL NUMBER SCALE ABOVE THE LARGE NUMBER SCALE

Figure 5 (Part 1): COMPUTING GROUND SPEED WITH CRAB ANGLE 10 DEGREES OR GREATER

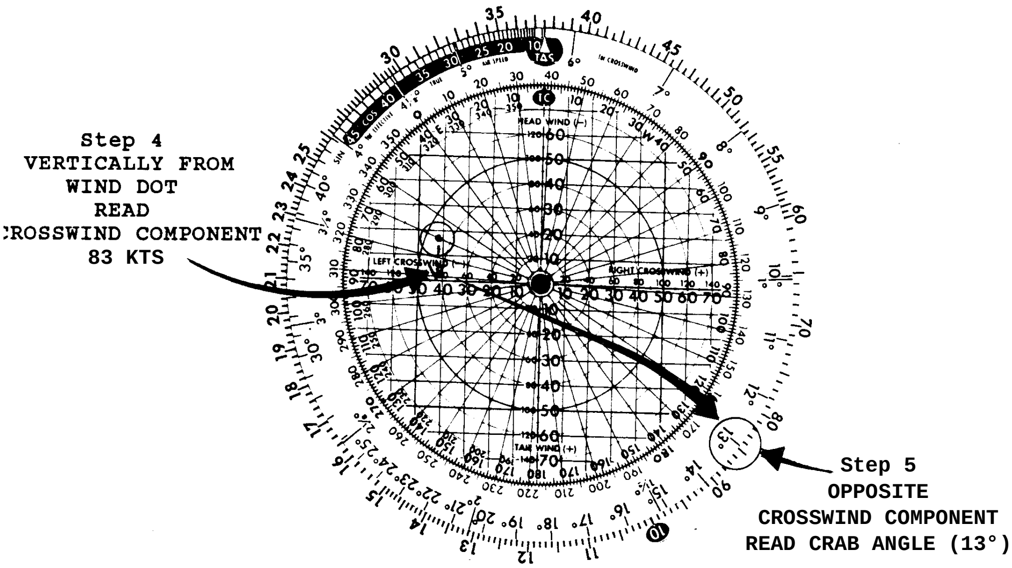


Figure 5 (Part 2): COMPUTING GROUND SPEED WITH CRAB ANGLE 10 DEGREES OR GREATER

As previously stated, for wind problems where the crab angle is less than 10 degrees, the headwind or tailwind component is simply applied to the true airspeed to obtain groundspeed. With small crab angles, this is very close to being accurate, any inaccuracy being too small to be concerned about. With crab angles of 10 degrees or more, however, the error is large enough to require the use of the **EFFECTIVE TRUE AIRSPEED (ETAS)** (Cosign Scale) for obtaining more precise groundspeeds.

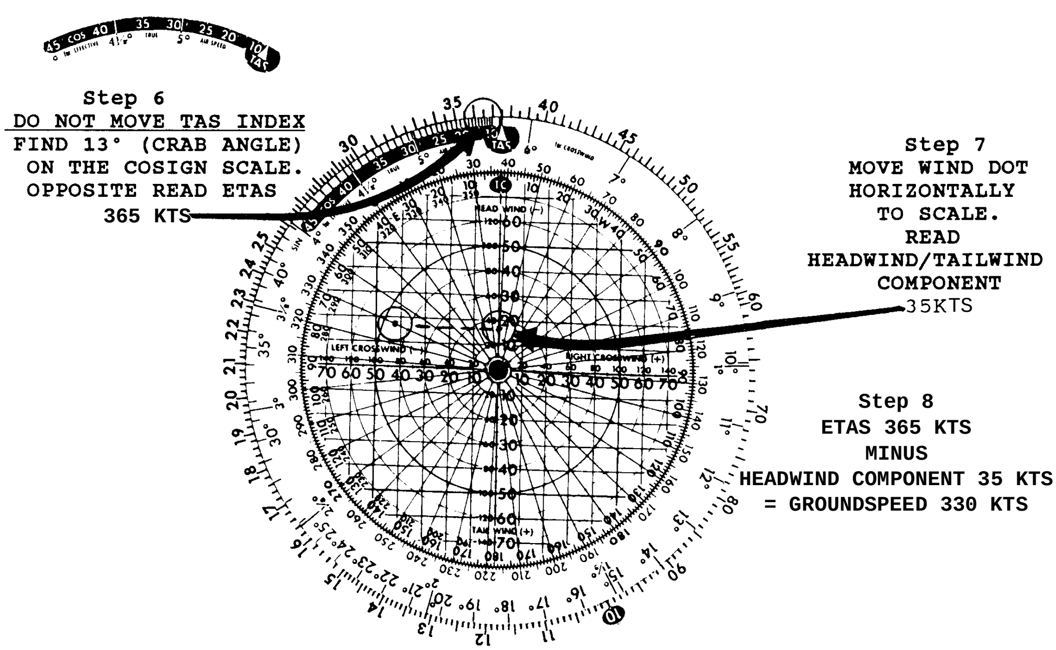


Figure 5 (Part 3): COMPUTING GROUND SPEED WITH CRAB ANGLE 10 DEGREES OR GREATER

3. Point-to-Point

The navigation computer wind side can be used for TACAN point-to-point problems. In essence we are going to use it as a plotting board.

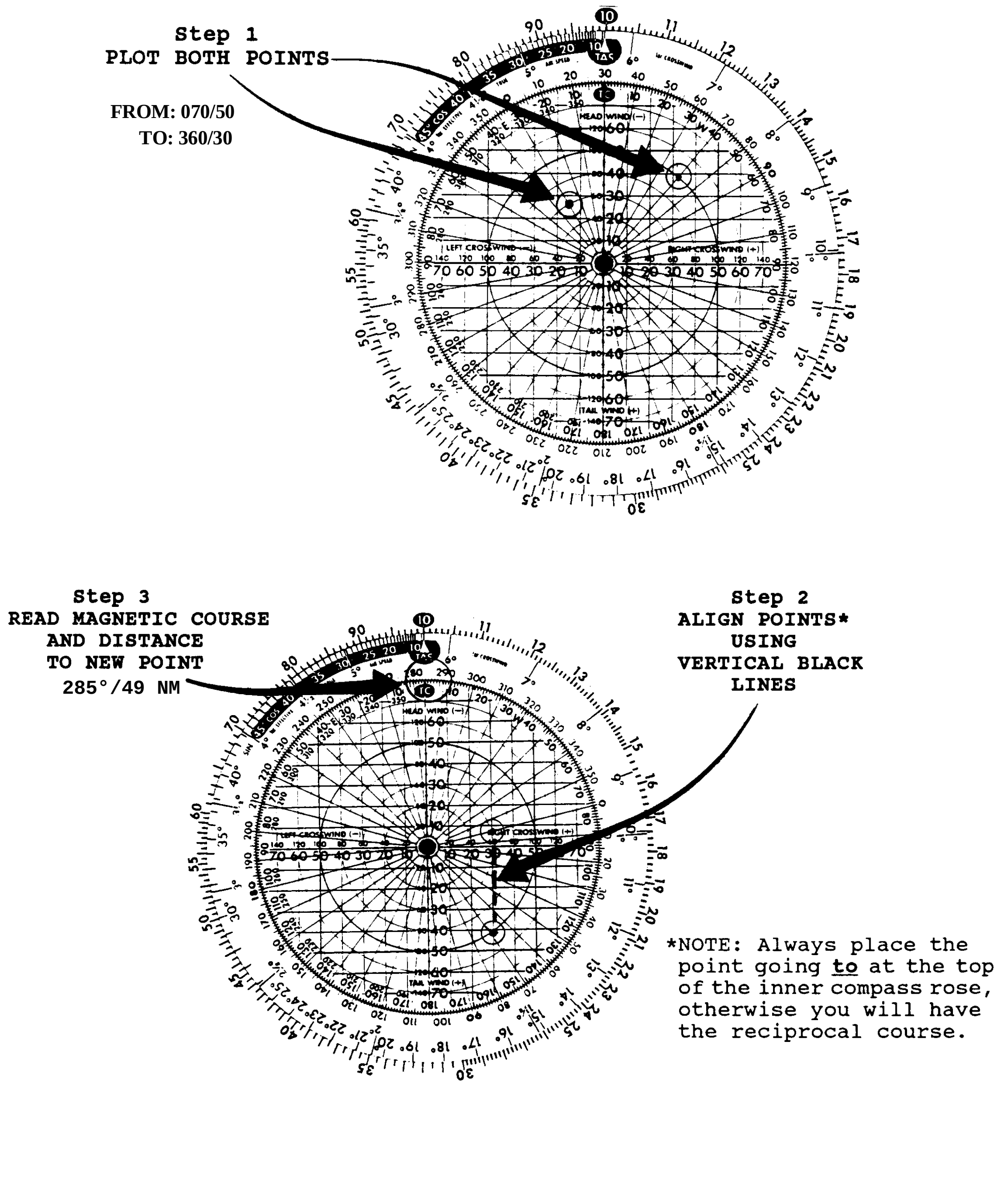


Figure 6: POINT-TO-POINT

One may use a pencil laid on the HSI to approximate the computer's output. The computer can be used to determine the course and distance from the IAF at your destination to the IAF at the alternate as follows.

Point-To-Point (IAF to IAF)
On the front side, lower portion of the Jet Flight Log are spaces for cruising from destination Initial Approach Fix (IAF) to the alternate Initial Approach Fix. The "Wind Side" of the Navigation Computer can be used to determine magnetic course and distance for this leg of the flight using a common feeder facility for the two IAF navigation facilities.

Step 1

Using forecast winds, determine appropriate Approach Procedure Charts for the probable runways in use at destination and alternate, based on forecast surface winds.

EXAMPLE:

Destination: New Orleans NAS
Alternate: Pensacola NAS

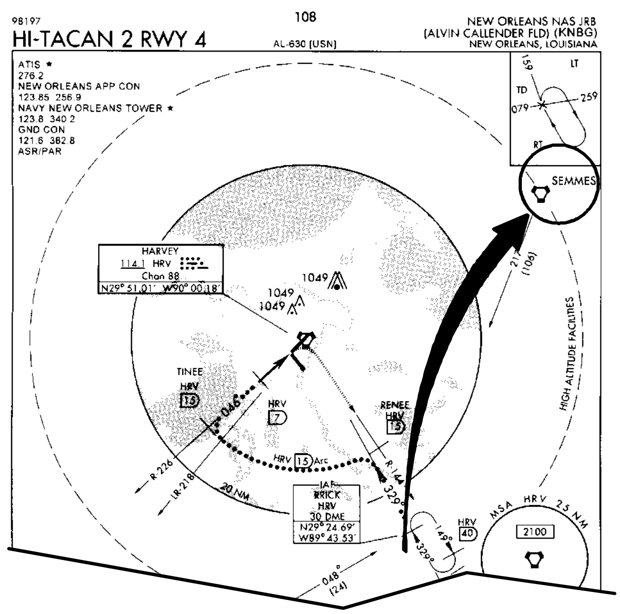


Figure 7: NAS NEW ORLEANS APPROACH

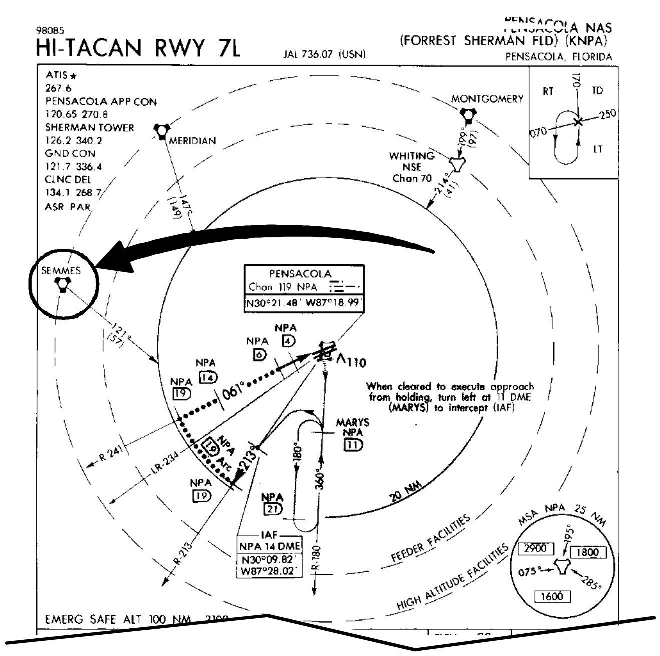


Figure 8: NAS PENSACOLA APPROACH

Step 2

Locate a NAVAID common to both Approach Procedure Charts which have "Feeder Routes" to the two IAFs.

EXAMPLE:

Semmes VORTAC is depicted on both charts with "Feeder Routes" to the Pensacola and New Orleans IAFs.

NOTE: "Feeder Routes" bearing and range are to the IAF, NOT the holding fix or the NAVAID.

Step 3

With the center of the computer being the common NAVAID, Semmes VORTAC, plot the IAF for New Orleans NAS and the IAF for Pensacola NAS by using the bearing and range of the "Feeder Routes" on the Approach Procedure Charts.

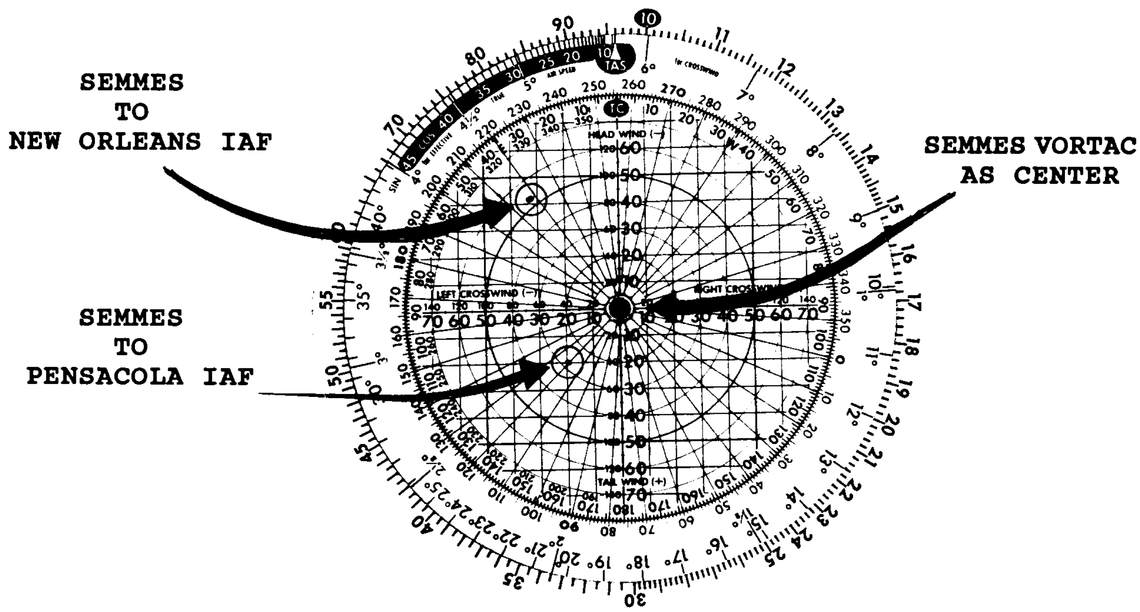


Figure 9 (Part 1): POINT-TO-POINT SOLUTION

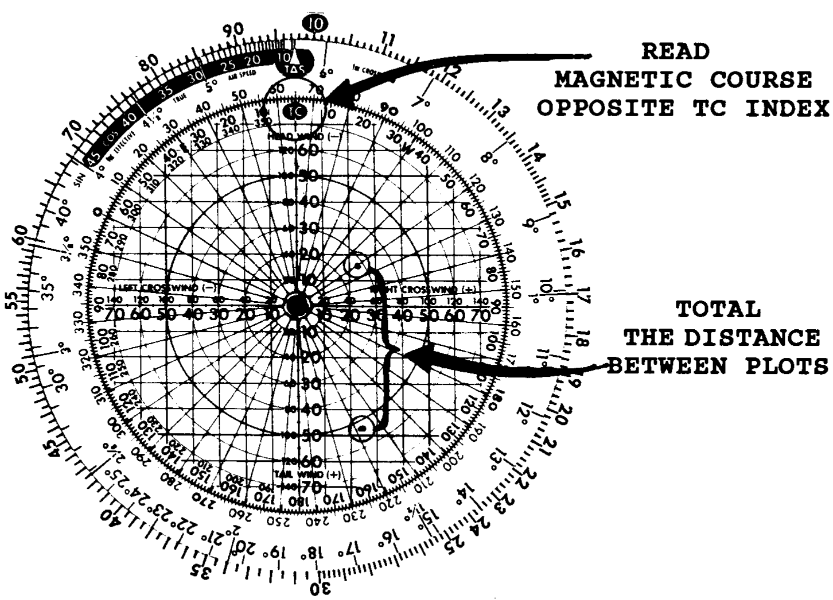
The "Feeder Routes" give two sides of the triangle from the center. Solution of the third side will be the Magnetic Course and distance from IAF to IAF.

Step 4

Align the two IAF plots parallel to one of the black vertical lines and read MAGNETIC COURSE and DISTANCE.

CAUTION: Alternate plot (Pensacola IAF) must be at the top to prevent reading reciprocal course.

Step 4
Align the two IAF plots parallel to one of the black vertical lines and read **MAGNETIC COURSE** AND **DISTANCE.**



CAUTION: Alternate plot (Pensacola) must be at the top to prevent reading reciprocal course.

Figure 9 (Part 2): POINT-TO-POINT SOLUTION

SUMMARY

Remember that you must consider three factors prior to beginning any flight:

* Weather minimums
* Alternate airfields
* Fuel requirements for route of flight

Navigation computer assists in preflight planning and airborne changes.

* Point-to-point

CONCLUSION

One of the most important facets of flight is planning. Planning flights accurately and completely will demonstrate your professionalism and help you complete every mission safely.

ANSWER KEY

Question 1
You need to check existing weather for the time of your clearance at your point of departure and for your __________.

ANSWER: route of flight

Question 2
Your forecast weather is for what period of time?

ANSWER: ETA +/- 1 hour

Question 3
What are your absolute minimums in a single-piloted aircraft?

ANSWER: 200-1/2

Question 4
For planning purposes, if your destination weather is at or above published minimums but below 3,000-3, forecast weather must be _________, for a non-precision approach at your alternate.

ANSWER: 300-1 above the published minimums.

Question 5
Do OPNAVINST 3710.7 filing minimums apply after missed approach at your destination?

ANSWER: No. Filing minimums are good for filing a DD-175. After you are in the air, your minimums are NLT 200-1/2 or the appropriate published minimums if higher.

NOTES

LECTURE GUIDE/LAB

COURSE/STAGE: T-45C TS Instrument Navigation

LESSON TITLE: Flight Planning (Departure)

LESSON IDENTIFIER: T-45C TS INav-09

LEARNING ENVIRONMENT: Classroom

ALLOTTED LESSON TIME: 0.8 hr

TRAINING AIDS:

* Single-engine jet log
* Figures
  Fig 1: Completed Single-Engine Jet Flight Log (Front)
  Fig 2: Completed Single-Engine Jet Flight Log (Back)

STUDY RESOURCES:

* T-45C NATOPS Flight Manual, A1-T45AC-NFM-000
* DoD FLIP General Planning (GP)
* DoD FLIP (En route) IFR-Supplement, United States
* DoD FLIP (Terminal) High Altitude United States, Southeast
* U.S. Enroute High Altitude Chart, H-5 (Southcentral)

(2-02) ORIGINAL

LESSON PREPARATION:

Read:

* INAV-08, Workbook
* Chapter 25 in the NATOPS Instrument Flight Manual, NAVAIR 00-80T-112
* Chapter 4-3, “Flight Plan VIP Codes,” DoD FLIP General Planning (GP)

REINFORCEMENT:

* Chapter 4, “Flight Planning,” DoD FLIP General Planning (GP)

EXAMINATION:

The objectives in this lesson will be tested in Instrument Navigation 12X.

LESSON OBJECTIVES

2.1.8.5
Recall instrument equipment required for IFR flight

2.1.8.3
Recall FLIPs required for flight planning

2.1.8.6
Recall information provided by NOTAM system

2.1.8.7
Recall items to be checked for destination airfield

2.1.8.8
Recall items to be checked during route/altitude selection

1.1.2.1
Plan route of flight

2.1.8
Prepare Single-Engine Jet Log

2.1.8.4.1
Recall procedures for planning and performing a BINGO profile

Sg 0, fr 4
Flight Planning

MOTIVATION

Every month we read articles in Approach and Naval Aviation News about fleet-experienced aviators who get into serious trouble or become accident statistics on “routine” flights.

Filling out a flight plan correctly serves as a checklist to ensure that you have the best information available on items such as weather, NAVAIDS, and fuel on board before you get airborne.

OVERVIEW

After this lesson, you will be better able to accurately plan a cross-country flight and complete a single-engine jet flight log.

This lesson consists of:

Information required for flight plan preparation

Planning a flight

Preparing a single-engine jet flight log

PRESENTATION

I. Information Required for Flight Plan Preparation

Sg 1, fr 1
Lesson Organization

A. Instruments required by OPNAVINST 3710.7 for instrument flight **2.1.8.5**

Sg 1, fr 2
Instruments Required for Instrument Flight

1. Mach/airspeed indicator
2. Altimeter
3. Turn and slip indicator
4. Clock with sweep second hand or digital readout
5. Attitude indicator
6. Magnetic compass with current calibration card
7. Heading indicator or gyro-stabilized magnetic compass
8. Vertical speed indicator

B. Additional equipment

Sg 1, fr 3
Additional Equipment

1. Two-way radio
2. IFF transponder with mode C
3. Navigation equipment for IFR navigation

II. Review Most Frequently Used FLIP Documents **2.1.8.3**

Sg 1, fr 4
Frequently Used FLIPs

III. Notices to Airmen (NOTAM) **2.1.8.6**

A. Time-critical aeronautical information that is temporary or so current it is not in published aeronautical charts

B. Military NOTAM system covers all NOTAMs for military bases

Sg 1, fr 5
Notices to Airmen and NOTAM

C. Covers FAA distant dissemination (D) and Flight Data Center (FDC) category NOTAMs for selected civilian airports

D. Classed by method of distribution

1. Class II—printed, mailed circulation

2. Military NOTAMs distributed via telecommunications

E. Flying from one military base to another—check military NOTAMs and Class II NOTAMs

F. Flying to civilian airport

1. Check with flight service station (FSS) for complete NOTAM information

2. Call field serving destination and obtain D, FDC, and local L NOTAMs

G. Flying from a civilian to military field

1. Call local FSS for departure NOTAMs

2. Call destination base operations for its NOTAMs

H. Flying between civilian fields

1. Call local FSS for departure NOTAMs

2. Call FSS serving destination airport for destination information and D, L, and FDC NOTAMs

Sg 1, fr 6
Items to Check for Destination Airfield

IV. Items to Check for Destination Airfield **2.1.8.7**

A. Status of runways, NAVAIDS, and emergency equipment (NOTAMs, FLIP Enroute IFR Supplement, and AP/1)

B. Hours of operation/landing restrictions (FLIP Enroute IFR Supplement, NOTAMs, and AP/1)

C. Length of runway (FLIP Enroute IFR Supplement and FLIP Terminal High Altitude Approach Procedures)

D. Types of approaches available and minimums (FLIP Terminal High Altitude Approach Procedures)

E. Runway lighting (FLIP Enroute IFR Supplement and FLIP Terminal High Altitude Approach Procedures)

F. Field elevation (FLIP Enroute IFR Supplement and FLIP Terminal High Altitude Approach Procedures)

G. Obstructions (FLIP Enroute IFR Supplement, FLIP Terminal High Altitude Approach Procedures and NOTAMs)

H. Communications/NAVAID frequencies (FLIP Enroute IFR Supplement and FLIP Terminal High Altitude Approach Procedures)

I. Arresting gear and/or jet barrier (FLIP Enroute IFR Supplement and FLIP Terminal High Altitude Approach Procedures)

J. Aircraft servicing and contract fuel (FLIP Enroute IFR Supplement)

K. Forecast weather at ETA +/- 1 hour (weather briefing)

L. Miscellaneous information concerning your destination (FLIP Enroute IFR Supplement, FLIP Area Planning AP/1 and NOTAMs)

V. Items to Check for Route/Altitude Selection **2.1.8.8**

Sg 1, fr 7
Items to Check for Route/Altitude Selection

A. Preferred IFR routes (Area Planning AP1/1A)

B. NOTAMs (flight planning area)

C. Availability of usable NAVAIDs (NOTAMs and FLIP Enroute High Altitude Chart)

D. En route weather (weather briefing)

E. Forecast winds (weather briefing) (request OPARS data as far in advance as possible)

F. Minimum en route altitudes (FLIP Enroute High Altitude Chart)

G. Special use airspace (FLIP Area Planning AP1/1A)

H. Cruise altitude rules (FLIP Enroute High Altitude Chart)

I. Fuel endurance (NATOPS)

J. Minimum safe and emergency safe altitudes (FLIP Terminal High Altitude Approach Procedures)

PROGRESS CHECK

Question 1—2.1.8.5
In addition to the basic instrument requirements, what three items are necessary for IFR navigation flight?

Answer: Two-way radio, IFF transponder with mode C, and navigation equipment

Question 2—2.1.8.3
Which FLIP publication provides a directory of airport facilities for military aircraft?

Answer: FLIP Enroute IFR Supplement

Question 3—2.1.8.6
If you are planning to fly from one military base to another, which NOTAMs are you required to check?

Answer: Military NOTAMs and Class II NOTAMs

Question 4—2.1.8.7
Where would you obtain information on the availability of aircraft servicing at your destination airfield?

Answer: FLIP Enroute IFR Supplement and NOTAMs

PROGRESS CHECK

Question 5—2.1.8.8
Where would you find information on special use airspace for your selected route/altitude?

Answer: FLIP Area Planning AP1/1A

VI. Planning a Flight **1.1.2.1**

Sg 1, fr 8
Lesson Organization

A. Suggested flight planning sequence

Sg 1, fr 9
Suggested Flight Planning Sequence— 1. Select Destination

1. Select your destination

   a. Generally OPNAVINST 3710.7, Section 4.4.1, restricts use of civil airfields

   b. Purchase of noncontract fuel from commercial sources is not authorized except in an emergency or when specifically authorized by the commanding officer

   c. Conduct a thorough examination of preferred routes (AP/1), and the NAVAIDS, winds, MEAs, terrain, special use airspace, en route weather, cruising altitude ruled, fuel endurance, and NOTAMs

2. Obtain initial weather briefing and request OPARS

Overlay 1
2. Obtain Weather Brief

   a. Takeoff, en route, and destination weather

   b. Record forecast surface winds for destination and alternate and data for computing takeoff performance (pressure altitude, winds, and temperature)

   c. Request OPARS flight data

3. Determine most favorable altitude/flight level for the route that offers acceptable weather and most favorable winds

Overlay 2
3. Most Favorable Altitude/Flight Level

Overlay 3
4. Consult FLIPs and NOTAMs

4. Consult FLIPs and NOTAMs

   a. Special notices in FLIP Flight Information Handbook

   b. FLIP General Planning (GP)

   c. FLIP IFR Enroute Supplement

   d. FLIP Area Planning AP/1

   e. Check NOTAM board in base operations

Overlay 4
5. Select Alternate

Overlay 5
6. Determine SID Availability

Overlay 6
7. Study Charts

Overlay 7
8. Complete Single-Engine Jet Flight Log

Overlay 8
9. Complete DD Form 175

Overlay 9
10. Obtain Weather Brief

Overlay 10
11. File Flight Plan

5. Select suitable alternate

6. Determine if a SID is available

7. Study Terminal Approach Charts

8. Complete single-engine jet flight log

9. Complete military flight plan (DD Form 175)

10. Obtain final weather briefing (DD Form 175-1)

11. File a military flight plan (DD Form 175)

VII. Single-Engine Jet Flight Log—Written Plan of Action Used to Monitor Flight Progress **2.1.8**

Sg 1, fr 10
Lesson Organization

Sg 1, fr 11
Single-Engine Jet Flight Log (Front)

Sg 1, fr 12
Departure Elevation

Sg 1, fr 13
Departure Frequencies

A. Departure Elevation (DEP ELEV)

   1. Found in FLIP Enroute IFR Supplement or FLIP Terminal High Altitude Approach Procedures

   2. Note difference between field elevation and the takeoff runway elevation

B. Departure frequencies (CLNC DELIV, GND CONT, TOWER)

   1. Clearance delivery, ground control, and tower

   2. Found in FLIP Enroute IFR Supplement

3. Include Automatic Terminal Information (ATIS) and METRO frequencies if available.

4. Note any difference in call sign

C. Altimeter Correction (ALT CORR)

Sg 1, fr 14
Altimeter Correction

1. Not normally used in training command or flight in Class A airspace

2. An altimeter error exceeding 75 feet is unacceptable for IFR flight

3. Spot elevation may be different than airfield elevation

D. Time Off (TIME OFF)

Sg 1, fr 15
Time Off

1. Enter time (GMT) at takeoff

2. Used for approach time (ETA) at destination with a communications failure en route

E. True Airspeed (TAS)—planned en route true airspeed after level off

Sg 1, fr 16
True Airspeed

F. Fuel use, pounds per hour (LBS PH/PMIN)—fuel flow at cruise/flight level from NATOPS performance charts based on TAS in pounds per hour only

Sg 1, fr 17
Fuel Use Pounds Per Hour

G. Clearance (CLEARANCE)

Sg 1, fr 18
Clearance and Departure

1. Enter expected clearance or

2. Leave blank and enter clearance as it is delivered

H. Departure (DEPARTURE)

1. Record local instructions for departing field: headings, altitudes, routes, and frequencies from SID or departure instructions if no SID available

2. IFF transponder code assigned

Sg 1, fr 19
Destination Elevation

I. Destination elevation (DEST ELEV)—record destination elevation from FLIP Enroute IFR Supplement or FLIP Terminal High Altitude Approach Procedures

Sg 1, fr 20
Destination Frequencies

J. Destination frequencies (APC CONT, TOWER, GND CONT)

1. Approach control, tower, ground control frequencies from FLIP Enroute IFR Supplement or FLIP Terminal High Altitude Approach Procedures

2. Include Automatic Terminal Information (ATIS) and METRO frequencies if available

Sg 1, fr 21
Navigation and Fuel Total Information

K. Navigation and fuel information

Sg 1, fr 22
Route To

1. Route (ROUTE TO)

   a. Enter jet route identifier or symbol/abbreviation indicating direct flight

   b. Include each point along intended route

   c. Include level off as fix because ground speed/ fuel flow will change

Sg 1, fr 23
NAVAID Identification and Channel

2. Identification/Channel (IDENT/CHAN)

   a. Enter NAVAID identifier and channel/frequency

   b. Found in FLIP Enroute High Altitude Chart

Sg 1, fr 24
Course

3. Course (CUS)

   a. Magnetic heading to first fix for a SID

   b. Magnetic course to fix

   c. Can split box and enter outbound and inbound magnetic course

   d. Use method that suits you

4. Distance (DIST)—enter miles to a fix

Sg 1, fr 25
Distance

5. Estimated time en route (ETE)

Sg 1, fr 26
ETE, ETA, and ATA

    a. Training squadrons do not use climb winds, refer to T-45C Fuel Planning Data

    b. Computed from ground speed and entered time in nearest whole minute

    c. Ground speed is computed utilizing expected TAS, forecast winds

6. Estimated Time of Arrival (ETA)/Actual Time of Arrival (ATA)—enter your estimated time of arrival and log your actual time of arrival as the flight progresses

7. Leg fuel (LEG FUEL)

Sg 1, fr 27
Fuel Information

    a. Enter estimated fuel required to fly each leg using fuel flow and estimated time en route

    b. Round UP to next higher ten pounds

8. Estimated fuel remaining (EFR)/actual fuel remaining (AFR)—enter estimated fuel remaining during planning and actual fuel remaining during flight

PROGRESS CHECK

Question 6—2.1.8
Your fuel flow at a cruise altitude of FL270 is 1125 and your estimated ground speed is 350 kts. Your FLIP Enroute High Altitude Chart indicates 76 miles from one fix to the next. This leg of your flight will take you __________ minutes and you will use _________ lbs of fuel.

