CHAPTER 5
Tools/Skills

I. Introduction

There are many tools for assistance in airspace coordination. This section will be presented in four categories:

- Charts and Publications
- DoD Publications
- Technology
- Airspace Coordination Skills

Certain skills are necessary for airspace coordination. Airspace coordination requires the ability to plot latitudes and longitudes; VOR/DME's and map reading skills, plotting and interpretation.

II. Charts and Sectionals

Agency personnel need certain information to assess the degree of complexity of the airspace overlying local public lands. This information is available from a variety of sources. Some of these sources contain duplicate information; another may be the sole source of a particular piece of information. It is important to obtain and have access to various sources to ensure that the local airspace "picture" is complete. Ordering information is available in Appendix C.

An aeronautical chart is a map used in air navigation containing all or part of the following: topographic features, obstructions, navigation aids, navigation routes, designated airspace and airports. There are a variety of charts available including:

<u>VFR Charts</u>

- Sectional Aeronautical Charts (Sectionals)
- Terminal Area Charts (TAC)
- World Aeronautical Charts (WAC)
- Helicopter Route Charts

IFR Charts

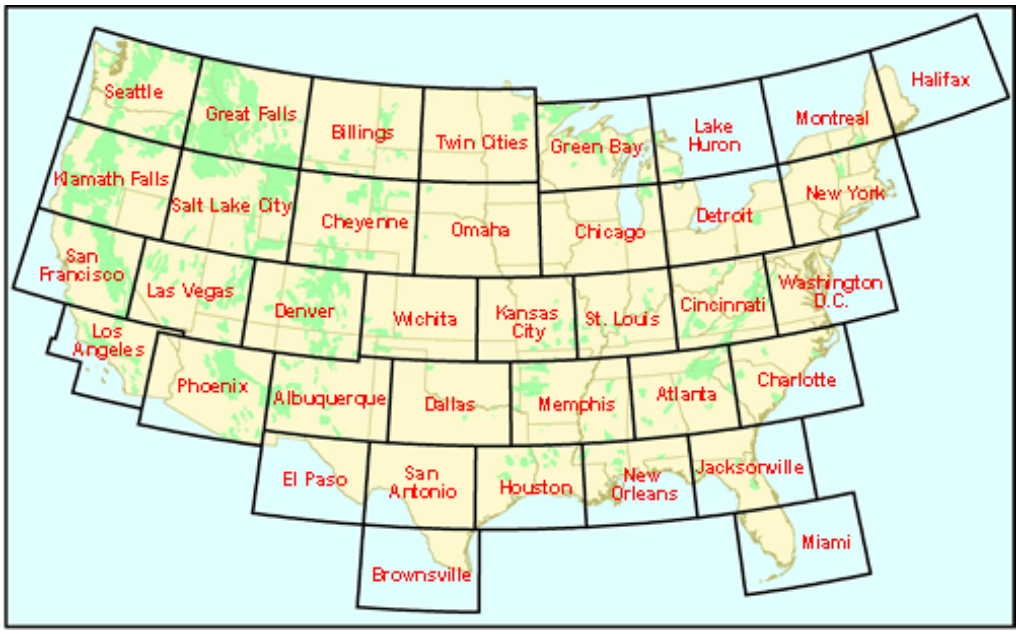
- En Route Low Altitude Contiguous U.S.
- En Route High Altitude Contiguous U.S.
- Alaska Charts
- Pacific Charts

Each office with responsibility for scheduling, dispatching or requesting aircraft should maintain current Sectional Aeronautical Charts (Sectionals) in a location where the Aircraft Dispatcher or Aviation Manager has immediate access to them. Areas of military operations (MOAs, MTRs, etc.) should be highlighted.

A. Sectional Aeronautical Charts

Sectionals are designed for visual navigation of slow or medium speed aircraft. Topographic information consists of contour lines, shaded relief, drainage patterns and an extensive selection of visual checkpoints and landmarks used for flight under VFR. These charts also include cities and towns, roads, railroads, and other distinct landmarks. Aeronautical information includes visual and radio aids for navigation, airports, controlled airspace, restricted areas, obstructions and related areas.

FIGURE 5-1 Sectional Geographic Boundaries



Sectionals are generally revised every six months. If sectionals are used as basis for a posted hazard map they need to be updated promptly. Sectionals may be purchased at local airport Fixed Wing Base Operators (FBOs) or through aviation specialty stores. Subscriptions are also available from the FAA. Ordering information is available in Appendix C.

