NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS **CNATRA P-767 (Rev. 04-20)**

FLIGHT TRAINING INSTRUCTION

VISUAL NAVIGATION

T-6B

2020

DEPARTMENT OF THE NAVY
CHIEF OF NAVAL AIR TRAINING
250 LEXINGTON BLVD SUITE 102
CORPUS CHRISTI TX 78419-5041

CNATRA P-767
N716
9 Apr 20

CNATRA P-767 (Rev. 04-20)

Subj: FLIGHT TRAINING INSTRUCTION, VISUAL NAVIGATION, T-6B

1. CNATRA P-767 (Rev. 04-20) PAT, "Flight Training Instruction, Visual Navigation, T-6B" is issued for information, standardization of instruction, and guidance to all flight instructors and student military aviators in the Naval Air Training Command.

2. This publication is an explanatory aid to the T-6B Joint Primary Pilot Training curriculum and shall be the authority for the execution of all flight procedures and maneuvers herein contained.

3. Recommendations for changes shall be submitted via the electronic TCR form located on the CNATRA website.

4. CNATRA P-767 (Rev. 06-11) PAT is hereby cancelled and superseded.

S. E. HNATT
By direction

Distribution:
CNATRA Website

FLIGHT TRAINING INSTRUCTION

FOR

VISUAL NAVIGATION T-6B

P-767

SAFETY/HAZARD AWARENESS NOTICE

This course does not require any safety precautions other than those normally found on the flightline.

FORWARD

Terminal Objective:

Upon completion of this course, the student naval aviator will be able to navigate using visual references and appropriate navigation charts in the T-6B aircraft.

Standards:

Conditions and standards are defined in CNATRAINST 1542.166 (series).

Instructional Procedures:

1. This is a flight training course and will be conducted in the OFT and the aircraft.

2. The student will demonstrate a functional knowledge of the material presented through successful completion of the flight maneuvers.

Instructional References:

1. T-6B NATOPS Flight Manual

2. Local Standard Operating Procedures Instruction

3. Aeronautical Information Manual/Federal Aviation Regulations

4. CNAF M-3710.7 (series)

LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:
Original…0…12 Mar 10 (this will be the date issued)
Revision…1…8 Jun 11
Revision…2…9 Apr 20

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 72 CONSISTING OF THE FOLLOWING:

Page No.	**Change No.**	**Page No.**	**Change No.**
COVER	0	5-6 (blank)	0
LETTER	0	6-1 – 6-8	0
iii – ix	0	7-1 – 7-3	0
x (blank)	0	7-4 (blank)	0
1-1	0	A-1	0
1-2 (blank)	0	A-2 (blank)	0
2-1 – 2-11	0	B-1 – B-2	0
2-12 (blank)	0	C-1 – C-4	0
3-1 – 3-10	0		
4-1 – 4-12	0		
5-1 – 5-5	0		

INTERIM CHANGE SUMMARY

The following Changes have been previously incorporated in this manual:

CHANGE NUMBER	REMARKS/PURPOSE

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

INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

TABLE OF CONTENTS

TABLE OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER ONE
VISUAL NAVIGATION

100. INTRODUCTION

Regardless of the type of aircraft you fly and the capabilities of its systems, at some point your mission will require you to navigate visually for a portion of your flight. The success of any mission depends on the aircrew's navigational confidence and abilities. The Visual Navigation Stage of Primary Flight Training will be your introduction to the basic principles, which will serve as the foundation of all follow-on navigation training. Your ability to properly prepare a sectional chart, study and interpret the information on the chart, and identify points on the ground while airborne determines the success of your mission.

Radio Navigation aids are not always available during wartime conditions. During these times, navigation is accomplished by utilizing a combination of dead reckoning and pilotage procedures. There are three purposes for this stage of training:

1. It will introduce you to VFR chart interpretation/symbology in order for you to successfully navigate without the benefit of radio NAVAIDS.

2. It is intended to familiarize you with the numerous types of airspace and restrictions which are involved in VFR flying.

3. It will prepare you for follow on training and fleet requirements; where arriving on time and on target will be imperative to mission success.

"Visual Navigation" is the process of directing an aircraft along a desired route at various altitudes and determining its exact position along the course at any time without the aid of radio NAVAIDS.

Before commencing a flight, the pilot shall be familiar with all available information appropriate to the intended operation. This is a requirement of Federal Aviation Regulations (FAR) Section 91.103 and CNAF M-3710.7 (series), (Preflight Planning). This preflight planning information should include, but is not limited to, destination weather reports and forecasts, route of flight, runway lengths at airports of intended use, fuel requirements, NOTAMS, alternatives available if flight cannot be completed as planned, and any expected delays that ATC has advised. Preflight planning becomes even more critical during VFR flying due to the more liberal routes/altitudes flown and less communications with ATC.

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER TWO
CHARTS

200. INTRODUCTION

The success of any mission depends on extensive crew preflight planning. The proper charts must be selected to cover the route of flight to the target, and the course to be flown must be plotted on the chart. The aircrew must be completely familiar with the symbols used on the chart so they can interpret them, navigate the aircraft, and avoid all hazards to flight.

201. VISUAL REFERENCE CHARTS

Lambert Conformal Projections

The most commonly used aeronautical chart, outside of polar regions, is the Lambert Conformal Projection. Some of the features making this chart type particularly useful are:

1. A straight line approximates a great circle. Therefore, courses and radial bearings can be plotted with a straight edge.

2. The scale about a point is the same in all directions throughout a single chart. Hence, the scales for nautical miles, statute miles, and kilometers printed on each chart can be used on any portion of that sheet and in any direction.

3. Since they are conformal, angles are correctly represented and small shapes are correctly proportioned. Consequently, land or water areas have substantially the same shape on the chart as they appear from the air.

Common Scales and Usage

The information contained on a chart is a function of the chart's scale. The scale is the ratio between the dimensions of the chart and actual dimensions represented. Thus, if the scale is 1:1,000,000, one inch of the chart represents 1,000,000 inches (about 14 miles) on the ground. If the scale is 1:500,000, one inch of the chart represents 500,000 inches (about 7 miles) on the ground.

NOTE

> A scale of 1:500,000 is considered larger than a scale of 1:1,000,000 (a large-scale chart gives you a large amount of detail and covers a smaller amount of area).

The conflict between chart requirements for local and long distance flights has led to the development of numerous special purpose charts of different scales. The objective is to put as much information on the chart as possible without cluttering the chart to the degree that it is less useful. The scale of charts used in general long range planning is typically between 1:5,000,000 and 1:1,000,000. For detailed area planning, a scale ranging between 1:500,000 and 1:25,000 is effective. The coverage on a 1:25,000 scale chart is too small for convenient use in aircraft because the plane would rapidly "fly off" the chart or sorties of extended range would require numerous charts.

Some chart types and scales:

1. Global Navigation Chart (GNC), scale 1:5,000,000 (small scale)

2. Jet Navigation Chart (JNC), scale 1:2,000,000

3. Operational Navigation Chart (ONC), scale 1:1,000,000

4. Tactical Pilotage Chart (TPC), scale 1:500,000 (large scale)

5. VFR Sectional Aeronautical Chart, scale 1:500,000

The following comparison is provided to help you visualize the amount of surface area covered by each chart:

1. One GNC covers several thousand square nautical miles, typically an entire ocean or continent.

2. It takes approximately three JNCs to cover the area of one GNC.

3. It takes five ONCs to cover the same area as one GNC.

4. It takes four TPCs to cover the area of one ONC.

Other chart scales are available, depending on your mission requirements. Such charts may have scales to 1:25,000 (Air Target Chart) or may even be derived from satellite imagery.

During the Navigation stage of instruction, the VFR Sectional Aeronautical Chart with a scale of 1:500,000 will be used. Also known as "**sectionals**," these charts are available for any location in the contiguous United States.

Interchart Relationship Diagram

On the bottom portion of the chart legend is an interchart relationship diagram which identifies the charts adjacent to the one you are using. If your route of flight extends beyond the coverage of your chart, obtain the adjacent chart and affix the two together by matching latitude and longitude. In sectionals (Figure 2-1), the magenta shaded boxes indicate areas where a Terminal Area Chart is available for navigation. These charts typically cover Class B airspace and provide greater detail.

Example: Planning a flight from Corpus Christi, TX to San Antonio, TX requires the use of the Brownsville and San Antonio sectionals. (Figure 2-1)

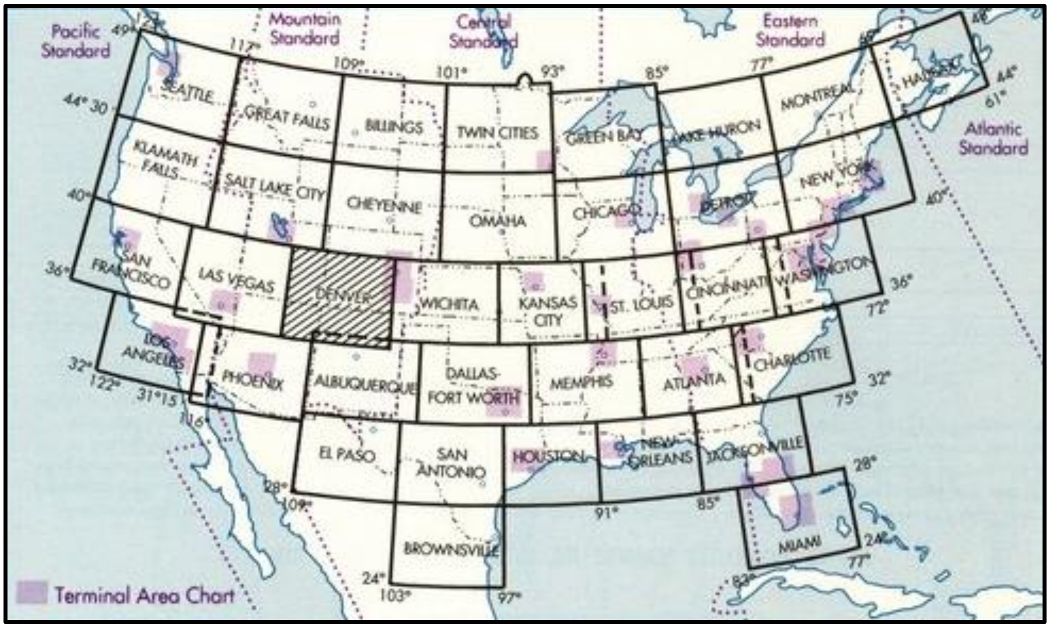


Figure 2-1 Interchart Relationship

202. INTERPRETATION OF THE CHART LEGEND

The chart does not represent a true picture of the real world, but rather is a schematic diagram of certain characteristics of the world. When the average person is looking at a schematic diagram of a radio, they understands that they are not looking at a facsimile of the radio itself. In a similar fashion, one should realize the chart is not a facsimile of the earth's surface. It is a simplified, generalized, and codified presentation of a selected sample of some characteristics of the earth's surface, annotated with various names, numbers, boundaries, and reference grids. Most aviators eventually come to realize that charts are not true pictures of the real world, but they frequently assume the misrepresentation inherent in charts is due to errors on the part of the cartographer. As a result, they develop a distrust of charts. Such mistrust is not warranted; it simply reflects a lack of understanding of the schematic nature of aeronautical charts.

The discrepancies that exist between the real world and its representation on an aeronautical chart are largely the results of limitations imposed by scale. To portray the world on the sectional, the cartographer must shrink the charted area to one half-millionth of its true size. If the cartographer were simply to reduce all features on the earth's surface equally to 1:500,000 scale, only the largest features would be visible. Roads, small towns, towers, power lines, streams, railroads, bridges, and many other features would be too small to see. The aeronautical chart would look like the familiar photographs of the earth taken from orbiting satellites. Consequently, the location of one object to another (for example, a tower that is one mile north of a primary road) will have that distance accurately displayed on the chart.

However, the sizes of symbols do **not** always conform to true scale. To give you an example, the width of a two-lane road on the sectional is shown at about 20 times its true scale. If drafted exactly to half-millionth scale, the charted road would be only about 0.0005 inch wide. The symbol for a lookout tower is about 1/2 nautical mile in diameter to scale on the sectional, even though its counterpart in the real world is much smaller. A VORTAC station is almost a mile wide as portrayed at sectional scale. The open circle denoting a minor airport has a diameter of 4000 feet to scale on the sectional, regardless of the actual size of the field.

Standard symbols are used for easy identification of information portrayed on aeronautical charts. While these symbols may vary slightly between various projections, the amount of variance is slight. Once the basic symbol is understood, variations of it are easy to identify. A chart legend (Figure 2-3) is the key explaining the meaning of the relief, culture, hydrography, vegetation, and aeronautical symbols. **You must be completely familiar with every symbol contained on the chart**. **The legends are a wealth of information that will aid you in understanding and being able to interpret the VFR Sectional**. You should have a current sectional available when studying this material; the different color schemes used on a VFR Sectional cannot be duplicated in this FTI.

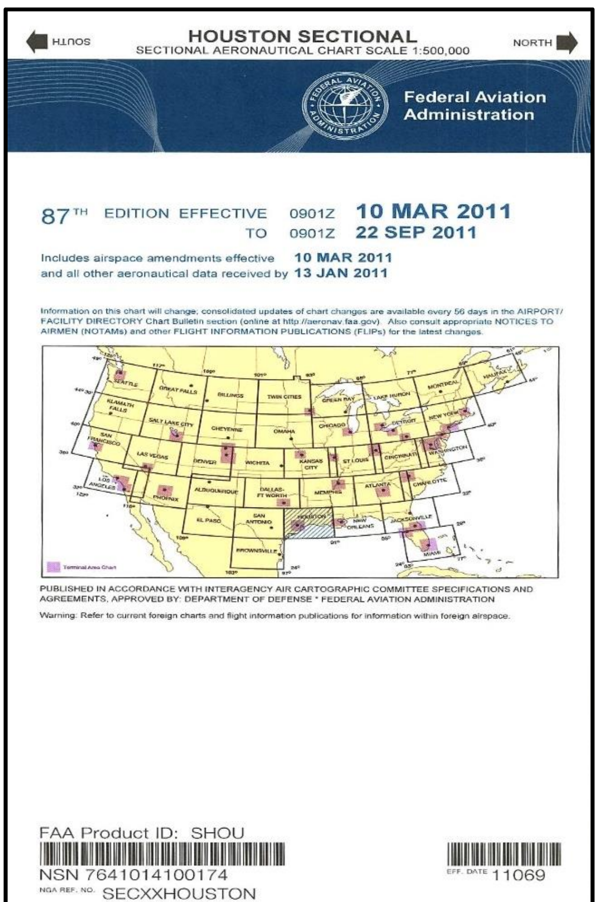


Figure 2-2 Sectional Chart

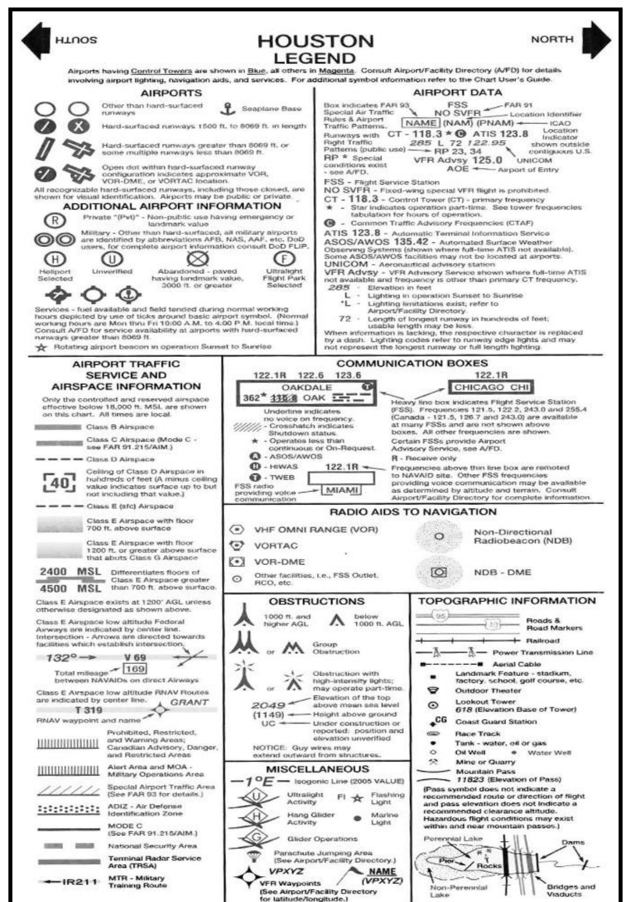


Figure 2-3 Chart Legend

203. RELIEF (HYPSOGRAPHY)

Chart relief shows the physical features related to the differences in elevation of the earth's surface. These include features such as mountains, hills, plateaus, plains, depressions, etc. Standard symbols and shading techniques are used in relief portrayal on charts; these include contours, spot elevations, variations in tint, and shading to represent shadows.