Answer: 13 minutes and 250 lbs of fuel (244 lbs rounded up to next higher ten pounds)

Sg 1, fr 28
Notes

9. Notes (NOTES)—use this section to include any additional information such as:

    a. Assigned frequencies

    b. Anticipated pertinent frequencies

    c. Divert information

    d. VOR and/or ILS frequencies

    e. Forecast altimeter (FRCST ALT)

Sg 1, fr 29
Navigation and Fuel Total Information

10. Total distance, ETE, and leg fuel columns

Sg 1, fr 30
Alternate Information

11. Alternate information—enter full name and three-letter identifier

    a. Route—normally direct from destination IAF to alternate IAF

    b. Altitude—cruise altitude/flight level from destination IAF to alternate IAF

    c. Time—time en route from destination IAF to alternate IAF

    d. Fuel—fuel available in hours and minutes, computed from EFR at destination IAF

    e. Alternate elevation—elevation of alternate airport

Sg 1, fr 31
Fig 1: *Completed Single-Engine Jet Flight Log (Front)*

    f. Alternate frequencies—appropriate frequencies for alternate

    g. Navigation and fuel information from destination IAF to alternate IAF

Sg 1, fr 32
Fuel Plan

12. Fuel plan—back or jet log, used to compare total fuel requirements with usable fuel and to compute spare fuel

a. Climbout/route dest IAF

   (1) Compute total fuel required after takeoff for climb and route to destination IAF

   (2) Use fuel figures entered on front of jet log

b. Route alt IAF

   (1) Enter planned fuel required to cruise from destination IAF to alternate IAF

   (2) Use fuel computed in alternate information section on front of jet log

c. Approaches—enter fuel required to execute a high altitude penetration, approach, and landing (250 lbs for the T-45C)

d. Total—add climbout/route destination IAF, route alt IAF and approaches

e. Reserve—10% of fuel in total but not less than 300 lbs (20 min at 10,000 MSL maximum endurance)

f. Start/taxi—total fuel for start, taxi, and takeoff (200 lbs for T-45C)

g. Total required—add total, reserve, and start/taxi fuel

h. Total aboard—enter prestart fuel (2938 for T-45C)

i. Spare fuel—enter total fuel on board after landing that exceeds the <u>total</u> OPNAV flight planning requirements (total minus total required)

SINGLE-ENGINE JET FLIGHT LOG
CNATRA-GEN 3760/1 (REV. 7-78) S/N0197LLCF19482

DEP ELEV	CLNC DELIV	GND CONT	TOWER
30	268.7/134.1	336.4/121.7	340.2/126.2
ALT CORR	**TIME OFF**	**TAS**	**LBS PH/PMIN**
		350	1,121

CLEARANCE ATC C TALON45 TO NAS JACKSONVILLE ATIS: 267.6 METRO: 359.6

VIA BREEZ 3 CEW J2 TAY —D→ NIP 204035

DEPARTURE

DEST ELEV	APC CONT	TOWER	GND CONT
22’	284.6/119.85	355.8/120.0	336.4/128.6

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR 2938 / AFR	NOTES (ATIS: 281.0 METRO: 344.6)
DEPART NPA	NPA / 119	START-TAXI-T.O.				200	2738	T/O RWY 7
↗ BREZZ 3	NPA / 119	180	38	5		320	2418	TOC
—D→ BREZZ	NPA / 119		16	3		60	2358	WIND: 283/10 GS: 350
—D→ CRESTVIEW	CEW / 106	069	21	4		70	2288	CEW: 115.9 GS: 360
J-2 CEW 088052	CEW / 106	088	52	9		170	2118	GS: 360
J-2 SEMINOLE	SZW / 122	108	42	7		140	1978	SZW: 117.5 GS: 360
J-2 TAYLOR	TAY / 76	089/095	94	16		300	1678	TAY: 112.9 GS: 360
—D→ JACKSONVILLE 204035	NIP / 49	148	60	11		190	1488	GS: 355
			323	0 + 55		1450		
								FRCST ALT 29.98

ALTERNATE	ROUTE	ALTITUDE	TIME	FUEL
NRB NAVY MAYPORT	—D→	250	0 + 05	1 + 12
ALT ELEV	**APC CONT**	**TOWER**	**GND CONT**	
17’	308.4/124.4	265.8/118.75	233.7/126.5	

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR / AFR	NOTES
MAYPORT IAF 078011	NRB / 51	050	62	11		200	1288	ATIS: 268.6 METRO: 301.3
								GS: 350

(Over)

Figure 1: COMPLETED SINGLE-ENGINE JET FLIGHT LOG (FRONT)

PROGRESS CHECK

Question 7—2.1.8
In Figure 1, what would you enter on the CLIMB/ROUTE/ DEST IAF line in the single engine jet log FUEL PLAN, using the information found in the navigation and fuel information section of the jet log.

Answer: 1,250 lbs.

13. Emergency "BINGO" to alternate—this section is used to compute total fuel required to the alternate IAF using three different scenarios **2.1.8.4.1**

Sg 1, fr 33
Emergency "BINGO" to Alternate

    a. Last cruising ALT—fuel required to proceed from destination IAF to alternate IAF, at cruise altitude, and execute a penetration, approach, and landing

    b. Initial APP ALT—fuel required to proceed from destination IAF to alternate IAF, at destination IAF altitude, and execute a penetration, approach, and landing

    c. Missed approach to alternate IAF

        (1) Fuel from missed approach at destination bingo to alternate IAF and approach and landing

        (2) Use no wind and BINGO fuel drag count 50

        (3) BINGO includes reserve but not approach fuel

14. Checklist, destination, alternate, and emergency field information

Sg 1, fr 34
Checklist and Destination, Alternate, Emergency Field Information

    a. Preflight reminders to check that destination and alternate airfields have adequate facilities and servicing for your aircraft

Sg 1, fr 35
Fig 2: *Completed Single-Engine Jet Flight Log (Back)*

b. Check that you have all necessary publications and documents for the flight

c. Runway length (RWY LENGTH)—enter runway length and width

d. Lighting—enter available runway lighting

e. FUEL/JASU/LOX—enter available fuel, jet starting units, and liquid oxygen servicing information (the T-45C doesn't need JASU or LOX)

f. ILS—enter runway and ILS minimums

g. LOC—enter runway and LOC minimums

h. ASR—enter runway and ASR minimums

i. PAR MINS—enter runway and PAR minimums

j. TAC MINS—enter runway and TACAN minimums

k. Arresting gear (ARR GEAR)—enter arresting gear availability

l. PUBS, NOTAMS, FUEL PACKET, FLASHLIGHT, WALLET, ETC.—check to make sure that you have these items and anything else appropriate in your navigation bag

m. Emergency fields (EMER FIELDS)

   (1) An emergency field is any suitable runway along your route to which you could divert in the event of an in-flight emergency

   (2) Enter name of emergency field

n. Identification (ID)—enter emergency field 3-letter identifier

o. Channel (CH)—enter the TACAN and VOR frequency of the emergency field

p. Page number (PAGE NO.)—enter the page number of the FLIP Terminal High Altitude Approach Procedures for your emergency field

FUEL PLAN

1. CLIMB/ROUTE DEST IAF	1250	6. START/TAXI	200
2. ROUTE ALT IAF (If required)	200	7. TOTAL REQUIRED (4, 5 & 6)	2200
3. APPROACHES	250	8. TOTAL ABOARD	2938
4. TOTAL (1, 2 & 3)	1700	9. SPARE FUEL (8–7)	738
5. RES 10% of 4 (Min 20 mins)	300		

EMERGENCY "BINGO" TO ALTERNATE

	REQUIRED		APPROACH		RES		TOTAL
FL250 LAST CRUSING ALT	200	+	250	+	300	=	750
FL200 INITIAL APP ALT GS: 250 WIND: 272/03 TAS: 250 FF: 946	240	+	250	+	300	=	790
MAP-IAF TIME: 0 + 07	440	+	250	+	—	=	690

CHECK LIST	DESTINATION	ALTERNATE
RWY LENGTH	27 8000 X 200	23 8000 X 200
LIGHTING	A1 HIRL REH 9/27	HIRL/REIL
FUEL/JASU/LOX	J5	J5
ILS	NONE	NONE
LOC	NONE	NONE
ASR	27 440 1	23 500 1 1/4
PAR MINS	27 213 1/2	23 200 1
TAC MINS	27 440 1	23 500 1 1/4
ARR GEAR	E28 Both Ends	E28 Both Ends
PUBS	✓	✓
NOTAMS	✓	✓
FUEL PACKET	✓	✓
FLASHLIGHT, WALLET, ETC.	✓	✓

EMER FIELDS
TALLAHASSEE REGIONAL
ID TLH
CH 122/117.5
PAGE NO. 195 & 196

CNATRA-GEN 3760/1 (REV. 7-78) S/N0197LLCF19482(BACK)

*U.S.GPO:1987-530-016/61134

Figure 2: COMPLETED SINGLE-ENGINE JET FLIGHT LOG (BACK)

SUMMARY

Sg 2, fr 1
Review Menu

Remember the three key elements of the flight planning process:

* Assembling the information required for the preparation of a flight plan
* Planning the flight
* Preparing the single-engine jet flight log

CONCLUSION

Having reviewed the materials and procedures involved in flight planning, you are now better prepared to plan and execute an instrument flight.

NOTES

LECTURE GUIDE/LAB

COURSE/STAGE: T-45C TS Instrument Navigation

LESSON TITLE: Flight Planning (En Route)

LESSON IDENTIFIER: T-45C TS INav-10

LEARNING ENVIRONMENT: Classroom

ALLOTTED LESSON TIME: 1.0 hr

TRAINING AIDS:

* Military Flight Plan, DD Form 175
* Figures
  Fig 1: Completed DD Form 175
  Fig 2: One Leg (Round Robin) Flight Plan
  Fig 3: Stop-over Flight Plan
  Fig 4: Terminal Delay Flight Plan
  Fig 5: Various Types of Flight Plan
  Fig 6: Formation Flight Plans

STUDY RESOURCES:

* T-45C NATOPS Flight Manual, A1-T45AC-NFM-000
* DoD FLIP General Planning (GP)
* DoD FLIP (Terminal) High Altitude United States, Southeast
* U.S. Enroute High Altitude Chart, H-5 (Southcentral)

(2-02) ORIGINAL

LESSON PREPARATION:

Read:

* Chapter 4-3, “Flight Plan VIP Codes,” DoD FLIP General Planning (GP)

REINFORCEMENT:

* Chapter 4, “Flight Planning,” DoD FLIP General Planning (GP)

EXAMINATION:

The objectives in this lesson will be tested in Instrument Navigation 12X.

LESSON OBJECTIVES

2.1.7
Complete DD-175 for route of flight

2.1.7.1
Recall procedures for completing DD-175

2.1.9
Select appropriate publications/items for navigation bag

Sg 0, fr 4
Flight Planning

MOTIVATION

Every month articles appear in Approach and Naval Aviation News about experienced fleet aviators who get into serious trouble or become accident statistics on “routine” flights. The proper filing of a DD-175 should never be approached as just placing the checks in the boxes. Filling out a flight plan correctly serves as a checklist to ensure that prior to takeoff you have the best information available on items such as weather, NAVAIDS, and fuel on board.

OVERVIEW

This lesson reviews how to complete the DD-175 and addresses the selection of items to be included in the navigation bag for cross-country flights.

This lesson consists of:

* Military Flight Plan, DD Form 175
* Navigation bag contents for cross-country flight

REFRESHER

Recall:

* INav-09, Flight Planning (Departure)
* Your previous experiences with flight planning

PRESENTATION

I. Military Flight Plan, DD Form 175 **2.1.7, 2.1.71**

Sg 1, fr 1
Lesson Organization

A. Used for two purposes

Sg 1, fr 2
Military Flight Plan, DD Form 175

1. Lets controlling agency know your intentions so that a clearance may be issued for your IFR flight

2. Provides search and rescue facilities necessary information in case of an emergency

3. Used for military flights within the contiguous United States, within the Honolulu, Alaskan, and San Juan Domestic Control Areas, and between the contiguous United States and Canada

B. Section I

Sg 1, fr 3
DD Form 175–Section 1

1. Date - enter date of the flight based on local time

2. Aircraft call sign

   a. Limited to seven characters

   b. Navy/Marine Corps Fleet and Training Command may use aircraft call sign (radio call) consisting of service code (VV for Navy and VM for Marine Corps), tail marking of assigned two letters or a digit and a letter, and the side number of not less than 2 or more than 3 digits, or assigned squadron JANAP call sign plus number identifier (TALONXX for VT-7)

3. Aircraft DESG and TD code

Sg 1, fr 4
TD Code Table

   a. First, enter “T45” for the aircraft military designator, then a slash (/); don’t use aircraft modification letters after the designation because they may be confused with the transponder code

b. Second, enter code that denotes the aircraft transponder and navigation capability; the T-45C is TD code I

c. DME indicates that the aircraft can receive VOR and the VOR DME at those VOR stations that are not VORTACs but do have DME

d. TD codes provided in DoD FLIP General Planning (GP), Chapter 4.

e. FAA assumes that all aircraft have VOR as their primary navigation means

PROGRESS CHECK

Question 1—2.1.7
What three completed documents are you required to have in your possession before commencing any IFR flight?

Answer: DD Form 175, Single-Engine Jet Flight Log, and Flight Weather Briefing (DD Form 175-1)

Question 2—2.1.7
What document provides the TD codes that you will need in order to fill in the block AIRCRAFT DESG and TD CODES?

Answer: DoD FLIP General Planning (GP), Chapter 4

C. Section II

Sg 1, fr 5
DD Form 175–Section II

1. Type of FLT plan

Sg 1, fr 6
DD Form 175–Type Flight Plan, True Airspeed, and Point of Departure

   a. Enter letter code from DoD FLIP General Planning (GP), Chapter 4

   b. Enter “I” for IFR or “V” for VFR

   c. Don’t combine IFR and VFR route segments on same line

2. True airspeed

   a. Enter true airspeed (TAS) at initial cruising altitude

   b. If you plan to change TAS on subsequent legs, you must notify ATC while airborne

3. Point of departure

   a. Enter three-letter identifier of the point of departure or the point (NAVAID or fix) where IFR begins

   b. Enter installation name if there is no location identifier

   c. Use only last three letters of a four-letter international identifier

4. Proposed departure time (Z)

Sg 1, fr 7
DD Form 175–Proposed Departure Time and Altitude

   a. Enter departure time in universal coordinated time (UTC) or Zulu

   b. For activation of an airborne segment (after an en route delay), enter the proposed time for beginning that segment in Zulu time

c. Should your actual departure time be delayed one hour or more beyond the filed departure time, you must advise Base Operations or the tie-in flight service station (FSS) serving the departure, stopover, or en route delay airport and provide an updated proposed departure time

Note: also update weather brief

d. If delay occurs when departing a nonmilitary base, you must ensure that the departure time is passed to the tie-in FSS by your request, through the tower or directly to the tie-in FSS

5. Altitude

a. Enter initial cruise altitude in hundreds of feet; do not enter letters “FL”

b. Subsequent en route altitude/flight level changes and location are entered in the REMARKS block

c. If you have not previously been cleared for it, you must request an altitude/flight level change while airborne from ATC and receive a clearance

d. If you are requesting an altitude block, enter the lower altitude/flight level of the requested block, the letter “B,” and then the higher altitude

Sg 1, fr 8
DD Form 175—
Route of Flight

6. Route of flight

a. Enter enough information to indicate the proposed ROUTE OF FLIGHT clearly

b. If no standard instrument departure (SID), enter planned NAVAID, TACAN/DME fix, or named intersection within the jet route structure

c. If SID used, enter coded identifier or name and transition fix (don't forget the "dot" between the SID name and the transition)

d. Clearly define the route of flight using NAVAID identifiers or radial/DME fixes (use six digits), jet route identifiers, or named intersections; no route identifiers between NAVAIDs/fixes indicates direct flight

e. To transition from one jet route to another at an unnamed intersection, enter the designations of the two routes separated by a space

f. For IFR flight plans, the last fix entered is the nearest appropriate IAF, NAVAID, first point of intended landing, or published fix, which most clearly establishes the route of flight to the destination or the point where the IFR portion of the flight will end

g. If a fix is collocated with a NAVAID, ILS (instrument landing system) marker, or other fix, the five-letter name/name-code applies

h. Also file fixes using fix radial and distance, which consists of NAVAID identifier, three characters for azimuth, and three characters for distance in nautical miles (nm), or by listing latitude and longitude

7. To block—three-letter FAA location identifier or last three letters of the international identifier of the final destination airport after last line entry in the ROUTE OF FLIGHT block (if there is no location identifier, enter the airport name)

Sg 1, fr 9
DD Form 175—TO and ETE

8. Estimated time en route (ETE)—enter estimated time en route using the standard hours + minutes format

    a. IFR flights - enter time from takeoff or departure for a delay fix to the last fix shown in the ROUTE OF FLIGHT exclusive of planned en route delays

    b. VFR flights - enter time from takeoff to landing, including planned en route delays

PROGRESS CHECK

Question 3—2.1.7, 2.1.7.1
To complete the ALTITUDE block, you enter your altitude/ flight level in _______ of feet.

Answer: hundreds

Sg 1, fr 10
DD Form 175—Section III

D. Section III

1. Remarks—enter information essential to safe and efficient control of air traffic entries that includes:

    a. R(ident)—if you plan on remaining overnight

    b. S(ident)—for servicing on arrival (particularly useful on stopover flight plans)

    c. ADF only—if so equipped

    d. VFR/OT ABOVE FL600—if you can get that high

    e. Hazardous cargo or inert devices—if applicable

f. Prior Permission Required (PPR) number—enter (ident) and PPR number

g. Anything else, use plain language

h. Void time usually entered in lower right corner

2. Rank and honor code—use VIP codes in DoD FLIP General Planning (GP), Chapter 4, to indicate branch of service, highest rank/grade aboard, and honors desired

a. V5H—Rear Admiral, accord honors

b. R50—Army Major General, request nothing

E. Section IV

Sg 1, fr 11
DD Form 175–Section IV

1. Fuel on Board (FUEL ON BD)

a. Enter total time, using standard hours + minutes format, that your aircraft can stay aloft while flying the planned profile with fuel available at initial takeoff

b. There are no specific methods to determine fuel-on-board time, and it will vary according to squadron procedures, type aircraft, and planned flight altitude

c. For ground school purposes only, use cruise altitude fuel flow to determine the fuel-on-board time

d. Additional time groups are entered in brackets to show the amount of additional flight time possible when in-flight refueling is planned

2. Alternate airfield (ALTN AIRFIELD)

a. Select alternate based on OPNAVINST 3710.7 criteria

b. Enter three-letter identifier or airport name if there is no location identifier

3. Estimated time en route to alternate (ETE TO ALT) -- enter planned time to fly from destination to planned alternate at your planned altitude/flight level

4. NOTAMS

   a. Preflight reminder to consult all NOTAMs

   b. Check block indicates that all relevant NOTAMS for your flight, including appropriate "Supplementary Airdrome Remarks" from AP/1, were checked

5. Weather

   a. Preflight reminder to obtain an adequate briefing on all weather conditions pertinent to your flight

   b. Enter checkmark or briefer's initials if you receive a brief by radio or telephone or the weather briefing number

   c. Normal procedure at many bases has the forecaster entering the "Flimsy Number" from the DD-175-1 and their initials

6. Weight and Balance (WT AND BALANCE)

   a. This block does not pertain to tactical jet aircraft (only to aircraft transporting passengers and/or cargo)

   b. Enter N/R

7. Aircraft serial number, unit, and home station -- enter aircraft bureau number followed by a slash(/), the aircraft unit of assignment followed by a slash, and the aircraft home three-letter location identifier

8. Signature of approval authority—OPNAVINST 3710.7 authorizes the pilot-in-command of a naval aircraft or formation leader to approve the proposed flight plan

9. Actual departure time and base operations use—don’t write in this space

PROGRESS CHECK

Question 4—2.1.7, 2.1.7.1
What format do you use to enter the total time for the FUEL ON BD block?

Answer: Standard hours + minutes

F. Section V

Sg 1, fr 12
DD Form 175—Section V

1. Duty

   a. Enter duty performed by each crew member, as defined by appropriate service directives

   b. For formation flight, identify the crew duty symbol and position of the aircraft in the formation

Fig 1:
Completed DD Form 175

2. Name and initials

   a. The name of the pilot-in-command must appear in the first block of the crew list

   b. Names of all crew members may be listed separately and attached to the flight plan

3. Rank—enter the appropriate military rank or suitable civilian classification

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397.
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight.
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan.
DISCLOSURE: Voluntary; however, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TD CODE
20 NOV 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	350	NPA	1355	250	BREZZ 3 CEW J2 TAY		
						NIP 204035	NIP	0 + 55

REMARKS

2R(NIP) NIP PPR 20-04

RANK AND HONOR CODE

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2 + 15	NRB	0 + 11	✓	103-3	N/R	ON FILE/CTW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
U R Yourself	ATTACHED / SEE PSGR MANIFEST		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	SPIFFY, I.M.	MAJ	ON FILE	CTW-1/NMM
CP	JONES, W. A.	ENS	ON FILE	VT7/NMM

DD Form 175, MAY 86 0102-LF-001-7500 *Previous editions are obsolete.* **MILITARY FLIGHT PLAN**

Figure 1: COMPLETED DD FORM 175

4. Social security number (SSN)—enter "on file" for each crew member

5. Organization and location

   a. Enter each individual crew member and location of his/her organization by three-letter location identifier

   b. Enter installation name if there is no location identifier

   c. If the crew member's branch of service differs from that of the aircraft, identify the branch of service in parentheses

   d. In multiplane (formation) flights, add the aircraft bureau number in parentheses for the pilot-in-command of the other aircraft

II. Other types of flight plans

A. One leg (round robin) flight plan

B. Stop-over flight plan

C. Terminal delay flight plan

1. On a terminal flight plan, you are not landing

2. ARTCC will turn you over to Approach Control to make your delay request for practice approaches or holding

D. En route delay flight plan—you will remain on with Air Route Traffic Control Center (ARTCC) frequency to make your delay request, such as practice holding

E. VFR flight plan

F. Composite flight plan

G. Formation flight plan

Sg 1, fr 13
Fig 2: *DD Form 175—One Leg (Round Robin) Flight Plan*

Sg 1, fr 14
Fig 3: *DD Form 175—Stop-over Flight Plan*

Sg 1, fr 15
Fig 4: *DD Form 175—Terminal Delay Flight Plan*

Sg 1, fr 16
Fig 5: *Various Types of Flight Plan*

Sg 1, fr 17
Fig 6: *Formation Flight Plan*

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan
DISCLOSURE: Voluntary, however failure to provide the SSN could result in denial of flight plan processing

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TD CODE
10 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NQI	1400	390	PSX2•PSX J29 IAH J2 SAT		
						J21 LRD RVERA	NQI	1+30

REMARKS

RANK AND HONOR CODE

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT AND HOME STATION
2+40	NGP	0+10	✓	Y-129	N/R	ON FILE/CTW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
[illegible]	ATTACHED / SEE PSGR MANIFEST		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	READY R.U.	LTJG	ON FILE	VT7/NMM

DD Form 175, MAY 86 — Previous editions are obsolete — MILITARY FLIGHT PLAN

Figure 2: DD FORM 175—ONE LEG (ROUND ROBIN) FLIGHT PLAN

STOP-OVER FLIGHT PLAN

PRIVACY ACT STATEMENT	DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
AUTHORITY: 10 USC 8012 and EO 9397. PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight. ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan. DISCLOSURE: Voluntary; however, failure to provide the SSN could result in denial of flight plan processing.	10 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NZC	1230	350	TLH J2 SJI RRICK	NBG	1+15
	I	387	NBG	1430	350	LCH J22 CRP WAADE	NQI	1+25
						(2+45 NGP 0+10)		

REMARKS: REQ RADAR DEP NZC, NBG
NBG-S

RANK AND HONOR CODE

VOID 4+00

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2+45	NMM	0+20	✓	4-131	N/R	ON FILE/CTW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY | CREW PASSENGER LIST: ATTACHED / SEE PSGR MANIFEST | ACTUAL DEP TIME (Z) | BASE OPERATIONS USE

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	DOE, J.J.	ENS	ON FILE	VT7/NMM

Figure 3: DD FORM 175—STOP-OVER FLIGHT PLAN

TERMINAL DELAY FLIGHT PLAN

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397

PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight.

ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan.

DISCLOSURE: Voluntary; however, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
10 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NQI	1245	390	HOBOZ 1•SAT BRYGS		0+32
						Ⓡ D 0+25 BSM NQI		
	I	387	BSM	1340	390	LFK J29 EMG BARGS	BAD	0+33
	I	392	BAD	1500	410	LFK J29 CRP NQI 270026	NQI	1+05
						(2+45 NGP 0+10)		

REMARKS
REQ RADAR DEP BAD
BAD-S

RANK AND HONOR CODE
RSN SPEED BAD TO NQI VOID 4+00

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2+45	NBE	0+22	✓	4-163	N/R	ON FILE/CTW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
J. G. Smith	ATTACHED / SEE PSGR MANIFEST ✓		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	SMITH, J. G.	LT	ON FILE	VT7/NMM

Figure 4: DD FORM 175—TERMINAL DELAY FLIGHT PLAN

EN ROUTE DELAY FLIGHT PLAN

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397. PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight. ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan. DISCLOSURE: Voluntary. However, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
12 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NMM	1345	39Ø	MEI J4 STAGE/D Ø+1Ø J4 DFW BOBIN	NFW	1+14

VFR FLIGHT PLAN

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397. PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight. ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan. DISCLOSURE: Voluntary. However, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
12 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	V	315	NPA	13ØØ	175	CEW MCN VAN ILM	NKT	1+35

COMPOSITE FLIGHT PLAN

PRIVACY ACT STATEMENT

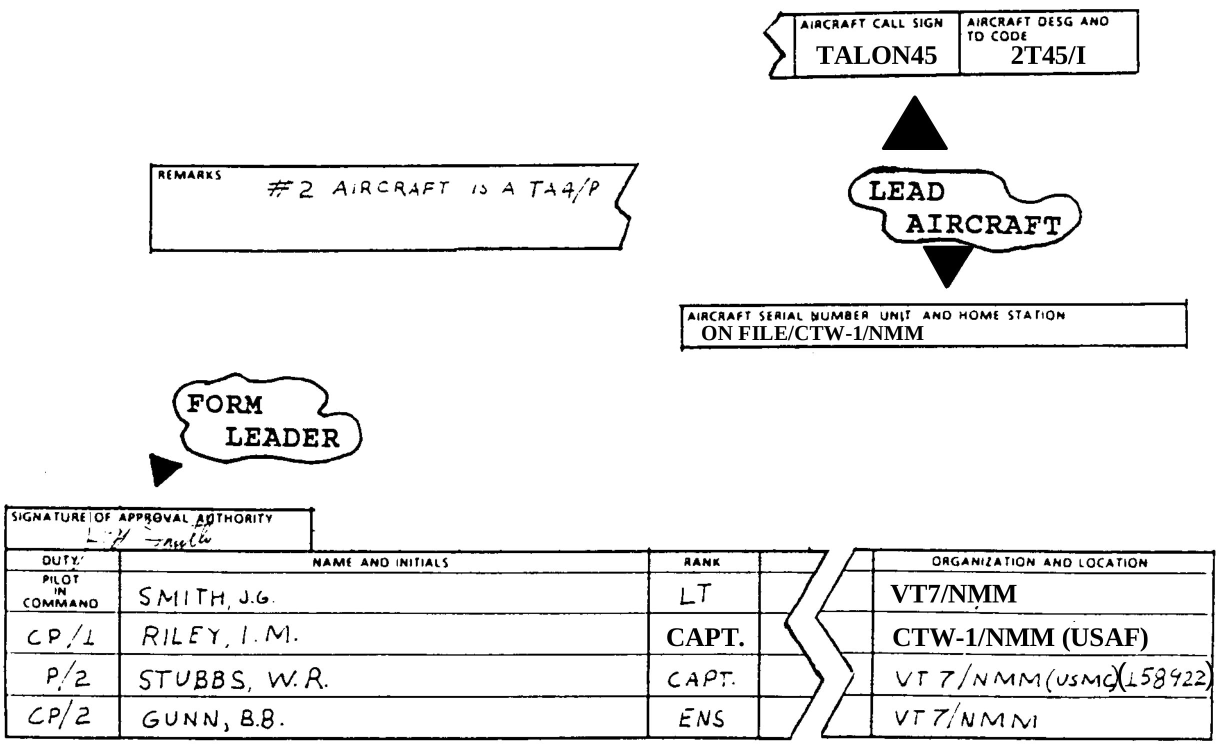
AUTHORITY: 10 USC 8012 and EO 9397. PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight. ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan. DISCLOSURE: Voluntary. However, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
12 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NQI	14ØØ	39Ø	HOBOZ 1•COT FST 122Ø43		Ø+45
	V					VR-196 (A-G)		Ø+28
	I	31Ø	SFLØ58Ø15	1514	18Ø	FANNY	ELP	Ø+1Ø

Figure 5: VARIOUS TYPES OF FLIGHT PLAN


AIRCRAFT CALL SIGN
TALON45
AIRCRAFT DESG AND TO CODE
2T45/I
LEAD AIRCRAFT
AIRCRAFT SERIAL NUMBER UNIT AND HOME STATION
ON FILE/CTW-1/NMM
REMARKS
#2 AIRCRAFT IS A TA4/P
FORM LEADER
SIGNATURE OF APPROVAL AUTHORITY

DUTY	NAME AND INITIALS	RANK	ORGANIZATION AND LOCATION
PILOT IN COMMAND	SMITH, J.G.	LT	VT7/NMM
CP/1	RILEY, I.M.	CAPT.	CTW-1/NMM (USAF)
P/2	STUBBS, W.R.	CAPT.	VT 7/NMM (USMC)(158922)
CP/2	GUNN, B.B.	ENS	VT 7/NMM

Figure 6: FORMATION FLIGHT PLAN

III. Filing IFR flight plans

A. File 30 minutes prior to planned departure

B. File with base operations having a communication link with ARTCC or by commercial telephone with a flight service station (FSS)

C. Flight plans can be filed in flight with an FSS, provided visual flight conditions can be maintained and you stay below Class A airspace until an IFR clearance is received

IV. Documents for IFR flight outside the local training area

A. Copy of flight weather briefing (DD Form 175-1)

B. Copy of the flight plan (DD Form 175)

C. Completed jet flight log with essential information to complete the assigned mission

V. Selecting Appropriate Publications/Items for Navigation Bag **(2.1.9)**—Contents of navigation bag for cross-country flights is based on your flight plan and should include

Sg 2, fr 1
Lesson Organization

Sg 2, fr 2
Appropriate Publications for Navigation Bag

A. U.S. Enroute High and Low Altitude Charts (if you plan on going into the high altitude structure, you should also carry the Low Altitude/Terminal Chart for your destination area)

B. DoD FLIP (Enroute) IFR Supplement, United States

C. DoD FLIP (Terminal) High (and Low) Altitude United States, if appropriate

D. DoD FLIP (Enroute) Flight Information Handbook

E. Fuel packet

F. Navigation computer (required by OPNAVINST 3710.7)

G. Navigation flight log forms

H. TRAWING in-flight guide

I. Flashlight for night flights

PROGRESS CHECK

Question 5—2.1.9
Select the items from the following list that you should include in your navigation bag:

a) Navigation computer
b) T-45C NATOPS Flight Manual
c) DoD FLIP (Enroute) High Altitude Chart(s)
d) Fuel Packet

Answer: a, c, d

SUMMARY

This lesson has focused on

* Preparing the military flight plan, DD Form 175

* Contents of the cross-country navigation bag

CONCLUSION

By completing the DD Form 175 fully, accurately, and neatly, you efficiently communicate your flight plans to the controlling agency, thus expediting your clearance. Further, you ensure that the search and rescue effort has enough information to track your flight. As for contents of your navigation bag, include resources necessary for any in-flight changes.