Sectionals are on a 1:500,000 scale (1 inch = 6.86 Nautical miles). They cover the entire United States and are separated into geographic sections by place names (Phoenix, Billings, etc.). Sectionals contain the most complete information available in one document for visual flight navigation; however, the user is cautioned that not all information is portrayed. The following information is depicted:

- Airport and permanent heliport locations and data
- Radio aids to navigation and communication
- VORs such as VORTACs and VOR-DMEs

FIGURE 5-2 Mapping Sources Information

Information Provided From Various Mapping Sources

Information Provided		Sectional Chart	AP1A Hdbk	AP1B Chart	AP1B Hdbk	IAMS/ CAHIS
MTRs	Route Centerline	Yes	N/A	Yes	Yes	Yes
	Route Width	No	N/A	No	Yes	Yes
	Route Altitudes	No	N/A	Yes	Yes	Yes
	Scheduling Activity	No	N/A	No	Yes	Yes
	Originating Activity	No	N/A	No	Yes	Yes
SR	Slow Routes	No	N/A	Yes	Yes	Yes
SUA	Airspace Lateral Boundaries	Yes	Yes	N/A	N/A	Yes
	Airspace Vertical Boundaries	Yes	Yes	N/A	N/A	Yes
	Controlling Agency	Yes	Yes	N/A	N/A	Yes
	Using Agency	No	Yes	N/A	N/A	No
	Scheduling Agency	No	Yes	N/A	N/A	Yes
CFA	Controlled Firing Areas	No	No	N/A	N/A	No
LATN	Low Altitude Tactical Navigation	No	No	N/A	N/A	No
AR	Aerial Refueling Routes (Low Level)	No	No	Yes	Yes	No

- Obstructions (not all are shown; those shown are predominantly >200 feet AGL).
- Topographic information
- Special conservation areas such as federal wilderness areas and wildlife refuges
- Airport traffic service and airspace information
  - Control zones
  - Transition areas
  - Special air traffic rules
  - Low-altitude federal airways
  - Mode C areas (altitude reporting system used in air traffic control)
  - National Security Areas
  - Military Training Routes (MTRs); centerline only; most but not all routes depicted
  - Special Use Airspace (MOAs, RAs, etc.); margin notes detail the location, time of use, altitudes used, and the controlling agency of each SUA