1. **Contour Lines** connect points of equal elevation. Figure 2-4 shows the relationship between contour lines and terrain. Notice that on steep slopes, the contour lines are close together and on gentle slopes, they are farther apart. The interval of the contour lines usually depends upon the scale of the chart and the terrain depicted. Depression contours are regular contour lines with spurs or ticks added on the downslope side.

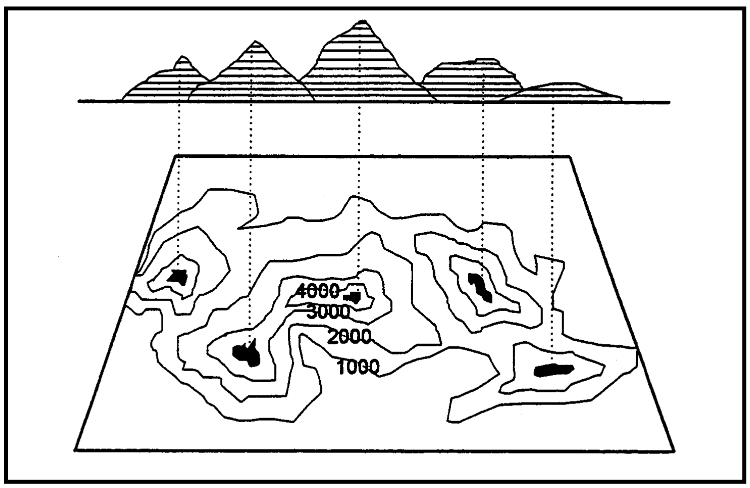


Figure 2-4 Relationship between Contour Lines and Terrain

2. **Contour Interval** are found in the chart legend (Figure 2-2). It indicates how often a contour line will be drawn on the chart. In Figure 2-4, the basic contour interval is 1000 feet. In addition, intermediate and auxiliary contour intervals will vary depending on the scale of the chart.

3. **Highest Terrain** location for each sectional is identified by location (latitude and longitude) and elevation (mean sea level) in the chart legend.

4. **Spot Elevations** are the heights of particular points of terrain above an established datum, usually Mean Sea Level (MSL) (Figure 2-2).

5. **Maximum Elevation Figures (MEF)** are two or three digit numbers found throughout the charts indicate the highest elevation (in hundreds of feet MSL) within a ticked area of latitude and longitude. MEFs are based on the highest known feature, including vertical obstructions (trees, towers, antennas), and provide 100-199 feet of clearance over that feature. The location within the ticked area for this highest feature is not indicated in the legend (Figure 2-2).

Example: 125 means the highest feature within that grid is between 12,301-12,400 feet MSL.

6. **Gradient Tints** emphasize the relief of the terrain is on charts. Each color of tint is used to designate areas within a certain elevation range. These colors range from light green for the lowest elevations to brown for higher elevations.

204. CULTURAL FEATURES

All man-made structures appearing on the chart are known as cultural features. The following three main factors govern the amount of detail given to cultural features.

1. The scale of the chart.

2. The use of the chart.

3. The geographical area covered.

Populated places, roads, railroads, installations, dams, bridges, and mines are some of the many examples. The size and shape of larger cities and towns are shown. Standardized coded symbols and type sizes are used to represent the smaller population centers. Symbols denoting cultural features are usually defined in the chart legend. Some charts use pictorial symbols which are self-explanatory.

Transportation lines, consisting primarily of railroads and roads, are important features for use in obtaining time checks along your route. When used in conjunction with other features, they can help to determine aircraft position.

Dual Lane Highways are multiple-lane, hard-surfaced roads having a center median or divider. They are indicated by a **double line** and are the easiest type of transportation line to identify from the air, since they are larger and few in number in most areas. An example is an interstate highway.

Primary Roads are hard-surfaced, all-weather roads, two or more lanes in width and are portrayed as a **single thick line**. In rural areas, almost all primary roads are selected for portrayal, but in built-up areas, they are shown only wherever space will permit. They are selected to represent the characteristic configuration of the transportation network in the area.

Secondary Roads are all other roads maintained for automobile traffic and may include both hard-surfaced and dirt roads. They are shown as a **single thin line** and are selected for portrayal when they do not cause clutter. Most often, they are shown in open areas containing few checkpoints or primary roads. **Tracks and Trails** are generally dirt roads not maintained for automobile traffic, portrayed with a **broken line** and shown only in areas where few roads exist. Except for dual lane highways, the road classification shown on the chart may not be a reliable indication of the visual appearance of the road (particularly true of two-lane roads which may be encoded as primary or secondary). Therefore, those roads that the aviator does see may be difficult to identify on any basis other than planned time of arrival. They should make no attempt to count roads as an orientation technique.

Bridges and viaducts **over 500 feet long** are portrayed with a bridge symbol in uncongested areas. The length of the bridge may be exaggerated on the chart, since the minimum length of scale on the sectional is 2000 feet between abutment ticks. In general, bridge symbols will be shown where roads cross double-line streams (streams at least 600 feet wide). However, you can expect to see many bridges along the flight path that are not shown on the chart. Their presence will have to be inferred by the fact that the road crosses a portrayed stream. Because of the wide disparities among the actual widths of single-line streams, the bridges that one might infer from road crossings may vary widely from minor culverts to significant spans. In addition, the vertical development of bridges cannot be determined from the symbol. A tall bridge will appear the same on the chart as a low bridge, although it will be easier to spot from a distance. When positively identified, a bridge can be used to fix the aircraft's position.

Railroads are almost always depicted**.** All multiple-track railroads and most single-track railroads are portrayed. If you see a railroad during flight, you should be able to find it on the chart. Furthermore, in most parts of the world, railroads are sufficiently sparse and they can be readily identified and distinguished from each other. They can also assume added significance in the accentuation of adjacent or associated features such as streams and towns, which otherwise might have little or no checkpoint value. However, railroads are not always easy to see from low altitude, even though they are portrayed boldly on the chart.

As a rule, railroads are easier to detect in hilly or mountainous terrain than in flat populated areas. Since a locomotive must operate on gentle grades and turns, the track bed in mountainous regions will normally be characterized by numerous cuts, fills, trestles, and tunnels. It is the features associated with the track bed that lend visual significance to railroads, not the tracks alone. These features are more significant in rugged terrain. Railroad yards, since they are excellent radar checkpoints, are generally shown if they exceed 2000 feet in length and are more than 5 tracks wide. Railroad stations, since they are often distinctive buildings, are generally shown in areas of sparse culture. With respect to the use of railroads for checkpoints, you should adopt the attitude, "I might not see it, but if I do, I will very likely be able to identify it on the chart."

Power Transmission Lines are generally difficult to see from the air. In addition, your chart may not indicate all transmission lines. Since trees must often be cut to install the towers and lines, you can often identify them from a distance by looking for these cutout areas.

Lookout Towers are usually located on high terrain, such as hilltops. They are generally difficult to locate due to their small size and coloring.

Pipelines installed underground obviously cannot be seen from the air. As with power transmission lines, they can often be identified by the cut out areas where trees were removed during installation. Pipelines are depicted by a broken line with the words "Underground Pipeline."

Populated Areas, such as cities, are valuable because they are usually prominent and can be positively identified by some unique element which differentiates one city from another in the same area. Although the shape of the built-up area of a city is shown on the chart, you should not attempt to identify a city on this basis alone. The city outline on the chart does not include recent suburban developments. The portrayed built-up area is primarily intended to identify the location where the significant vertical development of the city exists. Generally, only two categories of populated areas are shown.

1. Those of relatively large size and known shape, which are portrayed with city outlines.

2. Those of a small size or unknown shape, which are shown by means of a small circle.

Remember, prior to actually flying over a town, you cannot determine how the town will actually appear. Do not be surprised if the town is much smaller or larger than you expected after looking at the chart. This holds especially true for small towns, which could be anything from 1 store and 2 houses to 100 or more buildings.

Coastal Hydrography is recognized by the experienced aviator due to the importance of coastal penetration in low-level missions and the chart provides spatial orienting cues along the seaward side of the shoreline. Coastlines may be used in obtaining time checks, inbound or outbound, from the land and may be used for position determination if significant points or inlets are available.

In this category, aeronautical charts portray oceans, coastlines, lakes, rivers, streams, swamps, reefs, and numerous other hydrographic features. Open water may be portrayed by tinting, by vignetting, or may be left blank.

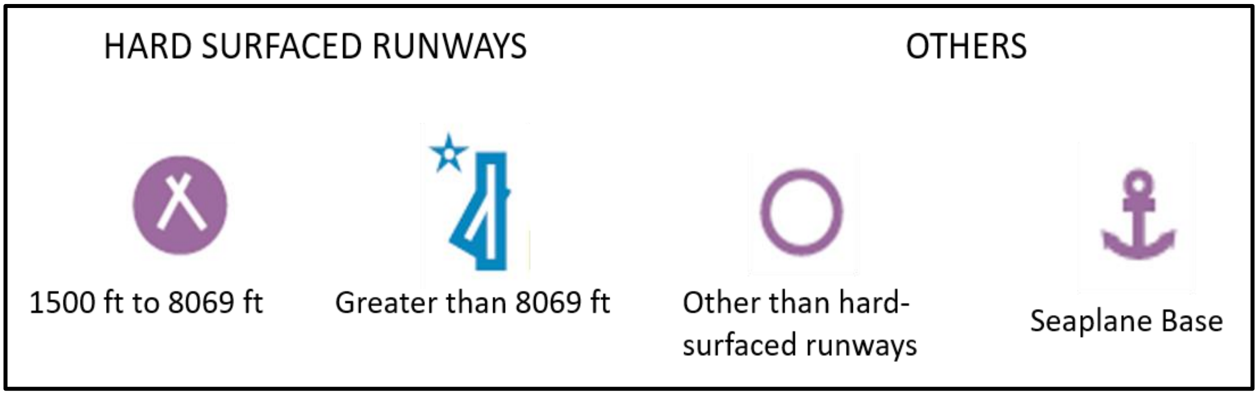
Vegetation is not shown on most small-scale charts. Forest and wooded areas in certain parts of the world are portrayed on some medium scale charts. On some large-scale charts, park areas, orchards, hedgerows, and vineyards are shown. Portrayal may be a solid unit, vignette, or supplemental vignette.

205. AERONAUTICAL INFORMATION

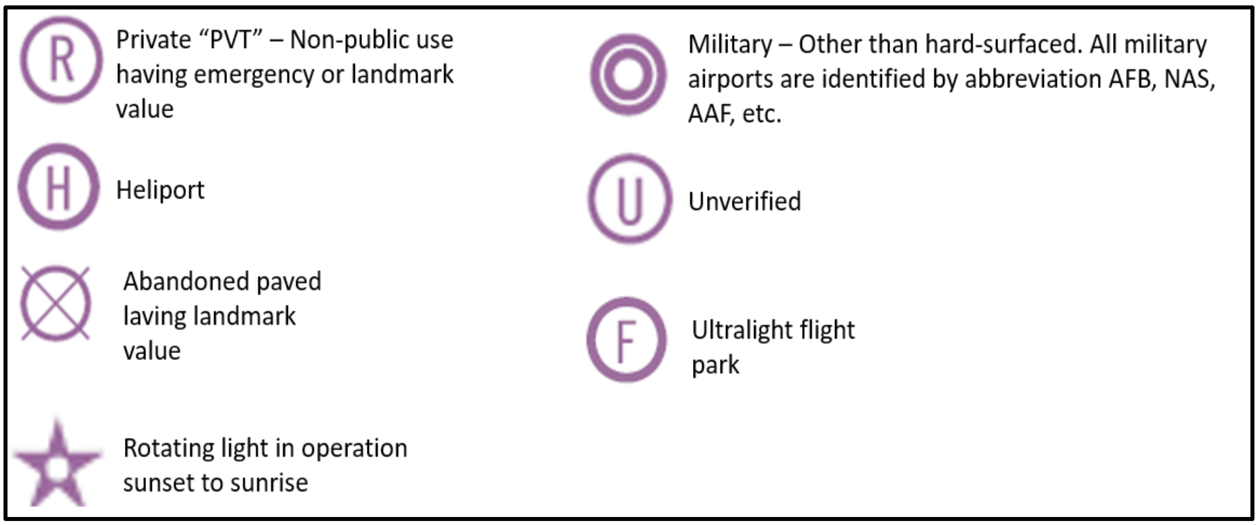
In the aeronautical category, coded chart symbols denote airfields, radio aids to navigation, commercial broadcasting stations, Air Defense Identification Zones (ADIZ), compulsory corridors, restricted airspace, warning notes, lines of magnetic variation, and special navigation grids. Some aeronautical information is subject to frequent change. For economy of production, charts are retained in stock for various periods of time. Since they may become rapidly out of date, only the more "stable" type information is on navigational charts. Aeronautical type data subject to frequent change is provided by the DOD Flight Information Publications (FLIP), Chart Updating Manual (CHUM), and Notices to Airmen (NOTAMS) documents.

1. On VFR Sectional Charts, airports having Control Towers are shown in blue, all others in magenta.

All recognizable hard-surfaced runways, including those closed, are shown for visual identification. The following symbols are used on VFR Sectional Charts:



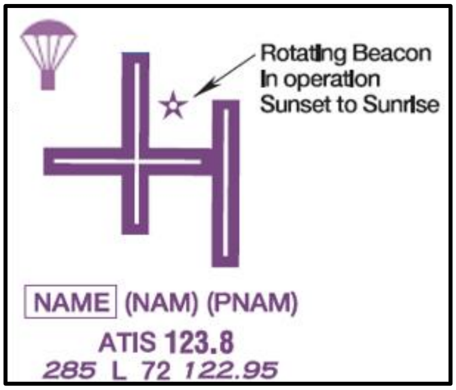
2. The following symbols portray additional airport information:



Services, such as fuel available and field tended during normal working hours, are depicted by use of ticks around the basic airport symbol.

NOTE

Consult the Airfield Directory (A/FD) for service availability at airports with runways greater than 8069 feet.



This airport has three runways, oriented NS/EW, the longest of which is 7200 feet (72) in length. The field elevation is 285 feet MSL. The field has a rotating light with runway lighting (L) available from sunset to sunrise. ATIS is broadcast on 123.8. There is no control tower (magenta) but there is a UNICOM frequency of 122.95. There is a Parachute Jumping Area in the vicinity.

3. Man-made obstructions extending 200 feet or more Above Ground Level (AGL) are depicted on charts with a symbol (refer to chart legends). Obstructions are marked/lighted to warn pilots of their presence during daytime and nighttime conditions. Most have aviation red obstruction lights. Obstructions with high intensity flashing white lights are depicted with an obstruction symbol with lightning bolts coming from the top.

Two examples of single obstructions are depicted:

The upper number is the altitude above MSL at the top of the tower, while the lower one in parenthesis is the tower height above the ground. The elevation of the ground at the tower can be determined by subtracting the lower number from the upper. In this case, the ground elevation is 1839 feet MSL.

Multiple obstructions near each other are depicted:

The numbers in this case indicate the same information as with single obstructions. Note that the obstruction symbols are NOT to scale. If they were, the obstructions would be over a mile high.

4. Radio Facilities have standard symbols used to depict radio aids to navigation. Refer to the chart legends and be completely familiar with the symbols for VOR, VORTAC, TACAN,VOR/DME, and other facilities such as ADFs and NDBs.

5. Special Use Airspace is airspace of defined dimensions in which aircraft flight may be restricted or which contains danger to flight operations. Special use airspace is depicted on charts unless activated only by Notices to Airmen. Letters and numerals identify each area of special use airspace and are internationally recognized. Refer to legends for examples.

By referring to FLIP Area Planning AP/1A, you can determine the coordinates (latitude and longitude) defining the area, affected altitudes, times of activation and controlling agency, if any.

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER THREE
FEDERAL AVIATION REGULATIONS

300. INTRODUCTION

The current Aeronautical Information Manual (AIM)/Federal Aviation Regulations (FAR) lists information and regulations pertinent to VFR/IFR operations. Listed are some, but not all of interest to visual navigation.