Sg 3, fr 1
Review Menu

NOTES

LESSON GUIDE/WORKBOOK LESSON (LAB)

COURSE/STAGE: T-45C TS & IUT Instrument Navigation

LESSON TITLE: Practical Problems

LESSON IDENTIFIER: T-45C TS & IUT INav-11

LEARNING ENVIRONMENT: Classroom/Homework

ALLOTTED CLASSROOM TIME: 1.0 hr

FIGURES:

STUDY RESOURCES:

* T-45C NATOPS Flight Manual, A1-T45AC-NFM-000
* TRAWING ONE IN-FLIGHT GUIDE
* FLIP General Planning (GP)

(2-02) ORIGINAL

LESSON PREPARATION:

Review:

* INav-09 & -10, “Flight Planning (Departure & En route)”

REINFORCEMENT: N/A

EXAMINATION:

The objectives of this lesson will be tested in Instrument Navigation 12x.

LESSON OBJECTIVES

1.1.1.1
Determine weather criteria for flight

2.1.8.7
Recall items to be checked for destination airfield

2.1.8.2
Determine alternate routes/airfields

2.1.8.8
Recall items to be checked during route/altitude selection

1.1.2.1
Plan route of flight

2.1.8
Prepare single-engine jet log

2.1.8.1
Determine fuel requirements for route of flight

2.1.7.1
Recall procedures for completing DD-175

2.1.7.3
Complete DD-175

HOW TO USE A WORKBOOK

1. This is a workbook/lab that will complete a practice problem done in group session with an instructor. You will then complete the enclosed problems as a homework assignment. FLIP publications, charts, and the T-45C NATOPs will be available.

2. It contains lesson information accompanied by exercises and/or questions to measure your understanding of the subject matter. Answers are provided in the back of the workbook to allow you to monitor your progress through the lesson.

3. The appendix contains the correctly completed flight logs and flight plans for the practice problems.

4. Your completed flight log and flight plan will be reviewed and certified by the instructor before you may proceed to the next unit.

MOTIVATION

The ability to prepare a flight plan quickly and accurately is one of the hallmarks of the professional pilot. In this lesson, you will practice flight plan preparation. Remember, you will not be allowed to advance to the next block of instruction until you have demonstrated mastery of these procedures, which are prerequisites to your RI, AN, and IR flights.

OVERVIEW

The purpose of this lesson is to provide you hands-on practice in flight planning for:

* Fuel, weather, and alternate airfield
* Departure
* En route

REFRESHER

Review the:

* Jet-flight log and DD-175 in INav-09 & -10

PRESENTATION

INTRODUCTION

This workbook poses flight planning problems simulating the actual preparatory stages of a flight. As you read the communications between ATC and the pilot in the cross-country scenario, imagine yourself in the situation represented.

Take your time on the problems in this workbook to avoid errors. Think of the context of the question and then consider several possibilities before answering.

INSTRUCTIONAL MATERIAL REQUIRED FOR PROBLEMS ONE AND TWO

1. A FLIP Enroute IFR Supplement
2. A FLIP Enroute Flight Information Handbook
3. A FLIP General Planning (GP)
4. An air navigation computer and plotter
5. A FLIP Enroute High Altitude Chart #5
6. A FLIP (Terminal) SE
7. A FLIP Area Planning (AP/1)
8. Fuel data from the TRAWING One In-Flight Guide
9. Bingo data from **Figure 1**

BACKGROUND INFORMATION FOR PROBLEM ONE

The problem: to plan a flight from NAS Meridian, Mississippi, to NAS JAX, Florida. Your estimated time of departure (ETD) will be 0700 CST, today's date.

General Information

* Aircraft: T-45C, equipped with TACAN, VOR/ILS, and transponder with mode C. Assigned to VT-7 NAS Meridian, BUNO 165080, call sign NAVY 1A143

* Pilot-in-command: yourself, attached to VT-7, NAS Meridian. You have a standard instrument rating

* Takeoff runway: 1R

* Route: request a radar departure to Montgomery VORTAC, J20 to Seminole VORTAC, J29 to Taylor VORTAC, and direct to Navy JAX TACAN IAF

Preliminary Weather Briefing

You have determined that you want to go to a particular destination, NAS JAX. The first thing you should do prior to beginning your preflight planning is to stop by the weather office. It would be pointless to plan a flight to your destination only to find that the weather there is unsuitable. You can get a preliminary weather briefing up to a week in advance of your flight. The forecaster can give you a general idea of what kind of weather to expect depending on the time of year, as well as probable en route and surface winds. An OPARS could be run based on historical data. At this time an OPARS request can be made for your ETD (which should be made at least 24 hours in advance if at all possible).

You will be looking for the following information in the weather office:

* Severe weather warning (WW) areas: found on the WW board

* Surface weather depiction chart: areas of IFR (red) and marginal VFR (blue) weather

  NOTE: Use this information to determine the direction to fly for emergency fields if the need for one occurs in flight.

* Surface analysis chart: locations of weather fronts along your route

Ask for:

* Your destination forecast weather based on estimated time of departure (ETD) and estimated time en route (ETE). If it appears that an alternate is required, ask for the forecast weather at suitable fields in your destination area and within your range of flight.

* The flight level of most favorable winds, weather permitting, along your intended route of flight

* The forecast surface winds at your destination and alternate fields in order to plan for a particular approach

* DD-175-1 flight weather briefing

Weather Briefing Information

* Altitude: The most favorable winds and weather en route are at FL370.

* Climb winds: Training squadrons do not use climb winds in type C class (tactical jet) aircraft. Refer to the climb data in **Figure 10** of this workbook and read distance, time, and fuel directly from the chart for the appropriate altitude.

* Winds aloft:

Meridian to Montgomery	280 degrees/60 kts
Montgomery to Seminole	280 degrees/60 kts
Seminole to Taylor	270 degrees/50 kts
Taylor to NAS JAX	270 degrees/50 kts
NAS JAX to Moody AFB	270 degrees/50 kts
NAS JAX IAF altitude	FL200; 250 degrees/30 kts

* Terminal forecasts (TAF Format):

NAS Jacksonville: 03005KT 2SM BKN008 BKN010 A2990
NAS Mayport: 03005KT 1SM FG OVC005 A2989
Moody AFB: 05010KT 5SM HZ OVC020 A2998

After obtaining this information from the weather office, you should look at the teletype NOTAMs for your destination, alternate, and route of flight. You can now check the special notices in the FLIP Enroute Flight Information Handbook, FLIP Enroute IFR Supplement, and in FLIP General Planning. Finally, check the general planning (GP) and area planning (AP/1) sections for specific instructions regarding flight planning problems.

Preflight Planning Questions

1. The FLIP high altitude en route chart number you should select is ________.

2. Your ETD will be ________Z.

3. The period of time when the weather forecast plays a major factor in your planning decisions is from ________ Z to ________ Z.

4. Did you determine from the terminal forecast that an alternate is required for NAS JAX? ________
   What are your reasons? ____
   ____
   ____
   ____

5. You have examined the terminal forecast for fields in your area and have determined which alternates have adequate services, runways, and NAVAIDs for the T-45C. What is your choice of an alternate airfield? ____

6. The forecast surface winds at JAX indicate that the duty runway is probably _______________.

7. Based on the duty runway you selected in Question 6, what instrument approach procedure will you choose?
   ____

8. What is your course and distance from Taylor to the JAX TACAN IAF?____________________
   ____

9. What is your course and distance from the IAF at JAX to the IAF (CARLO) at your alternate?

    ____

    NOTE: To determine the course and distance from the IAF at NAS JAX to the IAF at Moody AFB (CARLO), a combination of plotting on the chart and point-to-point plotting on the Air Navigation Computer needs to be employed. First, plot the reciprocal of the course and distance from Taylor (TAY) to NAS JAX IAF on the CR-2. Plot the IAF at Moody (CARLO) on your chart, and measure the course and the distance to TAYLOR from this plot. Plot this on your CR-2 and align the plots for course and distance from JAX IAF to CARLO (remember to put the point you are going <u>TO</u> at the top of the CR-2).

<u>Instructions for Filling Out the Flight Log</u>

Complete your jet flight log using your FLIP High Altitude Enroute Chart, the FLIP Enroute IFR Supplement, the FLIP High Altitude Instrument Approach Procedure Charts and the T-45C flight planning data provided in **Figure 10** in this workbook.

Refer to the following as you fill out the flight log:

1) Departure elevation
2) Departure frequencies
3) TAS at planned flight level
4) Fuel flow at planned flight level
5) Destination elevation
6) Destination frequencies
7) Route of flight
8) NAVAIDs/IDs/frequency
9) Courses
10) Distances
11) Leg ETEs
12) Forecast altimeter
13) Leg fuel
14) Alternate name/ID
15) Estimated fuel remaining
16) Route of flight from destination IAF to alternate IAF
17) Planned flight level
18) Alternate elevation
19) Alternate frequencies
20) ETE
21) Alternate's fuel remaining (hr, nm)

Use the wind information provided in your weather brief and the interpolation you have done to FL 370 on the climb/cruise schedule of the flight planning data in **Figure 10** of this workbook to determine the ETE, the leg fuel, and the EFR for each leg of your flight to destination and alternate.

NOTE: Use the wind side of the air navigation computer to determine ground speed.

<u>Flight Log Fuel Planning Questions</u>

1. Your ETE to destination is ________.
2. Your estimated fuel remaining at the JAX IAF will be ________lb.

DD-175 Questions

1. What is the last entry in the ROUTE OF FLIGHT section in your DD-175?____________________
   ____

2. The ETE to alternate (ALTN) on your DD-175 is computed from IAF JAX to IAF CARLO and is ________ minutes.

3. Is the date on your DD-175 local or Zulu? ____

Departure

You have filed your flight plan with the operations duty officer, retained a copy each of your original DD-175 and DD-175-1 (weather briefing form), and completed the preflight checklist. After starting your engine, you should put clearance on request with clearance delivery.

EXAMPLE:

PILOT: "McCain Clearance: Navy one Alpha one four three, clearance on request. IFR NAVY JAX."

CLEARANCE DELIVERY: "Navy one Alpha one four three, clearance on request."

PILOT: "Navy one Alpha one four three, Roger."

CLEARANCE DELIVERY: "Navy one Alpha one four three, McCain Clearance, I have your clearance, advise when ready to copy."

PILOT: "Navy one Alpha one four three, ready to copy."

CLEARANCE DELIVERY: "Navy one Alpha one four three is cleared to Navy Jacksonville as filed. Maintain seven thousand, expect flight level three seven zero ten minutes after departure. Departure frequency three four three point seven. Squawk two zero zero zero."

PILOT: "Clearance Delivery: Navy one Alpha one four three is cleared to Navy Jacksonville as filed. Maintain seven thousand, expect flight level three seven zero ten minutes after departure. Departure frequency three four three point seven. Squawk two zero zero zero."

NOTE: Remember that in the Training Command the pilot shall read back all clearances.

Obtain taxi instructions from ground control:

EXAMPLE:

PILOT: "McCain Ground Control: Navy one Alpha one four three, taxi, information Bravo."

NOTE: In this case, "information Bravo" is the current version of the ATIS weather update. If you did not have the current version, ground control would then communicate, "Navy one Alpha one four three: for current ATIS Charlie, frequency two seven three point two," or relay current information.

GROUND CONTROL: "Navy one Alpha one four three: taxi to runway one right."

PILOT: "Navy one Alpha one four three, Roger."

Contact tower for takeoff clearance:

EXAMPLE:

PILOT: "McCain Tower: Navy one Alpha one four three, takeoff."

TOWER: "Navy one Alpha one four three, on departure, maintain runway heading until two thousand feet, then turn right, direct Montgomery. Wind three six zero at five. Runway one right, cleared for takeoff, switch departure."

PILOT: "Navy one Alpha one four three, cleared and switching on the right."

You are airborne at 1301Z and contact departure control.

NOTE: When departure control is not located at the airport, you might not be able to get radio contact until airborne (due to UHF being line of sight).

EXAMPLE:

PILOT: "McCain Departure: Navy one Alpha one four three, airborne, passing two thousand for seven thousand."

DEPARTURE CONTROL: "Navy one Alpha one four three, radar contact, climb and maintain flight level three seven zero."

PILOT: "Navy one Alpha one four three, continuing to three seven zero."

Departure Questions

1. What frequency should you use to call clearance delivery? ______________________________

2. Are you required by ATC to read back the clearance when clearance is exactly as filed? ______

3. What frequency should you select to obtain the duty runway and altimeter information?________

4. What is the name of the service that provides the duty runway and altimeter information? _____
____

   NOTE: This broadcast information is designated as information Alpha, Bravo, Charlie, etc.

5. Before taxiing, contact ____.

6. What frequency should you be on to receive taxi instructions? ____________________

7. If departure instructions are not in the original clearance, you will be given them by relay through ground control or by the control tower. As you approach the holdshort area of the duty runway, you should check your TACAN equipment with the posted radial/distance signs along the mat area. Your tolerances for this check are ______________________________
____

8. To obtain takeoff clearance, you contact what controller on what frequency? ____________

9. After you have completed your call for takeoff clearance, select the TACAN channel you will use for departure, select TCN as the steering source. For this clearance you will use NMM channel 56. Switch your transponder to "normal," select the assigned frequency for McCain Departure Control, take the duty, do your runup, release your brakes, and note the ________ on your jet log after getting safely airborne.

<u>En route</u>

At some point during your climbout or after level off, departure control will turn you over to an en route Air Route Traffic Control Center (ARTCC).

Hand-off to center:

EXAMPLE:

DEPARTURE CONTROL: "Navy one Alpha one four three: contact Memphis Center on three seven seven point two."

PILOT: "Navy one Alpha one four three, Roger, Memphis Center, three seven seven point two."

Making initial contact:

EXAMPLE:

PILOT: "Memphis Center, Navy one Alpha one four three, checking in passing one zero thousand for flight level three seven zero."

CENTER: "Navy one Alpha one four three: Roger, squawk two one zero zero and ident."

CENTER: "Navy one Alpha one four three: radar contact."

Passing to another center:

EXAMPLE:

MEMPHIS CENTER: "Navy one Alpha one four three: contact Atlanta Center on three three five point six."

PILOT: "Navy one Alpha one four three, Roger, Atlanta Center, three three five point six."

NOTE: When flying over one of the preplanned fixes, note the actual time of arrival (ATA) and the actual fuel remaining (AFR) and log both these items to aid you in determining the status of the flight and the rate of fuel consumption. If one of or both these figures are different from their estimated values (ETA, EFR), consider the causes and decide if you should choose a new destination.

ATLANTA CENTER: "Navy one Alpha one four three: radar coverage lost, commence IFR position reporting."

PILOT: "Atlanta Center: Navy one Alpha one four three, Montgomery one six. Flight level three seven zero. Seminole three three, Taylor."

ATLANTA CENTER: "Navy one Alpha one four three: Atlanta Center, Roger."

Shortly after you give your Montgomery report, Atlanta Center advises you that you are in radar contact. The TACAN bearing pointer and TACAN data block information are blank. You make an attempt to troubleshoot but without success.

EXAMPLE:

PILOT: "Atlanta Center: Navy one Alpha one four three has a TACAN failure. Request radar vectors to Seminole."

ATLANTA CENTER: "Navy one Alpha one four three: say heading."

PILOT: "Navy one Alpha one four three, heading one three one."

ATLANTA CENTER: "Navy one Alpha one four three: turn right heading one three five vectors Seminole."

PILOT: "Navy one Alpha one four three, right one three five vectors Seminole."

You can now fly radar vectors to your destination; however, when equipment loss occurs, be aware that you will have to change your flight plan if the lost equipment is required to make an approach at your destination. Navigation equipment failures could indicate an electrical problem that might eventually affect your communication equipment. Relying on your radio for a radar approach without NAVAIDs to make an approach leaves you no options in the event of radio failure.

Atlanta Center now advises you that Montgomery FSS reports the Montgomery VOR out of service. You select Seminole VOR and get a good lock-on. You advise center of this and are directed to resume normal navigation.

EXAMPLE:

ATLANTA CENTER: "Navy one Alpha one four three: contact Jacksonville Center on three zero seven point two."

PILOT: "Navy one Alpha one four three, Roger, Jacksonville Center, three zero seven point two."

Before leaving an assigned frequency, you must request and receive permission to change frequency.

EXAMPLE:

PILOT: "Jacksonville Center: Navy one Alpha one four three, request off frequency to contact Metro."

JACKSONVILLE CENTER: "Navy one Alpha one four three, Roger. Cleared to leave frequency. Report back up."

PILOT: "Navy one Alpha one four three, wilco."

En route Questions

1. On initial contact, what information must you give center? ________________________________

   ____

2. Does the FAA recommend that you repeat the frequency when you are passed to another center?

   ____

3. What kind of a report do you give center when you communicate equipment failure?__________

   ____

4. At what point would you normally select the Seminole TACAN? _________________________

   ____

5. Jacksonville Center advises radar contact. What will you communicate as you pass Seminole?____

____

6. You want to know the existing weather at JAX. You could select the frequency for JAX ATIS or you could contact JAX Metro on frequency ________________________________

Arrival

Jacksonville Center has started your descent toFL240 into JAX for hand-off to approach control. You have received your updated weather from Metro and know that Delta is current from ATIS.

EXAMPLE:

JACKSONVILLE CENTER: “Navy one Alpha one four three: Jacksonville Center, contact Jacksonville Approach on three seven nine point nine.”

PILOT: “Navy one Alpha one four three, Roger, Jacksonville Approach on three seven nine point nine.”

PILOT: “Jacksonville Approach: Navy one Alpha one four three, flight level two five zero descending to 240 with information Delta.”

APPROACH CONTROL: “Navy one Alpha one four three: radar contact, JAX altimeter, two nine nine zero, descend to and maintain FL200. Fly heading one five zero radar vectors MERFY. Cleared to hold at MERFY as published, expect further clearance one four one five Zulu. Expect high TACAN runway nine.”

PILOT: “Navy one Alpha one four three, leaving FL240 for 200, heading one five zero vectors MERFY. Hold at MERFY. Expect further clearance one four one five Zulu, altimeter two nine nine zero.”

APPROACH CONTROL: “Navy one Alpha one four three: cleared high TACAN runway nine at Navy JAX .”

PILOT: “Navy one Alpha one four three, Roger, cleared high TACAN runway nine.”

Arrival Questions

1. You should always obtain an ________ time before accepting a holding clearance.

2. You should slow the aircraft to the maximum holding speed of ________ KIAS or less within three minutes of reaching the holding fix (unless you requested a higher speed).

3. Normally you would hold at ________ ________ to conserve fuel.

4. Do you report leaving FL200? ________

5. If ATC has you in radar contact, do you report entering holding? ________

6. Describe the holding pattern you will enter. ____
____
____
____

7. On the assigned heading, what entry procedure will you perform to enter holding? ___________

8. What would your next mandatory voice report be? _____
____

NOTE: OPNAVINST 3710.7 requires that pilots make a "wheels down" report prior to landing. Normally you will make this report at or after the FAF when your landing checklist is complete. This report is not an ATC requirement.

9. You are in radar contact. Is a missed approach a mandatory voice report? ________________

Approach and Landing

In the event of undue delays (e.g., head winds, traffic delays, etc.) and marginal weather, fuel can become a critical factor. At this point you must decide to proceed to your alternate or commence the approach. If there is any possibility of a missed approach, you should advise approach control of your missed approach intentions. If you have to execute a missed approach and proceed to your alternative without spare fuel on board, additional unexpected delays could put you in a critical fuel situation.

After landing roll-out, turn off the duty runway, contact ground control and request taxi instructions. Stop by the weather office to update the forecast weather for your route of flight and destination.

Approach and Landing Questions

1. Your minimum descent altitude (MDA) for the HI-TACAN RWY 9 approach at JAX Field NAS is ________ ft MSL.

2. How many feet above the touchdown zone (TDZE) is the MDA? _________________________

3. What is the elevation of the TDZE?____

4. If you request a precision radar approach to runway 9, your decision height is _____ ft MSL.

BACKGROUND INFORMATION FOR PROBLEM TWO

The problem: plan a flight from NAS JAX to NAS Kingsville, TX, with a 45-minute fuel stop at NAS New Orleans, LA.

General Information

* Aircraft: T-45C, equipped with TACAN, VOR/ILS, and transponder with mode C. Assigned to TW1, NAS Meridian. BUNO 165080 CALL SIGN TALON45

* Pilot-in-command: yourself, attached to VT-7, NAS Meridian. You have a standard instrument rating.

* Route: request a radar departure to Seminole, J2 Semmes, direct NAS New Orleans IAF. Second leg: J37 HEIGH X, J22 Corpus Christi, direct to NAS Kingsville IAF.

Weather Briefing Information

* Altitude: The most favorable winds and weather en route are at FL350.

* Climb winds: Training squadrons do not use climb winds in type C class (tactical jet) aircraft. Refer to the climb data in **Figure 10** of this workbook and determine the appropriate altitude by reading distance, time, and fuel.

* Winds aloft:

Winds aloft:	Jacksonville to Seminole	270 degrees/40 kts
	Seminole to New Orleans	280 degrees/30 kts
	New Orleans to Gulfport-Biloxi Regional at IAF altitude	290 degrees/30 kts
	New Orleans to Kingsville	300 degrees/70 kts
	Kingsville IAF altitude: 17,000 ft	260 degrees/40 kts

* Terminal forecasts (TAF Format):

  NAS New Orleans: 04005KT 4SM FG BKN030 A2999
  Gulfport-Biloxi Regional: 03005KT 5SM HZ SCT015 BKN035 A3000
  NAS Kingsville: 15009KT 4SM RA - FG SCT008 BKN010 A2998
  NAS Corpus Christi: 14008KT 4SM HZ RA - FG OVC010 A2997

SUMMARY

This lesson has focused on the following topics:

* Fuel, weather, and alternate airfield planning
* Flight planning (departure)
* Flight planning (en route)

CONCLUSION

Call upon this workbook practice when you prepare for an actual flight. Although your IP will help you on your first cross-country flights, eventually you will be solely responsible for flight planning.

ANSWER KEY

Preflight Planning Answers

1. The FLIP High Altitude Enroute Chart number you should select is ________.

   ANSWER: H-5

2. Your ETD will be ________ Z.

   ANSWER: 1300Z

3. The period of time when the weather forecast plays a major factor in your planning decisions is from ________ Z to ________ Z.

   ANSWER: 1300, 1500

4. Did you determine from the terminal forecast that an alternate is required for NAS JAX? _____ What are your reasons?

   ANSWER: Yes. The weather forecast calls for ceiling/visibility to be below 3000/3 at ETA.

5. You have examined the terminal forecast for fields in your area and have determined which alternates have adequate services, runways, and NAVAIDs for the T-45C. What is your choice of an alternate airfield?

   ANSWER: Moody with 2000/3

6. The forecast surface winds at JAX indicate that the duty runway is probably ________.

   ANSWER: 9

7. Based on the duty runway you selected in Question 6, what instrument approach procedure will you choose?

   ANSWER: HI TACAN runway 9

8. What is your course and distance from Taylor to the JAX TACAN IAF?

   ANSWER: 143 degrees/62 nm

9. What is your course and distance from the IAF at JAX to the IAF (CARLO) at your alternate?

   ANSWER: 315 degrees/092 nm +/- 5 degrees/10 nm

Flight Log Fuel Planning Answers

1. Your ETE to destination is ________.

   ANSWER: 1 + 02 +/- 5 minutes

2. Your estimated fuel remaining at the JAX IAF will be ________lb.

   ANSWER: 1280 +/- 50

DD-175 Answers

1. What is the last entry in the ROUTE OF FLIGHT section in your DD-175?

   ANSWER: NIP 204035

2. The ETE to alternate (ALTN) on your DD-175 is computed from IAF JAX to IAF CARLO and is _____ minutes.

   ANSWER: 16

3. Is the date on your DD-175 local or Zulu?

   ANSWER: Local

Departure Answers

1. What frequency should you use to call clearance delivery?

   ANSWER: 301.0

2. Are you required to read back the clearance when clearance is exactly as filed?

   ANSWER: Yes--CNATRA requires that all clearances be read back (ATC does not make this requirement, i.e., ATC requires only “acknowledge” the clearance).

3. What frequency should you select to obtain the duty runway and altimeter information?

   ANSWER: 273.2

4. What is the name of the service that provides the duty runway and altimeter information?

   ANSWER: ATIS

5. Before taxiing, contact ________.

   ANSWER: ground control

6. What frequency should you be on to receive taxi instructions?

   ANSWER: 336.4

7. If departure instructions are not in the original clearance, you will be given them by relay through ground control or by the control tower. As you approach the holdshort area of the duty runway, you should check your TACAN equipment with the posted radial/distance signs along the mat area. Your tolerances for this check are ______________________________.

   ANSWER: within +/- 4 degrees of the radial and .5 nm or 3% of the DME

8. To obtain takeoff clearance, you contact what controller on what frequency?

   ANSWER: Tower, 340.2

9. After you have completed your call for takeoff clearance, select the TACAN channel you will use for departure. For this clearance you will use NMM channel 56. Switch your transponder to "normal," select the assigned frequency for McCain Departure Control, take the duty, do your runup, release your brakes, and note the ________ on your jet log prior to takeoff roll.

   ANSWER: time

En route Answers

1. On initial contact, what information must you give center?

   ANSWER: When operating in a radar environment and no position report is required: On initial contact, pilots should advise controllers of their altitudes preceded by the word "level," "climbing," or "descending," and provide the present vacating altitude, if applicable, and the final altitude. Also, when on other than published routes, pilots should include the present navigational position on initial contact with each air traffic controller.

2. Does the FAA recommend that you repeat the frequency when you are passed to another center?

   ANSWER: Yes, it is a required procedure to assure that the hand-off will be completed.

3. What kind of a report do you give center when you communicate equipment failure?

   ANSWER: Malfunction report

4. At what point would you normally select the Seminole TACAN?

   ANSWER: 71 DME (halfway)

5. Jacksonville Center advises radar contact. What will you communicate as you pass Seminole?

   ANSWER: No report is required because you are in radar contact.

6. You want to know the existing weather at JAX. You could select the frequency for JAX ATIS or you could contact JAX Metro on frequency ________.

   ANSWER: 344.6

Arrival Answers

1. You should always obtain an ________ time before accepting a holding clearance.

   ANSWER: expect further clearance (EFC)

2. You should slow the aircraft to the maximum holding speed of ________ KIAS or less within three minutes of reaching the holding fix (unless you requested a higher speed).

   ANSWER: 230

3. Normally you would hold at ________ ________ to conserve fuel.

   ANSWER: maximum endurance

4. Do you report leaving FL200?

   ANSWER: Yes, you must report leaving an assigned altitude.

5. If ATC has you in radar contact, do you report entering holding?

   ANSWER: Yes. (However, at training command fields, it is not required.)

6. Describe the holding pattern you will enter.

   ANSWER: South of Navy JAX TACAN 204 degree radial 28 DME fix, left turns, 7 mile legs

7. On the assigned heading, what entry procedure will you perform to enter holding?

   ANSWER: Parallel entry

8. What would your next mandatory voice report be?

   ANSWER: IAF

9. You are in radar contact. Is a missed approach a mandatory voice report?

   ANSWER: Yes

Approach and Landing Answers

1. Your minimum descent altitude (MDA) for the HI-TACAN RWY 9 approach at JAX NAS is _______ ft MSL.

   ANSWER: 380

2. How many feet above the touchdown zone (TDZE) is the MDA?

   ANSWER: 358 ft

3. What is the elevation of the TDZE?

   ANSWER: 22 ft MSL

4. If you request a precision radar approach to runway 9, your decision height is _______ ft MSL.

   ANSWER: 222

FIGURES

FOR TRAINING PURPOSES ONLY

BINGO

GEAR UP - FLAPS UP

ZERO FUEL WEIGHT - 10,500 lb

	MAXIMUM RANGE CRUISE								
	DIST TO BASE	FUEL REQ'D	TIME REQ'D	CLIMB	CRUISE			DESCEND	
				KIAS or MACH	ALT	SPEED		SPEED	DIST
	NM	LB	MIN		FEET	KIAS	IMN	KIAS	NM
DRAG INDEX = 50	25	428	7	252	5,000	238	.39	186	12
	50	540	13		11,000	232	.43		27
	75	639	18		16,500	226	.46		41
	100	728	24		20,500	222	.49		54
	125	811	28		24,000	217	.52		64
	150	890	33		27,000	214	.54		74
	175	965	37		29,500	212	.56		83
	200	1,038	41		30,500	210	.58		88
	225	1,110	45		32,000	208	.58		92
	250	1,160	49	252 to .70	40,000	196	.66		126

Figure 1: BINGO

SINGLE–ENGINE JET FLIGHT LOG
CNATRA–GEN 3760/1 (REV. 7–78) S/N0197LLCF19482

DEP ELEV	CLNC DELIV	GND CONT	TOWER
317'	McCain 274.0	McCain 336.4	McCain 126.2/360.2
ALT CORR	**TIME OFF**	**TAS**	**LBS PH/PMIN**
		381	1098

CLEARANCE ATC C TALON45 TO NAS JAX — ATIS: 273.2 METRO: 312.4

VIA D→ MGM, J-20 SZW, J-29 TAY D→ JAX IAF ↗ 7K (370/10)

SQUAWK 2000

DEPARTURE

DEST ELEV	APC CONT	TOWER	GND CONT
81'	JACKSONVILLE 123.8/379.9	JAX 120.0/355.8	JAX 128.6/336.4

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR (2938) / AFR	NOTES (ATIS: 281.0 METRO: 344.6)
DEPART NAS MERIDIAN	NMM 56	START-TAXI-T.O.				200	2738	
↗ MONTGOMERY	NMM 56	098	75	14		570	2168	TOC
D→ MONTGOMERY	MGM 58	098	45	6		110	2058	WIND: 280/60 GS: 441 MGM: 112.1
J-20 SEMINOLE	SZW 122	132	142	20		370	1688	SZW: 117.5 GS: 433
J-29 TAYLOR	TAY 76	089/095	94	13		240	1448	WIND: 270/50 GS: 421 TAY: 112.9
D→ NIP 204/35	NIP 88	143	62	9		170	1278	VQQ: 117.9 (No Approach) GS: 412
			418	1 + 02		1660		
								FRCST ALT 29.90

ALTERNATE	ROUTE	ALTITUDE	TIME	FUEL
MOODY AFB	D→	370	0 + 16	1 + 09
ALT ELEV	**APC CONT**	**TOWER**	**GND CONT**	
223'	VALDOSTA 124.6/259.3	MOODY 128.45/289.6	120.625/275.8	

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR / AFR	NOTES
D→ VAD CARLO (VAD 180019)	VAD 80	310	92	16		300		ATIS: 256.0 METRO: 344.6 WIND: 270/50 GS: 342
								FRCST ALT: 29.98

(Over)

Figure 2: COMPLETED JET FLIGHT LOG (PROBLEM ONE)

FUEL PLAN

1. CLIMB/ROUTE DEST IAF	1460	6. START/TAXI	200
2. ROUTE ALT IAF (If required)	300	7. TOTAL REQUIRED (4, 5 & 6)	2510
3. APPROACHES	250	8. TOTAL ABOARD	2938
4. TOTAL (1, 2 & 3)	2010	9. SPARE FUEL (8–7)	428
5. RES 10% of 4 (Min 20 mins)	300		

EMERGENCY "BINGO" TO ALTERNATE

	REQUIRED		APPROACH		RES		TOTAL
LAST CRUSING ALT	300	+	250	+	300	=	850
15,000' INITIAL APP ALT GS: 290	400	+	250	+	300	=	950
WIND: 250/30 TAS: 305 FF: 1245 MAP-IAF (294/73)	720	+	250	+	—	=	970