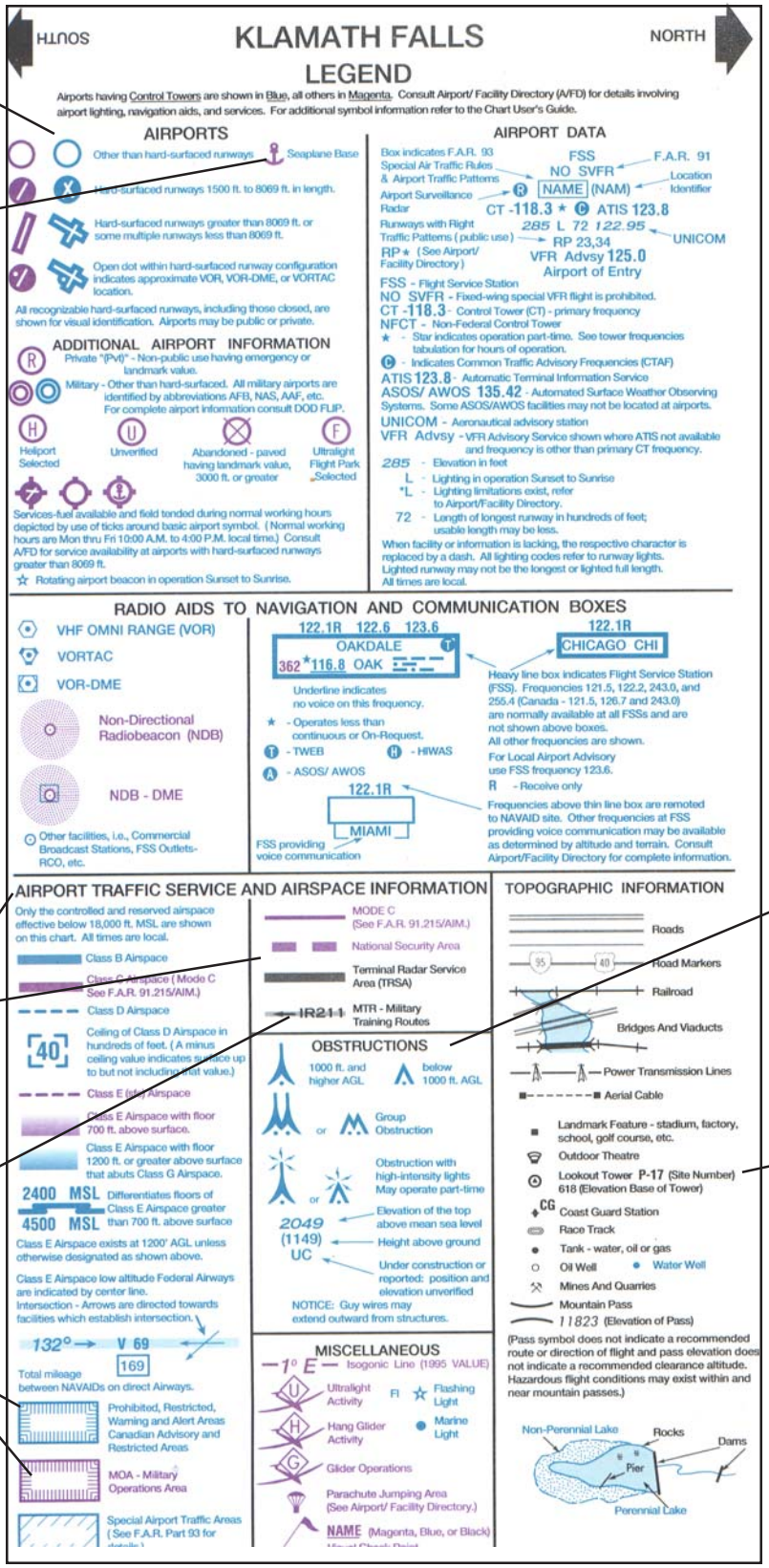
B. Helicopter Route Charts

Helicopter Route Charts are graphic portrayals of discrete and/or common use helicopter routes and/or operating zones located in high-density traffic areas. Their purpose is to facilitate helicopter pilot access into, egress from or operation within a charted area. They generally will include associated altitude or flight ceiling information to facilitate avoidance of IFR traffic and pilot adherence to minimum safe altitude requirements. The charts provide an expanded, and in some cases unique, ground reference symbols to improve visual navigation.

C. World Aeronautical Charts (WACs)

World Aeronautical Charts are a standard series of charts covering land areas of the world at a size and scale convenient for navigation by moderate speed aircraft. Topographic information includes populated areas, principal roads and distinctive landmarks. They are scaled at 1:1,000,000 (1 inch=13.7 NM). WACs do not depict all Special-Use Airspace or any Military Training Routes.

FIGURE 5-3 Overview of Basic Airspace Symbology on a Sectional



Airports & Helibase Symbology

Float Planes

Navigation Aids for Plotting Bearing & Distance

Airspace Symbols

MTRs

SUA

Towers & Obstructions

Note: Lookout Tower

NOTE: Detailed info on all chart symbology can be found in the Aeronautical Chart Users Guide. Ordering info is located in Appendix G.

D. Enroute Low Altitude Charts

Enroute Low Altitude Charts provide aeronautical information for enroute instrument navigation (IFR) below 18,000 feet MSL. They are revised every 56 days. Chart information includes airways, limits of controlled airspace, minimum enroute and obstruction clearance altitudes, airway distances, reporting points, Restricted Areas and related data.

E. Enroute High Altitude Charts

Enroute High Altitude Charts provide aeronautical information for enroute instrument navigation (IFR) above 18,000 feet MSL. They are revised every 56 days. Chart information includes jet routes, identification and frequencies of radio aids, selected airports, distances, time zones, Special Use Airspace and related information.