301. CONTROLLED AIRSPACE

The AIM defines controlled airspace as “a generic term that covers the different classifications of airspace (Class A, B, C, D, and E) and defined dimensions within which air traffic control service is provided to IFR and VFR flights in accordance with the airspace classification.” Safety, users’ needs, and volume of flight operations are some of the factors considered in the designation of controlled airspace. When so designated, the airspace is supported by ground-to-air communications, navigation aids, and air traffic control services.

The important point to remember about controlled airspace is to know when you are in it and when you are not. When flying a visual navigation route under VFR, visibility and cloud clearance requirements are different in controlled and uncontrolled airspace (see paragraph 306).

The following is a breakdown of airspace encountered during Navigation operations. The important point is to be able to recognize these airspaces on a sectional and know the particular requirements to operate in them.

1. **Class A** consists of controlled airspace between FL 180 and FL 600**. VFR flight is not permitted in Class A airspace.** All aircraft must be equipped with ADS-B Out (beginning 1 January 2020).

2. **Class B** consists of controlled airspace extending upward from the surface or higher to specified altitudes (generally 10,000 feet MSL), within which all aircraft are subject to the operating rules and pilot/equipment requirements specified in FAR 91.215 and FAR 91.131. Regardless of weather conditions, **an ATC authorization (i.e., clearance) is required prior to operating within Class B airspace.** For all practicable purposes, you must hold a private pilot certificate or be a designated military aviator to operate in Class B airspace. The aircraft must be equipped with an operable two-way radio capable of communicating with ATC. The aircraft must also have a radar beacon transponder with automatic altitude reporting equipment (Mode C) and ADS-B Out (beginning January 1, 2020) when within 30 NM of the primary airport, or if operating above the Class B airspace. If operating IFR, an operable VOR or TACAN receiver must be aboard. Penetration of Class B airspace without satisfying the above requirements may result in a flight violation. Class B airspace is marked with solid blue lines on sectionals.

NOTE

ATC authorization (i.e., clearance) will be specific to the Class B airspace entering (i.e., "*[call sign], you are **cleared** into the confines of the New Orleans Class B airspace*"). As with a takeoff or landing clearance, if there is any doubt about your clearance, request confirmation with the controller prior to entry.

3. **Class C** consists of controlled airspace extending upward from the surface or higher to specified altitudes (generally 4000 feet AGL) within which all aircraft are subject to operating rules. Class C airspace consists of two circles, both centered on the primary airport. The inner circle has a radius of 5 NM. The outer circle has a radius of 10 NM. There is an outer area which extends out to 20 NM for the purpose of establishing communication. The airspace of the inner circle extends upward from the surface to 4000 feet above the airport. The airspace in the area between the 5 NM and 10 NM rings begins at 1200 feet AGL and extends to the same altitude cap as the inner circle. No specific pilot certificate is required to operate within Class C airspace. The aircraft must have an operable two-way radio to communicate with ATC, a transponder with Mode C, and be equipped with ADS-B Out (beginning January 1, 2020). Two-way communication with ATC must be established prior to entering Class C airspace (see note following). Penetration of Class C airspace without satisfying the above requirements may result in a flight violation. Class C airspace is marked with solid magenta lines on sectionals.

NOTE

Two-way communication with ATC is "established" when the controller acknowledges your call sign (i.e., "*[call sign], Houston Approach, stand by*"). If the controller does not use your call sign when they respond to you (i.e., "*Aircraft calling Houston Approach, stand by*"), you have NOT established two-way communication.

4. **Class D** consists of the airspace from the surface to 2500 feet AGL surrounding those airports that have an **operational** control tower. The horizontal boundaries of Class D may vary with published instrument approaches. The horizontal boundaries of Class D may vary from location to location and will often feature a 4.4 NM core radius. The existence of Class D airspace is indicated on sectional charts by blue airport symbols and usually a blue dashed circle surrounding the airport defining the actual boundary. Pilots must establish two-way radio contact with the control tower or approach control prior to entering Class D airspace. If IFR or receiving radar services from an ATC facility, it becomes ATC's responsibility to coordinate with the appropriate control towers for approval through the airspace. Penetration of Class D airspace without satisfying the above requirements may result in a flight violation.

5. **Class E** generally consists of any airspace not Class A, B, C, or D and defined as controlled airspace. All Federal (Victor) Airways are Class E airspace and, unless otherwise specified, extend upward from 1200 feet AGL to, but not including, 18,000 feet MSL. Surface-based Class E airspace, depicted on sectional charts by broken magenta lines, is based on a primary airport but

may include one or more airports and is configured to contain all instrument approaches. Class E transition areas provide controlled airspace extensions from the primary airport and are used to contain instrument approaches procedures within controlled airspace. This airspace extends upward from 700 feet AGL and is depicted on the sectional by shaded magenta. Aircraft must be equipped with ADS-B Out while operating in Class E airspace above 10,000 feet but not below 2500 feet AGL (beginning 1 January, 2020).

6. **Class F** is **NOT USED**. Used ICAO only; no U.S. equivalent.

7. **Class G** consists of all uncontrolled airspace.

NOTE

Except in the western U.S., you will not find Class G airspace above 1200 feet AGL.

8. **A Terminal Radar Service Area (TRSA)** is the airspace surrounding designated airports wherein ATC provides radar vectoring, sequencing, and separation for all IFR and participating VFR aircraft operating within the TRSA. This service provided in a TRSA is called "Stage III service" or VFR flight following. Although not mandatory for civil aviation, compliance with Stage III service is mandatory for all CNATRA aircraft. TRSAs continue to exist because of no ICAO equivalent.

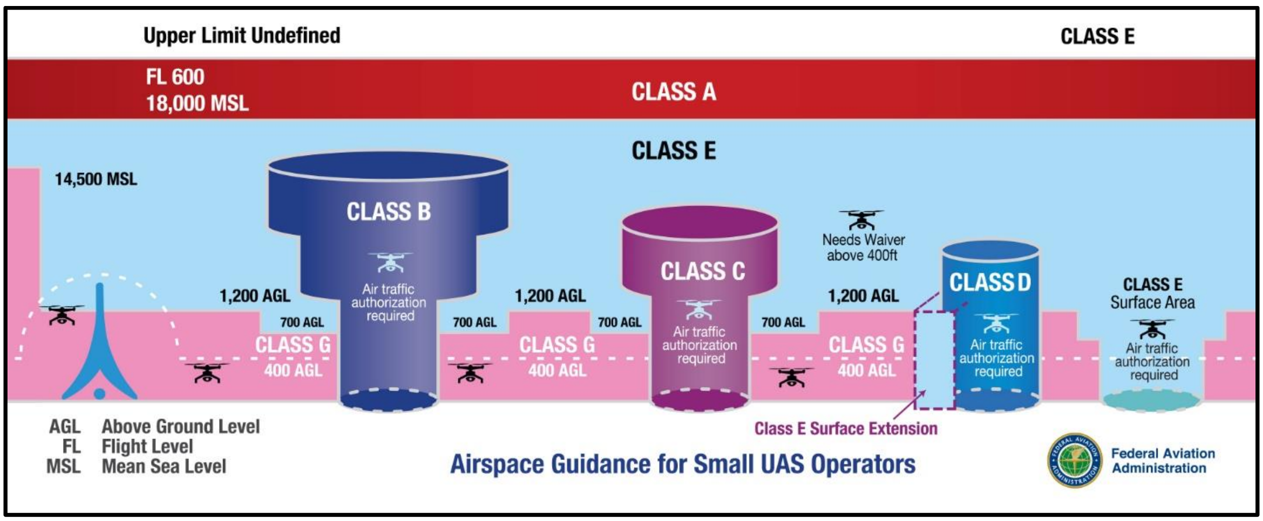


Figure 3-1 Classification Diagram

Airspace Features	Class A	Class B	Class C	Class D	Class E	Class G
Operations Permitted	IFR	IFR and VFR	IFR and VFR	IFR and VFR	IFR and VFR	IFR and VFR
Entry Prerequisites	ATC Clearance	ATC Clearance	ATC Clearance for IFR, Radio contact for all	ATC Clearance for IFR, Radio contact for all	ATC Clearance and Radio contact for IFR	None
Minimum Pilot Qualifications	Instrument Rating	Private or student certificate	Student certificate	Student certificate	Student certificate	Student certificate
Two-way Radio Communications	Yes	Yes	Yes	Yes	Yes for IFR	No
VFR Minimum Visibility	N/A	3 statute miles	3 statute miles	3 statute miles	*See Figure 3-5*	*See Figure 3-5*
VFR Minimum distance from clouds	N/A	Clear of Clouds	500' below 1,000' above and 2,000' horizontal	500' below 1,000' above and 2,000' horizontal	*See Figure 3-5*	*See Figure 3-5*
Aircraft Separation	All	All	IFR and VFR	IFR	IFR	None
Conflict Resolution	N/A	N/A	Between IFR and VFR Ops	No	No	No
Traffic Advisories	N/A	N/A	Yes	Workload permitting	Workload permitting	Workload permitting
Safety Advisories	Yes	Yes	Yes	Yes	Yes	Yes
ADS-B Out	Yes	Yes	Yes	No	Above 10,000’, but not below 2,500’ AGL	

Figure 3-2 Classification Chart

302. SPECIAL USE AIRSPACE

1. **Prohibited Areas** contain airspace of defined dimensions, identified by an area on the surface of the earth within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. For example, the White House is designated as P-56. Penetration of this airspace will result in, at a minimum, a flight violation.

2. **Restricted Areas** contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Restricted Areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted airspace without prior permission of the controlling authority may result in a flight violation.

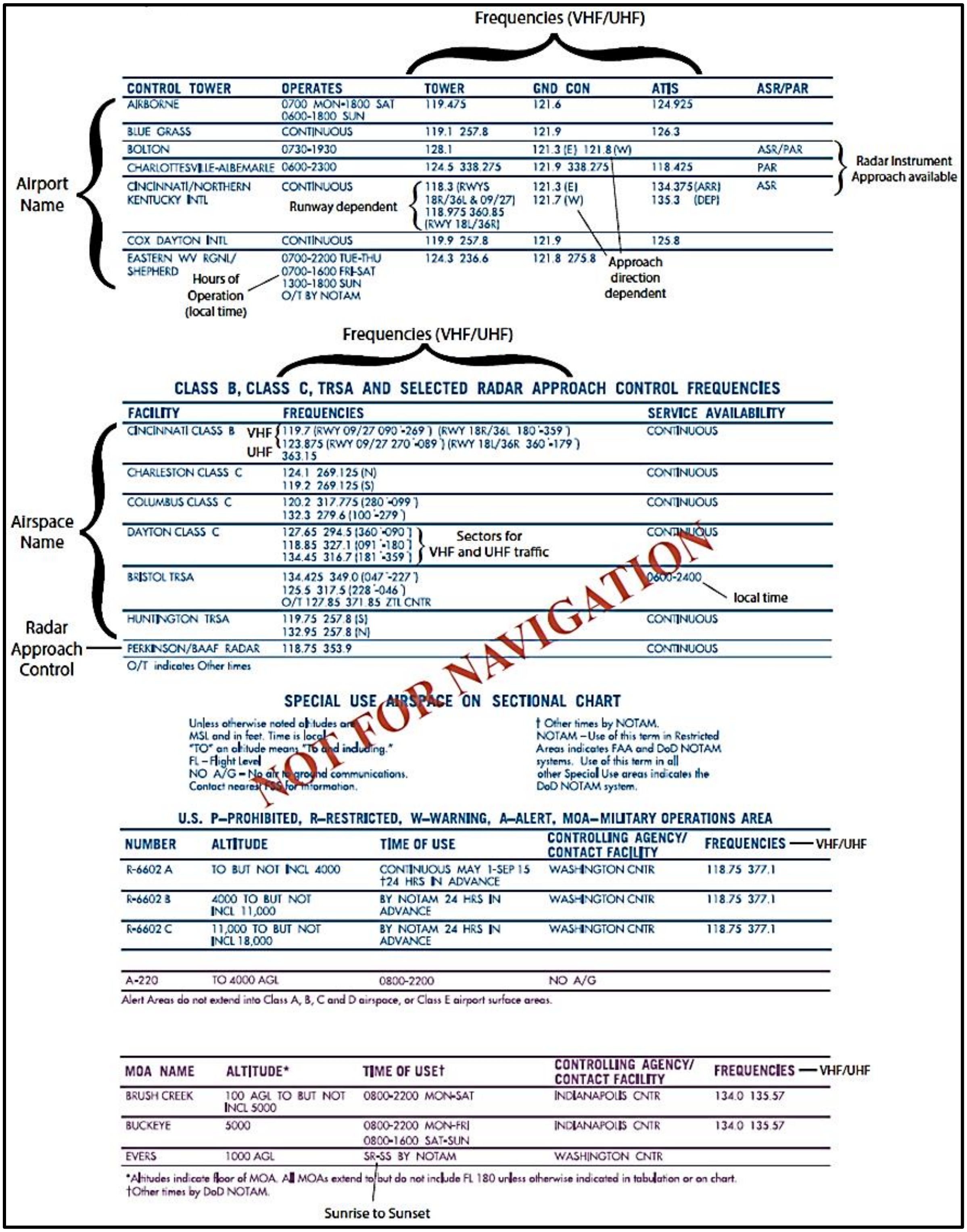
3. **Warning Areas** are airspace, which may contain hazards to nonparticipating aircraft in international airspace. Warning Areas are established beyond the coastal three mile limit. Warning Areas may be as hazardous as Restricted Areas, but cannot be designated Restricted

Areas because they are over international waters. Although not mandatory, pilots should obtain authorization prior to penetration of any Warning Areas.

4. **Alert Areas** are depicted on aeronautical charts to inform nonparticipating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should be particularly alert when flying in these areas.

5. **Military Operating Areas (MOA)** consist of airspace of defined vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic. Pilots operating under VFR should exercise extreme caution when flying in an operating MOA. The activity status (active/inactive) of MOAs may change frequently. Therefore, pilots should contact any FSS within 100 miles of the area to obtain accurate real-time information concerning MOA hours of operation.

VFR Sectional Charts list control tower frequencies (Figure 3-3) including the name of the control tower, its radio call (if different), times of operations, ATIS, and whether ASRs/PARs are available. Also listed are U.S. Prohibited Areas, Alert Areas, Warning Areas, and Military Operating Areas providing number, location, altitude, and time of use.



CONTROL TOWER	OPERATES	TOWER	GND CON	ATIS	ASR/PAR
AIRBORNE	0700 MON-1800 SAT 0600-1800 SUN	119.475	121.6	124.925	
BLUE GRASS	CONTINUOUS	119.1 257.8	121.9	126.3	
BOLTON	0730-1930	128.1	121.3 (E) 121.8 (W)		ASR/PAR
CHARLOTTESVILLE-ALBEMARLE	0600-2300	124.5 338.275	121.9 338.275	118.425	PAR
CINCINNATI/NORTHERN KENTUCKY INTL	CONTINUOUS	118.3 (RWYS 18R/36L & 09/27) 118.975 360.85 (RWY 18L/36R)	121.3 (E) 121.7 (W)	134.375 (ARR) 135.3 (DEP)	ASR
COX DAYTON INTL	CONTINUOUS	119.9 257.8	121.9	125.8	
EASTERN WV RGNL/ SHEPHERD	0700-2200 TUE-THU 0700-1600 FRI-SAT 1300-1800 SUN O/T BY NOTAM	124.3 236.6	121.8 275.8		

CLASS B, CLASS C, TRSA AND SELECTED RADAR APPROACH CONTROL FREQUENCIES

FACILITY	FREQUENCIES	SERVICE AVAILABILITY
CINCINNATI CLASS B	119.7 (RWY 09/27 090°-269°) (RWY 18R/36L 180°-359°) 123.875 (RWY 09/27 270°-089°) (RWY 18L/36R 360°-179°) 363.15	CONTINUOUS
CHARLESTON CLASS C	124.1 269.125 (N) 119.2 269.125 (S)	CONTINUOUS
COLUMBUS CLASS C	120.2 317.775 (280°-099°) 132.3 279.6 (100°-279°)	CONTINUOUS
DAYTON CLASS C	127.65 294.5 (360°-090°) 118.85 327.1 (091°-180°) 134.45 316.7 (181°-359°)	CONTINUOUS
BRISTOL TRSA	134.425 349.0 (047°-227°) 125.5 317.5 (228°-046°) O/T 127.85 371.85 ZTL CNTR	0600-2400
HUNTINGTON TRSA	119.75 257.8 (S) 132.95 257.8 (N)	CONTINUOUS
PERKINSON/BAAF RADAR	118.75 353.9	CONTINUOUS

O/T indicates Other times

SPECIAL USE AIRSPACE ON SECTIONAL CHART

Unless otherwise noted altitudes are MSL and in feet. Time is local.
"TO" an altitude means "To and including."
FL – Flight Level
NO A/G – No air to ground communications.
Contact nearest FSS for information.