CHECK LIST	DESTINATION	ALTERNATE
RWY LENGTH	8000	9300
LIGHTING	HIRL	HIRL/PAPI
FUEL/JASU/LOX	YES	YES
UHF/ADF	281.0	273.5
UHF/DF	NO	NO
RAPCON	123.8 379.9	NO
PAR MINS	200-1/2	200-1/2
TAC MINS	500-1	500-3/4
ARR GEAR	ALL	ALL
PUBS	✓	✓
NOTAMS	✓	✓
FUEL PACKET	✓	✓
FLASHLIGHT, WALLET, ETC.	✓	✓

EMER FIELDS
MAXWELL AFB
ID MXF
CH 97 I-MXF 109.3
PAGE NO. 98

CNATRA–GEN 3760/1 (REV. 7–78) S/N0197LLCF19482(BACK) *U.S.GPO:1987–530–016/61134

Figure 3: COMPLETED JET FLIGHT LOG (PROBLEM ONE, FUEL PLAN)

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397.
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight.
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan.
DISCLOSURE: Voluntary; however, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TD CODE
21 APR 95	VV1A143	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	381	NMM	1300	370	MGM J20 SZW J29 TAY NIP 204/35	NIP	1 + 02

REMARKS

NZC-S

RANK AND HONOR CODE

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2 + 30	VAD	0 + 16	✓	4-124	N/R	ON FILE/TW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
U R Yourself	X ATTACHED / SEE PSGR MANIFEST		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	TIMETER, A. L.	LT	ON FILE	VT-7/NMM

DD Form 175, MAY 86 0102-LF-001-7500 *Previous editions are obsolete.* MILITARY FLIGHT PLAN

Figure 4: COMPLETED DD-175 (PROBLEM ONE)

SINGLE-ENGINE JET FLIGHT LOG

CNATRA-GEN 3760/1 (REV. 7-78) S/N0197LLCF19482

DEP ELEV	CLNC DELIV	GND CONT	TOWER
22	135.9 352.4	128.6 336.4	120.0 355.8
ALT CORR	**TIME OFF**	**TAS**	**LBS PH/PMIN**
		375	1090

CLEARANCE — ATIS: 281.0 METRO: 344.6

DEPARTURE

DEST ELEV	APC CONT	TOWER	GND CONT
3’	NEW ORLEANS 123.85/256.9	NAVY N.O. 123.8/340.2	121.6/382.8

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR 2938 / AFR	NOTES (ATIS: 276.2 METRO: 265.8)
DEPART JACKSONVILLE	NIP / 49	START-TAXI-T.O.				200	2738	
D SEMINOLE	NIP / 49	276	70	12		540	2198	TOC
D SEMINOLE	SZW / 122	276	75	13		240	1958	WIND: 270/40 GS: 335
J2 X	SZW / 122	288	42	7		130	1828	WIND: 280/30 GS: 345
J2 CRESTVIEW	CEW / 106	268	80	14		260	1568	GS: 347
J2 SEMMES	SJI / 100	262	87	15		280	1288	GS: 347
D NAVY NEW ORLEANS IAF RRICK (HRV 149030)	HRN / 88	217	106	18		330	958	GS: 362
			460	1 + 19		1980		
								FRCST ALT 29.99

ALTERNATE GPT	ROUTE	ALTITUDE	TIME	FUEL
GULFPORT-BILOXI REG	D	350	0 + 09	0 + 53
ALT ELEV	**APC CONT** GULFPORT	**TOWER**	**GND CONT**	
28	124.6/354.1	123.7/339.8	120.4/348.6	

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR / AFR	NOTES
HI-ILS/ TACAN 32 (GPT 193018)	GPT / 27	032	53	9		170		ATIS: 119.45 GS: 387 I-UXI 108.3

(Over)

Figure 5: COMPLETED JET FLIGHT LOG (PROBLEM TWO, NIP-NBG)

FUEL PLAN

1. CLIMB/ROUTE DEST IAF	1780	6. START/TAXI	200
2. ROUTE ALT IAF (If required)	170	7. TOTAL REQUIRED (4, 5 & 6)	2700
3. APPROACHES	250	8. TOTAL ABOARD	2938
4. TOTAL (1, 2 & 3)	2200	9. SPARE FUEL (8–7)	238
5. RES 10% of 4 (Min 20 mins)	300		

EMERGENCY "BINGO" TO ALTERNATE

	REQUIRED		APPROACH		RES		TOTAL
FL 350 LAST CRUSING ALT	170	+	250	+	300	=	720
16,000' INITIAL APP ALT TIME: 10 GS: 316	190	+	250	+	300	=	740
WIND: 290/30 TAS: 308 PPH 1232							
MAP-IAF (075/49)	535	+	250	+	—	=	785

CHECK LIST	DESTINATION	ALTERNATE
RWY LENGTH	8000	9002
LIGHTING	04 HIRL A1 22 A2	14-PCL A3 32-PCL A5
FUEL/JASU/LOX	YES	AVG
VOR	114.1	109.0 GPT
ILS	NO	108.3 1-UX1
RAPCON	—	—
PAR MINS	200-1/2	ASR-32 400-1/2 14 500-3/4
TAC MINS	04-500-3/4 22-500-1	14-400-1/2 32-500-3/4
ARR GEAR	BOTH ENDS	14/32
PUBS	✓	—
NOTAMS	✓	—
FUEL PACKET	✓	—
FLASHLIGHT, WALLET, ETC.	✓	—

EMER FIELDS
TALLAHASSEE
ID TLH
CH 122
PAGE NO. 195-197

CNATRA-GEN 3760/1 (REV. 7-78) S/N0197LLCF19482(BACK)

*U.S.GPO:1987-530-016/61134

Figure 6: COMPLETED JET FLIGHT LOG (PROBLEM TWO, FUEL PLAN, NIP-NBG

SINGLE–ENGINE JET FLIGHT LOG
CNATRA–GEN 3760/1 (REV. 7–78) S/N0197LLCF19482

DEP ELEV	CLNC DELIV (GROUND)	GND CONT NAVY N.O.	TOWER
3’	121.6/382.8	121.6/382.8	123.8/340.6/350.2
ALT CORR	**TIME OFF**	**TAS**	**LBS PH/PMIN**
		375	1090

CLEARANCE — ATIS: 276.2 METRO: 255.8

DEPARTURE

DEST ELEV	APC CONT	TOWER	GND CONT
50	119.9/383.6	124.1/346.0	352.4

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR 2938 / AFR	ATIS: 276.2 METRO: 344.6 NOTES
DEPART NAS NEW ORLEANS		START-TAXI-T.O.				200	2738	
J37 PEKON X	HRV 71	264	70	12		540	2198	TOC
J37 PEKON X	HRV 71	264	83	16		300	1898	WIND: 300/70 GS: 317
J37 HEIGH X	HUB 117.6/123	264	71	14		260	1638	GS: 317
J22 PALACIOS	PSX 120	235	119	21		390	1248	GS: 345
J22 CORPUS CHRISTI	CRP 102	221	79	13		240	1008	GS: 360
N. KINGSVILLE WAADE IAF (270026)	NQI 125	237	49	9		150	858	I-NQI 110.9 GS: 344
			471	1 + 25		2080		
								FRCST ALT 29.98

ALTERNATE	ROUTE	ALTITUDE	TIME	FUEL
NAS CORPUS CHRISTI	D	400	0 + 07	0 + 47

ALT ELEV	APC CONT CORPUS CHRISTI	TOWER NAVY C.C.	GND CONT
19	120.9/363.1	126.2/340.2	135.3/348.0

TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR / AFR	NOTES
AIMEE IAF (323027)	NCP 87	045	50	8		150		ATIS: 138.6/284.2 METRO: 344.6
								GS: 393 FRCST ALT: 29.97

(Over)

Figure 7: COMPLETED JET FLIGHT LOG (PROBLEM TWO, NBG-NQI)

FUEL PLAN

1. CLIMB/ROUTE DEST IAF	1880	6. START/TAXI	200
2. ROUTE ALT IAF (If required)	150	7. TOTAL REQUIRED (4, 5 & 6)	2780
3. APPROACHES	250	8. TOTAL ABOARD	2938
4. TOTAL (1, 2 & 3)	2280	9. SPARE FUEL (8–7)	158
5. RES 10% of 4 (Min 20 mins)	300		

EMERGENCY "BINGO" TO ALTERNATE

	REQUIRED		APPROACH		RES		TOTAL
FL: 350 LAST CRUSING ALT	150	+	250	+	300	=	700
17,000 INITIAL APP ALT	190	+	250	+	300	=	740
MAP-IAF 40NM	500	+	250	+	—	=	750

CHECK LIST	DESTINATION	ALTERNATE	EMER FIELDS
RWY LENGTH	8000	8000 13R-31L	ELLINGTON
LIGHTING	35R A1 HIRL ALL RNWY	13R A2 HIRL ALL REIL 13R-31L	ID EFD
FUEL/JASU/LOX	YES	YES	CH 31
UHF/ADF	NO	NO	PAGE NO. 81-89
UHF/DF	NO	NO	
RAPCON	NO	NO	
PAR MINS	200-1/2	200-1/2	
TAC MINS	400-1	400-3/4	
ARR GEAR	ALL RNWYS	13R-31L	
PUBS	✓	✓	
NOTAMS	✓	✓	
FUEL PACKET	✓	✓	
FLASHLIGHT, WALLET, ETC.	✓	✓	

CNATRA-GEN 3760/1 (REV. 7-78) S/N0197LLCF19482(BACK)

*U.S.GPO:1987-530-016/61134

Figure 8: COMPLETED JET LOG (PROBLEM TWO, FUEL PLAN, NBG-NQI)

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397.
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight.
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan.
DISCLOSURE: Voluntary; however, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TD CODE
21 APR 95	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	375	NZC	1330	350	SZW J2 SJI RRICK	NBG	1 + 19
	I	375	NBG	1530	350	J37 HEIGH J22 CRP WAADE	NQI	1 + 23
						(2 + 10 NGP 0 + 07)		

REMARKS

REQ RADAR DEPARTURE
NBG-S

RANK AND HONOR CODE

VOID 4 + 00

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2 + 30	GPT	0 + 10	✓	4-203	N/R	ON-FILE/TW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
U R Yourself	X ATTACHED / SEE PSGR MANIFEST		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	TIMETER, A. L.	LT	ON-FILE	VT-7/NMM

DD Form 175, MAY 86 0102-LF-001-7500 *Previous editions are obsolete.* **MILITARY FLIGHT PLAN**

Figure 9: COMPLETED DD-175 (PROBLEM TWO)

STANDARD T-45C FUEL PLANNING DATA

Based on T-45C NATOPS flight manual. Actual performance will vary with nonstandard temperature, winds, and varying gross weights. For initial planning only.

Total usable fuel . . . . 2938 lbs
Start/Taxi/Takeoff 200
Penetration approach 250
GCA 250
Reserve (20 min @ 10,000 FT MSL) 300

LOW LEVEL

360 KGS, 12K GW = 6.6 lbs/NM and 2,375 PPH
300 KGS, 12K GW = 5.0 lbs/NM and 1500 PPH

JP-4 = 6.5 lbs/Gal **JP-5 = 6.8 lbs/Gal** **JP-8 = 6.7 lbs/Gal**

CLIMB OUT (Using climb schedule: 250 KIAS to 10K, 300 KIAS to intercept .72 IMN)

ALTITUDE	KIAS	NM	TIME	FUEL USED
5,000	250	04	0+01	60 lbs
10,000	250	10	0+02	120
15,000	300	20	0+04	190
20,000	300	28	0+06	260
25,000	292/.72	38	0+08	360
30,000	263/.72	53	0+10	440
35,000	235/.72	70	0+12	540
40,000	209/.72	80	0+16	600

ENROUTE

ALTITUDE	#/NM	IMN	CAS	#/HR	TAS
5,000	5.21	.43	260	1460	280
10,000	4.72	.45	250	1345	285
15,000	4.08	.49	245	1245	305
20,000	3.69	.52	240	1180	320
25,000	3.46	.56	230	1160	335
30,000	3.24	.61	225	1165	360
35,000	2.90	.65	220	1090	375
40,000	2.84	.68	200	1110	390

DESCENT

ALTITUDE	KIAS	NM	TIME	FUEL USED
5,000	195	12	0+03	25 lbs
10,000	195	28	0+07	80
15,000	195	39	0+10	90
20,000	195	53	0+14	125
25,000	195	68	0+17	150
30,000	195	85	0+21	175
35,000	195	100	0+24	210
40,000	195	116	0+26	225

OPTIMUM ALTITUDE and SPEED

GROSS WEIGHT	IMN	ALT	#/NM
13,000	.68	36,800 ft	3.08
12,000	.68	38,400 ft	2.86
11,000	.68	39,600 ft	2.63

Figure 10: T-45C FUEL CARD

NOTES

LECTURE GUIDE

COURSE/STAGE: T-45C ADV Instrument Navigation

LESSON TITLE: INav Review

LESSON IDENTIFIER: T-45C ADV INav-03

LEARNING ENVIRONMENT: Classroom

ALLOTTED LESSON TIME: 0.8 hr

TRAINING AIDS:

* Figures
  Fig 1: ATC Facilities
  Fig 2: FAA Instrument Landing System (ILS)
  Fig 3: DD-175 Fuel Plan—Alternate Required
  Fig 4: DD-175 Fuel Plan—Alternate Not Required
  Fig 5: Instrument Ratings
  Fig 6: DD-175 Standard Instrument Departure (SID)
  Fig 7: DD-175 Radar Departure
  Fig 8: DD-175 VFR Climb on Course
  Fig 9: Dallas-Love Field (Hi) (Pilot Nav)
  Fig 10: Dallas-Love Field (Hi) (Vector)
  Fig 11: Single Frequency Approach (SFA-UHF)
  Fig 12: Circling Approach
  Fig 13: Circling Approaches
  Fig 14: Minimum Vectoring Altitude
  Fig 15: Visual Descent Point
  Fig 16: Basic Penetration Pattern
  Fig 17: Altitude Restrictions (Profile View)
  Fig 18: Full-Page Airport Diagram
  Fig 19: Hi-VOR/DME or TACAN RWY 27R Billings Logan Intl
  Fig 20: Hi-VOR RWY 19 Pensacola NAS
  Fig 21: Hi-ILS RWY 10R Portland Intl

(2-02) ORIGINAL

STUDY RESOURCES:

* NATOPS General Flight and Operating Instructions Manual, OPNAVINST 3710.7
* NATOPS Flight Manual, NAVAIR 00-80T-112
* T-45C NATOPS Flight Manual, A1-T45AC-NFM-000
* T-45C NATOPS Flight Manual, A1-T45AB- NFM-300
* DoD FLIP General Planning (GP)
* Handbook Section B; IFR Supplement (Back Cover)
* Aeronautical Information Manual (AIM)
* DoD FLIP General Planning (GP)
* DoD FLIP (En route) IFR-Supplement, United States
* DoD FLIP (Terminal) High Altitude United States, Southeast
* U.S. Enroute High Altitude Chart, H-5 (Southcentral)

LESSON PREPARATION:

Read:

* Complete materials from INav-01 through INav-05 [IUT curriculum] or INav-01 through INav-02 [ADV curriculum] and note any questions or problems concerning content, progress questions, and practice exercises.

REINFORCEMENT: N/A

EXAMINATION:

The objectives in this lesson will be tested in IUT Instrument Navigation 07X.

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LESSON OBJECTIVES

Introduction to INav

1.1.1.9
Recall location, types, uses, functions of Air Traffic Control Facilities

1.1.1.9.8
Recall responsibility of ATC for aircraft separation

1.1.1.9.2
Recall ground control responsibilities

1.1.1.9.3
Recall airport tower responsibilities

1.1.1.9.5.2
Recall departure control responsibilities

1.1.1.9.4
Recall air route traffic control center responsibilities

1.1.1.9.5.1
Recall approach control responsibilities

1.1.1.9.6
Recall services provided by flight service stations

2.7.5.3.2
Recall controlling agencies associated with radio instrument communications

2.7.6.1.1
Recall elements normally contained in an ATC clearance

2.1.12.1.1.1.1
Recall theory and operating characteristics of the global positioning system

2.1.10.1.1.1.2
Recall theory and operating characteristics of the inertial navigation system

2.7.5.1.1.2
Recall operating characteristics of the TACAN, VOR, VOR/DME

2.7.5.1.1.2.3
Recognize TACAN/VOR cone of confusion

2.7.4.2.1
Recall definition of 40-degree TACAN lock-on

2.9.4.6.5
Recall function and use of ILS equipment

2.9.4.6.5.1
Recall function of localizer transmitter

2.9.4.6.5.2
Recall function of glideslope transmitter

2.9.4.6.5.3
Recall function of ILS marker beacons

Departure and Terminal Procedures

1.1.1.8.2
Recall fuel requirements for filing DD-175

2.5.12.2
Recall takeoff minimums as defined in OPNAVINST 3710.7

2.6.6.1
Recall procedures for performing an instrument departure

2.6.6.4
Recall procedures for a standard instrument departure

2.7.6.1.2
Recall proper response to ATC clearance

2.9.4.1.2.3
Recall standard terminal arrival (STAR) procedures

2.9.4.1.1
Recall criteria which influence type of instrument approach

2.9.4.2.3
Recall communications requirements and procedures for approach

2.9.4.1.2
Recall procedures for performing an en route descent

1.9.1.3.1.1
Recall procedures and reasons for performing flight under IFR to a visual approach

1.9.1.3.1.2
Recall procedures/reasons for performing IFR approach to a contact approach

2.9.5.4.1
Recall procedures/reasons for performing a circling approach

2.9.4.5.2.4
Recall factors associated with performing radar vectors and approaches

2.9.4.9.2
Recall constraints and guidelines for performing a missed approach

2.9.4.5.1.2
Recall procedures/constraints associated with performing instrument approaches

2.9.6.1
Recall instrument postflight requirements and procedures

Interpretation of High Altitude Instrument Approach Plates

2.1.8.3.1.1
Recall FLIP usage and application in instrument flight planning for tactical jet aircraft

2.9.5.5.2
Interpret visual information system indications provided for approach and landing

2.9.4.2.1
Interpret TACAN/VOR DME approach plates

2.9.4.3.1
Interpret VOR approach plates

2.9.4.6.1
Interpret ILS approach plates

Flight Planning (Departure and En route)

2.1.8.5
Recall instrument equipment required for IFR flight

2.1.8.3
Recall FLIPs required for flight planning

2.1.8.6
Recall information provided by NOTAM system

2.1.8.7
Recall items to be checked for destination airfield

2.1.8.8
Recall items to be checked during route/altitude selection

1.1.2.1
Plan route of flight

2.1.8
Prepare Single-Engine Jet Log

2.1.8.4.1
Recall procedures for planning and performing a BINGO profile

2.1.7
Complete DD-175 for route of flight

2.1.7.1
Recall procedures for completing DD-175

2.1.9
Select appropriate publications/items for navigation bag

MOTIVATION

Your thorough understanding of the material covered in the INav block is important not only to pass the INav exam but also to progress through later segments of your flight training, particularly Radio Instruments and Airways Navigation.

OVERVIEW

This is the review lesson for the IUT INav block examination. It is the final INav lesson in the advanced curriculum.

We will review the following:

* Overview of test

* Introduction to INav

* Departure and Terminal Procedures

* Interpretation of High Altitude Instrument Approach Plates

* Flight Planning (Departure and En route)

PRESENTATION

I. Overview of the Test

A. Grading criterion: 80% correct

B. Length of test approximately 70 questions

C. Types of questions

1. Multiple choice

2. True or false

II. Introduction to INav

A. Responsibilities of ATC facilities **1.1.1.9, 1.1.1.9.8, 2.7.5.3.2**

1. Ground control **1.1.1.9.2**

? **What are some of the functions of ground control?**

ANSWER: Answers follow

a. Provides taxi instructions

b. Issues information

c. Relays clearance at some locations

Sg 0, fr 3: *Overview of Test Organization*

INAV REVIEW

* **Overview of Test**
* Introduction to INav
* Departure and Terminal Procedures
* Interpretation of High Altitude Instrument Approach Plates
* Flight Planning (Departure and En route)

Sg 0, fr 5: *INav Preview Organization—Introduction to INav Organization*

INAV REVIEW

* Overview of Test
* **Introduction to INav**
* Departure and Terminal Procedures
* Interpretation of High Altitude Instrument Approach Plates
* Flight Planning (Departure and En route)

Sg 1, fr 2: *Introduction to INav Organization*

INTRODUCTION to INAV

* **Responsibilities of ATC facilities**
* Clearances
* TACAN/VOR characteristics
* GPS/INS characteristics
* ILS characteristics

Sg 1, fr 4
Fig 1: *ATC Facilities*

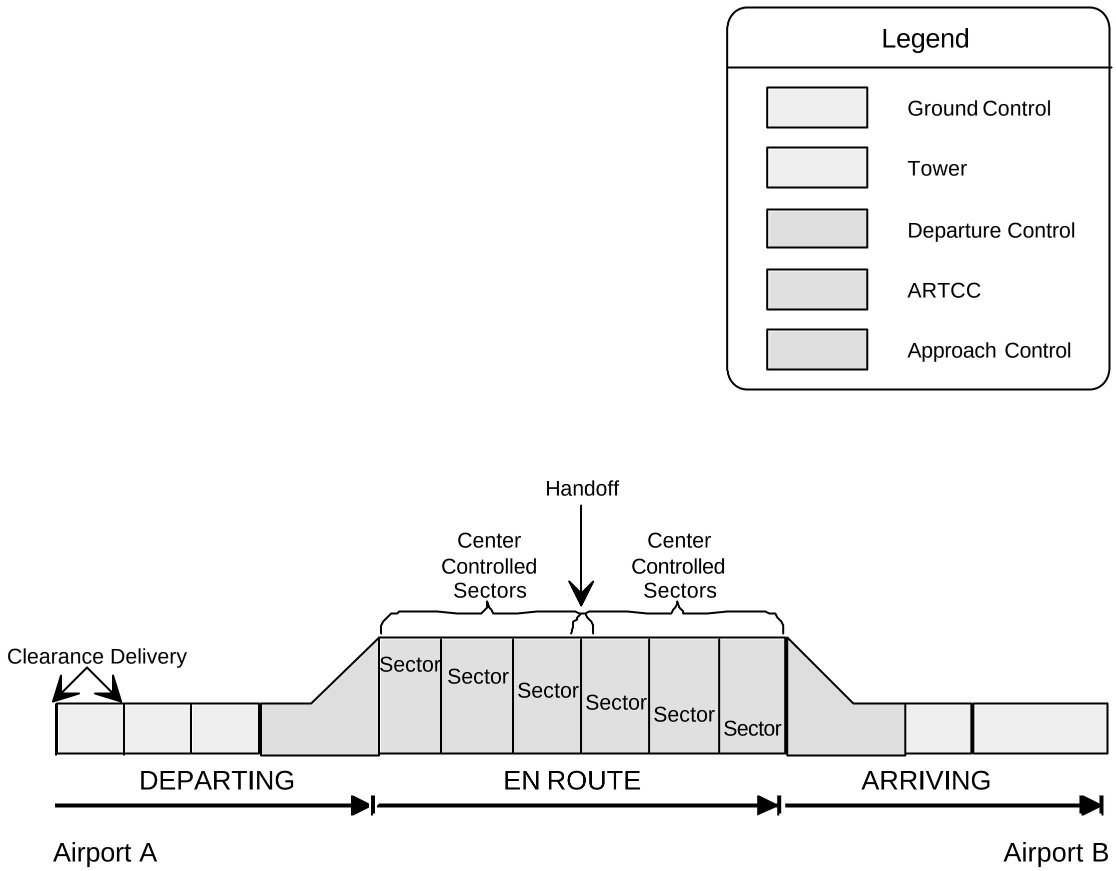


Figure 1: ATC FACILITIES

2. Clearance delivery
3. Tower: an arm of Air Traffic Control (ATC) **1.1.1.9.3**
    a. Controls runway traffic
    b. Issues takeoff clearance
    c. Controls all airborne traffic in control area
    d. Provides airport advisory information to arriving flights in absence of ATIS
    e. Issues landing clearance
4. Departure Control **1.1.1.9.5.2**

? **What is Departure Control's primary responsibility?**

ANSWER: Answer follows

    a. Controls aircraft from Class D airspace to en route traffic control
    b. Sequences and separates IFR and participating VFR aircraft
    c. Provides radar service
5. Air Route Traffic Control Center (ARTCC) **1.1.1.9.4**
    a. Issues route assignment (Air Traffic Control issues clearances, ARTCC coordinates route assignment)
    b. Controls en route IFR flight
    c. Verifies/assigns altitude

d. Provides traffic separation

e. Furnishes vectors (as do other entities, i.e., Departure Control)

f. Issues NOTAMs

g. Provides current weather information (as required)

h. ARTCC IFR control starts at 1,200 ft AGL on airways. All traffic in Class A airspace, which starts at 18,000 ft MSL, is under Center's direct control

6. Approach control **1.1.1.9.5.1**

a. Controls all IFR aircraft from hand-off by ARTCC control to hand-off for Tower control

b. Provides radar service to separate and sequence all IFR traffic and assist VFR traffic

c. Provides arrival information to incoming traffic on initial contact

7. Automated Flight Service Station (FSS) **1.1.1.9.6**

a. Does not perform ATC control functions; assists, advises, coordinates, relays and issues information

b. Primary purpose is to provide services to the VFR civilian aviation community; however, military pilots can utilize many valuable services

PROGRESS CHECK

Question 1—1.1.1.9.2
What code identifies ATIS information and how often is the information (usually) updated?

ANSWER: Alphabetic (Alpha, Bravo, Charlie, etc.), when a new Aviation Weather Report is issued.

PROGRESS CHECK

Question 2—1.1.1.9.5.2
What is the primary purpose of TRSA?

ANSWER: Provide separation between all participating VFR and IFR aircraft operating within the TRSA.

Question 3—1.1.1.9.4
Which portion of your IFR flight is directly controlled by ARTCC?

ANSWER: En route

Sg 2, fr 2: Introduction to INav Organization

INTRODUCTION to INAV

* Responsibilities of ATC facilities
* **Clearances**
* TACAN/VOR characteristics
* GPS/INS characteristics
* ILS characteristics

B. Normal ATC clearance elements **2.7.6.1.1**

? **What are the nine normal elements of an IFR clearance?**

ANSWER: Answers follow

1. Aircraft identification
2. Clearance limit
3. Departure instructions or SID
4. Route of flight
5. Altitude assignment
6. Departure frequency
7. IFF code
8. Any holding instructions
9. Other information as required

PROGRESS CHECK

Question 4—2.7.6.1.1
List the nine elements normally contained in an ATC clearance.

ANSWER:
1. Aircraft identification
2. Clearance limit
3. Departure instructions or SID
4. Route of flight
5. Altitude assignment
6. Departure frequency
7. IFF code
8. Any holding instructions
9. Other information as required

C. Operating Characteristics of TACAN and VOR **2.7.4.2.1, 2.7.5.1.1.2, 2.7.5.1.1.2.3**

1. TACAN

a. Unaffected by weather

b. 360 magnetic radials emitted from station

c. Operates in UHF band

d. Limitations

(1) Line of sight

(2) DME to 399.9 nm

(3) Standard service volume (SSV)

NOTE: SSV defines the interference free reception limits of unrestricted NAVAIDs which are usable for random/unpublished route navigation. Reception may be

Sg 3, fr 2: *Introduction to INav Organization*

INTRODUCTION to INAV

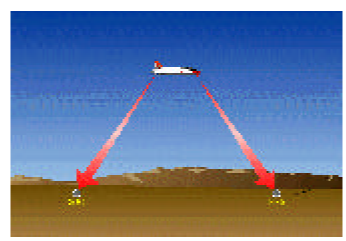
- Responsibilities of ATC facilities
- Clearances
- **TACAN/VOR characteristics**
- GPS/INS characteristics
- ILS characteristics

Sg 3, fr 3: *Operating Characteristics of TACAN and VOR*

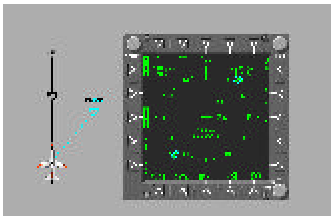
OPERATING CHARACTERISTICS OF TACAN AND VOR

	TACAN	VOR
Affected by weather	No	No
Emits 360 RDLS about station	Yes	Yes
Voice communication	None	Transmits voice
Limited by line of sight	Yes	Yes
Operates in	UHF 252 channels (X and Y)	VHF 108.0-177.95 MHz
Provides	Magnetic bearing Slant range	Magnetic bearing
Identified by 3-letter Morse code	Yes-Every 35 seconds	Yes-And/or recorded voice

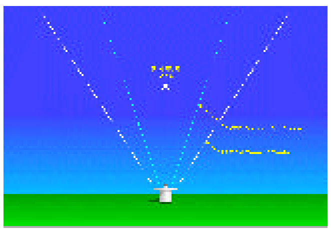
Sg 3, fr 4: *TACAN Channel Overlaps*



Sg 3, fr 5: *TACAN 40 Degree Lock-On Error*



Sg 3, fr 6: *VOR/TACAN Cones of Confusion*



Sg 3, fr 7: *Operating Characteristics of TACAN and VOR*

OPERATING CHARACTERISTICS OF TACAN AND VOR

[redacted]	TACAN	VOR
Affected by weather	No	No
Emits 360 RDLS about station	Yes	Yes
Voice communication	None	Transmits voice
Limited by line of sight	Yes	Yes
Operates in	UHF 252 channels (X and Y)	VHF 108.0-177.95 MHz
Provides	Magnetic bearing Slant range	Magnetic bearing
Identified by 3-letter Morse code	Yes-Every 35 seconds	Yes-And/or recorded voice

possible beyond (T), (L) and (H) reception ranges; however, interference from other stations on the same frequency may cause 40° off bearing lock-on.

e. Identified by aural three-letter Morse code repeating every 35 seconds

f. Neither transmits nor receives voice communications

g. Cone of confusion - A “cone of confusion,” where TACAN azimuth information is not available, exists over TACAN stations. The “cone” varies from 60°-110° wide

2. VOR

a. Unaffected by weather

b. 360 radials emitted from station

c. Provides magnetic radial

d. Operates in the VHF band (108.0-117.95 MHz)—59 available frequencies

e. Limitations

(1) Line of sight

(2) Standard service volume (SSV)

NOTE: SSV defines the reception limits of unrestricted NAVAIDs which are usable for random/unpublished route navigation.

f. Identified by three-letter aural Morse code identifier or recorded automatic voice alternating with Morse code identifier

g. There is a negligible “cone of confusion” over a VOR antenna

LESSON NOTES

If you feel it necessary to again show the graphic depicting VOR/TACAN Cones of Confusion, call up Seg 3/frame 6.

3. VOR/DME

NOTE: The acronym VORTAC describes a facility in which a VOR and a TACAN station are collocated. Operating characteristics are the same as VOR/ DME.

a. Same as VOR plus DME information

b. Both VOR frequency and TACAN channel must be tuned (T-45C)

D. GPS and INS theory and operating characteristics

1. GPS **2.1.12.1.1.1.1**

a. THEORY: GPS is a 24+ satellite-based navigation, positioning, and time transfer system. GPS satellites transmit identity, calibration, and time signals. Aircraft use passive receivers to process that satellite data. Triangulation and sensed aircraft flight path angles are used to compute aircraft position. Altitude can also be extrapolated using GPS signals

NOTE: The T-45C does not use GPS to generate cockpit altitude information. The T-45C GPS and INS are linked together in the Global Positioning System/Inertial Navigation Assembly (GINA).