III. DoD Publications

The National Imagery and Mapping Agency (NIMA) publishes DoD Flight Information Publications (FLIP), and has the overall responsibility for the management and distribution of all DoD navigational charts and publications. These publications consist of books and charts, some of which are valuable tools to resource and aviation managers in determining the location of Military Training Routes, Slow Routes, Aerial Refueling Routes, etc. **All of the documents are available online at *https://164.214.2.62/products/digitalaero/index*. Ordering information is located in Appendix C**. The publications include the following:

A. Flight Information Publications Program (FLIP)

FLIP uses the concept that there are basically three separate phases of flight: planning, enroute operations and terminal operations. The FLIP planning document is intended primarily for use in ground planning at military facility base operations offices. It is arranged into four sections: General Planning, Area Planning, Special Use Airspace and Military Training Routes (North and South America).

1. General Planning (GP)

This publication contains general information on all FLIPs, terms and abbreviations, explanation of the divisions of United States Airspace, flight plans and codes, common worldwide pilot proce-

dures, International Civil Aviation Organization (ICAO) procedures, operations over the high seas and aviation weather codes. This book is published every 32 weeks.

2. Area Planning (AP/1)

This publication contains planning and procedure information for a specific region or geographic area and is published every 24 weeks.

3. Military Area Planning AP/1A Handbook

The publication contains specific information (e.g. phone numbers) concerning each area of Special Use Airspace, including all Prohibited, Restricted, Danger, Warning and Alert Areas listed by country. Military Operations and known Parachute Jumping Areas are also listed. Lateral and vertical boundary descriptions are limited to RAs, WAs and AAs. MOA data is limited to Scheduling Agency. The AP/1A is updated every six months.

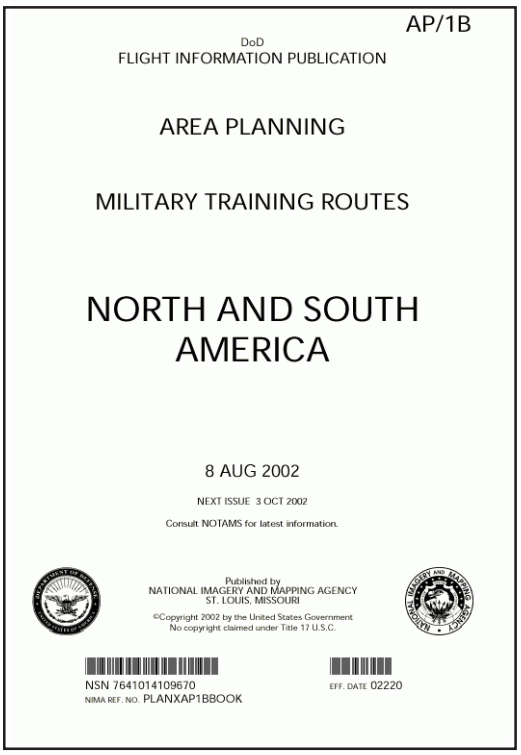
Note that SUA is also depicted on Sectionals but the Scheduling Agency with whom critical coordination must occur is NOT listed. Since the Scheduling and Using Agencies ARE indicated in the AP/1A, this publication is a useful tool for deconfliction of airspace, or for preparing airspace agreements.

4. Military Area Planning AP/1B Charts and Handbooks

The AP1/B contains information relative to military routes, including:

- IFR Military Training Routes (IR)
- VFR Military Training Routes (VR)
- Slow Routes (SR)
- Refueling Tracks/Anchors/VFR
- Helicopter Aerial Refueling Tracks (AR)
- Avoidance Locations (nuclear power plants)

FIGURE 5-4 AP/1B Cover



A series of four charts are issued covering the United States.

The AP/1B Handbook provides specific information on each IR, VR and SR route (e.g. width and height of all points along the route, turning points, Scheduling Activity, phone numbers), plus any unusual information pertaining to that route.

Scheduling activity phone numbers may be either Defense Switched Network (DSN) or commercial (or both). If a route only lists a DSN number, agency personnel will have to pursue obtaining a commercial number. One suggestion is to call information for the military unit and obtain the local base number. The scheduling activity can usually be reached by switching the last four digits of the commercial information number with the last four digits of the DSN number.

Agency personnel need to preplan by listing commercial numbers in their mobilization guide or other aviation plan. The AP/1B Handbook is the most complete source of information on Military Training Routes. Due to map scale, not all routes listed in the Handbook appear on the Charts.

If a unit does not have access to the IAMS program via the Internet, the most effective way to determine route location and parameters is to use Sectionals in conjunction with the AP/1B Handbook and Charts.