† Other times by NOTAM.
NOTAM – Use of this term in Restricted Areas indicates FAA and DoD NOTAM systems. Use of this term in all other Special Use areas indicates the DoD NOTAM system.

U.S. P–PROHIBITED, R–RESTRICTED, W–WARNING, A–ALERT, MOA–MILITARY OPERATIONS AREA

NUMBER	ALTITUDE	TIME OF USE	CONTROLLING AGENCY/ CONTACT FACILITY	FREQUENCIES
R-6602 A	TO BUT NOT INCL 4000	CONTINUOUS MAY 1-SEP 15 †24 HRS IN ADVANCE	WASHINGTON CNTR	118.75 377.1
R-6602 B	4000 TO BUT NOT INCL 11,000	BY NOTAM 24 HRS IN ADVANCE	WASHINGTON CNTR	118.75 377.1
R-6602 C	11,000 TO BUT NOT INCL 18,000	BY NOTAM 24 HRS IN ADVANCE	WASHINGTON CNTR	118.75 377.1
A-220	TO 4000 AGL	0800-2200	NO A/G	

Alert Areas do not extend into Class A, B, C and D airspace, or Class E airport surface areas.

MOA NAME	ALTITUDE*	TIME OF USE†	CONTROLLING AGENCY/ CONTACT FACILITY	FREQUENCIES
BRUSH CREEK	100 AGL TO BUT NOT INCL 5000	0800-2200 MON-SAT	INDIANAPOLIS CNTR	134.0 135.57
BUCKEYE	5000	0800-2200 MON-FRI 0800-1600 SAT-SUN	INDIANAPOLIS CNTR	134.0 135.57
EVERS	1000 AGL	SR-SS BY NOTAM	WASHINGTON CNTR	

*Altitudes indicate floor of MOA. All MOAs extend to but do not include FL 180 unless otherwise indicated in tabulation or on chart.
†Other times by DoD NOTAM.

Figure 3-3 Control Tower Frequencies and Special Use Airspace

In review, there are two important points to remember about airspaces:

1. How to recognize them on the VFR Sectional (depicted on the legend).

2. The requirements for operating in and around these airspaces.

As a professional aviator, it is your responsibility to stay current with all the requirements to operate in the VFR and IFR environment. To stay up–to-date with all the FAA's changes, **it is highly encouraged you obtain a current edition of the FAR/AIM.**

303. GENERAL FLIGHT OPERATIONS

1. **Altitude Restrictions**, FAR Part 91.119 states: "Except when necessary for takeoff or landing, no person may operate aircraft below the following altitudes:

    a. **Anywhere**. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.

    b. **Over congested areas**. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of **1000 feet** above the highest obstacle within a horizontal radius of **2000 feet** of the aircraft.

    c. **Over other than congested areas**. An altitude of **500 feet** above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than **500 feet** to any person, vessel, vehicle, or structure."

CNAF M-3710.7 (series) makes a more stringent requirement: "Except when necessary for takeoff and landing or when the mission of the flight requires otherwise, flight in fixed-wing aircraft shall not be conducted below an altitude of **500 feet** above the terrain or surface of the water." Additionally, "Flights of naval aircraft shall be conducted so that a minimum of annoyance is experienced by persons on the ground. It is not enough for the pilot to be satisfied that no person is actually endangered. Definite and particular effort shall be taken to fly in such a manner that individuals do not believe they or their property are endangered."

"Commanding Officers of aviation units shall take steps to prevent aircraft from frightening wild fowl or driving them from their feeding grounds. When it is necessary to fly over known wild fowl habitations, an altitude of at least 3000 feet shall be maintained, conditions permitting. During hunting season, pilots shall avoid flying near wildlife haunts except as noted above."

2. **Speed Restrictions**

    a. As per FAR Part 91.117, the maximum authorized airspeed for aircraft below 10,000 feet MSL is 250 KIAS.

b. Class B - The maximum airspeed within Class B airspace is also 250 KIAS. If an aircraft is operating beneath the lateral limits of Class B airspace, the aircraft's speed is restricted to 200 KIAS.

c. Class C - The maximum airspeed within Class C airspace is 250 KIAS. However, when the aircraft is within 4 NM of the primary airport and at or below 2500 feet AGL, the maximum airspeed is reduced to 200 KIAS.

d. Class D - The maximum airspeed within 4 NM of the primary airport inside Class D airspace and at or below 2500 feet AGL is 200 KIAS. This speed restriction also applies where Class D airspace (other than the primary airport) overlaps into Class B airspace.

e. Military training routes are established corridors where high performance military aircraft are authorized to exceed the 250 KIAS restriction. VR and IR routes are identified on VFR sectionals and on an AP/1B Chart. Detailed information on each route can be found in the AP/1B. Information on the activity status may be obtained from the nearest FSS or from the scheduling authority listed in AP/1B.

304. AIRCRAFT RIGHT-OF-WAY

When weather conditions permit, regardless of whether an operation is conducted under IFR or VFR conditions, vigilance shall be maintained by persons operating an aircraft so as to see and avoid other aircraft in compliance with FAR 91.113. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

FAR sets forth priority of converging aircraft as follows:

1. Balloon

2. Glider

3. Towing/Airborne refueling

4. Airships

5. Rotary and fixed-wing aircraft

It further states:

1. **Converging** occurs when aircraft of the same category are converging at approximately the same altitude (except head-on or nearly so) the aircraft to the other's right has the right-of-way.

2. **Approaching Head-On** is when aircraft are approaching each other head-on, or nearly so, each pilot of each aircraft shall alter course to the right.

3. **Overtaking** is simply passing another aircraft that is headed in the same direction. Each aircraft that is being overtaken has the right-of-way and each pilot of an overtaking aircraft shall alter course to the right to pass well clear.

4. **Distressful** situations may occur with an aircraft experiencing an emergency situation. Aircraft in distress have the right-of-way over all other aircraft in all emergencies.

5. **Landing.** Aircraft while on final approach to land or while landing, have the right of way over other aircraft in flight. When two or more aircraft are approaching an airport for the purpose of landing, the aircraft at the lower altitude has the right of way, but shall not take advantage of this rule to cut in front of another which is on final approach to land or to overtake that aircraft.

305. VFR CRUISING ALTITUDES

VFR cruising altitudes begin above 3000 feet AGL and are determined by magnetic course, **NOT THE AIRCRAFT'S HEADING!** Easterly courses (360-179 º) should be flown at altitudes of odd thousands plus 500 (e.g., 3500, 5500, 7500, etc). Westerly courses (180-359 º) should be flown at altitudes of even thousands plus 500 (e.g., 4500, 6500, 8500, etc.).

306. CLOUD CLEARANCE/VISIBILITY REQUIREMENTS

ALTITUDE	AIRSPACE	VISIBILITY	DISTANCE FROM CLOUDS
1200 feet AGL or less above the surface	CONTROLLED	3SM	500 feet Below 1000 feet Above 2000 feet Horizontal
	UNCONTROLLED (DAY)	1 SM	Clear of Clouds
	UNCONTROLLED (NIGHT)	3 SM	500 feet Below 1000 feet Above 2000 feet Horizontal
More than 1200 feet AGL above the surface, but less than 10,000 feet MSL	CONTROLLED	3 SM	500 feet Below 1000 feet Above 2000 feet Horizontal
	UNCONTROLLED (DAY)	1 SM	500 feet Below 1000 feet Above 2000 feet Horizontal
	UNCONTROLLED (NIGHT)	3 SM	500 feet Below 1000 feet Above 2000 feet Horizontal
More than 1200 feet AGL above surface and at or above 10,000feet MSL	CONTROLLED AND UNCONTROLLED	5 SM	1000 feet Below 1000 feet Above 1 SM Horizontal

Figure 3-4 Cloud Clearances/Visibility Requirements

307. AVOIDANCE CRITERIA

1. The minimum altitude for any visual navigation route (excluding designated Low Level events) is 1000 feet AGL. Descent to 500 feet AGL is limited to simulated emergencies and must be in accordance with Paragraph 303.

2. Do not overfly uncontrolled airports below 1500 feet AGL. Do not penetrate any Class D airspace (i.e., operating control towers). When practicable, avoid flight within 1500 feet AGL or 5 NM of airports.

3. Noise-sensitive areas (breeding and poultry farms, resorts, beaches, national parks, etc.) shall be avoided when at altitudes of less than 3000 feet AGL. If it is necessary to overfly wild fowl habitations, maintain at least 3000 feet AGL (CNAF M-3710.7 (series)). See Figure 3-5.

4. Refer to current FLIP AP/1B for other restrictions.

REGULATIONS REGARDING FLIGHTS OVER CHARTED NATIONAL PARK SERVICE AREAS, U.S. FISH AND WILDLIFE SERVICE AREAS, AND U.S. FOREST SERVICE AREAS

The landing of aircraft is prohibited on lands or waters administered by the National Park Service, U.S. Fish and Wildlife Service or U.S. Forest Service without authorization from the respective agency. Exceptions include: 1) when forced to land due to an emergency beyond the control of the operator, 2) at officially designated landing sites, or 3) on approved official business of the Federal Government.

All aircraft are requested to maintain a minimum altitude of 2,000 feet above the surface of the following: National Parks, Monuments, Seashores, Lakeshores, Recreation Areas and Scenic Riverways administered by the National Park Service; National Wildlife Refuges, Big Game Refuges, Game Ranges and Wildlife Ranges administered by the U.S. Fish and Wildlife Service; and Wilderness and Primitive areas administered by the U.S. Forest Service. FAA Advisory Circular (AC) 91-36C, "Visual Flight Rules (VFR) Flight Near Noise-Sensitive Areas," defines the surface as: the highest terrain within 2,000 feet laterally of the route of flight, <u>or</u> the upper-most rim of a canyon or valley.

Federal regulations also prohibit airdrops by parachute or other means of persons, cargo, or objects from aircraft on lands administered by the three agencies without authorization from the respective agency. Exceptions include: 1) emergencies involving the safety of human life, or 2) threat of serious property loss.

Boundary of National Park Service areas. U.S. Fish and Wildlife Service areas and U.S. Forest Service Wilderness and Primitive areas.

Figure 3-5 Federal Regulations

CHAPTER FOUR
PREFLIGHT PLANNING

400. INTRODUCTION

There are five important steps in preflight planning:

1. Acquiring navigational material and reference publications

2. Route and checkpoint selection

3. Chart preparation

4. Jet log preparation

5. DD 175 preparation

401. ACQUIRING NAVIGATION AND REFERENCE MATERIALS

Prior to any Navigation flight, it is imperative the pilot thoroughly familiarize themselves with intended routes of flight, possible alternate routes of flight, intended destination, possible alternates, and fuel requirements for each flight.

Flight planning publications that should be reviewed during the preflight planning include the Chart Update Manual (CHUM), FLIP General Planning, Area Planning, Enroute Supplement, Instrument Approach Plates, Enroute Low Altitude Charts, and VFR Sectional Charts. Check all Temporary Flight Restrictions (TFRs) from the Flight Data Center (FDC) NOTAMs and the various Air Traffic Control Center (ARTCC) NOTAMS. Ensure all publications are current prior to use.

Cross-country fuel packets may be checked out prior to the flight and must be returned (with any fuel receipts) immediately after the flight. Except in emergency situations, fuel and oil shall be obtained from military activities or commercial sources with government contract fuel and oil.

402. ROUTE AND CHECKPOINT SELECTION

There are two important steps to take prior to chart preparation. The first is the selection of a destination and the second is selection of the route. As a rule of thumb, select a VFR destination within approximately 200-300 NM of the departure airport. This should allow for adequate fuel reserves to perform practice approaches and pattern work at the destination. **Be sure to coordinate destination airport and route selection with your instructor prior to beginning your flight planning**. It is important to obtain the route early so the proper preflight planning can be completed. The choice of routes by your instructor will be made with main consideration for the weather and a secondary consideration of distance, due to the fuel limitations of the T-6B. **Routes should, at a minimum, have 6 checkpoints.** However, the more checkpoints along your route, the less chance you will get disoriented.

Once the destination of the flight is established, check the weather and acquire the terminal forecast at homefield and at the destination. Obtain all available information pertaining to enroute weather, destination weather, and the forecast weather for the return flight. A major factor controlling the route of flight is distance and fuel onboard. Fuel planning involves more than a homefield-to-destination computation. Fuel considerations must include diverts to alternates along the entire route, minimum fuel along the route required to successfully divert (Bingo), minimum fuel along the route to complete the mission as briefed, and emergency fuel requirements in compliance with CNAF M-3710.7 (series).

Characteristics of good checkpoints

In military flying, Dead Reckoning (DR) is your primary means of visual navigation. DR navigation is based upon visually identifying a point and then traveling in a direction for a set time and airspeed in order to visually find the next point. Visual fixing is the primary means of identifying aircraft position. Radar, Global Positioning System (GPS), and Inertial Navigation System (INS) are all great “crutches,” but it all starts with visual situational awareness. Your most important duty in this environment is to look outside the aircraft! Now you need to know what to look for. The focus of this section is on the qualities that make a checkpoint more easily identifiable and usable for position determination.

Several factors determine the most important quality of a visual checkpoint - our ability to see it! Size is important because a larger feature can generally be seen from greater distances and is easier to identify. Also, the more unique and distinctive a point is, the better. If you can find a feature that has something unique (color, shape, size), it will reduce errors in identifying your point.

Horizontal development refers to the “width” of the feature. Coastlines, lakes, roads, and rivers are examples of features with large horizontal development. Vertical development refers to towers, mountains, and other man-made structures.

The ideal checkpoint has both vertical and horizontal development. Such a point might be a tall bridge across a wide river or a large factory complex with tall smoke stacks. Unfortunately, such points are not always available.

For T-6B flights, horizontal development is generally more desirable than vertical development due to the altitude flown. Small towers can be difficult to see from 1500-2500 feet AGL due to their size and possibility of blending into a nearby tree line. In lower altitude flight (500 feet AGL), vertical development will prove more effective, as horizontally developed features become masked by trees and a shortened horizon. Further, as aircraft altitude decreases, vertical development tends to rise above the horizon due to the perspective change, making the vertical checkpoint more easily identifiable.

Also consider the information that a checkpoint provides. Linear features (e.g., roads, railroads, pipelines, power lines) running parallel to your planned track give information regarding course. Features running perpendicular to your track give information regarding time. An ideal checkpoint should give both course and time information (e.g., a road intersection, a distinctive bend of a river, or bridge). On the contrary, a linear feature crossing the planned track at a 45º angle does not provide either accurate course or time information if used alone.

The surrounding area of a checkpoint can also be helpful through the use of funneling and limiting features. A **funneling** feature is an aid that helps track your eyes onto the point for which you are looking. Flying parallel to a river that leads to the desired bridge, or visually tracking a power line that forms your desired road intersection, are great uses of funneling features to find an individual checkpoint. Roads, rivers, power lines, and railroad tracks can all be good funneling features. A **limiting** or **catching** feature alerts you when you are at your checkpoint or have flown past it. This can be any feature that is prominent and located at or past your checkpoint. Availability of these features is a plus when selecting a checkpoint.

The ultimate goal when choosing checkpoints is to fix your position as accurately as possible. While an airfield is a good example of horizontal development and good for situational awareness, it may not provide the most accurate position unless a distinctive structure or runway pattern is used. The ideal checkpoint will not only have both vertical and horizontal development, but will have funneling and limiting features available as well.

As you build your proficiency in visual navigation, your preflight selection of checkpoints will become more discriminating, and your airborne ability to gain situational awareness from less than ideal checkpoints will improve.

Additional items to remember when selecting checkpoints:

1. Inferred bridges crossing double-lined rivers are a minimum of 600 feet in length.

2. Where primary roads cross interstate highways, an overpass, bridge, or access ramp is generally present.

3. Multiple tower annotations can represent two, three, or even twenty towers making accurate position fixing difficult.

4. Look for other nearby features to aide in identifying the checkpoint, such as terrain, river bends, roads, etc. In this manner, any checkpoint can be uniquely and positively identified.