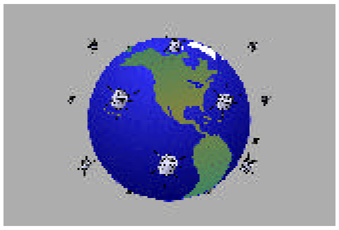
b. GPS Standard Position Service (SPS) has 100 meters horizontal positioning accuracy with a probability of 95%

***Sg 4, fr 5:** Introduction to INav Organization*

INTRODUCTION to INAV

* Responsibilities of ATC facilities
* Clearances
* TACAN/VOR characteristics
* **GPS/INS characteristics**
* ILS characteristics

***Sg 4, fr 6:** Global Positioning System (GPS)*

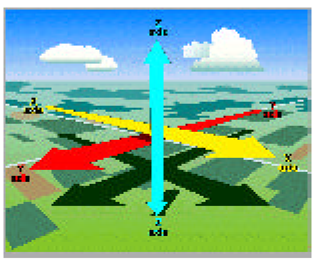


c. A minimum of three GPS satellites are required for lat/long positioning; four for lat/long/altitude computations

NOTE: T-45C requires four satellites for full system operability; does not compute GPS altitude.

d. CNO and FAA have not yet (time of this writing) approved the T-45C for RNav. CNO only allows (time of this writing) GPS to support visual navigation

Sg 4, fr 7: *Inertial Navigation System (INS)*



2. INS **2.1.10.1.1.1.2**

a. THEORY: An inertial navigation system determines aircraft position by sensing three-dimensional acceleration vectors, whenever the aircraft moves. Initial alignment establishes a "level" platform. Initial geographic (lat/long) position information must be supplied to the INS if it is to be used for navigation. The T-45C uses currently sensed GPS position or waypoint zero (WYPT-0) for that initial position alignment

Acceleration vectors are derived from two sources: ring laser gyroscopes, and three axis (xyz) accelerometer readings

NOTE: The T-45C GPS and INS are linked together in the Global Positioning System/ Inertiat Navigation Assembly (GINA).

b. The T-45C INS uses GPS present position latitude and longitude, when performing initial position alignment

E. Instrument Landing System (ILS) function and equipment

NOTE: The ILS approach system is made up of three functional components: guidance systems, range systems, and the visual systems. This lesson discusses each of the systems in detail.

1. ILS characteristics **2.9.4.6.5**

   a. ILS provides cockpit indications for final approach course and glidepath

   b. ILS (with glideslope) is categorized as a precision approach system

2. Guidance Systems—the guidance system of the ILS is made up of two parts, the localizer transmitter (azimuth information) and the glideslope transmitter (glidepath information)

   a. Localizer: azimuth beacon transmitter **2.9.4.6.5.1**

      (1) Provides precise horizontal (course) guidance information to the runway centerline by way of a navigational beacon to localizer-equipped aircraft within the sensing area of the localizer beacon signal

      (2) Beam is produced by two overlapping modulated frequencies

      (3) Signal acquisition and off-course indications are 10 degrees either side of the course along a radius of 18 nm from the antenna and 35 degrees either side of the course along a radius of 10 nm from the antenna

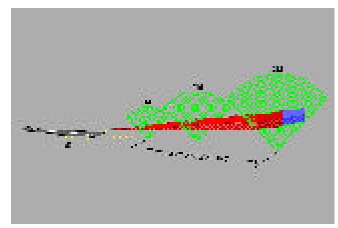
Sg 5, fr 8: *Introduction to INav Organization*

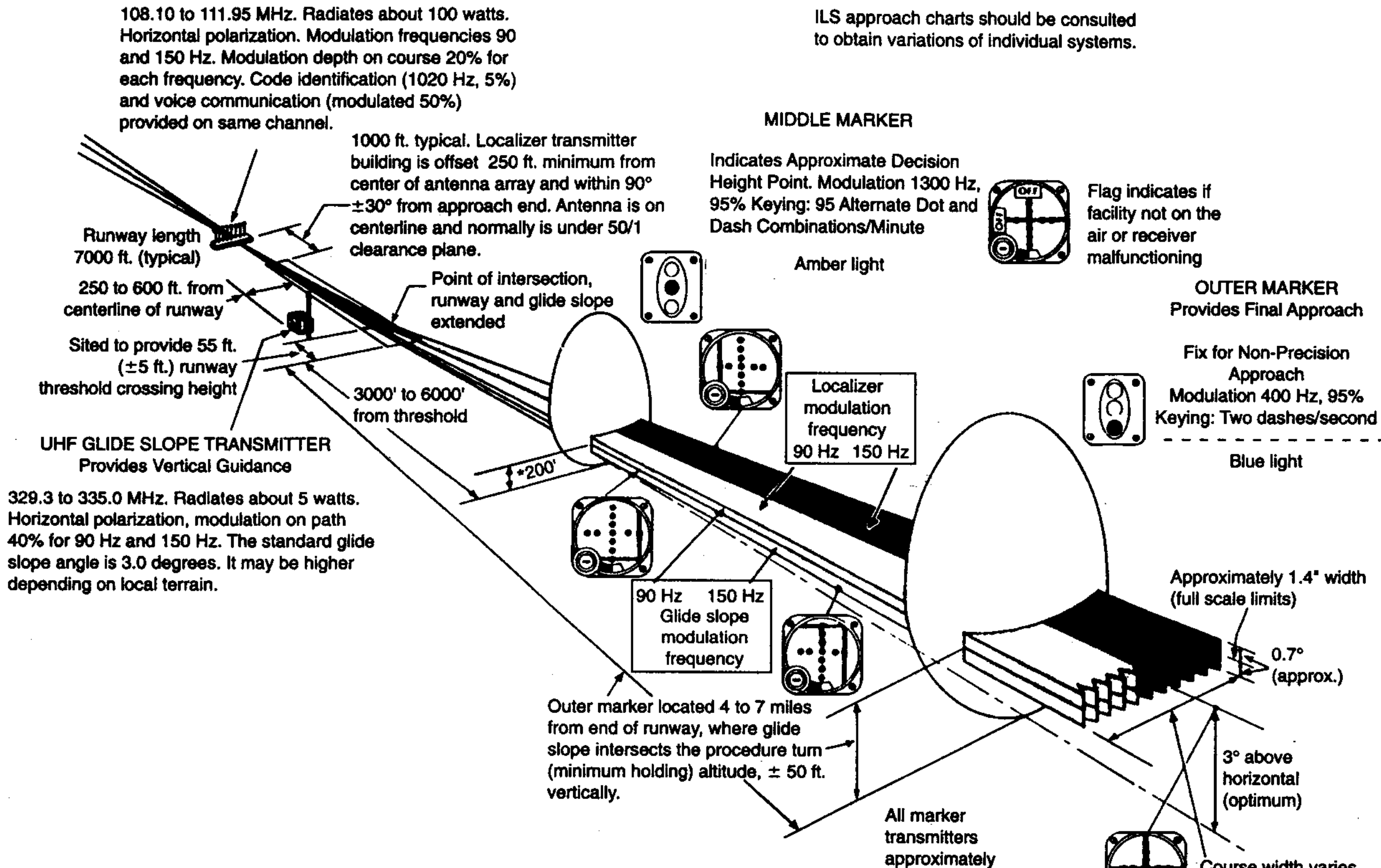
INTRODUCTION to INAV

* Responsibilities of ATC facilities
* Clearances
* TACAN/VOR characteristics
* GPS/INS characteristics
* **ILS characteristics**

Fig 2: *FAA Instrument Landing System (ILS)*

Sg 5, fr 9: *Basic ILS Layout*





RATE OF DESCENT CHART
(feet per minute)

Speed (knots)	Angle		
	2 1/2°	2 3/4°	3°
90	400	440	475
110	485	535	585
130	575	630	690
150	665	730	795
160	707	778	849

NOTE:
Compass locators, rated at 25 watts output 190 to 535 kHz, are installed at many outer and some middle markers. A 400 Hz or a 1020 Hz tone, modulating the carrier about 95%, is keyed with the first two letters of the ILS identification on the outer locator and the last two letters on the middle locator. At some locations, simultaneous voice transmissions from the control tower are provided, with appropriate reduction in identification percentage.

* Figures marked with asterisk are typical. Actual figures vary with deviations in distances to markers, glide angles and localizer widths.

Figure 2: FAA INSTRUMENT LANDING SYSTEM (ILS)

b. Glideslope: glideslope beam transmitter **2.9.4.6.5.2**

(1) The glideslope (highly directional shielded antenna) signal is radiated in the direction of the localizer front course

(2) The glideslope transmitter operates on one of 40 dedicated ILS channels

CAUTION: Pilots should be aware that vehicular traffic not subject to ATC may cause momentary deviation in ILS course or glideslope signals. Also, critical areas around the ILS equipment shielded antennas are not protected at uncontrolled airports or at airports with an operating control tower when weather or visibility conditions are above those requiring protective measures.

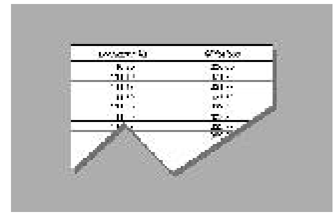
(3) Range (position) systems **2.9.4.6.5.3**

(a) The following systems are commonly used to identify range (position) when flying an ILS/LOC approach

* Marker beacons
* Distance Measuring Equipment (DME)
* Cross-radial
* Compass locator

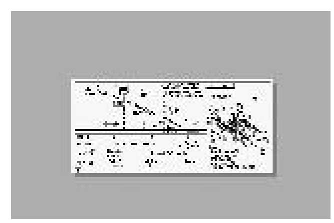
(b) The position of the aircraft on ILS/LOC approaches is very important due to the precise nature of the approach, lower minimums, and obstacle clearances associated with them. The pilot relies on this information to execute specific portions of the approach and for position in relation to the glidepath

Sg 5, fr 10: *ILS Frequencies*



Sg 5, fr 11: *High ILS Approach Plate (Plan View)*

Sg 5, fr 11a: *High ILS Approach Plate (Profile View)*



Sg 5, fr 12: *Introduction to INav Review Menu*

Sg 7, fr 1: Lesson Organization

INAV REVIEW

* Overview of Test
* Introduction to INav
* **Departure and Terminal Procedures**
* Interpretation of High Altitude Instrument Approach Plates
* Flight Planning (Departure and En route)

Sg 7, fr 2: Departure and Terminal Procedures Organization

DEPARTURE AND TERMINAL PROCEDURES

* **Fuel requirements for filing DD-175**
* Departure point minimums for takeoff
* Types of IFR departures
* Standard instrument departure (SID)
* Approaches
* Closing flight plan
* Log book entries

Sg 7, fr 3
***Fig 3:** DD-175 Fuel Plan—Alternate Required*

Sg 7, fr 4
***Fig 4:** DD-175 Fuel Plan—Alternate Not Required*

III. Departure and Terminal Procedures

A. Fuel requirements for filing DD-175 **1.1.1.8.2**

1. Alternate required

a. Route: fly to destination initial approach fix (IAF) and then to alternate IAF (i.e., plan from destination IAF to alternate IAF at filed cruising altitude)

b. Fuel for <u>one</u> approach, start, taxi and takeoff

c. Fuel reserve: 10% of planned requirements or 20 minutes of flight computed at 10,000 ft MSL maximum endurance operation (whichever is greater)

2. Alternate not required

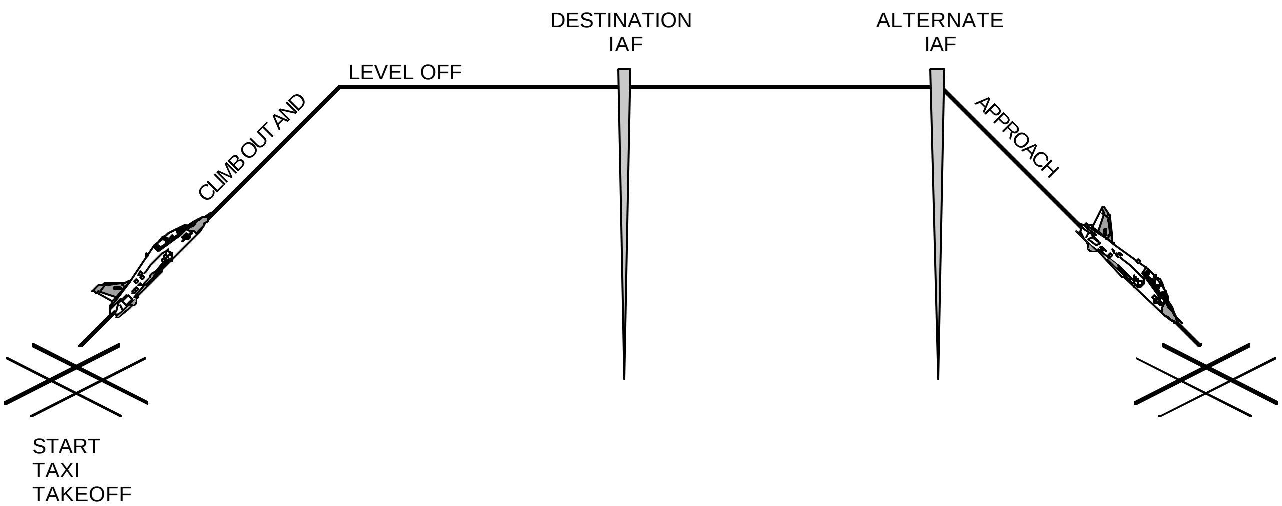
1. Route: fly to destination IAF, plus fuel for one approach

2. Fuel reserve: 10% of planned requirements or 20 minutes of flight computed at 10,000 ft MSL maximum endurance operation (whichever is greater)

PROGRESS CHECK

Question 5—1.1.1.8.2
In all cases, what are the minimum reserve fuel requirements?

ANSWER: 10% of planned requirements or 20 minutes of flight computed at 10,000 ft MSL based on maximum endurance operation, whichever is greater.

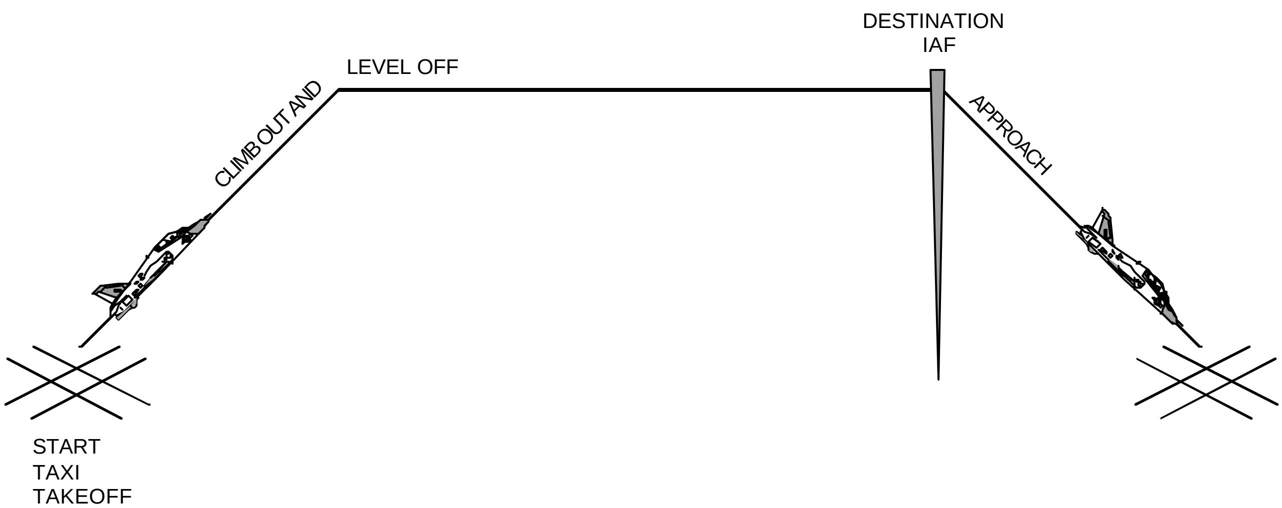


FUEL PLAN

1.	CLIMB/ROUTE DEST IAF	1500	6.	START/TAXI	200
2.	ROUTE ALT IAF (If required)	500	7.	TOTAL REQUIRED (4,5,&6)	2750
3.	APPROACHES	250	8.	TOTAL ABOARD (JP-8)	2938
4.	TOTAL (1,2,&3)	2250			
5.	RES 10% of 4 (Min 20 mins)	300	9.	SPARE FUEL (8-7)	188

EMERGENCY "BINGO" TO ALTERNATE

Figure 3: DD-175 FUEL PLAN—ALTERNATE REQUIRED



FUEL PLAN

1.	CLIMB/ROUTE DEST IAF	1500	6.	START/TAXI	200
2.	ROUTE ALT IAF (If required)		7.	TOTAL REQUIRED (4,5,&6)	2250
3.	APPROACHES	250	8.	TOTAL ABOARD	2938
4.	TOTAL (1,2,&3)	1750	9.	SPARE FUEL (8-7)	688
5.	RES 10% of 4 (Min 20 mins)	300			

EMERGENCY "BINGO" TO ALTERNATE

Figure 4: DD-175 FUEL PLAN—ALTERNATE NOT REQUIRED

B. Departure point weather minimums for takeoff depend on the instrument rating of the pilot-in-command **2.5.12.2**

1. Special instrument rating—no takeoff ceiling or visibility limits apply

2. Standard instrument rating—ceiling 300 ft, visibility 1 sm

3. Formations—weather must be equal to, or above, published circling minimums for runway in use (if circling approach not authorized for runway in use, formation takeoff minimums revert to basic VFR of 1,000/3)

Sg 8, fr 2: *Departure and Terminal Procedures Organization*

DEPARTURE AND TERMINAL PROCEDURES

* Fuel requirements for filing DD-175
* **Departure point minimums for takeoff**
* Types of IFR departures
* Standard instrument departure (SID)
* Approaches
* Closing flight plan
* Log book entries

Sg 8, fr 3
Fig 5: *Instrument Ratings*

PROGRESS CHECK

Question 6—2.5.12.2
When is takeoff permitted with a ceiling of less than 300 ft and visibility of less than 1 sm for a standard instrument-rated pilot?

ANSWER: When a precision approach is available to the runway in use with minimums of not less than 200-1/2.

C. Types of IFR Departures **2.6.6.1**

1. There are three basic types of IFR departures from military airports:

   a. Standard instrument departure (SID)

   b. Radar departure

   c. VFR climb on course

2. Standard Instrument Departure (SID)—enter the name of the coded identifier of the SID as the first entry in the route of flight section of the DD-175

Sg 9, fr 2: *Departure and Terminal Procedures Organization*

DEPARTURE AND TERMINAL PROCEDURES

* Fuel requirements for filing DD-175
* Departure point minimums for takeoff
* **Types of IFR departures**
* Standard instrument departure (SID)
* Approaches
* Closing flight plan
* Log book entries

Sg 9, fr 3
Fig 6: *DD-175 Standard Instrument Departure (SID)*

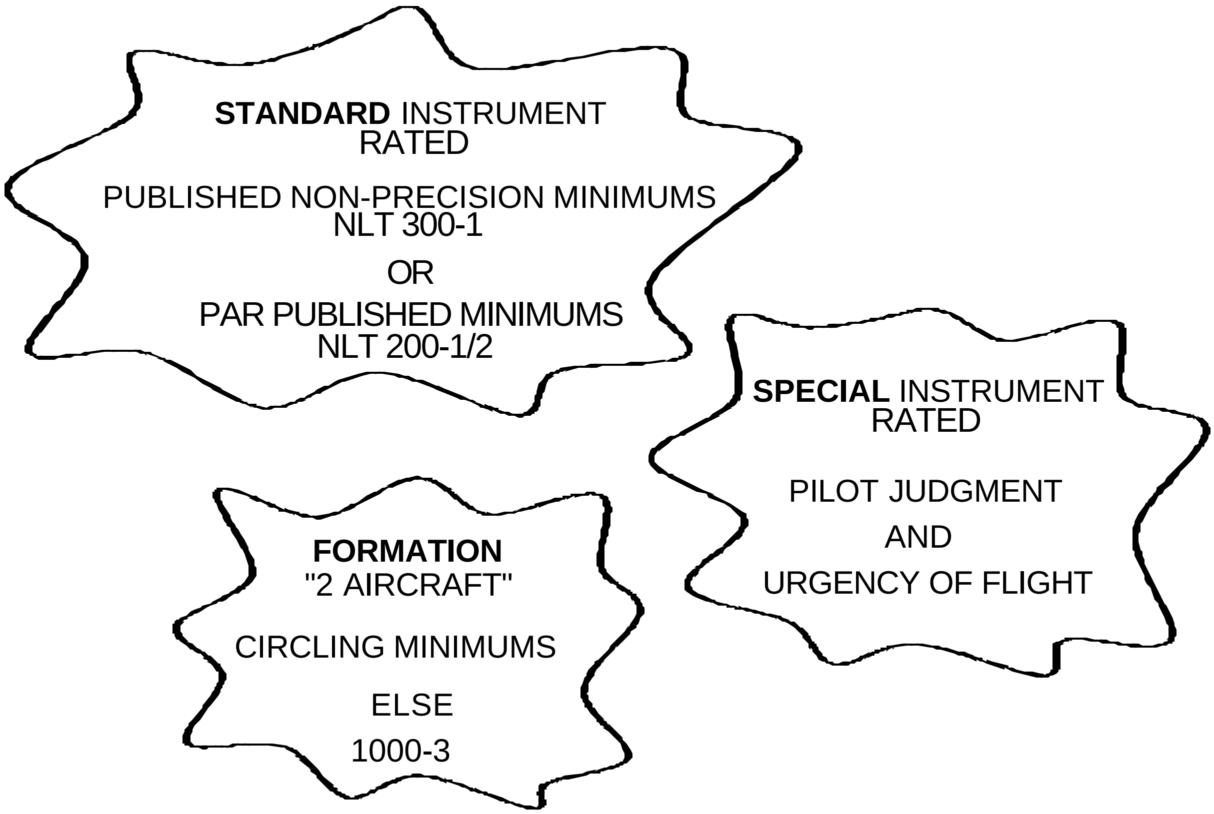


Figure 5: INSTRUMENT RATINGS

STANDARD INSTRUMENT DEPARTURE (SID)

ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	WAGES 3 • AVE		

Figure 6: DD-175 STANDARD INSTRUMENT DEPARTURE (SID)

3. Radar Departure—this type of departure is used where there is no published SID, or pilot desires to proceed directly to first point on route of flight

4. VFR Climb on Course—enter the NAVAID or intersection which will establish you on your route as the first entry in the "ROUTE-OF-FLIGHT" section

D. Standard Instrument Departure (SID) **2.6.6.4**

1. This information is located in the DoD FLIP (Terminal) Instrument Approach Procedure booklet

2. Use is not mandatory by OPNAV, but use is encouraged

3. Use can be made mandatory by a local airport, but a pilot can reject SID if safety of flight dictates

4. Pilot responsibility is to ensure all climb and crossing restrictions can be met

5. Expedites traffic from high density airport environment into en route structure with less impact on controllers

6. Provides terrain clearance for aircraft operating in instrument conditions when aircraft climbs above the minimum vectoring altitude for that airport

LESSON NOTES

Be sure your students are aware of the differences between pilot nav and vector SIDs.

7. Types

a. Pilot nav departure plate describes aircraft's vertical and horizontal flight path

Sg 9, fr 4
Fig 7: *DD-175 Radar Departure*

Sg 9, fr 5
Fig 8: *DD-175 VFR Climb On Course*

Sg 10, fr 2: *Departure and Terminal Procedures Organization*

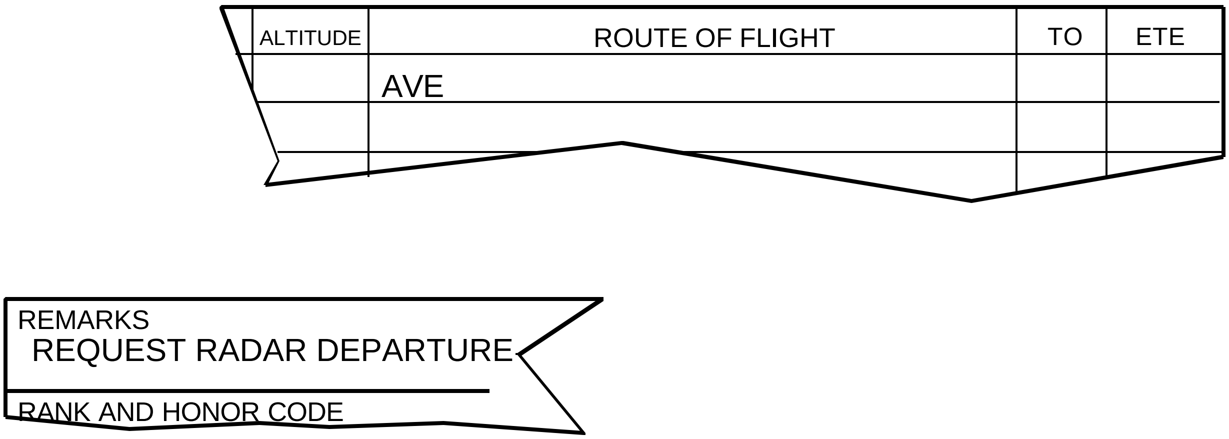
DEPARTURE AND TERMINAL PROCEDURES

* Fuel requirements for filing DD-175
* Departure point minimums for takeoff
* Types of IFR departures
* **Standard instrument departure (SID)**
* Approaches
* Closing flight plan
* Log book entries

Sg 10, fr 3
Fig 9: *Dallas-Love Field (HI) (Pilot Nav)*

Sg 10, fr 4: *Dallas-Love Field (HI) (Pilot Nav) Lower Half*
Fig 9: *Dallas-Love Field (HI) (Pilot Nav)*

RADAR DEPARTURE:

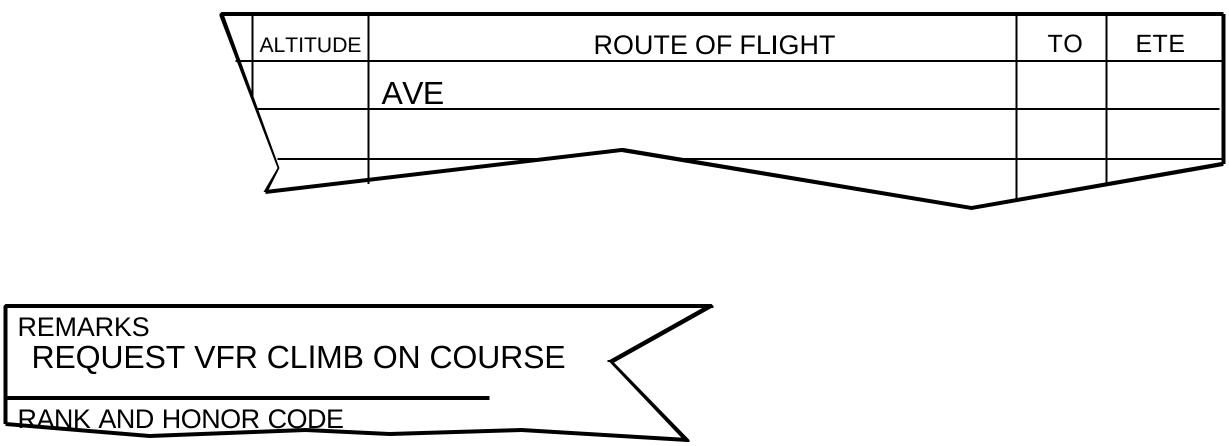


ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	AVE		

REMARKS
REQUEST RADAR DEPARTURE
RANK AND HONOR CODE

Figure 7: DD-175 RADAR DEPARTURE

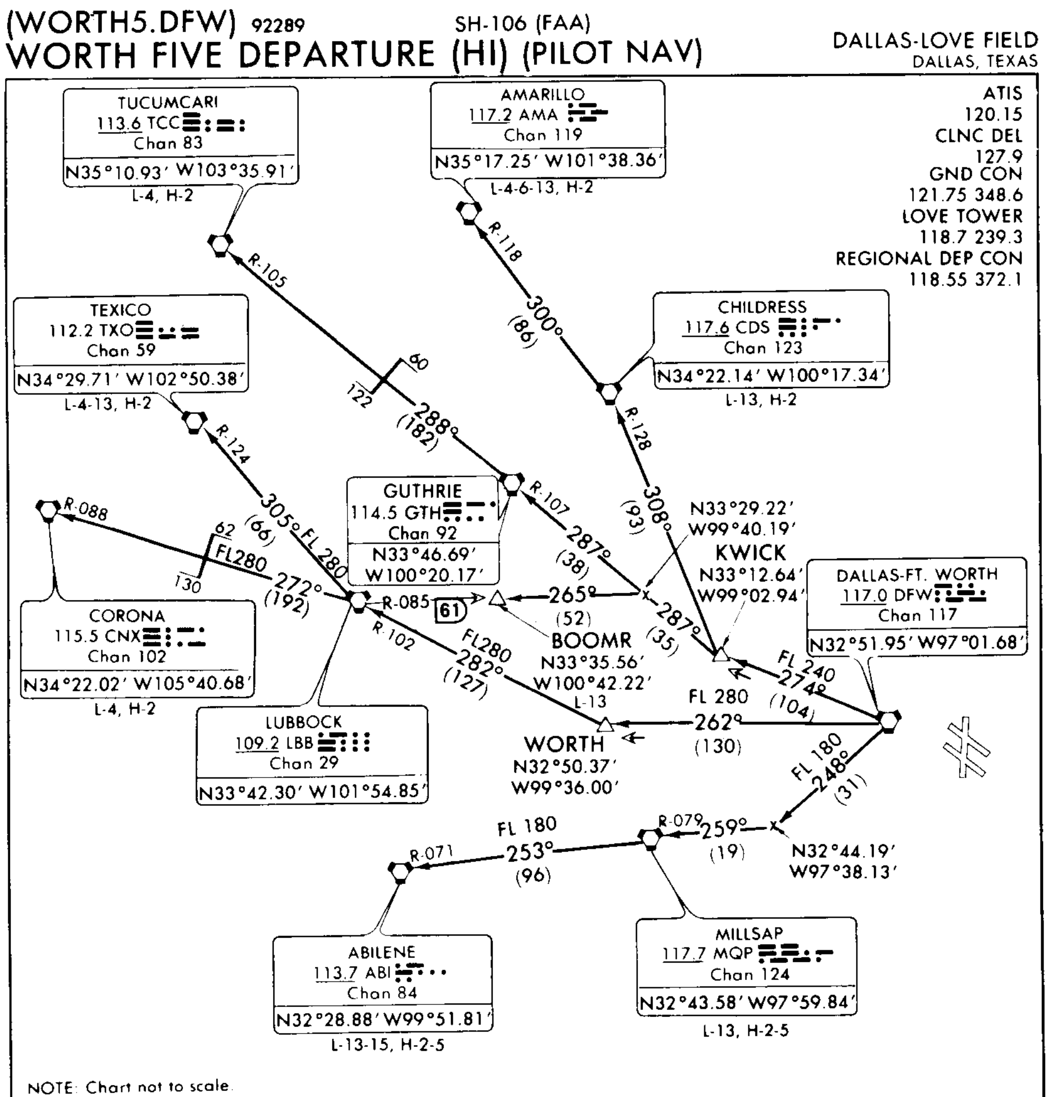
VFR CLIMB ON COURSE:



ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	AVE		

REMARKS
REQUEST VFR CLIMB ON COURSE
RANK AND HONOR CODE

Figure 8: DD-175 VFR CLIMB ON COURSE



DEPARTURE ROUTE DESCRIPTION

Fly assigned heading and altitude for vector to appropriate route. Expect filed altitude 10 minutes after departure.

ABILENE TRANSITION (WORTH5.ABI): From over DFW VORTAC via DFW R-248 and MQP R-079 to MQP VORTAC, then via MQP R-253 and ABI R-071 to ABI VORTAC.

AMARILLO TRANSITION (WORTH5.AMA): From over DFW VORTAC via DFW R-274 and CDS R-128 to CDS VORTAC, then CDS R-300 and AMA R-118 to AMA VORTAC.

BOOMR TRANSITION (WORTH5.BOOMR): From over DFW VORTAC via DFW R-274, GTH R-107 and LBB R-085 to BOOMR INT.

(Continued on next page)

WORTH FIVE DEPARTURE (HI) (PILOT NAV) DALLAS, TEXAS
(WORTH5.DFW) DALLAS-LOVE FIELD
65

Figure 9: DALLAS-LOVE FIELD (HI) (PILOT NAV)

Sg 10, fr 5
Fig 10: *Dallas-Love Field (HI) (Vector)*

Sg 10, fr 6: *Dallas-Love Field (HI) (Vector) Lower Half*
Fig 10: *Dallas-Love Field (HI) (Vector)*

b. Vector provides navigational guidance by ground radar to filed/assigned route or fix

8. Changes to clearance **2.7.6.1.2**

   a. Amendments to initial clearance will be issued any time ATC deems such action necessary to avoid possible conflict between aircraft

   b. Cancellation departure control must indicate portion of SID routing that still applies and must restate altitude restrictions

9. STAR **2.9.4.1.2.3**—a STAR is a preplanned instrument flight rule (IFR) air traffic control arrival procedure published for pilot use in graphical and/or textual form. STARs provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area. Its purpose is to simplify clearance delivery procedures

Sg 11, fr 2: *Departure and Terminal Procedures Organization*

DEPARTURE AND TERMINAL PROCEDURES

* Fuel requirements for filing DD-175
* Departure point minimums for takeoff
* Types of IFR departures
* Standard instrument departure (SID)
* **Approaches**
* Closing flight plan
* Log book entries

E. Approaches

1. Published approaches

   a. Criteria determining type of approach **2.9.4.1.1**

? **What are some factors that affect your choice of an approach?**

ANSWER: Answers follow

(1) Duty runway

(2) Weather

(3) Navigational equipment on aircraft

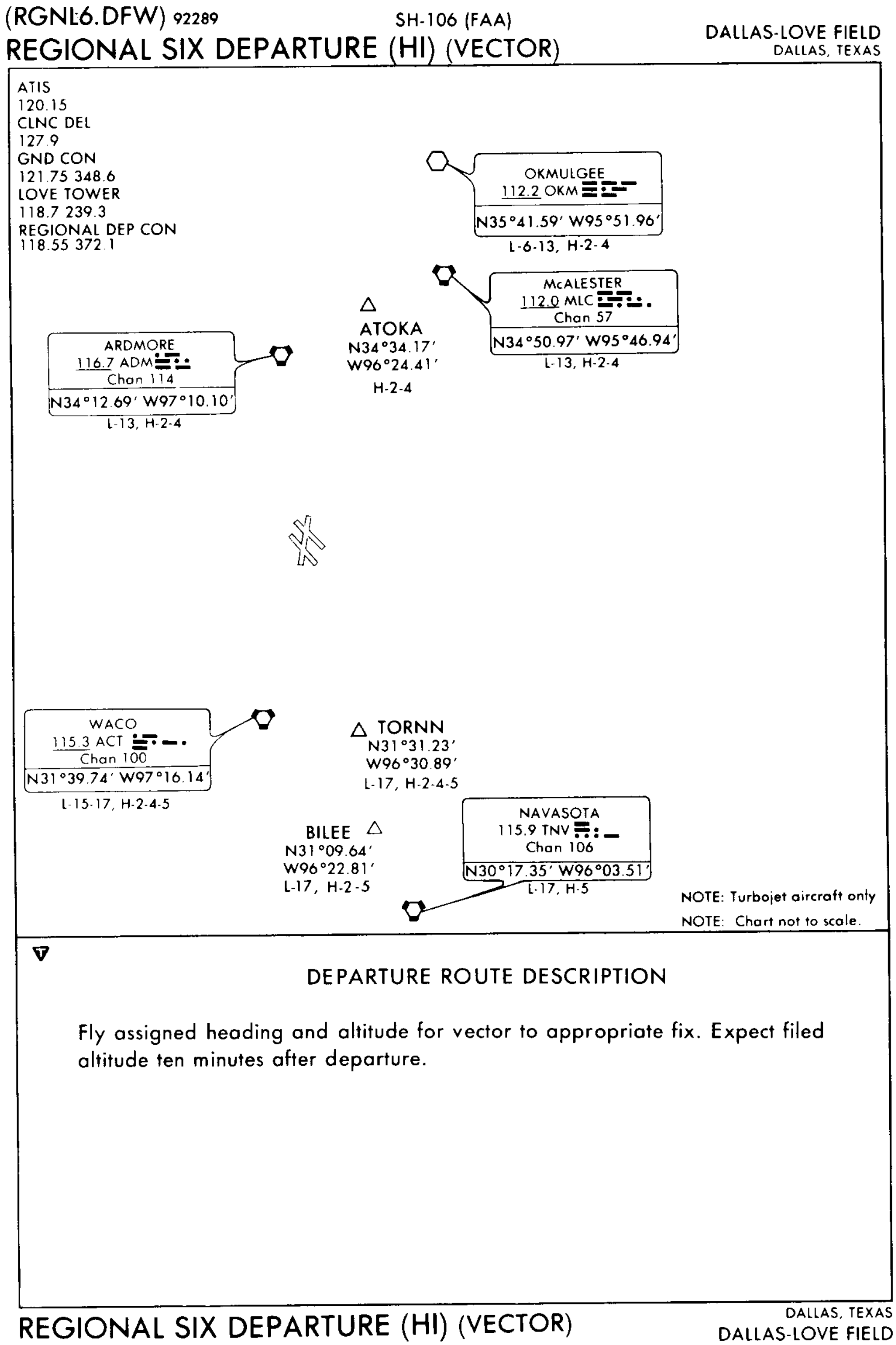


Figure 10: DALLAS-LOVE FIELD (HI) (VECTOR)

(4) Type of approaches available at destination

(5) Minimums for approach

b. Minimums for approach

(1) Single-piloted aircraft—published minimums for the type of approach, but not less than 200-ft ceiling and not less than 1/2-mile visibility, or 2,400 ft RVR if available

(2) Formations—restricted to two aircraft in instrument conditions and the reported weather must be at least published circling minimums to commence the approach. If a circling approach is not authorized for the runway in use, basic VFR minimums of 1,000 ft and 3 sm apply for an approach

c. Approach clearances **2.9.4.2.3**

(1) “Cleared for approach”

(2) “Cleared for TACAN approach”

(3) “Cleared for straight-in TACAN approach”

(4) “Cleared for Hi-TACAN runway 24 approach”

(5) “Cleared for Hi-TACAN runway 24 approach, circle to land Runway 6”

(6) “Cleared for ILS runway 7 left approach, side-step to runway 7 right”

2. En route descent **2.9.4.1.2—**a descent from an en route altitude to the final approach of an established procedure without execution of the entire instrument approach procedure prescribed in the FLIP (Terminal) publications

3. SFA—UHF single frequency approach **2.9.4.2.3—** provided to single-piloted jet aircraft on an IFR flight plan during the hours of darkness or when the aircraft is in instrument weather conditions

Sg 11, fr 3
Fig 11: *Single Frequency Approach (SFA-UHF)*

PROGRESS CHECK

Question 7 - 2.9.4.1.1
What are the absolute minimums for a single-piloted aircraft executing a precision approach?

ANSWER: 200-ft ceiling and 1/2-sm visibility

4. Approach modifications

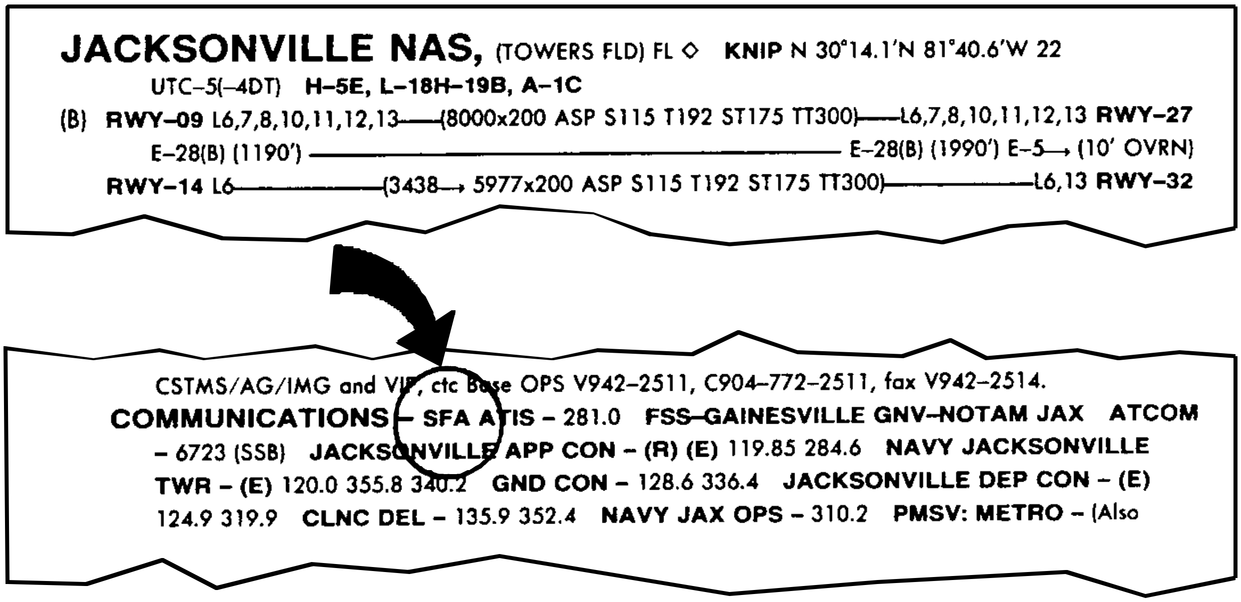
   a. Visual approach **1.9.1.3.1.1**—an approach conducted on an instrument flight rules (IFR) flight plan which authorizes the pilot to proceed visually and clear of clouds to the airport

   b. Contact approach **1.9.1.3.1.2**—an approach wherein an aircraft on an IFR flight plan, having an air traffic authorization, operating clear of douds with at least one statute mile flight visibility and a reasonable expectation of continuing to the destination airport in those conditions, may deviate from the instrument approach procedure and proceed to the destination airport by visual reference to the surface

   c. Circling approach **2.9.5.4.1**—use the circling minimums on the approach procedure, or path-over-the-ground, for which you were cleared

Sg 11, fr 4, pg 1
Fig 12: *Circling Approach*

Fig 13: *Circling Approaches*


JACKSONVILLE NAS, (TOWERS FLD) FL ◇ KNIP N 30°14.1′N 81°40.6′W 22
UTC–5(–4DT) H–5E, L–18H–19B, A–1C
(B) RWY–09 L6,7,8,10,11,12,13—(8000x200 ASP S115 T192 ST175 TT300)—L6,7,8,10,11,12,13 RWY–27
E–28(B) (1190′) — E–28(B) (1990′) E–5→ (10′ OVRN)
RWY–14 L6—(3438→ 5977x200 ASP S115 T192 ST175 TT300)—L6,13 RWY–32

CSTMS/AG/IMG and VIP, ctc Base OPS V942–2511, C904–772–2511, fax V942–2514.
COMMUNICATIONS – SFA ATIS – 281.0 FSS–GAINESVILLE GNV–NOTAM JAX ATCOM – 6723 (SSB) JACKSONVILLE APP CON – (R) (E) 119.85 284.6 NAVY JACKSONVILLE TWR – (E) 120.0 355.8 340.2 GND CON – 128.6 336.4 JACKSONVILLE DEP CON – (E) 124.9 319.9 CLNC DEL – 135.9 352.4 NAVY JAX OPS – 310.2 PMSV: METRO – (Also

Figure 11: SINGLE FREQUENCY APPROACH (SFA-UHF)

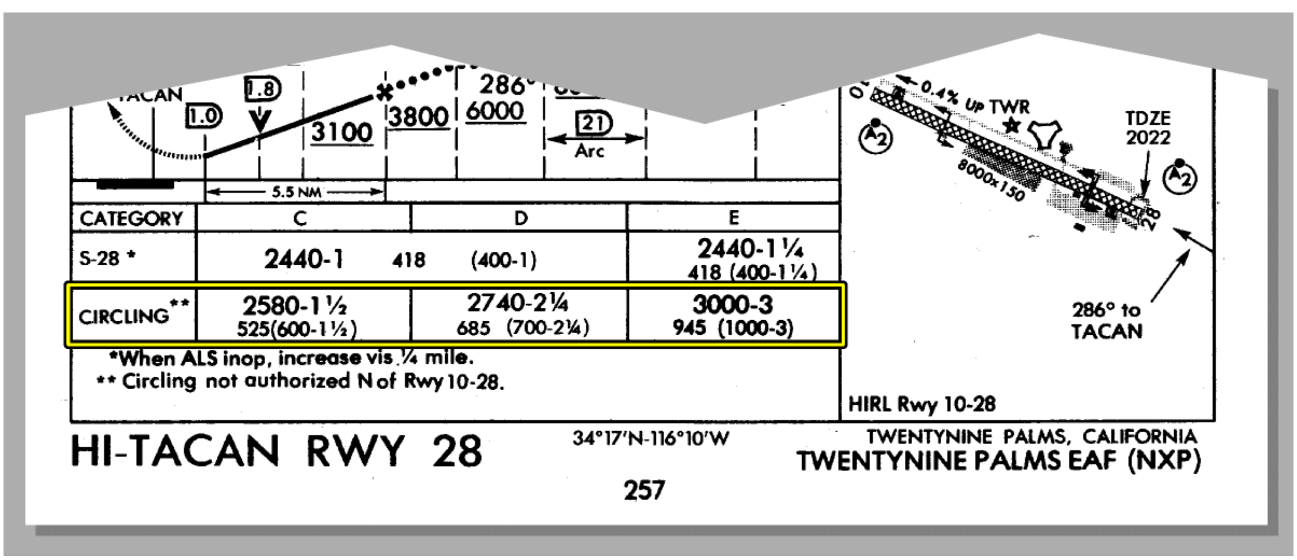


Figure 12: CIRCLING APPROACH

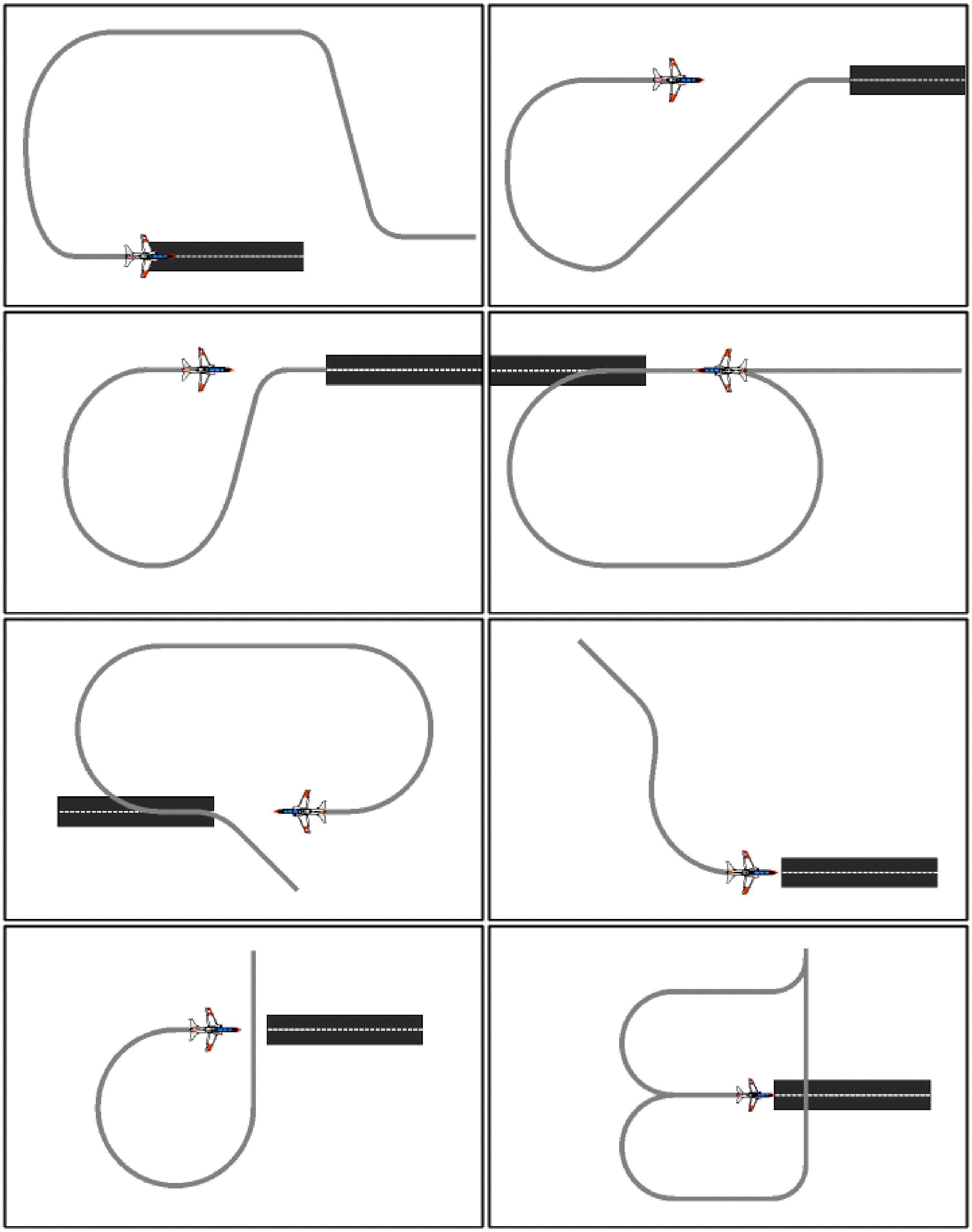


Figure 13: CIRCLING APPROACHES

Sg 11, fr 7
Fig 14: *Minimum Vectoring Altitude*

d. Minimum vectoring altitude **2.9.4.5.2.4**—the lowest MSL altitude at which an IFR aircraft will be vectored by a radar controller, except as otherwise authorized for RADAR approaches, departures and missed approaches

e. NORDO missed approach to alternate **2.9.4.9.2**

(1) If marginal weather conditions exist at destination (and possibly low on fuel after a long flight), file a flight plan or DRAFT with the controller in case of missed approach prior to commencing the approach

(2) In case of lost communications during the approach and subsequently you take a missed approach due to weather conditions

(a) Squawk 7600

(b) Follow the published missed approach instructions to ensure adequate obstructions clearance

(c) Proceed to alternate IAF as filed and commence an approach

CAUTION: A filed flight plan, or DRAFT, before commencing an approach at destination constitutes a ROUTE clearance in event of NORDO; however, it does not constitute an altitude clearance since you have not received an ATC clearance.

(3) Altitude to alternate

(a) The <u>expected</u> altitude if given one after filing a DRAFT; otherwise,

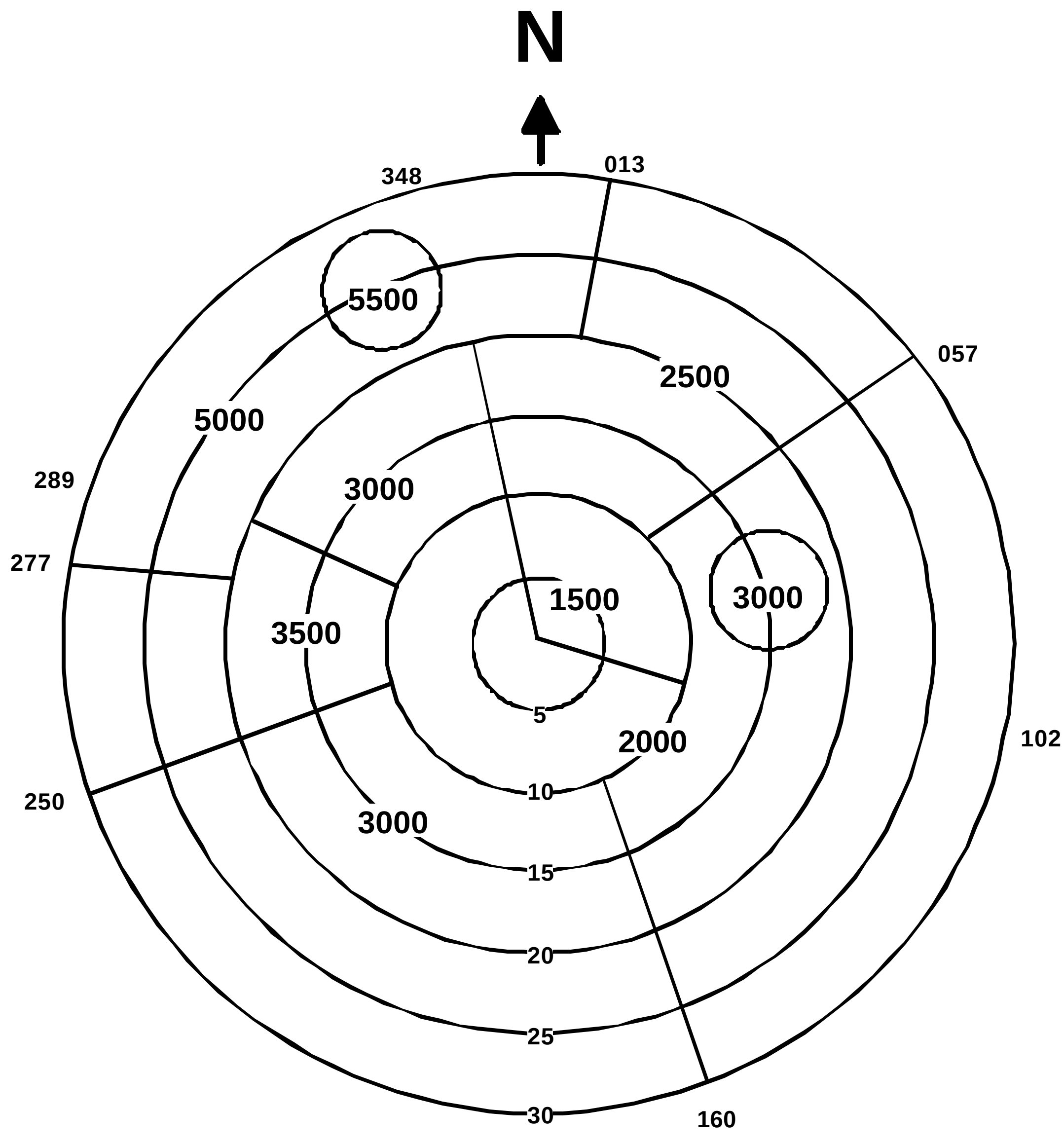


Figure 14: MINIMUM VECTORING ALTITUDE

(b) The highest of the two EMERGENCY SAFE ALTITUDES depicted on the destination and alternate approach procedure charts if fields are within 200 nm of each other or,

(c) At flight level equivalent to 18,000 ft MSL

Sg 11, fr 8
Fig 15: *Visual Descent Point*

f. Visual descent point—the visual descent point (VDP) is a defined point on the final approach course for a nonprecision straight-in approach procedure from which a normal descent from the MDA to the runway touchdown point may be commenced, provided reference to the runway has been obtained

g. Landing criteria from an IFR approach **2.9.4.5.1.2**—landing minimums and criteria for continuing an instrument approach below the DH/DA or MDA are different for the civil and military pilot. Criteria for operating below the DH/DA or MDA for civilian pilots is clearly stated in FAR 91.175(c)(3), landing criteria for Navy pilots is stated in OPNAV 3710.7 para 5.3.3.4, but it is not stated as definitively. Criteria for the Navy pilot continuing an approach to a landing is stated as:

> "Pilots shall not descend below the prescribed MDA or continue an approach below the DH/DA unless they have the runway environment in sight, and, in their judgement, a safe landing can be executed, either straight-in or from a circling approach, whichever is specified in their clearance"

Sg 12, fr 2: *Departure and Terminal Procedures Organization*

DEPARTURE AND TERMINAL PROCEDURES

* Fuel requirements for filing DD-175
* Departure point minimums for takeoff
* Types of IFR departures
* Standard instrument departure (SID)
* Approaches
* **Closing flight plan**
* Log book entries

F. Closing flight plan **2.9.6.1**—it is the responsibility of the pilot-in-command/formation leader to ensure that the proper agency is notified of flight termination

1. Canceling an IFR flight plan in flight does not close out your military flight plan

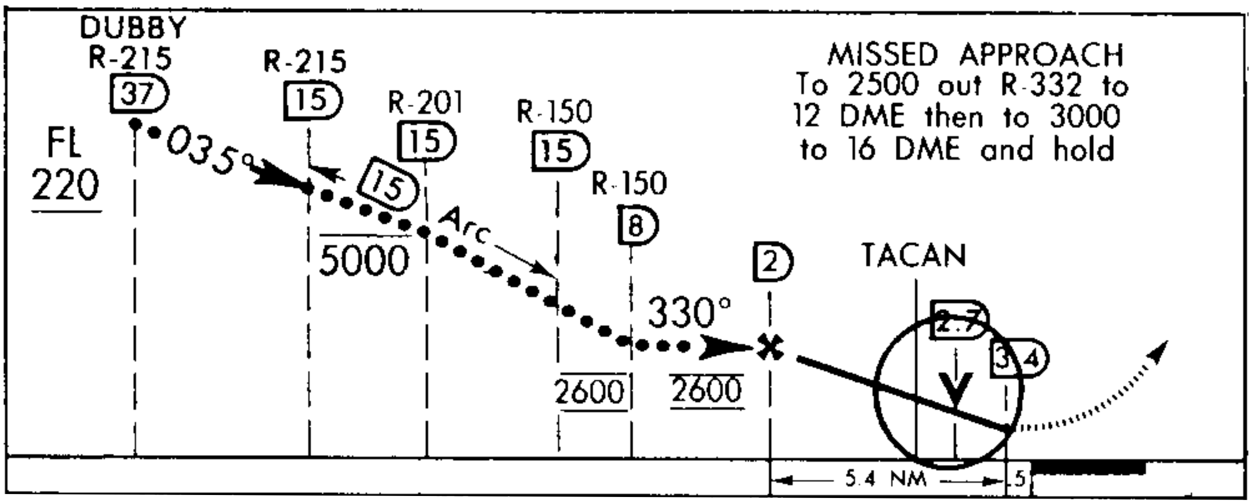


Figure 15: VISUAL DESCENT POINT

Sg 13, fr 2: Departure and Terminal Procedures Organization

DEPARTURE AND TERMINAL PROCEDURES

* Fuel requirements for filing DD-175
* Departure point minimums for takeoff
* Types of IFR departures
* Standard instrument departure (SID)
* Approaches
* Closing flight plan
* **Log book entries**

2. For safety and accountability of its aircraft, the Navy requires verbal closing of flight plans on the ground through Ground Control, Control Tower, or Base Operations

3. At nonmilitary installations, the pilot shall close the flight plan with flight service through any means available

4. “Closing” your flight plan will ensure a proper arrival report will be sent to ATC and your aircraft will be accounted for

G. Log book entries

1. Log only the approach executed to a missed approach or landing

2. If actual instrument conditions are encountered at less than 1,000 ft AGL, you would log an ACTUAL approach

3. In a student-instructor relationship and in actual instrument conditions, both the student and instructor will log the ACTUAL approach

4. If the airport is operating under VMC, you would log a SIMULATED approach

5. In a formation approach, only the formation leader will log the approach

6. Only the pilot physically controlling the aircraft will log a landing

7. In actual instrument conditions, both pilots in an aircraft will log ACTUAL instrument time

8. Only the pilot physically controlling the aircraft will log SIMULATED instrument time

9. If a student is under the instrument “hood” and actual instrument conditions exist outside the aircraft, the student will log ACTUAL instrument time

PROGRESS CHECK

Question 8—1.9.1.3.1.1
What are the criteria for a visual approach?

ANSWER: 1,000-ft ceiling visibility of 3 sm, with the field and/ or preceding aircraft in sight

Question 9—1.9.1.3.1.2
What are the criteria for a contact approach?

ANSWER: Operating clear of the clouds with at least 1-sm visibility at the pilot's request

Sg 14, fr 2: Departure and Terminal Procedures Review Menu

IV. Interpretation of High/Altitude Instrument Approach Plates

A. Features common to high altitude instrument approach plates **2.1.8.3.1.1**

1. Planview and profile symbols and elements

a. Overhead and cross-sectional view of approach path

(1) Penetration track

(2) Procedure track

(3) Missed approach route

Sg 15, fr 1: Lesson Organization

INAV REVIEW

* Overview of Test
* Introduction to INav
* Departure and Terminal Procedures
* **Interpretation of High Altitude Instrument Approach Plates**
* Flight Planning (Departure and En route)

Sg 16, fr 1: Interpretation of High Altitude Instrument Approach Plates Organization

INTERPRETATION OF HIGH ALTITUDE INSTRUMENT APPROACH PLATES

* **Features common to high altitude instrument approach plates**
* Elements specific to types of high altitude approaches

Fig 16: Basic Penetration Pattern

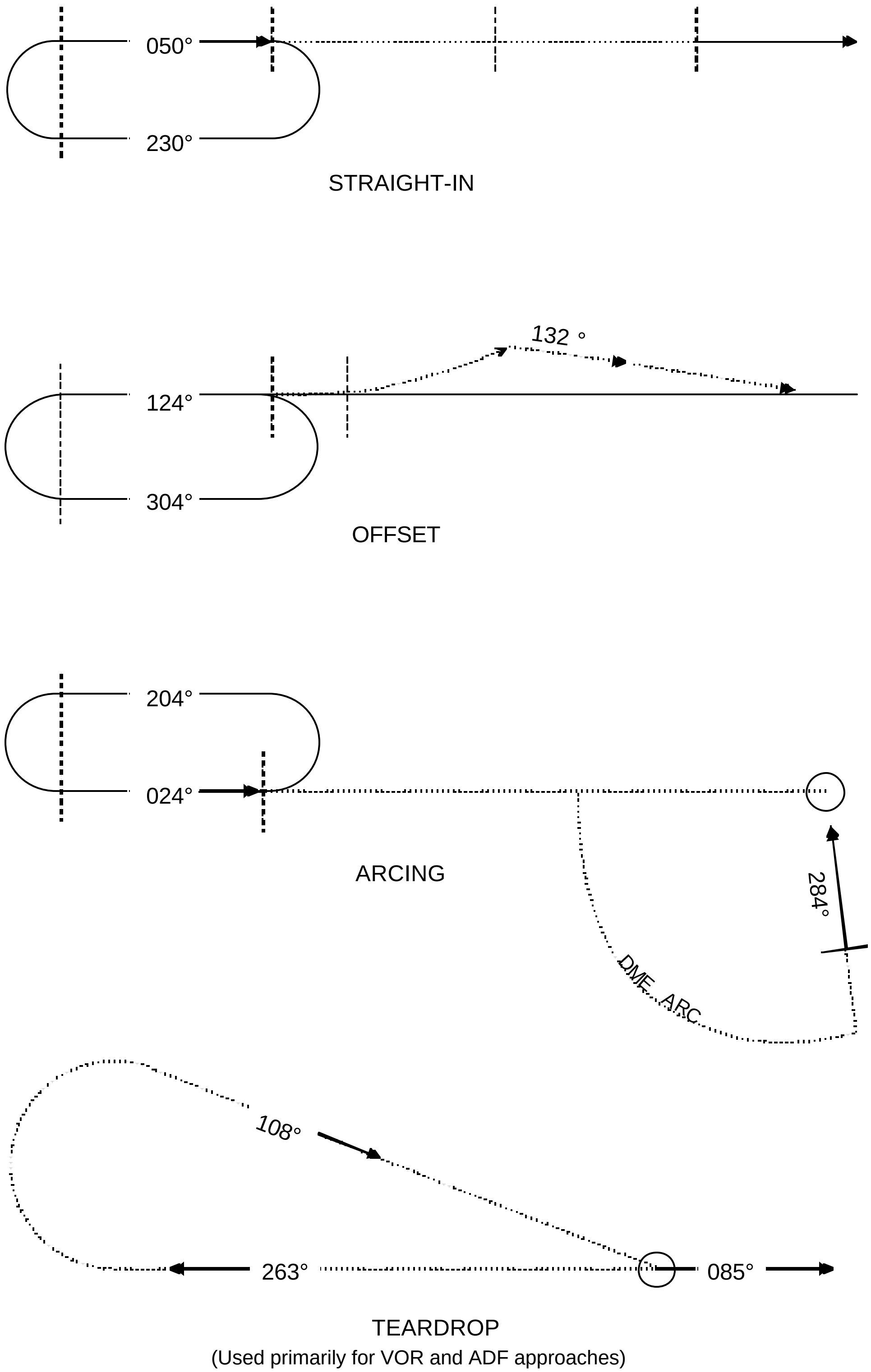


Figure 16: BASIC PENETRATION PATTERN

b. Altitude restrictions

NOTE: Altitude restrictions are depicted prior to the specified fix in the direction of flight in the profile view.