Additional considerations for choosing checkpoints

It is important to anticipate what the checkpoint will look like from the cockpit and not just the ground level perspective. Until you gain more experience in the aircraft, utilizing all available resources is a great way to build your image of how the checkpoint should appear from the aircraft prior to actually getting there.

For example, while a power plant initially sounds like a good checkpoint, further investigation should be conducted. Satellite imagery from common, open source websites will provide you with a bird's eye view for your checkpoint. In Figures 4-1, 4-2, and 4-3, you can see how the differences in perspective from chart (Figure 4-1), visual imagery (Figure 4-2), and from the aircraft (Figure 4-3).

Combining the image from the chart, aerial photographs (if available), and satellite imagery should give you a complete picture of your checkpoints. Learn to reconcile these images with your every day, ground-level sight picture to that of the actual cockpit perspective.

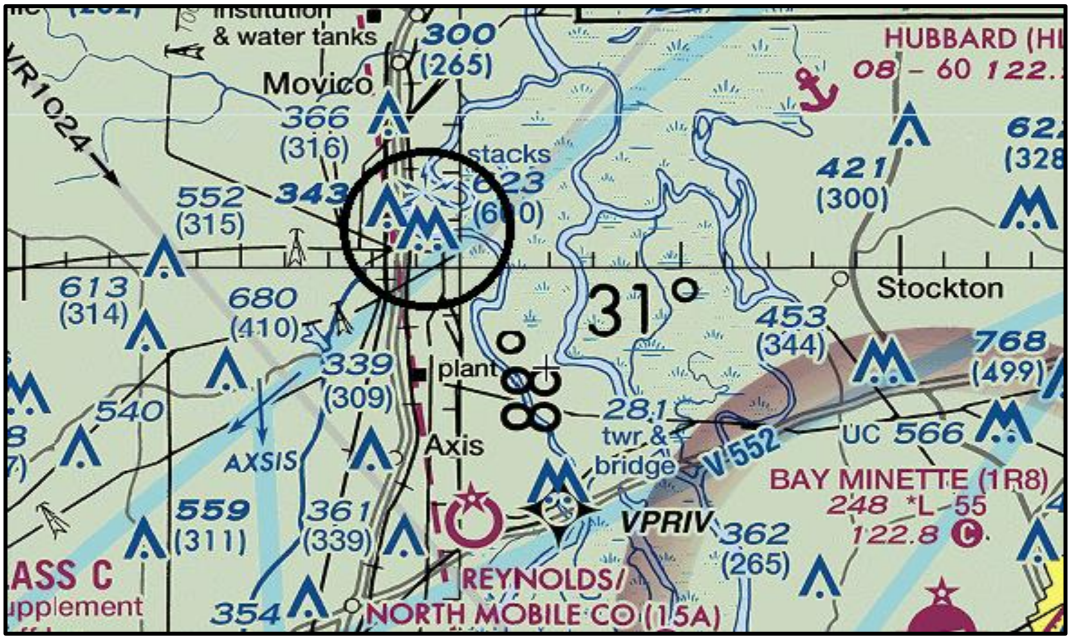


Figure 4-1 VFR sectional image of power plant

Figure 4-2 Satellite imagery of power plant

Figure 4-3 Visual of power plant from aircraft

403. CHART PREPARATION

Select the charts to be used for the flight and check the dates of expiration to make certain they are current. If two or more charts are required for the flight, match the features on the charts together and not the Lat/Long lines (Lat/Long lines do not appear on the earth's surface).

The following equipment is required to properly lay out a route: dividers, nav plotter, pencil, black ballpoint pen, highlighters and template for making circles, squares, and arrows. A general rule when preparing your chart is to minimize marking up the chart to avoid possibly obscuring potential needed information. However, when planning night Visual Navigation Routes, consideration should be given to using thicker and darker lines for routes, with larger print for all associated magnetic courses, fuel, and timing requirements.

Figure 4-5 is a sample Visual Navigation Route segment, simplified to show the basics.

1. The first step is to determine the end point or destination of your route. In real world terms, this could consist of an enemy position, landing zone, drop zone, etc. For purposes of Primary navigation training, your final checkpoint will be referred to as your **target**. The required time of arrival at this final checkpoint is your Time on Target (TOT). Once you determine your final checkpoint, you must locate checkpoints along your route of flight allowing you to navigate from your initial checkpoint to the final checkpoint. A circle should be drawn around each checkpoint for easy identification (circle should be about the size of a nickel). Recommend all marks be done initially in pencil to allow easy correction. Ballpoint black ink can be used after all work is completed and proofread.

2. Referencing paragraph 402, checkpoint selection is critical to the successful completion of your Navigation route. You should select prominent features on the chart that will be easily identified from the air. Distance between checkpoints is another factor in determining your route. As a rule, checkpoints should be no closer than 3 minutes and not more than 25 minutes apart.

NOTE

To the maximum extent practical, checkpoints and route selection should avoid flying over or through congested airspace (e.g., OLF's, controlled airfields, Alert Areas, etc.).

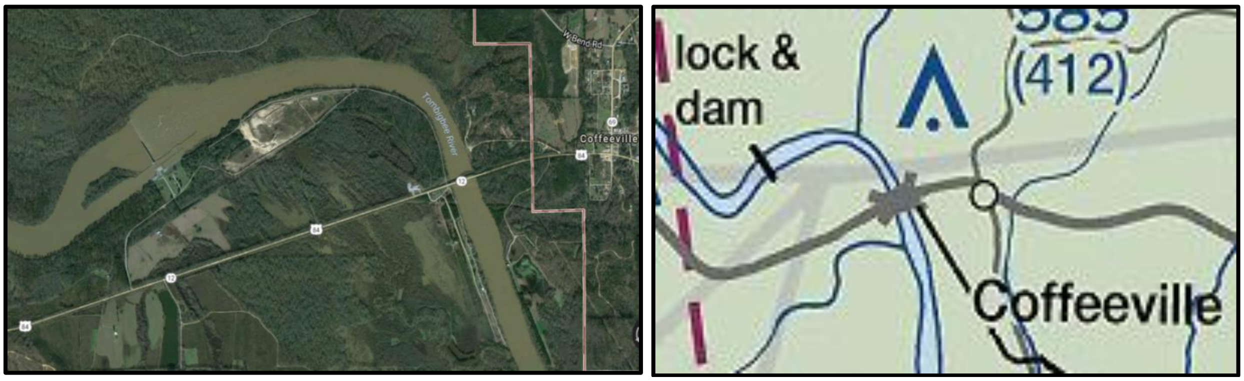


Figure 4-4 Comparison of visual imagery and VFR sectional

3. Use your nav plotter to connect the points directly with a course line. Stop your course line at the edge of your circle to preclude obscuring important data over your checkpoint.

4. There are two methods to figure the magnetic course of each leg:

a. Use the nearest compass rose on the chart to give you magnetic course. Lay the ruler along your course line and then slide the ruler over to the center of the compass rose and read the magnetic course. This method is not as accurate as using the Longitude lines for obvious reasons.

b. Use of the Longitude lines will give you true heading. Isogonic lines of variation are found on the chart and will be used to compute magnetic course based on the formulas shown below:

i. Measure the true course (TC) with your plotter directly from the chart.

ii. Find the average isogonic variation for the route segment from the chart.

iii. Compute magnetic course: TC – Variation (E) = MC
TC + Variation (W) = MC

iv. Record these values on your Jet Log.

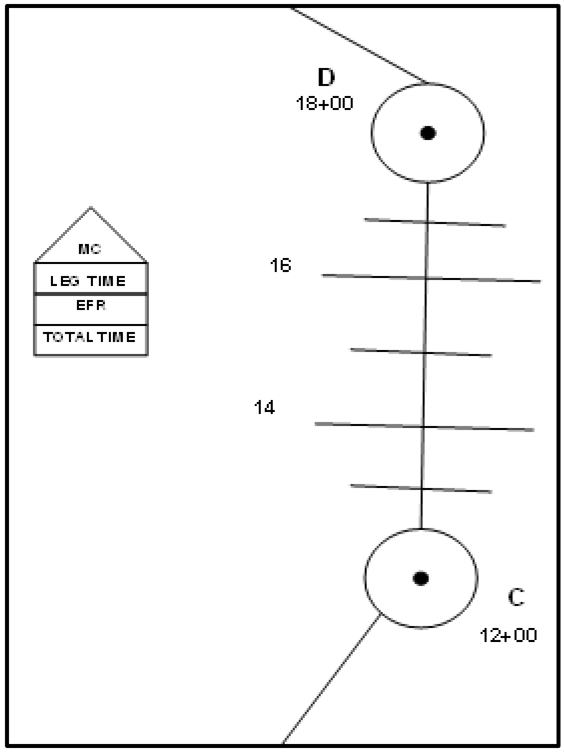


Figure 4-5 Sample Navigation Route Segment

5. There are several ways you can measure the distance of each leg on the chart. Dividers or a plotter will allow you to accurately measure distance. If you do not have dividers or a plotter, recommend you use your Jet Log as a straightedge and transfer a 40 NM scale onto it (scales are located along the bottom of the sectional). The scale should be ticked at each 10 NM interval with the last 10 NM block being ticked at each 1 NM. Measure from center to center of each checkpoint and round off to the nearest one-half nautical mile. Record these values on your Jet Log.

6. Figure timing between each leg based on 210 knots ground speed (3.5 miles/minute). Next, place time tic marks perpendicular to the course line at 1 minute intervals (3.5 NM) to aid in determining position while enroute. These tic marks are used to aid a pilot in verifying their position while using pilotage procedures. Note the interval between tic marks can be as restrictive as needed for the particular mission.

7. Calculate **Continuation Fuel** for each checkpoint. Continuation Fuel is the minimum amount of fuel required at each checkpoint to continue with the planned route and proceed to the final landing destination with required reserves. When computing Continuation Fuel, it is important to note whether the final checkpoint is also your destination airport. If this is not the case, you will need to plan for the fuel to transit from the end of your route to the landing destination. Compute Continuation Fuel by working backwards along your route of flight. First, begin by adding fuel reserves (in accordance with local SOP) to the fuel required to transit from your landing destination to your final checkpoint. Next, add this amount to the fuel required to fly each leg of the flight plan from the final checkpoint back to the initial takeoff. Real world

constraints may dictate a route/mission abort. For Primary navigation training, modifications or termination of the route early and proceeding direct to your final checkpoint are the expected courses of action if fuel to continue will be exceeded along the route.

8. **Time on Target (TOT)** is the exact arrival time at the last checkpoint based upon the preplanned total route time. Meeting a TOT can mean the difference of mission success or mission failure when working with other military assets. In order to successfully make your TOT, prior planning will be required. Begin by placing a start time of 0+00 in the bottom of your first data box (first checkpoint, not your departure airfield). Calculate the time enroute for your first leg to be flown. Enter this time into the second data box for elapsed time. On the subsequent legs continue adding your leg time to the previous elapsed time. Your elapsed time at your final checkpoint, or TOT, should equal your total preplanned time enroute. By noting the clock at the time of route commencement, a hard time, or actual arrival time can be determined for each checkpoint in advance. Sequentially number each checkpoint on the route to the right of the checkpoint.

9. Draw a data box along each route segment, pointing in the direction that the leg is to be flown. **Do not obscure any geographical features usable for navigation**. A data box may contain as much or as little information as necessary. For the Primary navigation stage, fill in the information as shown in Figure 4-6 below.

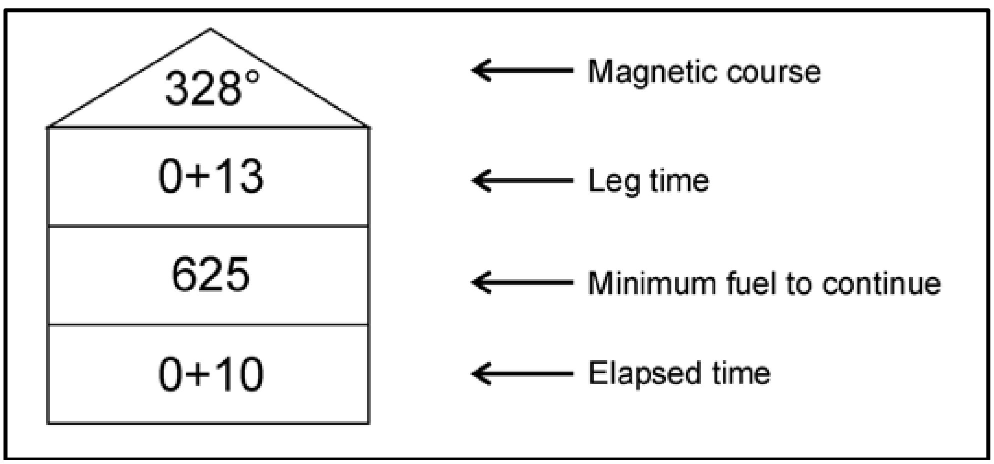


Figure 4-6 Data Box

NOTES

1. The data box (doghouse) in Figures 4-5 and 4-6 are provided as an example. Specific block details may be determined by local SOP.

2. Do not cut or destroy any sectional chart so they may be reused on your subsequent flights! It is unauthorized for SNAs to utilize charts which are handed down from any stage complete SNA. This action would be grounds for attrition of each student.

10. Study the route! Note landmarks on your route that can be used as a time check or as a position check. There are three types of landmarks:

a. **Positive landmarks** are features which can be positively identified and plotted at a point on the chart. A large distinctively shaped lake, an airport, or a road with a prominent bend would be some examples of positive landmarks.

b. **Linear landmarks** are features which can be positively identified but not specifically plotted because they extend for some distance. Rivers, roads, and railroad tracks are examples of linear landmarks.

c. **Uncertain landmarks** are features which the pilot suspects they can correlate with the chart but are not fully reliable. Uncertain landmarks, though they may not be used as the basis for a heading correction, indicate to the pilot a likely position from which they can better anticipate future landmarks. Small lakes, farms, oil fields, or towers are examples of uncertain landmarks.

404. JET LOG

All the necessary checkpoint information (course, time and fuel) will be placed on the Jet Logs for these routes. You need only fill out fuel and alternate data on the reverse side if your flight is not a round robin. For simplicity, only the following columns will be utilized (Figure 4-7).

1. **Route/To:** Under the Route/To column, place each checkpoint description in the block.

2. **Ident/Chan:** Write the checkpoint identifier (if applicable) in the Ident block. Leave Chan blank.

3. **Course (CUS):** Write the magnetic course (MC) for each leg in this column.

4. **Distance (DIST):** Write each leg distance in the appropriate block of the distance column.

5. **Estimated Time Enroute (ETE):** Visual navigation routes will be planned for 210 knots GS, 3.5 NM/min. Actual airspeeds flown may be changed at the discretion of the IP. Using ground speed based on forecast wind, compute a leg time. Write it in the appropriate ETE column.

6. **Estimated Time Of Arrival (ETA):** The ETA block will be determined by inserting the elapsed time from the data box on your chart for each checkpoint. The Actual Time Of Arrival (ATA) will be filled in during flight and compared with the ETA and elapsed time from your data box.

7. **Leg Fuel:** Use your CR-2 or other circular slide ruler, and the NATOPS Flight Manual performance charts to calculate the fuel burned for each leg. Round this number up to the nearest five pounds and write it in the appropriate block of this column.

8. **Estimated/Actual Fuel Remaining (EFR/AFR):** Compute EFR at each checkpoint and enter this figure in the EFR block. AFR will be entered in the AFR block for each checkpoint during the flight. Compare this to minimum fuel to continue from the chart data box.

9. **Additional Information:** The top and bottom of the card provide spaces for information which will be particularly useful when departing from airports or landing at airports other than your home field.

405. DD 175 PREPARATION

All Navigation flights will require submission of a VFR DD-175 flight plan. Consult FLIP General Planning, Chapter Four, for proper format (Figure 4-8 is a sample DD 175). Upon completion of the DD 175, pilots will receive a weather briefing IAW local procedures.

A VFR flight plan is different from an IFR flight plan in that it is not a clearance. A VFR flight plan's purpose is essentially to provide flight following by FSS. When filling out the route of flight portion, approximate your route as best you can with airport, NAVAID, or intersection identifiers as per the AIM.

FSS will consider you overdue 30 minutes after your ETA based on your actual takeoff time and estimated time enroute. Any time you will be more than 15 minutes late, you should update your ETA with FSS. If you have not closed your flight plan by your ETA plus 30 minutes, FSS will start trying to locate you. This starts with phone calls, and can go as far as launching search and rescue aircraft on your flight plan route and any subsequent VFR position reports you have delivered to FSS. Always close your flight plan on arrival via phone (1-800-WX-BRIEF), or over the radio, when landing is assured, or in person if FSS is located at the airfield.

SINGLE–ENGINE JET FLIGHT LOG
CNATRA–GEN 3760/1 (REV. 7–78) S/N0197LLCF19482

DEP ELEV 390' (14R)	CLNC DELIV	GND CONT	TOWER
ALT CORR	TIME OFF	TAS 210	LBS PH/PMIN 510/8.5

CLEARANCE

DEPARTURE

DEST ELEV 292'	APC CONT	TOWER	GND CONT

ROUTE / TO	IDENT / CHAN	CUS	DIST	ETE	ETA / ATA	LEG FUEL	EFR / AFR	NOTES
EASTER-WOOD	CLL	070	20	5+45	0+00	50	1050	
NAVASOTA		124	22	6+20	5+45	55	1000	
BRENHAM		232	16	4+30	12+05	40	945	
SKYLAKE	3XS7	114	28	8+00	16+35	70	905	
MNTGMRY CO	CXO	046	44	12+30	24+35	110	835	
HUNTSVILLE		334	26	7+30	37+05	65	725	
HOUSTON CO	T56	009	35	10+00	44+35	85	660	
MADISON-VILLE ARPT	51R	224	37	10+30	54+35	90	575	
			228	65+05	65+05	565		
								FRCST ALT

ALTERNATE	ROUTE	ALTITUDE	TIME	FUEL
ALT ELEV	APC CONT	TOWER	GND CONT	

NOTE: Fuel flow figures are ficticious. Refer to NATOPS CHARTS.

(Over)

Figure 4-7 Sample Jet Log

NOTE

Fuel flow figures are fictitious. Refer to NATOPS Flight Manual Charts.

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
DDMMMYY	VV6EXXX	TEX2/R

BASE OPERATIONS USE

	TYPE FLT PLAN	TRUE AIRSPEED	POINT OF DEPARTURE	PROPOSED DEPARTURE TIME (Z)	ALTITUDE	ROUTE OF FLIGHT	TO	ETE
	V	210	KNSE	1200	25	12J GZH MVC 1R8 SJI	PQL	1+10

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+30	GPT	0+15	X	09-123	ON FILE	166XXX/TW-5/NSE

SIGNATURE OF APPROVAL AUTHORITY	CREW/PASSENGER LIST	ACTUAL DEP TIME (Z)	BASE OPERATIONS USE
	ATTACHED / SEE PSGR		

DUTY	NAME AND INITIALS	RANK	SSN	ORGANIZATION AND LOCATION
PILOT IN COMMAND	JONES, I.P.	LT		VT6/NSE
SNA	SMITH, S.A.	ENS		VT6/NSE

DD Form 175, MAY 86 *Previous editions are obsolete.* Reset MILITARY FLIGHT PLAN Adobe Professional 7.0

Figure 4-8 Sample DD 175

406. NAV ALTITUDES

1. Daytime Visual Navigation routes will never be flown lower than 1000 feet AGL, and normally no higher than 4500 feet AGL.

2. Nighttime Visual Navigation routes shall not be flown lower than 2000 feet AGL.

CHAPTER FIVE
NAVIGATION PROCEDURES

500. INTRODUCTION

The key to any successful flight can be directly attributed to sound procedures. Much like the Radio Instrument Navigation Stage, a good scan, thorough preflight planning, and the 6 Ts, will equip any aviator with the tools necessary for successful navigation.

501. COCKPIT MANAGEMENT

Before each flight, Crew Resource Management (CRM) will be discussed along with the NATOPS Preflight briefing. It should cover the conduct of the flight and what is expected from both the instructor pilot and student.

In the training environment, the SNA will normally be the pilot at the controls and their responsibilities include:

1. Navigation and mission requirements.

2. Radio calls.

3. Timing between checkpoints and continuous update of course and airspeed corrections as well as TOT updates if required.

4. Landmark identification.

5. Management of all radio frequencies.

6. Perform Operations Checks every 15-20 minutes and update closest divert field.

502. GROUND PROCEDURES

All checklists shall be accomplished IAW the NATOPS Flight Manual or local SOP/Course Rules. After the Before Taxi Checklist is complete and current ATIS information is obtained, the following call to Ground Control will be made (IAW local SOP or Course Rules):

"________ Ground, [A/C call sign], taxi, VFR, [destination], with information _________."

Before leaving the run-up area, ensure your charts, logs and pubs are open and readily accessible for the flight. Be organized. The departure climbout is not the time to have to fold your chart or look for your Jet Logs.

503. DEPARTURE

Takeoff and departure will be in accordance with local SOP or Course Rules. Level off at altitude using normal procedures. Stabilize on airspeed and altitude prior to the first checkpoint. Trim!

Cruise control procedures are very important to a successful flight. Good trim ensures accurate altitude and heading control, even fuel flow, and will minimize pilot fatigue. Maintain a continuous VFR scan of the surrounding airspace and engine instruments to ensure flight safety.

504. NAVIGATION

The primary means of navigation used on Visual Navigation flights will be a combination of Dead Reckoning (DR) and pilotage. DR is a logical system in which time, velocity, and distance are combined to arrive at a position. Pilotage is flying by visual reference to features on the ground.

Visual Fixing

When flying the Navigation route, the correct procedure is to check the chart for preselected checkpoints, then look ahead on the ground for the point identified by the chart. Look for checkpoints 2-5 minutes ahead and have them identified by 1 minute out. Crosscheck this against your timing. This **"clock-chart-ground"** method will prove to be remarkably accurate when combined with careful heading control. A recommended method is to align the chart in the same relative direction as the aircraft's actual track. Do not limit yourself to crosschecking your navigation with only references off the nose of the aircraft. Exercise a scan to include as far as you can see in each direction to assist with your navigation. Further, make note to the relationship of how landmarks are arranged in relation to one another. For example, if two small towns lie ahead, and you are unsure of which one is your next checkpoint, the existence of several towers to the east of one city may help to identify the correct checkpoint.

Checkpoint Procedures

Once positive identification of a checkpoint has been made, fly directly over the checkpoint and perform the following procedures (**6 Ts**):

1. **TIME** – Note the time at the checkpoint. This time should correspond with your leg time and elapsed time. Write your ATA in the block of your Jet Log.

2. **TURN** – Turn to the new heading and look for a landmark off the nose to aid in heading control.

3. **TIME** – As required.

4. **TRANSITION** – Check that the altitude is in conformance with VFR cruising procedures; climb or descend as necessary using normal procedures prior to the checkpoint to be at the appropriate altitude before commencing the next leg. Determine appropriate timing correction, if necessary, to arrive at TOT.

5. **TWIST** – Adjust heading bug to coincide with leg course.

6. **TALK** – Give an Operations Check to the instructor over the ICS; if desired (or required by the instructor).

Corrections to Course and Time.

You will find you can get very close to a target simply by using DR navigation. Occasionally, you will find it necessary to make an in-flight correction to course or airspeed because of improper heading control, improper power control, faulty flight planning, winds stronger than forecast, etc. Making in-flight corrections to course and time are simple, however, you must know how far off course you are before determining a correction. Making a correction without knowing your exact location typically results in greater error!

1. **Course Corrections**. Use the following techniques, in the following order, to correct course deviations:

Aim for a feature in the distance that is on course. Before selecting your point, ensure you are on course and have rechecked your heading for accuracy. This will keep you on course. As you get closer to your selected point, recheck your heading and select another feature that is on course. Keep doing this until you find and positively identify your checkpoint or turn on time.

Use funneling features between 10 and 2 o'clock to steer back to course. You may find roads on either side of you that converge on your checkpoint. A valley between two ridgelines may lead you directly to your checkpoint. Funneling features are relatively common, but they might not be obvious. Study your chart for possible funneling features prior to flight. Again, make sure you know where you are and where you should be before making a course correction. A good technique is to confirm your current position by at least two other references before making a course correction.

If you cannot find any features between 10 and 2 o'clock, use a technique known as Standard Closing Angle (SCA). SCA is calculated by dividing 60 by your GS in NM/min. This results in an SCA of 15° for 210 knots GS. The SCA is then applied to your planned heading and held one minute for every mile you are off course. You could also apply double the angle for half the time (30° for 30 sec per mile off course) but as you increase the heading corrections, you will increase the timing error your correction induces. Making too rapid or too acute a correction may affect your timing. For instance if you were 2 miles left of course and chose to turn 90° right for 2 miles and then 90° left on course, you would increase your overall running time by 30 seconds at 210 knots GS.

An example of a course correction follows: you confirm you are 2 miles left of course and want to correct to course minimizing timing errors. You cannot find a feature in the distance that is on course and you cannot find any funneling features to steer back to course. You decide to use the SCA to correct. With 210 knots GS you would turn 15° right for 2 minutes (or 30° right for 1 minute). The correction you choose depends on the length of the leg on which you are making the course correction. A short leg may not allow you to make a 2-minute correction. When back on track, analyze why you got off track. Were you holding the desired heading or did you let your heading drift? Do the winds appear different than planned? Whatever you determine, apply the appropriate corrections to avoid repeating your mistake.

2. **Timing Corrections**. Timing corrections are simply a matter of changing your GS for a period of time or off-course maneuvering. Off-course maneuvering will change the distance you fly which will affect your timing. The following methods are recommended:

a. **Off-Course Maneuvering.** Off-course maneuvering works well on routes that are circular (semicircular) or have turns of more than a few degrees between legs. If a route has three legs that are 90° to each other you can adjust your turn to either lose or gain time, think of it as a parallelogram. For example if you have confirmed you are one minute early at a previous checkpoint you can simply turn 30 seconds past your next checkpoint. At 210 knots GS you will travel 1.75 miles in 30 seconds so if you parallel your course 2 miles to that side and turn abeam your next checkpoint you will lose 1 minute. The same technique will work if you are late - you just turn 30 seconds early at your checkpoint**.**

b. **Proportional Method.** For every second off of your planned ETA, change your GS by 1 knot and hold this new speed for the number of minutes equal to your GS in miles per minute. For example, you are traveling at 3.5 NM per minute at a 210 knots GS. If you arrive at a checkpoint 10 seconds early, decrease your airspeed 10 knots for 4 minutes. This relationship can be modified to optimize timely corrections. You may decrease your airspeed 40 knots for 1 minute or 20 knots for 2 minutes. Again, the amount of time you spend making the correction depends on how quickly you want the correction to occur.

c. **Ten Percent Method.** To use this method you will need to know the amount of time to gain or lose. This amount is calculated by taking 10 percent of the flight-planned GS (10% x 210 knots = 21 knots). The rule states that holding the 10 percent increase or decrease in flight-planned GS for 10 minutes gains or loses 1 minute. This also means you can gain or lose 6 seconds for every minute the adjustment is made.

NOTE

If you are close to continuation fuel, beware of increasing your speed too much. The increase in fuel consumption may force an early return to base. In this situation, it may be better to accept and allow the timing error.

505. WEATHER DEVIATIONS

Occasionally in the course of the flight, you may encounter serious weather across your proposed route. It may be necessary to return to home field, go to an alternate destination, or possibly deviate from the planned route and circumnavigate the weather. If circumnavigation is possible, the deliberate course duration method should be used. Leave the route by making a turn a number of degrees (i.e., 60º), determined by the distance and size of the obstructing weather. Noting the time, maintain the new heading until abeam the obstruction. Note the time again, turn back toward the original course using twice the original heading change. The amount of heading change is determined by how extensive the storm is and how close your flight is to the weather. It is recommended that no angle above 70º be used. After the new heading has been determined, it is very important the heading change is made and the time of the turn is recorded.

The amount of time on the outbound leg will be determined by fixing the flight's position abeam the storm. The total time on the outbound leg will be from the point of turn outbound to the point of turn inbound and the time will be recorded.

The amount of time on the inbound leg will be the same as that for the outbound leg, (assuming crosswinds to be negligent). Turn to the original heading at the completion of timing on the inbound leg. If 60º heading changes are used, it is possible to update the ETA to the next checkpoints by adding the leg time of one leg to the ETA. This example only applies to the 60º method (Figure 5-1).

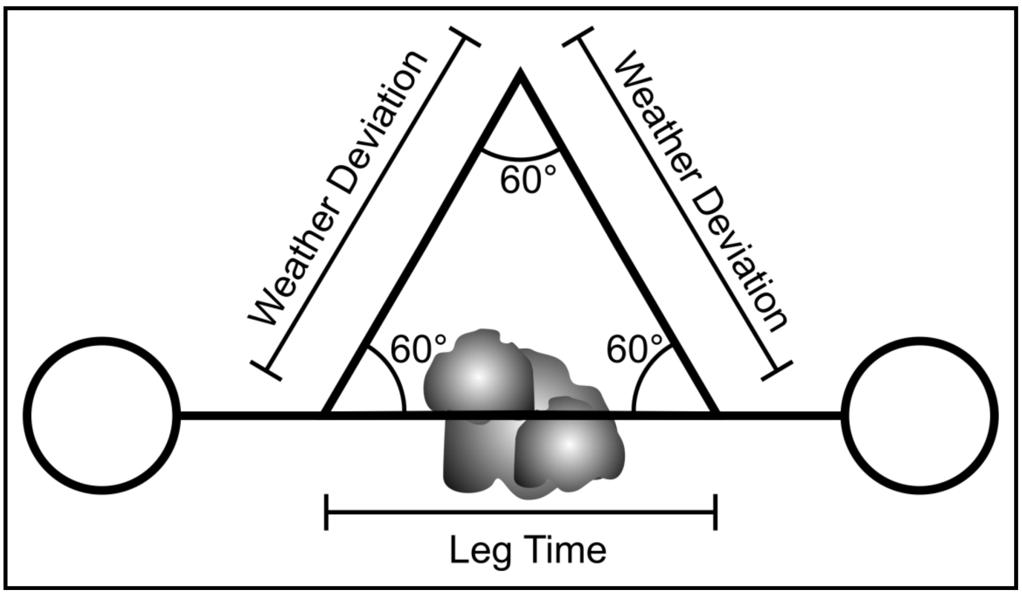


Figure 5-1 Leg Time

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER SIX
AIR OPERATIONS

600. INTRODUCTION

During Navigation training, you may find yourself entering civilian airfields. This chapter along with the Contact FTI will assist you in civilian airfield operations.

NOTE

> The following information is condensed from the Aeronautical Information Manual (AIM) "Airport Operations."

601. TOWER-CONTROLLED AIRPORTS

1. When operating at an airport where traffic control is being exercised by a control tower, pilots are required to maintain two-way radio contact with the tower while operating within the Class B, Class C, or Class D surface area unless the tower authorizes otherwise. Initial call-up should be made about 15 miles from the airport, preferably at a VFR reporting point depicted on the VFR sectional by a magenta flag. When reporting at other than a depicted reporting point, utilize the following format:

"________ tower, [A/C call sign], 15 miles, [direction from airport], for landing, with information __________."

When departing, unless there is a good reason to leave the tower frequency before exiting the Class B, Class C, or Class D surface area, it is a good operating practice to remain on the tower frequency for the purpose of receiving traffic information. In the interest of reducing tower frequency congestion, pilots are reminded that it is not necessary to request permission to leave the tower frequency once outside of the Class B, Class C, or Class D surface area.

2. When necessary, the tower controller will issue clearances or other information instructing aircraft to fly a desired flight path (traffic pattern) when flying in Class B, Class C, or Class D surface areas. If not otherwise authorized or directed by the tower, pilots of fixed-wing aircraft approaching to land must circle the airport to the left. However, if an "RP" is depicted under the airport data on the sectional, pilots are expected to execute a right hand pattern (RP 23 for example, denotes a right hand pattern for runway 23). Ground Control (or tower) will provide proper taxi routes when operating on the ground.