(1) Mandatory altitude

(2) Minimum altitude

(3) Maximum altitude

(4) Recommended altitude

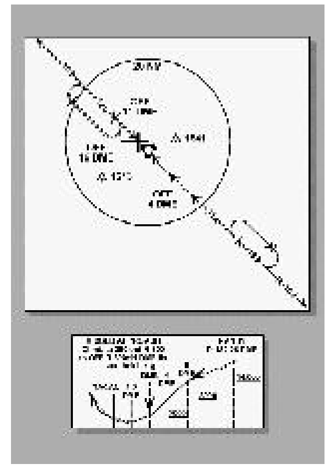
c. Holding patterns

(1) Arrival holding pattern

(2) Holding entry

(3) Missed approach holding pattern

Sg 16, fr 2: *Plan View and Profile Elements (4 Overlays)*



Overlay 1: *Penetration Track*

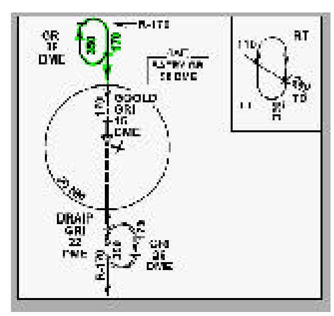
Overlay 2: *Procedure Track*

Overlay 3: *Missed Approach*

Overlay 4: *Missed Approach*

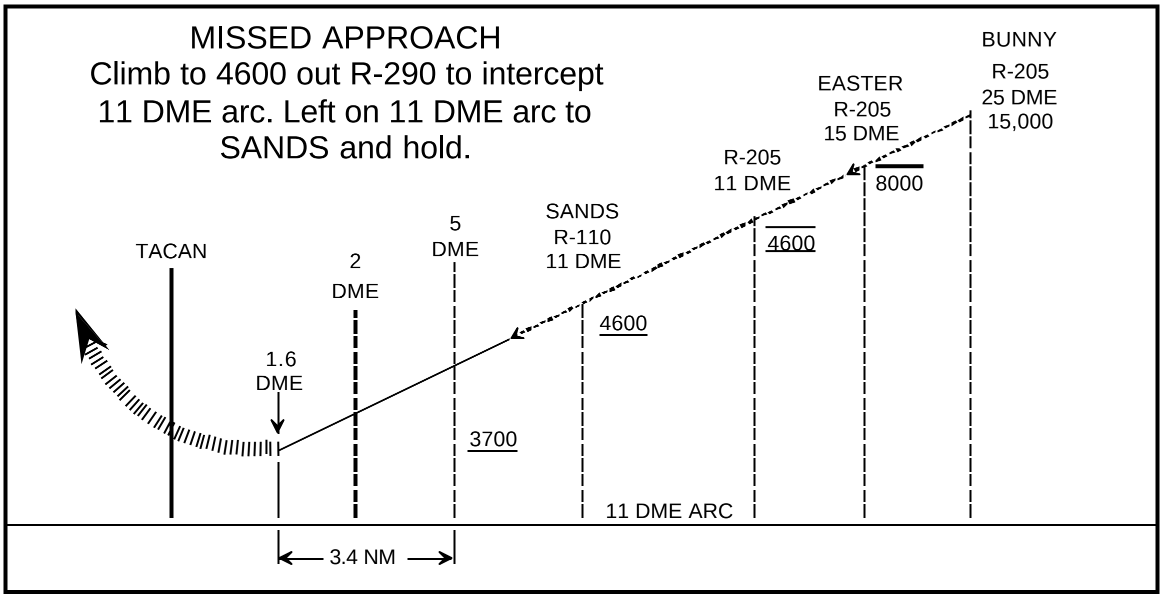
Sg 16, fr 7
Fig 17: *Altitude Restrictions (Profile View)*

Sg 16, fr 8: *Arrival Holding Pattern (2 Overlays)*



Overlay 1: *Entry Diagram*

Overlay 2: *Missed Approach Holding Pattern*



ALTITUDES

$\overline{\underline{4600}}$	MANDATORY ALTITUDE
$\underline{4600}$	MINIMUM ALTITUDE
$\overline{8000}$	MAXIMUM ALTITUDE
15,000	RECOMMENDED ALTITUDE

Figure 17: ALTITUDE RESTRICTIONS (Profile View)

d. Concentric rings on planview

   (1) Features inside 20-mile radius circle are to scale

   (2) Feeder and high altitude facility

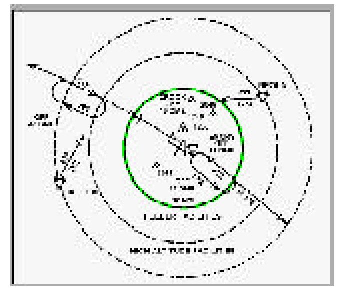
e. Types of NAVAIDs—azimuth information only and bearing and distance information

f. Obstacles and spot elevations

   (1) Obstacles—man-made obstructions

   (2) Spot elevation—natural obstructions

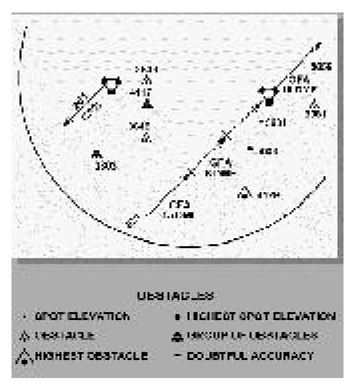
Sg 16, fr 11: *20-Mile Radius Circle (1 Overlay)*



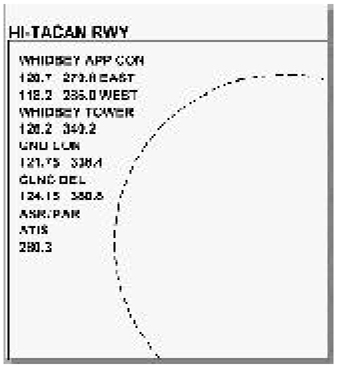
Overlay 1: *Feeder and High Altitude Facilities*

Sg 16, fr 13: *Radio Aids to Navigation*

Sg 16, fr 14: *Obstacles and Spot Elevations*

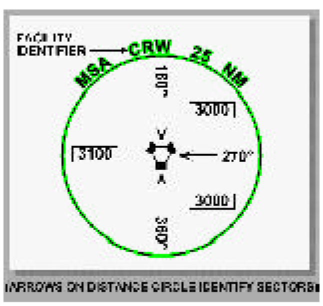


Sg 16, fr 15: *Frequencies*

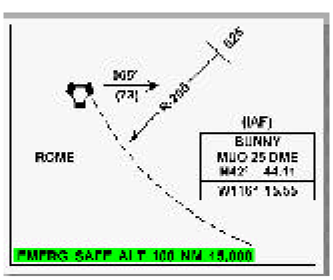


Sg 16, fr 16: *Minimum Safe Altitude (1 Overlay)*

Overlay 1: *Minimum Safe Altitude*



Sg 16, fr 18: *Emergency Safe Altitude*



g. Airport communications frequencies and radar coverage information

h. Safe altitudes minimum and emergency:

(1) Minimum safe given for radius of 25 nm from approach NAVAID (may be divided into sectors of at least 90º with different altitudes)

(2) Emergency safe given for radius of 100 nm from approach NAVAID. Provides 1,000-ft obstruction clearance, and in FAA-designated mountainous areas, it will provide 2,000 ft obstruction clearance

2. Airport diagrams/sketches **2.9.5.5.2**

   a. Sketch on approach plate

   b. Full-page airport diagram—airport diagrams are specifically designed to assist in the movement of ground traffic at locations with complex runway/taxiway configurations and provide information for updating Computer-Based Navigation Systems (i.e., INS) aboard aircraft. Airport diagrams are not intended to be used for approach and landing or departure operations

3. Instrument approach minimums

   a. Type of approach straight-in/circling and precision/nonprecision

   b. Aircraft category T-45C falls under C

   c. Ceiling and visibility requirements—criteria used for IFR destination and alternate filing purposes. Also establishes takeoff criteria

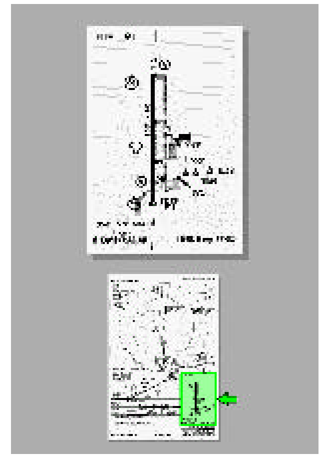
   d. Decision height/altitude (DH/DA)/minimum descent altitude (MDA)

   e. Glideslope angle information for PAR approaches

   COMMON ERROR: Not looking up asterisks/ symbols that pertain to modifications of minimums.

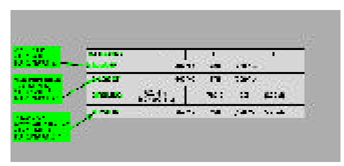
   NOTE: Use rate-of-climb/descent table on inside back cover.

Sg 16, fr 19: *Airport Diagram*



Sg 16, fr 20
Fig 18: *Full-Page Airport Diagram - Grand Forks, North Dakota*

Sg 16, fr 21: *Minimums Block (8 Overlays)*



Overlay 1: *Aircraft Categories*

Overlay 2: *Ceiling and Prevailing Visibility*

Overlay 3: *Runway Visual Range (RVR)*

Overlay 4: *Decision Height/ Altitude (DH/DA)*

Overlay 5: *Minimum Descent Altitude (MDA)*

Overlay 6: *Height Above Touchdown (HAT) (AGL Altitude)*

Overlay 7: *Height Above Airport*

Overlay 8: *Glideslope Angle*

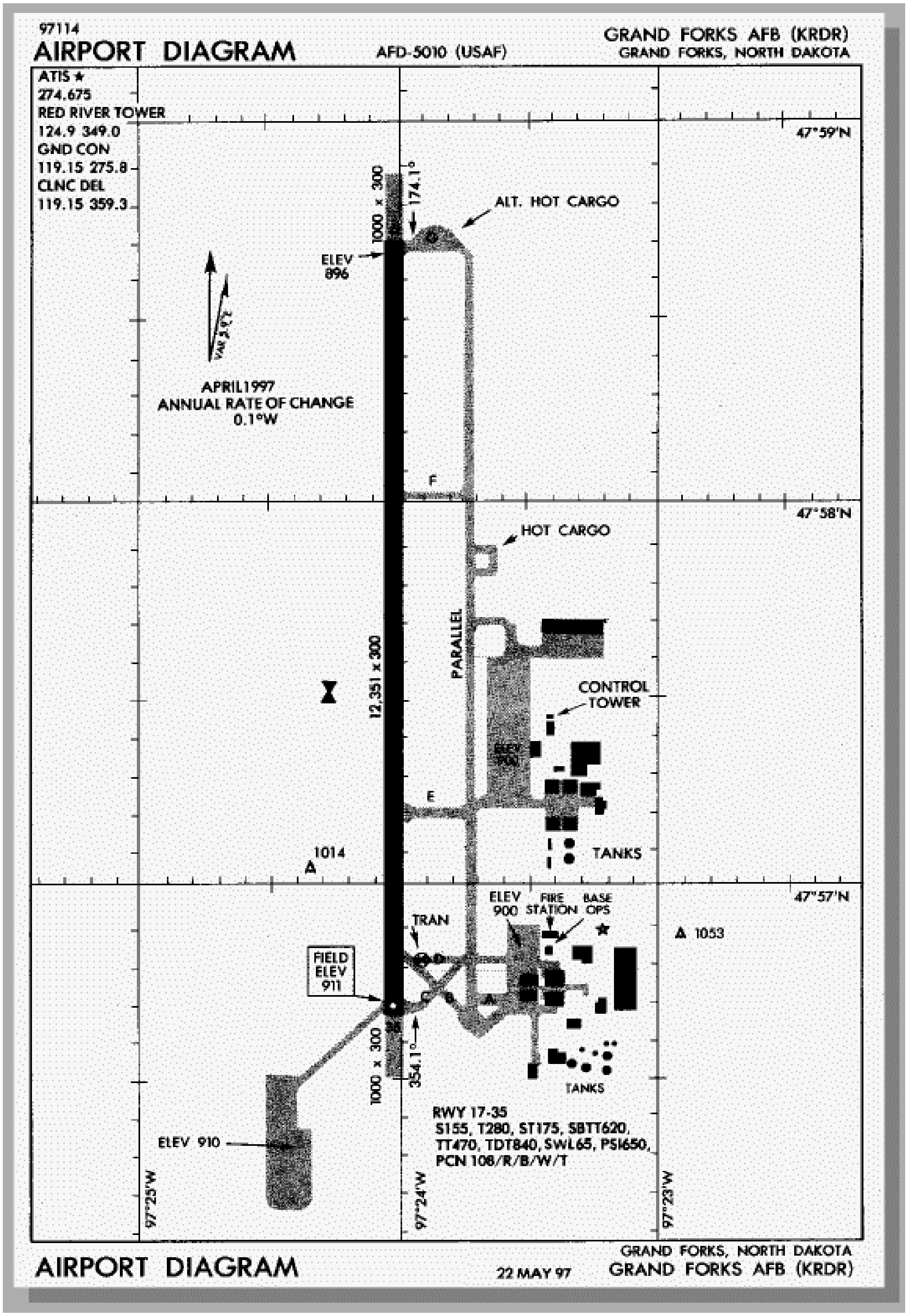


Figure 18: FULL-PAGE AIRPORT DIAGRAM

4. FAF to MAP table—used on nonprecision approaches when DME unavailable and radio facility not located at field

B. Elements specific to types of high altitude approach plates **2.1.8.3.1.1**

1. HI-TACAN and VOR/DME **2.9.4.2.1**

2. VOR **2.9.4.3.1**

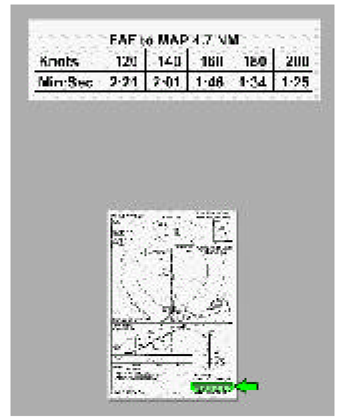
a. Penetration turn altitude listed in profile section

b. MAP determined by:

C. ILS **2.9.4.6.1**

D. GPS

Sg 16, fr 30: *FAF to MAP Table*



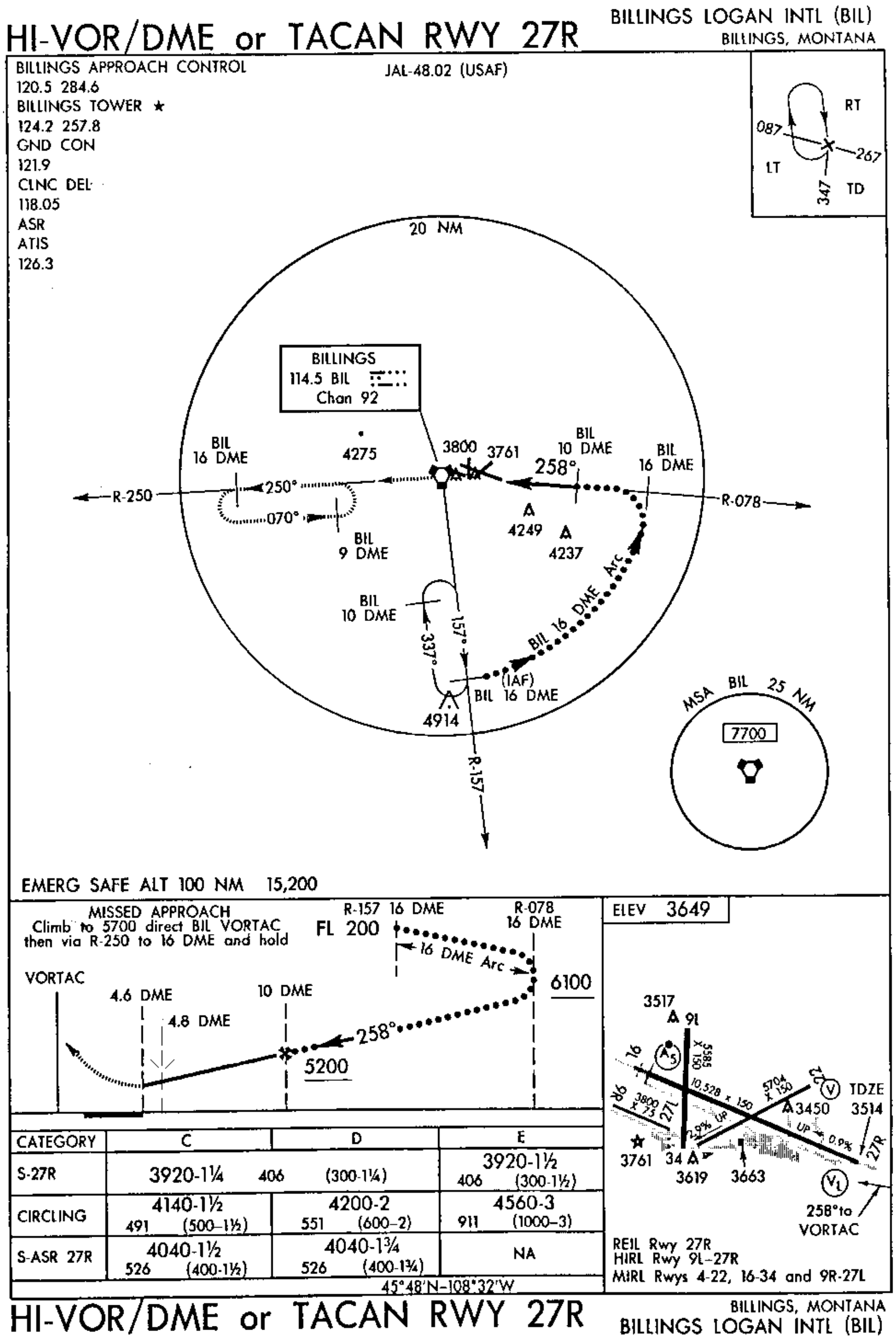
Sg 17, fr 1: *Interpretation of High Altitude Instrument Approach Plates Organization*

INTERPRETATION OF HIGH ALTITUDE INSTRUMENT APPROACH PLATES

* Features common to high altitude instrument approach plates

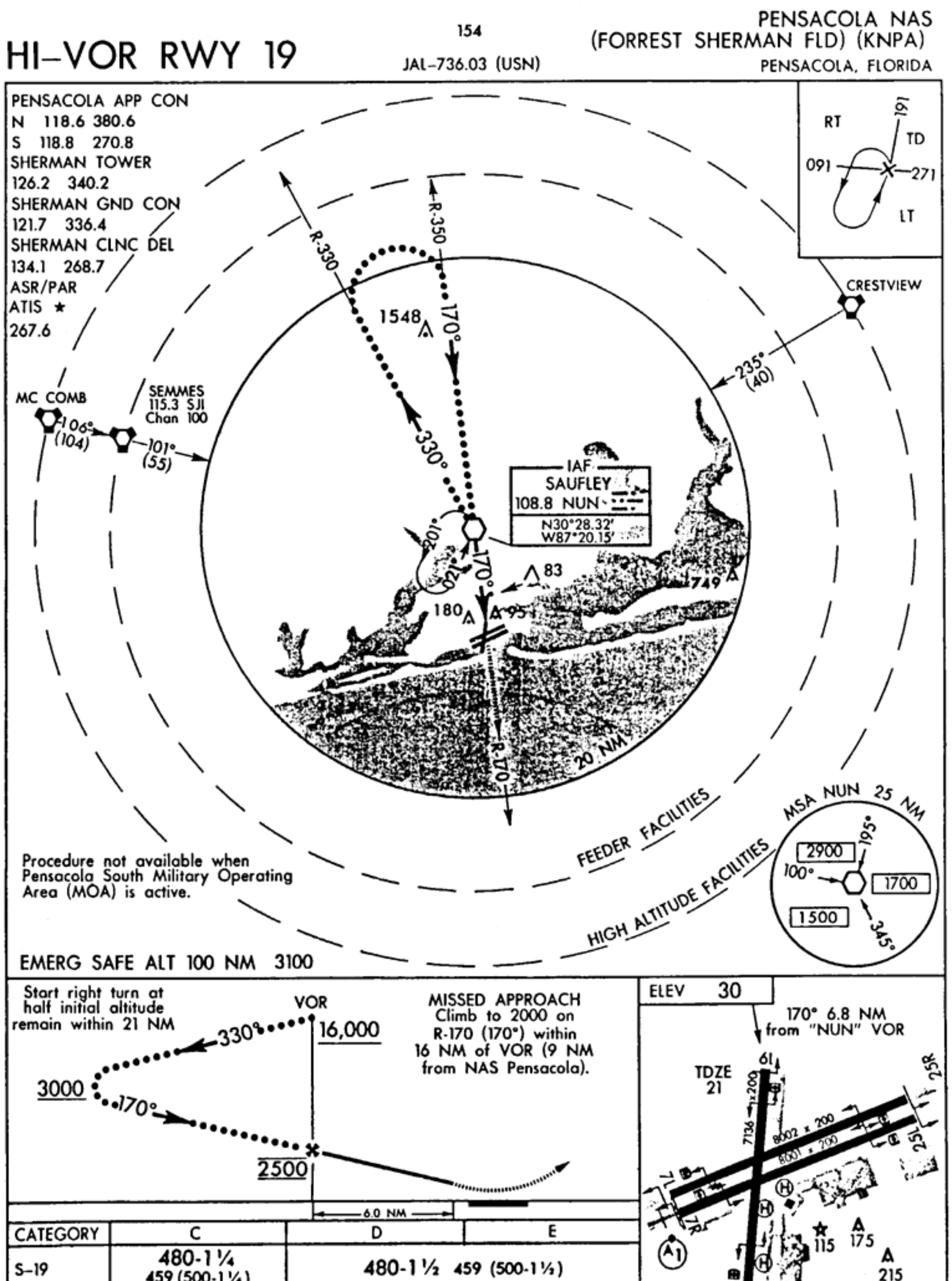
* **Elements specific to types of high altitude approaches**

Sg 17, fr 2: *HI-TACAN and VOR/DME*
Fig 19: *HI-VOR DME or TACAN RWY 27R Billings Logan Intl*



CATEGORY	C	D	E
S-27R	3920-1¼ 406 (300-1¼)		3920-1½ 406 (300-1½)
CIRCLING	4140-1½ 491 (500-1½)	4200-2 551 (600-2)	4560-3 911 (1000-3)
S-ASR 27R	4040-1½ 526 (400-1½)	4040-1¾ 526 (400-1¾)	NA

Figure 19: HI-VOR/DME OR TACAN RWY 27R BILLINGS LOGAN INTL



CATEGORY	C	D	E
S-19	480-1¼ 459 (500-1¼)	480-1½ 459 (500-1½)	
CIRCLING	520–1½ 490 (500–1½)	580–2 550 (600–2)	
S-PAR 19	121-½	100 (100–½) GS 3.0°	

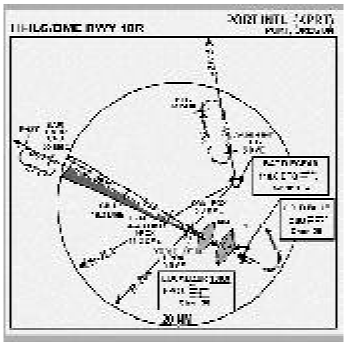
VOR to Missed Approach 6.0 NM	Knots	120	140	160	180	200
	Min:Sec	3:00	2:34	2:15	2:00	1:48

Figure 20: HI-VOR RWY 19 PENSACOLA NAS

Sg 17, fr 3 & 4
Penetration Turn Altitude

Fig 20: *HI-VOR RWY 19 Pensacola NAS*

Sg 17, fr 5: *Localizer Course*
Fig 21: *HI-ILS RWY 10R Portland Intl*

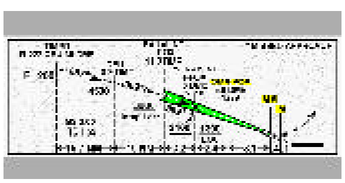


Overlay 1

Overlay 2

Overlay 3

Sg 17, fr 9: *ILS Profile File*



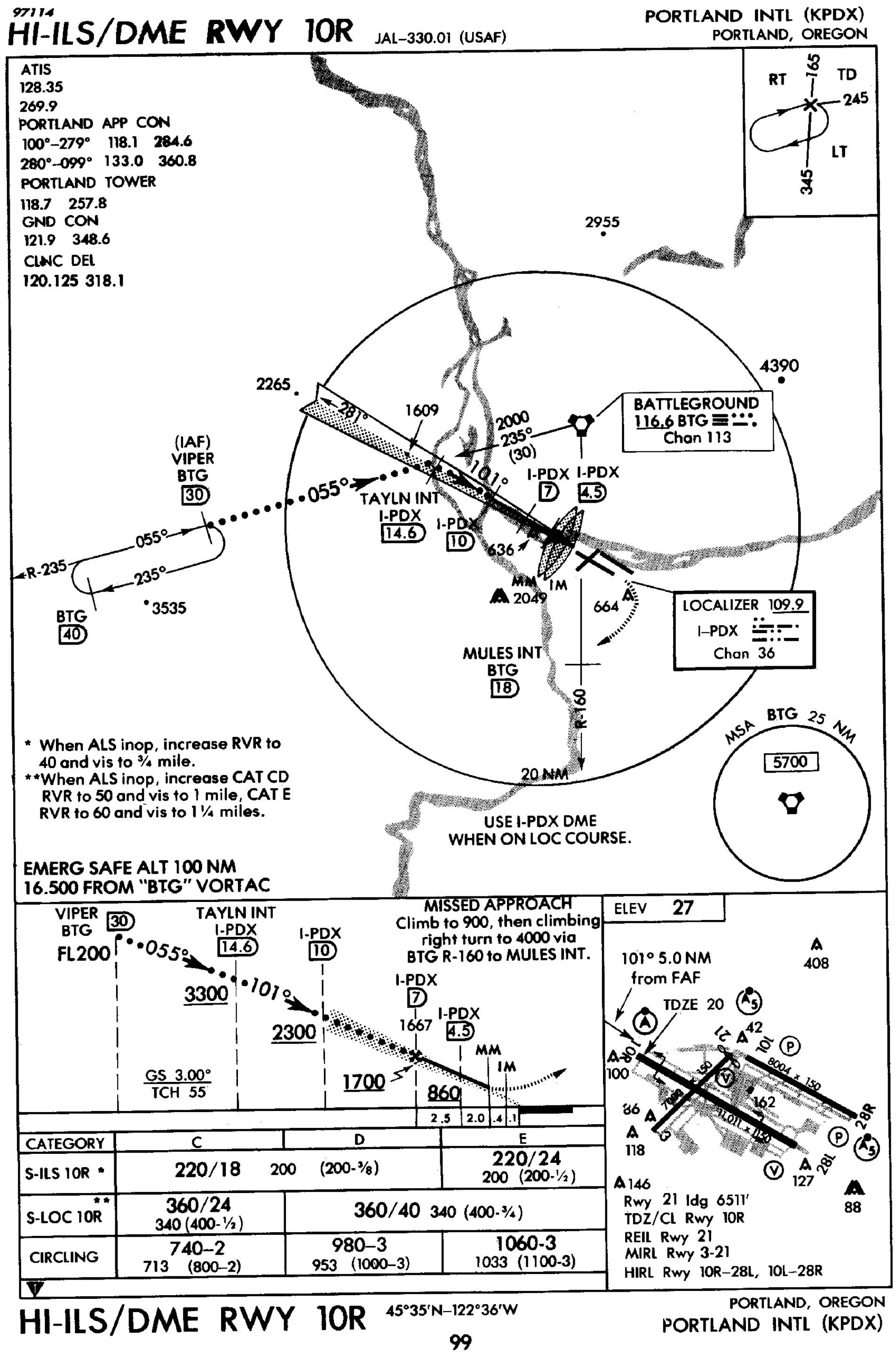
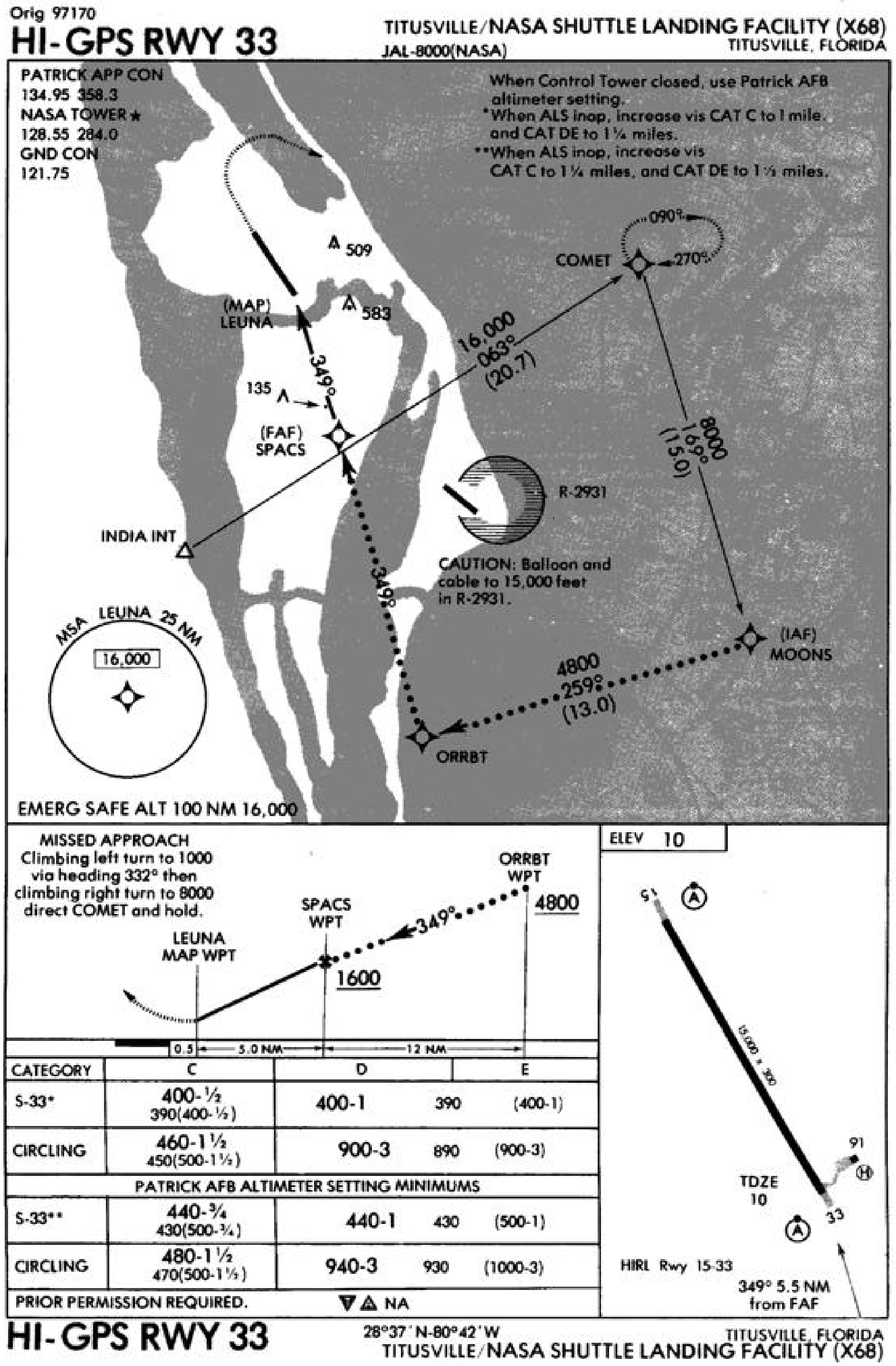


Figure 21: HI-ILS RWY 10R PORTLAND INTL



CATEGORY	C	D		E
S-33*	400-½ 390(400-½)	400-1	390	(400-1)
CIRCLING	460-1½ 450(500-1½)	900-3	890	(900-3)
PATRICK AFB ALTIMETER SETTING MINIMUMS				
S-33**	440-¾ 430(500-¾)	440-1	430	(500-1)
CIRCLING	480-1½ 470(500-1½)	940-3	930	(1000-3)
PRIOR PERMISSION REQUIRED.		▼▲ NA		

Sg 17, fr 10
Fig 22: *HI-GPS RWY 33 Titusville/NASA Shuttle Landing Facility*

Sg 18, fr 1
Interpretation of High Altitude Instrument Approach Plates Review Options

Figure 22: HI-GPS RWY 33 TITUSVILLE/NASA SHUTTLE LANDING FACILITY

Sg 19, fr 5: *Lesson Organization*

INAV REVIEW

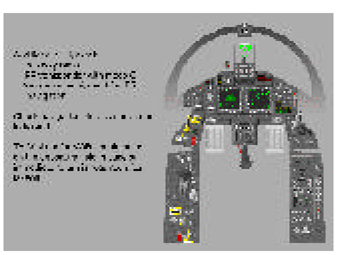
* Overview of Test
* Introduction to INav
* Departure and Terminal Procedures
* Interpretation of High Altitude Instrument Approach Plates
* **Flight Planning (Departure and En route)**

Sg 20, fr 1: *Flight Planning (Departure and En route) Organization*

FLIGHT PLANNING (Departure and En route)

* **Information required for flight plan preparation**
* Planning a flight
* Preparing a single-engine jet flight log
* Military flight plan, DD Form 175
* Navigation bag contents for cross-country flight

Sg 20, fr 2: *Instruments Required for Instrument Flight (1 Overlay)*



Overlay 1

V. Flight Planning (Departure and En route)

A. Information required for flight plan preparation

1. Instruments required by OPNAVINST 3710.7 for instrument flight **2.1.8.5**

a. Mach/airspeed indicator

b. Altimeter

c. Turn and slip indicator

d. Clock with sweep second hand or digital readout

e. Attitude indicator

f. Magnetic compass with current calibration card

g. Heading indicator or gyro-stabilized magnetic compass

h. Vertical speed indicator

2. Additional equipment

a. Two-way radio

b. IFF transponder with mode C

c. Navigation equipment for IFR navigation

3. Check navigation aid accuracy prior to takeoff

B. Notices to Airmen (NOTAM)—time-critical aeronautical information that is temporary or so current it is not in published aeronautical charts **2.1.8.6**

C. Items to check for destination airfield **2.1.8.7**

D. Items to check for route/altitude selection **2.1.8.8**

PROGRESS CHECK

Question 10—2.1.8.5
In addition to the basic instrument requirements, what three items are necessary for IFR navigation flight?