3. The following terms for the various components of a traffic pattern have been adopted as standard for use by control towers and pilots.

   a. Upwind leg

   b. Crosswind leg

   c. Downwind leg

d. Base leg

e. Final approach

602. VISUAL INDICATORS AT UNCONTROLLED AIRPORTS

1. At those airports without an operating control tower, a segmented circle visual indicator system, if installed, is designed to provide traffic pattern information. The segmented circle system consists of the following components:

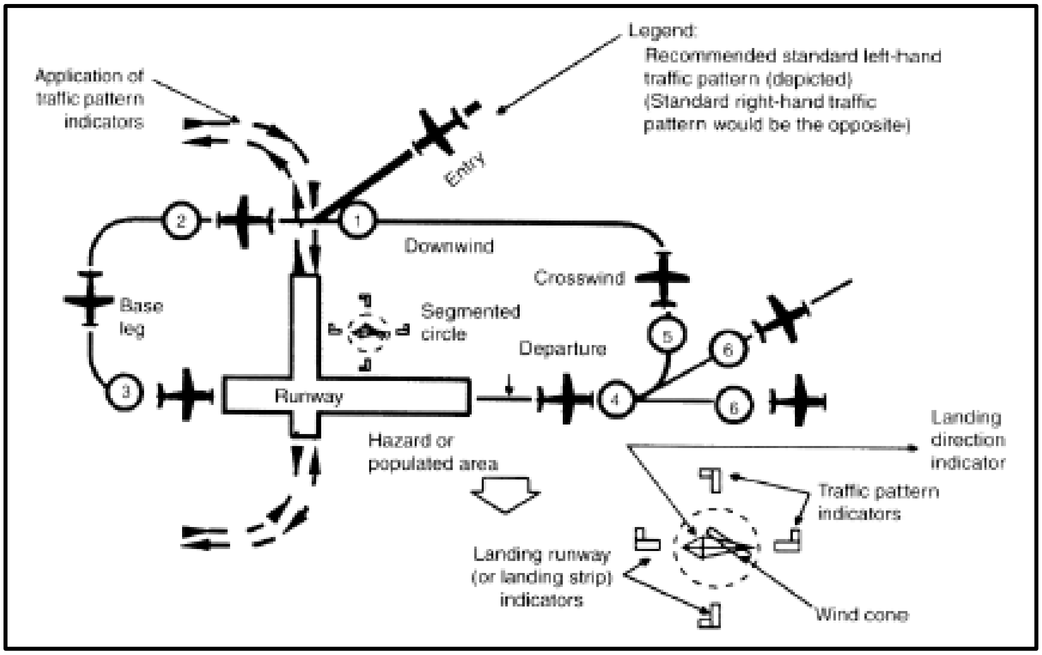


Figure 6-1 Traffic Pattern Operations

a. **Segmented Circle** is located in a position affording maximum visibility to pilots in the air and on the ground and providing a centralized location for other elements of the system.

b. **Wind Direction Indicator** is a wind cone, windsock, or wind tee installed near the operational runway to indicate wind direction. The large end of the wind cone/sock points into the wind as does the large end (crossbar) of the wind tee. In lieu of a tetrahedron and where a windsock or wind cone is collocated with a wind tee, the wind tee may be manually aligned with the runway in use to indicate landing direction. These signaling devices may be located in the center of the segmented circle and may be lighted for night use. Pilots are cautioned against using a tetrahedron to indicate wind direction.

c. **Landing Direction Indicator** is a tetrahedron installed when conditions at the airport warrant its use. It may be used to indicate the direction of landings and takeoffs. A tetrahedron may be located at the center of a segmented circle and may be lighted for night operations. The small end of the tetrahedron points in the direction of landing. Pilots are cautioned against using a tetrahedron for any purpose other than as an indicator of landing direction. Further, pilots should use extreme caution when making runway selection by use of a tetrahedron in very light or calm wind conditions as the tetrahedron may not be aligned with the designated calm wind runway. At airports with control towers, the tetrahedron should only be referenced when the control tower is not in operation. Tower instructions supersede tetrahedron indications.

d. **Landing Strip Indicators** are installed in pairs as shown in the segmented circle diagram (Figure 6-1) and used to show the alignment of landing strips.

e. **Traffic Pattern Indicators** are arranged in pairs in conjunction with landing strip indicators, and are used to indicate the direction of turns when there is a variation from the normal left traffic pattern. If there is no segmented circle installed at the airport, traffic pattern indicators may be installed on or near the end of the runway.

2. Preparing to land at an airport without a control tower, or when the control tower is not in operation, the pilot should concern themselves with the indicator for the approach end of the runway to be used. When approaching for landing, all turns must be made to the left unless a traffic pattern indicator indicates that turns should be made to the right. If the pilot will mentally enlarge the indicator for the runway to be used, the base and final approach legs of the traffic pattern to be flown immediately become apparent. Similar treatment of the indicator at the departure end of the runway will clearly indicate the direction of turn after takeoff.

3. When two or more aircraft are approaching an airport for the purpose of landing, the aircraft at the lower altitude has the right-of-way, but shall not take advantage of this rule to cut in front of another which is on final approach to land, or to overtake that aircraft.

603. TRAFFIC PATTERNS

At most airports and military air bases, traffic pattern altitudes for propeller-driven aircraft generally extend from 600 feet to as high as 1500 feet AGL. Traffic pattern altitudes for military turbojet aircraft sometimes extend up to 2500 feet AGL. **The FAR 91.129 defines altitudes for class D airports, while the Advisory Circular 90-66A page 3 describes the altitudes at airports without operating control towers for turbine powered airplanes as 1500’ AGL.**

NOTE

Airports with a published pattern altitude for turbine powered aircraft supersede the generic 1500 feet AGL listed above. Always check airport facility directories to determine pattern specifics. Pilots of enroute aircraft should be constantly alert for other aircraft in traffic patterns and avoid these areas whenever possible. Traffic pattern altitudes should be maintained unless otherwise required by the applicable distance from cloud criteria (Figures 3-2 and 3-5).

604. INTERSECTION TAKEOFFS

1. In order to enhance airport capabilities, reduce taxiing distances, minimize departure delays, and provide for more efficient movement of aircraft, controllers may initiate intersection takeoffs as well as approve them when the pilot requests. If for any reason a pilot prefers to use a different intersection or the full length of the runway, or desires to obtain the distance between the intersection and the runway end, **THEY ARE EXPECTED TO INFORM ATC ACCORDINGLY.**

2. An aircraft is expected to taxi to (but not onto) the end of the assigned runway unless prior approval for an intersection departure is received.

3. Pilots should state their position on an airport when calling tower for departure from a runway intersection.

605. LOW APPROACH

1. A low approach (sometimes referred to as a low pass) is the go-around maneuver following an approach. Unless otherwise authorized by ATC, the low approach should be made straight ahead, with no turns or climbs made until the pilot has made a thorough visual check for other aircraft in the area.

2. When operating within a Class D airspace, a pilot intending to make a low approach should contact the tower for approval. This request should be made prior to starting the final approach.

3. When operating at an airport which does not have an operating control tower, a pilot intending to make a low approach should advise the FSS, UNICOM, or make a broadcast on the CTAF, as appropriate. This call should be made prior to leaving the final approach fix inbound for nonprecision approaches, or the outer marker or fix used in lieu of the outer marker for precision approaches.

606. TRAFFIC CONTROL LIGHT SIGNALS

1. The following procedures are used by Air Traffic Control Towers in the control of aircraft, ground vehicles, equipment, and personnel not equipped with radio. These same procedures will be used to control aircraft, ground vehicles, equipment and personnel equipped with radios if radio contact cannot be established. ATC personnel use a directive traffic control signal which emits an intense narrow light beam of a selected color (red, white, or green) when controlling aircraft by light signal.

2. The directions transmitted by a light signal (Figure 6-2) are very limited, since no approval or disapproval of a pilot’s anticipated actions may be transmitted. No supplemental or explanatory information may be transmitted except by the use of the “General Warning Signal” which advises the pilot to be on the alert.

3. Between sunset and sunrise, a pilot wishing to attract the attention of the control tower should turn on a landing light and taxi the aircraft into a position, clear of the active runway, so that light is visible to the tower. The landing light should remain on until appropriate signals are received from the tower.

4. During daylight hours, acknowledge tower transmissions or light signals by moving the ailerons or rudder. At night, acknowledge by blinking the landing and navigation lights. If radio malfunction occurs after departing the parking area, watch the tower for light signals while monitoring tower frequency.

COLOR AND TYPE OF SIGNAL	MOVEMENT OF VEHICLE, EQUIPMENT, AND PERSONNEL	AIRCRAFT ON GROUND	AIRCRAFT IN FLIGHT
STEADY GREEN	Cleared to cross, proceed, or go	Cleared for takeoff	Cleared to land
FLASHING GREEN	Not applicable	Cleared for taxi	Return for landing (to be followed by steady green at the proper time)
STEADY RED	STOP	STOP	Give way to other aircraft and continue to circle
FLASHING RED	Clear the taxiway or runway	Taxi clear of runway in use	Airport unsafe do not land
FLASHING WHITE	Return to starting point on airport	Return to starting point on airport	Not applicable
ALTERNATING RED AND GREEN	Exercise extreme caution	Exercise extreme caution	Exercise extreme caution

Figure 6-2 ALDIS Lamp Signals

607. APPROACH CONTROL SERVICE FOR VFR ARRIVING AIRCRAFT

1. Numerous approach control facilities have established programs for VFR arriving aircraft to contact approach control for landing information. This information includes: wind, runway, and altimeter setting at the airport of intended landing. This information may be omitted if contained in the ATIS broadcast and the pilot states the appropriate ATIS code.

NOTE

Pilot use of the phraseology “have numbers” does not indicate receipt of the ATIS broadcast. In addition, the controller will provide traffic advisories on a workload permitting basis.

2. Such information will be furnished upon initial contact with the approach control facility. The pilot will be requested to change to the tower frequency at a predetermined time or point, to receive further landing information.

3. Where available, use of this procedure will not hinder the operation of VFR flights by requiring excessive spacing between aircraft or devious routing.

4. Compliance with this procedure is not mandatory but pilot participation is encouraged.

608. TRAFFIC ADVISORY PRACTICES AT AIRPORTS WITHOUT OPERATING CONTROL TOWERS

1. **Airport Operations Without Operating Control Tower**

   a. There is no substitute for alertness while in the vicinity of an airport. It is essential that pilots be alert and look for other traffic and exchange traffic information when approaching or departing an airport without an operating control tower. This is of particular importance since other aircraft may not have communication capability and, in some cases, pilots may not communicate their presence or intentions when operating into or out of such airports. To achieve the greatest degree of safety, it is essential all radio-equipped aircraft that transmit/receive on a common frequency be identified for the purpose of airport advisories.

   b. An airport may have a full- or part-time tower or Flight Service Station (FSS) located on the airport. It may have a full- or part-time UNICOM station or no aeronautical station at all. There are three ways for pilots to communicate their intentions and obtain airport/traffic information when operating at an airport that does not have an operating tower: by communicating with an FSS, a UNICOM operator, or by making a self-announce broadcast.

2. **Communicating On A Common Frequency (CTAF)**

   a. The key to communicating at an airport without an operating control tower is selection of the correct common frequency. The acronym CTAF, which stands for Common Traffic Advisory Frequency, is synonymous with this program. A CTAF is a frequency designated for the purpose of carrying out airport advisory practices while operating to or from an airport without an operating control tower. The CTAF may be a UNICOM, MULTICOM, FSS, or tower frequency and is identified in appropriate aeronautical publications.

   b. The CTAF frequency for a particular airport is contained in the Airport/Facility Directory (A/FD), Alaska Supplement, Alaska Terminal Publication, Instrument Approach Procedure Charts, and Standard Instrument Departure (SID) Charts. Also, the CTAF frequency can be obtained by contacting any FSS. Use of the appropriate CTAF, combined with a visual alertness and application of the following recommended good operating practices, will enhance safety of flight into and out of all uncontrolled airports.

3. Recommended Traffic Advisory Practices

All inbound traffic should monitor and communicate as appropriate on the designated CTAF from 10 miles to landing. Departing aircraft should monitor/communicate on the appropriate frequency from start-up, during taxi, and until 10 miles from the airport unless the FAR's or local procedures require otherwise.

4. Airport Advisory Service Provided By An FSS

a. Airport Advisory Service (AAS) is a service provided by an FSS physically located on an airport which does not have a control tower or where the tower is operated on a part-time basis. The CTAF for FSS's which provide this service will be disseminated in appropriate aeronautical publications.

b. When communicating with a CTAF FSS, establish two-way communications before transmitting outbound/inbound intentions or information. An inbound aircraft should establish communications approximately 10 miles from the airport, reporting altitude and aircraft type, location relative to the airport, state whether landing or overflight, and request airport advisory. Departing aircraft should state the aircraft type, full identification number, type of flight planned (VFR or IFR) and the planned destination or direction of flight. Report before taxiing on the runway for departure. If communications with a UNICOM are necessary after initial report to FSS, return to FSS frequency for any traffic updates.

NOTE

A sample CTAF call would sound like: "Monroe County traffic, Red Knight 123, single TEX II, 10 miles south, 4500 feet, inbound for straight-in, full stop, Runway 03, request airfield advisories, Monroe."

c. A CTAF FSS provides wind direction and velocity, favored or designated runway, altimeter setting, known traffic, notices to airmen, airport taxi routes, airport traffic pattern information, and instrument approach procedures. These elements are varied so as to best serve the current traffic situation. Some airport managers have specified that under certain wind or other conditions, designated runways be used. Pilots should advise the FSS of the runway they intend to use.

CAUTION

All aircraft in the vicinity of the airport may **NOT** be in communication with the FSS.

5. **Information Provided by Aeronautical Advisory Stations (UNICOM)**

a. UNICOM is a non-government air/ground radio communication station which may provide airport information at public use airports where no tower or FSS is available and it is primarily a VHF frequency.

b. On pilot request, UNICOM stations may provide pilots with weather information, wind direction, the recommended runway, or other necessary information. If the UNICOM frequency is designated as the CTAF, it will be identified in the appropriate aeronautical publications.

c. If no FSS or UNICOM is available, wind and weather information may be obtainable from nearby controlled airports via Automatic Terminal Information Service (ATIS) or Automated Weather Observing System (AWOS) frequencies.

6. **Self-Announce Position And/Or Intentions**

a. Self-announce is a procedure whereby pilots broadcast their position or intended flight activity or ground operation on the designated CTAF. This procedure is used primarily at airports which do not have an FSS on the airport. The self-announce procedure should also be used if a pilot is unable to communicate with the FSS on the designated CTAF. Keep in mind that when communicating on a CTAF or UNICOM frequency, there may not be any response to your transmissions. The self-announce procedures simply alert other aircraft to your presence, and any response from another aircraft or a UNICOM ground station is advisory only.

b. If an airport has a tower and it is temporarily closed, or operated on a part-time basis and there is no FSS on the airport or the FSS is closed, use the CTAF to self-announce your position or intentions.

c. Pilots conducting practice instrument approaches should be particularly alert for other aircraft that may be departing in the opposite direction. When conducting any practice approach, regardless of its direction relative to other airport operations, pilots should make announcements on the CTAF as follows:

i. Departing the final approach fix inbound (nonprecision approach) or departing the outer marker or fix used in lieu of the outer marker inbound (precision approach).

ii. Established on the final approach segment or immediately upon being released by ATC.

iii. Upon completion or termination of the approach.

iv. Upon executing the missed approach procedure.

CHAPTER SEVEN
EMERGENCY PROCEDURES

700. INTRODUCTION

Although emergency procedures must be handled IAW NATOPS Flight Manual procedures, special provisions may exist for Visual Navigation sorties.

701. MINIMUM SAFE ALTITUDE/ROUTE - ABORT ALTITUDE

1. All Navigation routes will include a Minimum Safe Altitude (MSA) for each leg of the planned route. The MSA will be 500 feet higher than the highest obstacle (rounded up to the nearest 100 feet interval) within 10 NM of route centerline. Aircrew experiencing temporary disorientation with regard to navigation will climb to MSA until positive position is regained.

2. An Emergency Route Abort Altitude (ERAA) will be planned for the entire route of flight. The ERAA will be calculated as 1000 feet (2000 feet in mountainous terrain) above the highest obstacle (rounded to the nearest 100 feet interval) within 10 NM of route centerline. In the event of total disorientation, inadvertent IMC, or aircraft malfunction, aircraft will immediately climb to ERAA. In case of inadvertent IMC, aircraft will climb to ERAA and notify the controlling agency with intentions for the remainder of flight.

702. LOST AIRCRAFT

A cool head is the pilot’s best asset should he/she become temporarily disoriented.

1. **Determine the extent of disorientation**. "Anxiety disorientation" can occur even with the pilot exactly on course if their “chart-to-ground” method fails to identify an anticipated landmark and they misconstrue it as proof of being lost. When disorientation occurs, the pilot must review their progress from their last known position and determine the cause and extent of error. Causes include: pilot errors in heading and airspeed control, timing, navigation chart planning; malfunction of instruments or navigation aids; wind; or deviations around weather or enemy defenses.

2. **Check the clock immediately**. Timing may be a factor in determining the extent of disorientation and required correction. Write down the time.