Answer: Two-way radio. IFF transponder with mode C, and navigation equipment

Question 11—2.1.8.3
Which FLIP publication provides a directory of airport facilities for military aircraft?

Answer: FLIP Enroute IFR Supplement

Question 12–2.1.8.6
If you are planning to fly from one military base to another, which NOTAMs are you required to check?

Answer: Military NOTAMs and Class II NOTAMs

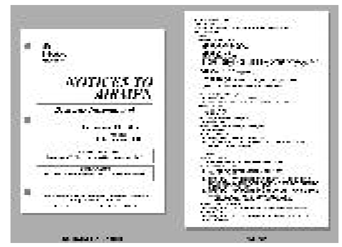
Question 13–2.1.8.7
Where would you obtain information on the availability of aircraft servicing at your destination airfield?

Answer: FLIP Enroute IFR Supplement and NOTAMs

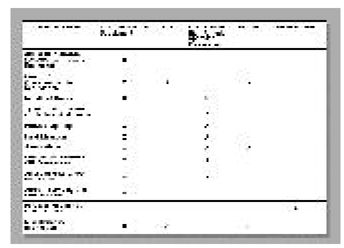
Question 14–2.1.8.8
Where would you find information on special use airspace for your selected route/altitude?

Answer: FLIP Area Planning AP1/1A

Sg 20, fr 4: *Notices to Airmen and NOTAMs*



Sg 20, fr 5: *Items to Check for Destination Airfield*



Sg 20, fr 6: *Items to Check for Route/Altitude Selection*

Sg 21, fr 1: *Flight Planning (Departure and En route) Organization*

FLIGHT PLANNING
(Departure and En route)

* Information required for flight plan preparation
* **Planning a flight**
* Preparing a single-engine jet flight log
* Military flight plan, DD Form 175
* Navigation bag contents for cross-country flight

Sg 21, fr 2: *Suggested Flight Planning Sequence*

Overlay 1

Overlay 2

Overlay 3

Overlay 4

Overlay 5

Overlay 6

Overlay 7

Overlay 8

Overlay 9

Sg 22, fr 1: *Flight Planning (Departure and En route) Organization*

FLIGHT PLANNING
(Departure and En route)

* Information required for flight plan preparation
* Planning a flight
* **Preparing a single-engine jet flight log**
* Military flight plan, DD Form 175
* Navigation bag contents for cross-country flight

Sg 22, fr 2: *Single-Engine Jet Flight Log*
Fig 23: *Completed Single-Engine Jet Flight Log (Front)*

E. Planning a flight **1.1.2.1**

1. Suggested flight planning sequence

   a. Select your destination

   b. Obtain initial weather briefing and request OPARS

   c. Determine most favorable altitude/flight level for the route that offers acceptable weather and most favorable winds

   d. Consult FLIPs and NOTAMs

   e. Select suitable alternate

   f. Determine if a SID is available

   g. Study Terminal Approach Charts

   h. Complete single-engine jet flight log

   i. Complete military flight plan (DD Form 175)

   j. Obtain final weather briefing (DD Form 175-1)

   k. File a military flight plan (DD Form 175)

F. Single-Engine Jet Flight Log -- written plan of action used to monitor flight progress **2.1.8**

1. Departure Elevation (DEP ELEV)

SINGLE–ENGINE JET FLIGHT LOG
CNATRA–GEN 3760/1 (REV. 7–78) S/N0197LLCF19482

DEP ELEV	CLNC DELIV	GND CONT	TOWER
30	268.7/134.1	336.4/121.7	340.2/126.2
ALT CORR	**TIME OFF**	**TAS**	**LBS PH/PMIN**
		350	1,121

CLEARANCE ATC C TALON45 TO NAS JACKSONVILLE ATIS: 267.6 METRO: 359.6

VIA BREEZ 3 CEW J2 TAY —D→ NIP 204035

DEPARTURE

DEST ELEV 22'	APC CONT 284.6/119.85	TOWER 355.8/120.0	GND CONT 336.4/128.6

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR 2938 / AFR	ATIS: 281.0 METRO: 344.6 NOTES
DEPART NPA	NPA / 119	START-TAXI-T.O.				200	2738	T/O RWY 7
↗ BREZZ 3	NPA / 119	180	38	5		320	2418	TOC
—D→ BREZZ	NPA / 119		16	3		60	2358	WIND: 283/10 GS: 350
—D→ CRESTVIEW	CEW / 106	069	21	4		70	2288	CEW: 115.9 GS: 360
J-2 CEW 088052	CEW / 106	088	52	9		170	2118	GS: 360
J-2 SEMINOLE	SZW / 122	108	42	7		140	1978	SZW: 117.5 GS: 360
J-2 TAYLOR	TAY / 76	089/095	94	16		300	1678	TAY: 112.9 GS: 360
—D→ JACKSONVILLE 204035	NIP / 49	148	60	11		190	1488	GS: 355
			323	0 + 55		1450		
								FRCST ALT 29.98

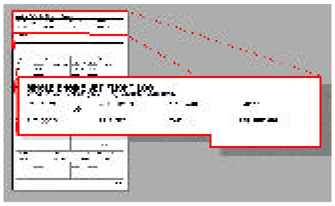
ALTERNATE	ROUTE	ALTITUDE	TIME	FUEL
NRB NAVY MAYPORT	—D→	250	0 + 05	1 + 12
ALT ELEV 17'	**APC CONT** 308.4/124.4	**TOWER** 265.8/118.75	**GND CONT** 233.7/126.5	

MAYPORT IAF 078011	NRB / 51	050	62	11		200	1288	ATIS: 268.6 METRO: 301.3
								GS: 350

(Over)

Figure 23: COMPLETED SINGLE-ENGINE JET FLIGHT LOG (FRONT)

***Sg 22, fr 3:** Departure Elevation (18 Overlays)*



Overlay 1

Overlay 2

Overlay 3

Overlay 4

Overlay 5

Overlay 6

Overlay 7

Overlay 8

Overlay 9

Overlay 10

Overlay 11

Overlay 12

Overlay 13

Overlay 14

2. Departure frequencies (CLNC DELIV, GND CONT, TOWER)
3. Altimeter correction (ALT CORR)
4. Time off (TIME OFF)
5. True airspeed (TAS)—planned en route true airspeed after level off
6. Fuel use, pounds per hour (LBS PH/PMIN)—fuel flow at cruise/flight level from NATOPS performance charts based on TAS in pounds per hour only
7. Clearance (CLEARANCE)
8. Departure (DEPARTURE)
9. Destination elevation (DEST ELEV)—record destination elevation from FLIP Enroute IFR Supplement or FLIP Terminal High Altitude Approach Procedures
10. Destination frequencies (APC CONT, TOWER, GND CONT)
11. Navigation and fuel information
    a. Route (ROUTE TO)
    b. Identification/Channel (IDENT/CHAN)
    c. Course (CUS)
    d. Distance (DIST)—enter miles to a fix
    e. Estimated time en route (ETE)
    f. Estimated time of arrival (ETA)/actual time of arrival (ATA)—enter your estimated time of arrival and log your actual time of arrival as the flight progresses

g. Leg fuel (LEG FUEL)

h. Estimated fuel remaining (EFR)/actual fuel remaining (AFR)—enter estimated fuel remaining during planning and actual fuel remaining during flight

Overlay 15

PROGRESS CHECK

Question 15—2.1.8
Your fuel flow at a cruise altitude of FL270 is 1125 and your estimated ground speed is 350 kts. Your FLIP Enroute High Altitude Chart indicates 76 miles from one fix to the next. This leg of your flight will take you __________ minutes and you will use _________ lbs of fuel.

Answer: 13 minutes and 250 lbs of fuel (244 lbs rounded up to next higher ten pounds)

i. Notes (NOTES)—use this section to include any additional information:

Overlay 16

12. Total distance, ETE, and leg fuel columns

Overlay 17

13. Alternate information—enter full name and three-letter identifier

Overlay 18

14. Fuel plan—back or jet log, used to compare total fuel requirements with usable fuel and to compute spare fuel

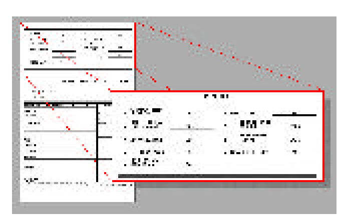
Sg 22, fr 22: *Single-Engine Jet Flight Log*

a. Climbout/route dest IAF

b. Route alt IAF

c. Approaches—enter fuel required to execute a high altitude penetration, approach, and landing (250 lbs for the T-45C)

Sg 22, fr 23: *Fuel Plan (2 Overlays)*



d. Total—add climbout/route destination IAF, route alt IAF and approaches

e. Reserve—10% of fuel in total but not less than 300 lbs (20 min at 10,000 MSL maximum endurance)

f. Start/taxi—total fuel for start, taxi and takeoff (200 lbs for T-45C)

g. Total required—add total, reserve and start/taxi fuel

h. Total aboard—enter prestart fuel (2938 for T-45C)

i. Spare fuel—enter total fuel on board after landing that exceeds the total OPNAV flight planning requirements (total minus total required)

PROGRESS CHECK

Question 16—2.1.8
In Figure 23, what would you enter on the CLIMB/ROUTE/DEST IAF line in the single engine jet log FUEL PLAN using the information found in the navigation and fuel information section of the jet log?

Answer: 1,250 lbs.

Overlay 1

15. Emergency "BINGO" to alternate—this section is used to compute total fuel required to the alternate IAF using three different scenarios **2.1.8.4.1**

16. Checklist, destination, alternate, and emergency field information

    a. Preflight reminders to check that destination and alternate airfields have adequate facilities and servicing for your aircraft

    b. Check that you have all necessary publications and documents for the flight

    c. Runway length (RWY LENGTH)—enter runway length and width

    d. Lighting—enter available runway lighting

    e. FUEL/JASU/LOX—enter available fuel, jet starting units, and liquid oxygen servicing information (the T-45C doesn't need JASU or LOX)

    f. ILS—enter runway and ILS minimums

    g. LOC—enter runway and LOC minimums

    h. ASR—enter runway and ASR minimums

    i. PAR MINS—enter runway and PAR minimums

    j. TAC MINS—enter runway and TACAN minimums

    k. Arresting gear (ARR GEAR)—enter arresting gear availability

    l. PUBS, NOTAMS, FUEL PACKET, FLASHLIGHT, WALLET, ETC.—check to make sure that you have these items and anything else appropriate in your navigation bag

Overlay 2

Sg 22, fr 26
Fig 24: *Completed Single-Engine Jet Flight Log (Back)*

FUEL PLAN

1. CLIMB/ROUTE DEST IAF	1250		6. START/TAXI	200
2. ROUTE ALT IAF (If required)	200		7. TOTAL REQUIRED (4, 5 & 6)	2200
3. APPROACHES	250		8. TOTAL ABOARD	2938
4. TOTAL (1, 2 & 3)	1700		9. SPARE FUEL (8–7)	738
5. RES 10% of 4 (Min 20 mins)	300			

EMERGENCY "BINGO" TO ALTERNATE

	REQUIRED		APPROACH		RES		TOTAL
FL250 LAST CRUSING ALT	200	+	250	+	300	=	750
FL200 INITIAL APP ALT GS: 250 WIND: 272/03 TAS: 250 FF: 946	240	+	250	+	300	=	790
MAP-IAF TIME: 0 + 07	440	+	250	+	—	=	690

CHECK LIST	DESTINATION	ALTERNATE	EMER FIELDS
RWY LENGTH	27 8000 X 200	23 8000 X 200	TALLAHASSEE REGIONAL
LIGHTING	A1 HIRL REH 9/27	HIRL/REIL	ID TLH
FUEL/JASU/LOX	J5	J5	CH 122/117.5
			PAGE NO. 195 & 196
ILS	NONE	NONE	
LOC	NONE	NONE	
ASR	27 440 1	23 500 1 1/4	
PAR MINS	27 213 1/2	23 200 1	
TAC MINS	27 440 1	23 500 1 1/4	
ARR GEAR	E28 Both Ends	E28 Both Ends	
PUBS	✓	✓	
NOTAMS	✓	✓	
FUEL PACKET	✓	✓	
FLASHLIGHT, WALLET, ETC.	✓	✓	

CNATRA–GEN 3760/1 (REV. 7–78) S/N0197LLCF19482(BACK)

*U.S.GPO:1987–530–016/61134

Figure 24: COMPLETED SINGLE-ENGINE JET FLIGHT LOG (BACK)

G. Military Flight Plan, DD Form 175 **2.1.7, 2.1.7.1**

1. Used for two purposes

   a. Lets controlling agency know your intentions so that a clearance may be issued for your IFR flight

   b. Provides search and rescue facilities necessary information in case of an emergency

2. Section I

   a. Date—enter date of the flight based on local time

   b. Aircraft call sign

   c. Aircraft DESG and TD code

PROGRESS CHECK

Question 17—2.1.7
What three completed documents are you required to have in your possession before commencing any IFR flight?

Answer: DD Form 175, Single-Engine Jet Flight Log, and Flight Weather Briefing (DD Form 175-1)

Question 18—2.1.7
What document provides the TD codes that you will need in order to fill in the block AIRCRAFT DESG and TD CODES?

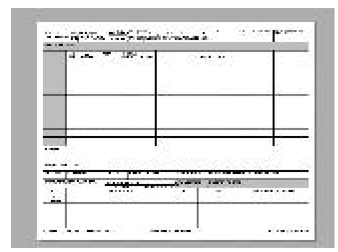
Answer: DoD FLIP General Planning (GP), Chapter 4

Sg 23, fr 1: *Flight Planning (Departure and En route) Organization*

FLIGHT PLANNING
(Departure and En route)

* Information required for flight plan preparation
* Planning a flight
* Preparing a single-engine jet flight log
* **Military flight plan, DD Form 175**
* Navigation bag contents for cross-country flight

Sg 23, fr 2: *Military Flight Plan, DD Form 175 (10 Overlays)*



Overlay 1: *DD Form 175—Section I*

Overlay 2: *TD Code Table*

***Overlay 3:** DD Form 175—Section II*

***Overlay 4:** DD Form 175—Type Flight Plan, True Airspeed, and Point of Departure*

***Overlay 5:** DD Form 175—Proposed Departure Time and Altitude*

***Overlay 6:** DD Form 175—Route of Flight*

***Overlay 7:** DD Form 175—To and ETE*

3. Section II

   a. Type of FLT plan—enter “I” for IFR or “V” for VFR

   b. True airspeed—enter true airspeed (TAS) at initial cruising altitude

   c. Point of departure—enter three-letter identifier of the point of departure or the point (NAVAID or fix) where IFR begins

   d. Proposed departure time (Z)—enter departure time in universal coordinated time (UTC) or Zulu

   e. Altitude—enter initial cruise altitude in hundreds of feet, do not enter letters “FL”

   f. Route of flight —enter enough information to indicate the proposed ROUTE OF FLIGHT clearly

   g. To block—three-letter FAA location identifier or last three letters of the international identifier of the final destination airport after last line entry in the ROUTE OF FLIGHT block (if there is no location identifier, enter the airport name)

   h. Estimated time en route (ETE)—enter estimated time en route using the standard hours + minutes format

PROGRESS CHECK

Question 19—2.1.7, 2.1.7.1
To complete the ALTITUDE block, you enter your altitude/flight level in _______ of feet.

Answer: hundreds

4. Section III

Overlay 8: DD Form 175—Section III

a. Remarks—enter information that is essential to safe and efficient control of air traffic entries

b. Rank and honor code—used VIP codes in DoD FLIP General Planning (GP), Chapter 4, to indicate branch of service, highest rank/grade aboard, and honors desired

(1) V5H—Rear Admiral, accord honors

(2) R50—Army Major General, request nothing

5. Section IV

Overlay 9: DD Form 175—Section IV

a. Fuel on board (FUEL ON BD)—enter total time, using standard hours + minutes format, that your aircraft can stay aloft while flying the planned profile with fuel available at initial takeoff

b. Alternate airfield (ALTN AIRFIELD)—select alternate based on OPNAVINST 3710.7 criteria

c. Estimated time en route to alternate (ETE TO ALT)—enter planned time to fly from destination to planned alternate at your planned altitude/ flight level

d. NOTAMs—check block indicates that all relevant NOTAMs for your flight, including appropriate “Supplementary Airdrome Remarks” from AP/1, were checked

e. Weather—preflight reminder to obtain an adequate briefing on all weather conditions pertinent to your flight

f. Weight and balance (WT AND BALANCE)—this block does not pertain to tactical jet aircraft (only to aircraft transporting passengers and/or cargo)

g. Aircraft serial number, unit, and home station—enter aircraft bureau number followed by a slash(/), the aircraft unit of assignment followed by a slash, and the aircraft home three-letter location identifier

h. Signature of approval authority—OPNAVINST 3710.7 authorizes the pilot-in-command of a naval aircraft or formation leader to approve the proposed flight plan

i. Actual departure time and base operations use—don't write in this space

PROGRESS CHECK

Question 20—2.1.7, 2.1.7.1
What format do you use to enter the total time for the FUEL ON BD block?

Answer: Standard hours + minutes

Overlay 10: *DD Form 175 -- Section V*

Fig 25: *Completed DD Form 175*

6. Section V

a. Duty—enter duty performed by each crew member, as defined by appropriate service directives

b. Name and initials—the name of the pilot-in command must appear in the first block of the crew list

c. Rank—enter the appropriate military rank or suitable civilian classification

d. Social security number (SSN)—enter "on file" for each crew member

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397.
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight.
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan.
DISCLOSURE: Voluntary; however, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TD CODE
20 NOV 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	350	NPA	1355	250	BREZZ 3 CEW J2 TAY		
						NIP 204035	NIP	0 + 55

REMARKS

2R(NIP) NIP PPR 20-04

RANK AND HONOR CODE

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2 + 15	NRB	0 + 11	✓	103-3 [illegible]	N/R	ON FILE/CTW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
[illegible]	ATTACHED / SEE PSGR MANIFEST		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	SPIFFY, I.M.	MAJ	ON FILE	CTW-1/NMM
CP	JONES, W. A.	ENS	ON FILE	VT7/NMM

DD Form 175, MAY 86 0102-LF-001-7500 *Previous editions are obsolete.* MILITARY FLIGHT PLAN

Figure 25: COMPLETED DD FORM 175

Sg 23, fr 13
Fig 26: *DD Form 175—One Leg (Round Robin)*

Sg 23, fr 14
Fig 27: *DD Form 175—Stop-Over*

Sg 23, fr 15
Fig 28: *DD Form 175—Terminal Delay Flight Plan*

Sg 23, fr 16
Fig 29: *Various Types of Flight Plan*

Sg 23, fr 17
Fig 30: *Formation Flight Plan*

e. Organization and location—enter each individual crew member and location of his/her organization by three-letter location identifier

D. Other types of flight plan

1. One leg (round robin) flight plan
2. Stop-over flight plan
3. Terminal delay flight plan
4. En route delay flight plan -- you will remain on with Air Route Traffic Control Center (ARTCC) frequency to make your delay request, such as practice holding
5. VFR flight plan
6. Composite flight plan
7. Formation flight plan

E. Filing IFR flight plans

1. File 30 minutes prior to planned departure
2. File with base operations having a communication link with ARTCC or by commercial telephone with a flight service station (FSS)
3. Flight plans can be filed in flight with an FSS, provided visual flight conditions can be maintained and you stay below Class A airspace until an IFR clearance is received

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan
DISCLOSURE: Voluntary, however failure to provide the SSN could result in denial of flight plan processing

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
10 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NQI	1400	390	PSX2•PSX J29 IAH J2 SAT		
						J21 LRD RVERA	NQI	1+30

REMARKS

RANK AND HONOR CODE

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2+40	NGP	0+10	✓	+-129	N/R	ON FILE/CTW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
	ATTACHED / SEE PSGR MANIFEST		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	READY R.U.	LTJG	ON FILE	VT7/NMM

DD Form 175, MAY 86 Previous editions are obsolete MILITARY FLIGHT PLAN

Figure 26: DD FORM 175—ONE LEG (ROUND ROBIN) FLIGHT PLAN

PRIVACY ACT STATEMENT

AUTHORITY	10 USC 8012 and EO 9397	ROUTINE USES.	To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan
PRINCIPAL PURPOSE	To aid in accurate identification of personnel participating in the filed flight	DISCLOSURE	voluntary. However, failure to provide the SSN could result in denial of flight plan processing

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
10 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NZC	123Ø	35Ø	TLH J2 SJI RRICK	NBG	1+15
	I	387	NBG	143Ø	35Ø	LCH J22 CRP WAADE	NQI	1+25
						(2+45 NGP Ø+1Ø)		

REMARKS

REQ RADAR DEP NZC, NBG
NBG-S

RANK AND HONOR CODE

VOID 4+ØØ

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2+45	NMM	Ø+2Ø	✓	4-1/31	N/R	ON FILE/CTW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW PASSENGER LIST		ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
	ATTACHED	SEE PSGR MANIFEST		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	DOE, J.J.	ENS	ON FILE	VT7/NMM

Figure 27: DD FORM 175—STOP-OVER FLIGHT PLAN

TERMINAL DELAY FLIGHT PLAN

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan.
DISCLOSURE: Voluntary; however, failure to provide the SSN could result in denial of flight plan processing.

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
10 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NQI	1245	390	HOBDZ 1•SAT BRYGS		Ø+32
						Ⓡ D Ø+25 BSM NQI		
	I	387	BSM	1340	390	LFK J29 EMG BARGS	BAD	Ø+33
	I	392	BAD	15ØØ	41Ø	LFK J29 CRP NQI 27ØØ26	NQI	1+05
						(2+45 NGP Ø+1Ø)		

REMARKS
REQ RADAR DEP BAD
BAD-S

RANK AND HONOR CODE
R5N SPEED BAD TO NQI

VOID 4+ØØ

FUEL ON BD	ALTN AIRFIELD	ETE TO ALTN	NOTAMS	WEATHER	WT AND BALANCE	AIRCRAFT SERIAL NUMBER, UNIT, AND HOME STATION
2+45	NBE	Ø+22	✓	4-1/3	N/R	ON FILE/CTW-1/NMM

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
J. G. Smith	ATTACHED / SEE PSGR MANIFEST ✓		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	SMITH, J. G.	LT	ON FILE	VT7/NMM

Figure 28: DD FORM 175—TERMINAL DELAY FLIGHT PLAN

EN ROUTE DELAY FLIGHT PLAN

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan
DISCLOSURE: Voluntary, however failure to provide the SSN could result in denial of flight plan processing

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
12 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NMM	1345	39Ø	MEI J4 STAGE/D Ø+1Ø J4 DFW BOBIN	NFW	1+14

VFR FLIGHT PLAN

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan
DISCLOSURE: Voluntary, however failure to provide the SSN could result in denial of flight plan processing

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
12 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	V	315	NPA	13ØØ	175	CEW MCN VAN ILM	NKT	1+35

COMPOSITE FLIGHT PLAN

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012 and EO 9397
PRINCIPAL PURPOSE: To aid in accurate identification of personnel participating in the filed flight
ROUTINE USES: To provide data required to process flight plans with appropriate air traffic service authorities. A file is retained by the agency processing the flight plan
DISCLOSURE: Voluntary, however failure to provide the SSN could result in denial of flight plan processing

DATE	AIRCRAFT CALL SIGN	AIRCRAFT DESG AND TO CODE
12 APR 98	TALON45	T45/I

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	I	387	NQI	14ØØ	39Ø	HOBOZ 1·COT FST 122Ø43		Ø+45
	V					VR-196 (A-G)		Ø+28
	I	31Ø	SFLØ58Ø15	1514	18Ø	FANNY	ELP	Ø+1Ø

Figure 29: VARIOUS TYPES OF FLIGHT PLAN

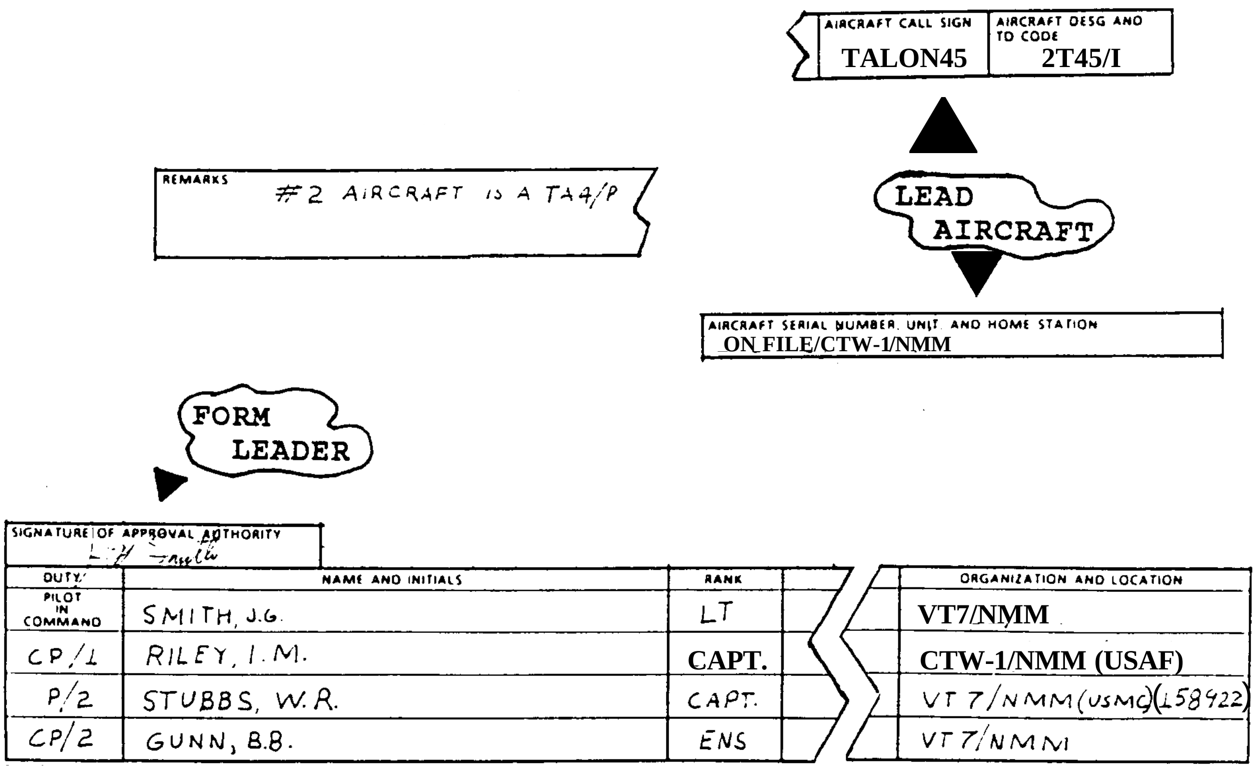


Figure 30: FORMATION FLIGHT PLAN

***Sg 24, fr 1:** Flight Planning (Departure and En route) Organization*

FLIGHT PLANNING
(Departure and En route)

* Information required for flight plan preparation
* Planning a flight
* Preparing a single-engine jet flight log
* Military flight plan, DD Form 175
* **Navigation bag contents for cross-country flight**

***Sg 24, fr 2:** Appropriate Publications for Navigation Bag*

APPROPRIATE PUBLICATIONS FOR NAVIGATION BAG

* U.S. Enroute High and Low Charts
* DoD FLIP (Enroute) IFR Supplement, United States
* DoD FLIP (Terminal) High Altitude United States (and LOW Altitude if appropriate)
* DoD FLIP (Enroute) flight information handbook
* Fuel packet
* Navigation computer (required by OPNAVINST 3710.7)
* Navigation flight log forms
* TRAWING in-flight guide
* Flashlight for night flights

***Sg 25, fr 1:** Flight Planning (Departure and En route) Review Menu*

F. Selecting appropriate publications/items for navigation bag—contents of navigation bag for cross-country flights is based on your flight plan, should include **2.1.9**

1. U.S. Enroute High and Low Altitude Charts (if you plan on going into the high altitude structure, you should also carry the Low Altitude/Terminal Chart for your destination area)
2. DoD FLIP (Enroute) IFR Supplement, United States
3. DoD FLIP (Terminal) High (and Low) Altitude United States, if appropriate
4. DoD FLIP (Enroute) Flight Information Handbook
5. Fuel packet
6. Navigation computer (required by OPNAVINST 3710.7)
7. Navigation flight log forms
8. TRAWING in-flight guide
9. Flashlight for night flights

PROGRESS CHECK

Question 21—2.1.9
Select the items from the following list that you should include in your navigation bag:
a) Navigation computer
b) <u>T-45C NATOPS Flight Manual</u>
c) DoD FLIP (Enroute) High Altitude Chart(s)
d) Fuel packet

Answer: a, c, d

VI. Post-instructional activities: if you have specific questions, consult the following resources as appropriate

A. INav FTI

B. INav workbook

C. INav lecture guides

D. T-45C NATOPS

E. NATOPS instrument flight manual

F. FLIPs

G. AIM

Sg 26, fr 1
INav Lesson Review Menu

SUMMARY

This lesson has focused on the following topics

* Overview of test
* Introduction to INav
* Departure and Terminal Procedures
* Interpretation of High Altitude Instrument Approach Plates
* Flight Planning (Departure and En route)

CONCLUSION

Having reviewed the material from the previous lessons, you should be prepared to take the exam for this block of instruction.