3. **Do not complicate the situation**. Avoid wandering aimlessly while planning what to do next. Immediately upon realizing a problem exists, decide on a temporary plan. Normally, continue flying preplanned headings and times or fly toward a charted known landmark.

4. **Check your fuel state** against the **Minimum Fuel Required** to continue to complete the route. The disorientation may have caused more problems than just navigation if seriously disoriented; remember the “Five Cs” (confess, climb, communicate, conserve, and comply) before your fuel state becomes a significant factor.

5. **Climb to conserve fuel and to help aid in reorientation**. The pilot should consult the chart and then look outside and attempt to locate the largest landmark possible. This should be a large terrain feature such as a mountain, large lake or coastal feature. Care must be taken to avoid following a hunch or making a decision based on uncertain information.

6. Once reoriented, **correct on-course** using the methods previously discussed. These procedures will not be possible unless the pilot's chart includes sufficient area to account for possible disorientation. At least 10 miles to either side of the course line is recommended.

703. LOST COMMUNICATIONS

Prior to assuming radio failure, troubleshoot your helmet hookups and the radio. Check the all applicable circuit breakers in; check the ICS volume up and the COM 1 and COM 2 volume up. Also, double-check the selected frequency for transposed numbers and reselect the previously assigned frequencies. Attempt contact on UHF Guard (243.0) or VHF Guard 121.5. Use the back-up VHF control head. Finally, attempt contact on UHF Guard using your survival radio.

Once radio failure is confirmed, maintain VMC and comply with procedures listed in the Flight Information Handbook (FIH). If electing to return to homefield, conform with local lost communication procedures.

704. PRECAUTIONARY EMERGENCY LANDING

Some situations may dictate an unplanned stop at one of the emergency fields you marked on your chart. If possible, communications should be established with the airport, on a not-to-interfere basis with your emergency procedures. Remember: Aviate-Navigate-Communicate. The rule of thumb for such a call is, "Who you are, where you are, and what you want."

Many small civilian airfields have VHF capability only, so ensure you communicate your intentions on the correct radio. If communication cannot be established, pilots are expected to observe other aircraft and conform to the pattern in use. If no other aircraft are observed, then markings such as the segmented circle and wind indicators may be checked to find out runway and pattern direction. These markings can be checked, time permitting, while circling the airport at a safe altitude. A segmented circle is large enough so that a pilot can see it easily from pattern altitude as they fly over the airport. The L-shaped marker on the outside of the segmented circle corresponds to the base and final legs of the airport traffic pattern.

705. NIGHT ENGINE FAILURES

Comply with the NATOPS Flight Manual.

1. **Engine Failure at or above 2000 feet AGL** - If a restart is not attempted or unsuccessful, and a lighted runway is not immediately available, ejection is highly recommended. Review the NATOPS Flight Manual Emergency procedures section.

2. **Engine Failure below 2000 feet AGL -** If the engine fails below 2000 feet AGL, attempting a restart is not recommended. If a lighted runway is not immediately available and your engine fails below 2000 feet AGL, your first priority is getting set up to eject from the aircraft.

NOTE

Remember, airspeed can be exchanged for altitude.

706. LOW LEVEL EMERGENCIES

The first reaction to any emergency encountered in the low level environment is "climb to cope."

1. Engine Malfunctions. If the engine fails on a low level, recovery is unlikely unless a suitable landing field is within approximately 3 miles. As a rule of thumb, airfields within an arc circumscribed by the wingtips can be reached with an immediate turn and climb to the airfield. Chart study for potential emergency diverts before the mission will greatly enhance chances for success. A zoom from 240 knots GS gains approximately 1300 feet of altitude. Consider a restart in the zoom, altitude permitting.

2. Route Aborts. Route aborts are executed for various reasons (insufficient fuel to complete the route, aircraft malfunction, bird hazards, and weather). Use the chart, GPS, and NAVAIDs to maintain positional awareness or to find the nearest suitable recovery airfield.

a. **VMC.** Maintain safe separation from the terrain, comply VFR altitude restrictions (if possible), squawk the appropriate transponder code, maintain VMC, and attempt contact with the controlling agency, if required.

b. **IMC.** An abort into IMC is an emergency. Execute an immediate climb to the ERAA (minimum) and squawk 7700. Attempt contact with the appropriate ATC agency. Fly the proper VFR altitude until an IFR clearance is received.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A
GLOSSARY

A100. INTRODUCTION – N/A

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B
SAMPLE VOICE REPORTS

The following are examples of voice reports encountered during Navigation flights. As always, if in doubt of the "right" words, use the format: **WHO** you are, **WHERE** you are, and **WHAT** you want.

INITIAL CALL TO GROUND

"Tallahassee Ground, (call sign), taxi VFR to North Whiting with information______."

INITIAL CALL TO TOWER

"Dothan Tower, (call sign), ready for departure, VFR to the east, 2500."

INITIAL CONTACT WITH FSS WHEN AIRBORNE

The term "initial contact" (or "initial call-up") means the first radio call you make to a given ATC facility. As per the AIM, in order to expedite communications, state the frequency being used and the aircraft location during initial call-up.

"Gainesville Radio, (call sign) on 255.4, over Tallahassee."

ACTIVATING VFR FLIGHT PLAN

"Macon Radio, (call sign), on 255.4, over Valdosta."

RESPONSE FROM FSS: *"(call sign), Macon Radio, go ahead."*

YOU RESPOND WITH: *"Macon Radio, (call sign), I would like you to activate the first leg of my VFR Flight Plan from Valdosta Regional to North Whiting at 1304 Zulu."*

RESPONSE FROM FSS: *"(call sign), I have your VFR Flight Plan activated at 1304 Zulu."*

It is a good practice to give ATC a courtesy call prior to transmitting a long message. This gives the controller a chance to focus their attention on your call. The likelihood of the controller missing part of the call is greatly reduced.

"Tallahassee Approach, (call sign)."

"(call sign), Tallahassee Approach, go ahead."

"(call sign) is a single TEX II, 2500 feet, VFR, 20 miles north of Tallahassee, for landing at Tallahassee with information ________."

AFTER HAND-OFF TO TOWER

"Tallahassee Tower, (call sign) is entering a left base for Runway 27, full stop."

APPENDIX C
OPERATIONS AT NON-TOWERED AIRPORTS

The following appendix is a condensed version of "Safety Advisor: Operations and Proficiency No. 3" by the Aircraft Owners and Pilot's Association (AOPA).

Non-towered airports are uncontrolled airfields not served by operating air traffic control towers, and includes most of the airports in the United States. At present, over 12,000 airports are non-towered, compared to approximately 400 that have FAA towers. Millions of safe operations in all types of aircraft are conducted at non-towered airports in a variety of weather conditions. It works because pilots put safety first and use commonly known procedures.

There are several sources of information that explain official FAA recommended procedures at non-towered airports and you should review them in detail to gain a full understanding. FAR 91.113 cites basic right-of-way rules and FAR 91.126 and 91.127 establish traffic-flow rules at non-towered airports. The AIM expands on these regulations. Together, these documents define procedures for non-towered flight operations.

Regulations and procedures can't cover every conceivable situation, and the FAA has wisely avoided imposing rigid operating regulations at non-towered airports. What is appropriate at one airport may not work at the next. Some airports have special operating rules due to obstacles or hazards, while other rules may promote a smooth and efficient flow of traffic or keep aircraft from overflying unsympathetic airport neighbors. But, overall, the general procedures that apply for controlled and uncontrolled airfields exist for one main purpose...**TRAFFIC SEPARATION**.

The Traffic Pattern

Safe flight operation begins with knowing the structure of a standard traffic pattern. A standard pattern is comprised of six legs to create a logical, safe flow at a non-towered airport (Figure C-1).

1. Let's take a trip around the pattern. We'll begin in the runup area at the end of Runway 23 at Frederick, Maryland (Figure C-1). The Before Takeoff Checklist is complete and our aircraft is positioned at the hold short line, where we can see the downwind, base, and final legs. The radio is tuned to the CTAF frequency, and we've heard traffic in the pattern.

    a. Scanning the pattern for traffic, we see a Cessna on downwind and determine that we have enough room to safely takeoff.

    b. When communicating on a CTAF frequency, you must self-announce your intentions to other aircraft. This broadcast is for information purposes only and does not require a response from anyone. Multiple airports may be using the same CTAF frequency, so it is important that you begin and end each transmission with the name of the airport at which you are operating.

    c. Announce - *"Frederick traffic, (call sign) departing Runway 23, remaining in the pattern, Frederick."*

d. Scan for traffic once again in both directions, taxi onto the runway completing the Lineup Checklist and takeoff IAW Contact FTI procedures.

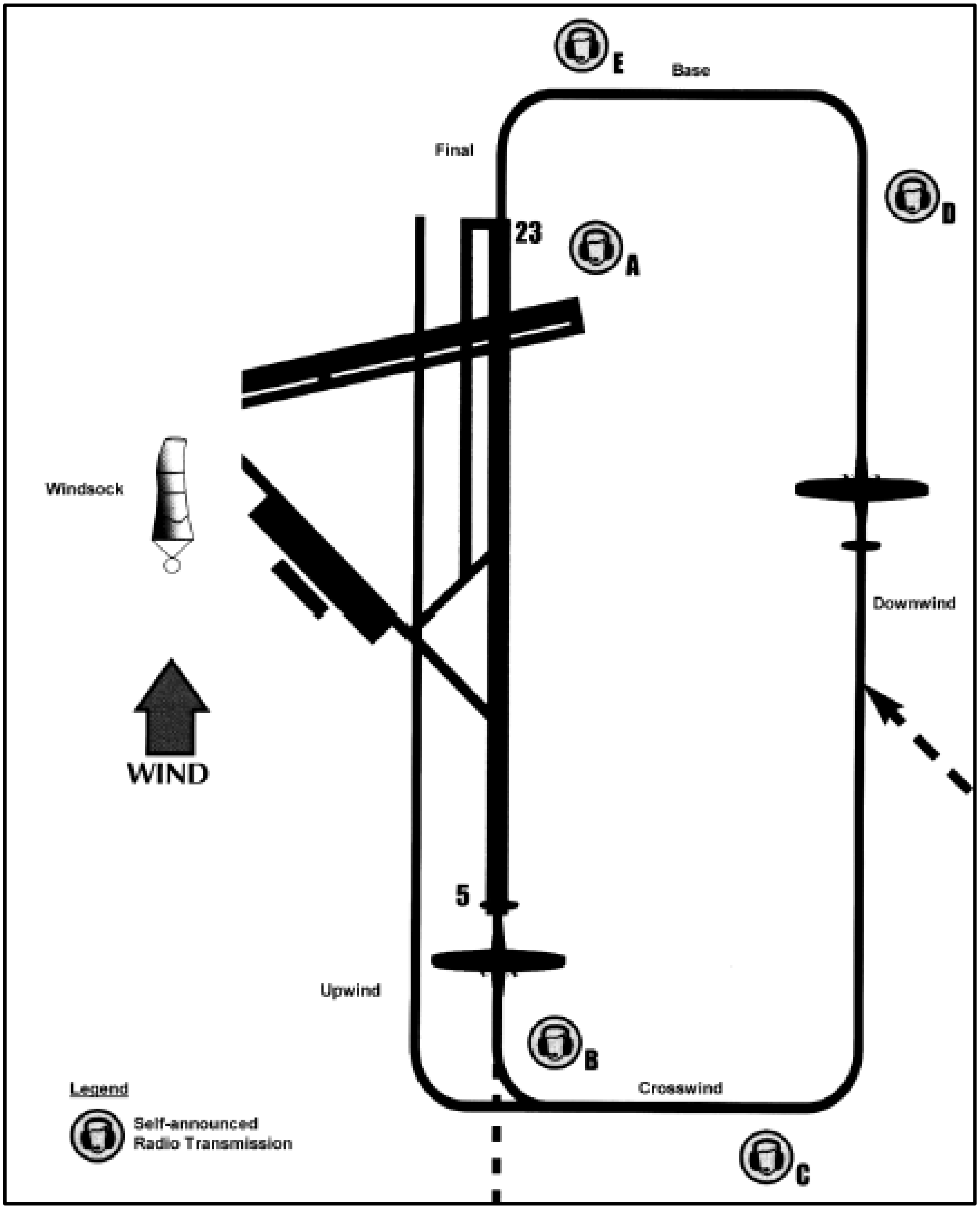


Figure C-1 Traffic Pattern

2. Complete the **Departure Leg** by:

   a. Climbing on the extended runway centerline to within 300 feet of traffic pattern altitude. Since Frederick airport is 303 feet MSL, our traffic pattern will be 1800 feet MSL (1500 feet AGL for turbine powered aircraft).

   b. When 300 feet below pattern altitude, look left and right to be sure there is no traffic conflict and announce - *"Frederick traffic, (call sign) turning crosswind Runway 23, Frederick."*

3. The **Crosswind Leg** will usually be a left standard traffic pattern unless the airport requires right traffic. Continue climb to pattern altitude (1500 feet AGL) and level off IAW the Contact FTI.

   a. Continue on crosswind until approximately 1/2 mile from the extended runway centerline. Civilian traffic patterns are rectangular in shape so try to conform to their traffic pattern. To help visualize this distance, many general aviation runways are about 1 mile long, so use half the runway length as a guide for the turn to downwind.

   b. As you approach the checkpoint, scan for traffic on downwind and announce - *"Frederick traffic, (call sign) turning left downwind Runway 23, Frederick."*

4. Establish yourself on the **Downwind Leg** and complete the Before Landing Checklist IAW Contact FTI. Be especially vigilant by scanning and listening for traffic entering the pattern on the downwind leg. This could occur anywhere on downwind but will usually happen at midfield.

   a. Continue on downwind and begin the turn to the base leg to achieve a 1/2 to 3/4 mile final. As a general rule, begin your turn to base when the runway is 45º behind your wingtip.

   b. Approaching the checkpoint, scan for conflicting traffic, and announce - *"Frederick traffic, (call sign) turning left base Runway 23, Frederick."*

5. The **Base Leg** is flown perpendicular to the runway centerline.

   a. Adjust power to continue a normal descent rate. Scan and listen for traffic on an opposite base leg or an extended final. Also, scan the runway for traffic that may be taking off in the opposite direction of your final approach! Remember, at non-towered airports, there is no such thing as a duty runway.

   b. Approaching the checkpoint for final, announce - *"Frederick traffic, (call sign) turning final, full stop Runway 23, Frederick."*

6. On the **Final Leg**, continue a normal descent and recheck proper configuration (Gear down).

   a. Continue scanning and listening for conflicting traffic on the runway. After rollout, expeditiously exit the runway at the nearest taxiway.

   b. Announce - *"Frederick traffic, (call sign) clear of Runway 23, Frederick."*

Departing the Pattern

1. Before taxiing onto the runway, listen to the CTAF and scan the entire airport traffic area. Announce - "Frederick traffic, (call sign) departing Runway 23 to the west, Frederick."

2. After takeoff, climb on the extended runway centerline to within 300 feet of pattern altitude. At this point, you can continue straight ahead or make a 45º heading change in the direction of the landing pattern (to the left in this case).

3. If you will be departing opposite the traffic pattern, wait until you are at least 500 feet above pattern altitude before making your turn, and announce - "Frederick traffic, (call sign) departing the pattern Runway 23, right turn westbound, Frederick."

Arriving at a Non-towered Airport

1. Approximately 10 miles out, tune the appropriate VHF frequency for ATIS, AWOS or ASOS and copy the weather, if available. Then, tune the appropriate CTAF frequency and begin listening for traffic in the landing pattern at your destination airport.

2. If automated weather services are unavailable, tune in the appropriate FSS (if located at the field), UNICOM or CTAF frequency and request airport advisories. Announce - "Hammond traffic/UNICOM, (call sign) is a TEX II 10 miles to the east, request airport advisories, Hammond." Listen for and respond to any advisories given and begin setting up for a normal entry to the landing pattern.

3. If automated weather services are unavailable and there is no response to an advisory call on FSS, UNICOM or CTAF, overfly the field 500 feet above pattern altitude (turbine powered aircraft at 1500 feet AGL, so overfly at 2000 feet AGL). Locate the segmented circle if available for information on wind direction, landing direction and pattern direction.

4. When well clear of the pattern (approximately two miles), descend to pattern altitude and turn inbound to the airport. Perform the Before Landing Checklist and enter the pattern at midfield at a 45º angle of intercept. Announce - "Hammond traffic, (call sign) entering left downwind Runway 18, Hammond."

5. The remaining traffic pattern and appropriate radio calls are the same as discussed previously.