Each Office with responsibility for scheduling, dispatching or requesting agency aircraft should maintain a current copy of the AP/1B Chart and Handbook in a location where the Aircraft Dispatcher or Aviation Manager has immediate access to it. The book and charts are published every 56 days.

5. Flight Information Handbook

The Flight Information Handbook is a DoD publication. It contains aeronautical information which is required by DoD aircraft in flight and is not subject to frequent change. Sections include information on emergency procedures, FLIP and NOTAM abbreviations and codes, national and international flight data and procedures, meteorological information, conversion tables and standard time signals.

IV. Other Publications

A. Federal Aviation Regulations Publication

Federal Aviation Regulations are the Title 14 part of the Code of Federal Regulations (CFRs), and may be listed as 14 CFR, Aeronautics and Space. Agency personnel should be familiar with Part 91, which includes regulations affecting the National Airspace System (NAS). The FAA publishes the regulations to make them readily accessible to the aviation community. One source is the Government Printing Office (by subscription). Notices of Proposed Rule Making (NPRM) are sent to subscribers when regulatory changes are being considered. Another source is via the Internet, at *www.faa.gov*. The CFRs, also available on-line, can be found at *www.access.gpo.gov/nara/cfr/cfr-table-search.html*.

NPRM notices may also be accessed at the Federal Register website at *www.regulations.gov*.

B. Aeronautical Information Manual (AIM)

The Airman's Information Manual (AIM) is designed to provide the aviation community with basic flight and ATC procedures for use in the National Airspace System. It contains a wealth of data related to ATC functions. Information parallels the U.S. Aeronautical Information Publication (AIP) that is distributed internationally. The AIM is available from various commercial sources.

The AIM has information of a relatively permanent nature, such as descriptions of aeronautical lighting and airport visual aids, descriptions of various navigation aids with proper use procedures, procedures for obtaining weather, preflight and in-flight services, arrival, departure and enroute procedures, emergency procedures and a pilot/controller glossary.

C. Airport/Facilities Directory (A/FD)

The Airport/Facilities Directory, designed to be used with sectional charts, contains information on airports, communications, navigation aids, parachute jumping areas, controlled firing areas, major updates to sectionals, and other information essential to navigation through the airspace. The FAA's National Flight Data Center compiles and maintains data for this Directory. It is compiled in seven volumes, by geographical areas, and is available by subscription or may be purchased from aviation specialty stores.

D. Notices to Airmen Publication (*www.faa.gov/NTAP*)

This is a publication by the FAA containing Notices to Airmen (NOTAMs) that are considered essential to the safety of flight. It includes current Flight Data Center (FDC) NOTAMs that are regulatory in nature and are issued to establish restrictions to flight, such as temporary Military Operations Areas (MOAs), or to amend charts or published information. This publication is issued every 28 days and is available by subscription from the Superintendent of Documents or from the internet.

NOTE: FDC NOTAMs for Temporary Flight Restrictions (TFRs) are not published in the Notices to Airmen Publication.

E. Advisory Circulars (*http://www.faa.gov/regulatory advisory/ac_index.htm*)

The FAA issues Advisory Circulars to inform the aviation public of non-regulatory material of interest. They either explain the actual regulation or provide additional information to aid in compliance with regulations. Advisory Circulars are numbered to correspond with 14 CFR.

F. Aeronautical Chart Users' Guide

This Guide is designed to be used as a teaching tool, a reference document and as an introduction to the wealth of information provided on the sectional charts and publications. It includes explanations for both VFR and IFR terminology and symbols. It depicts (in color) all the symbols used throughout various aeronautical charts. Agency personnel will find this to be a valuable educational or reference tool. Copies may be purchased from local FBOs or from aviation specialty stores. Ordering information is listed in Appendix C.

V. Technology

FIGURE 5-5 HAI Safety Poster

Reprinted with permission of United States Aviation Underwriter Inc.

"See and Avoid" is the basic principle of VFR flight and collision prevention. In the early days of aviation, all airspace was uncontrolled. There were few aircraft and none had the equipment necessary to fly through clouds. Traffic density was low and aircraft flew slowly compared to today. It was generally agreed that if aircraft remained clear of clouds and had at least one mile of visibility, then pilots could see other aircraft, obstructions and terrain in time to avoid a collision. With the advent of faster and increased numbers of aircraft, and new technologies (e.g. Instrument Flight (IFR) capabilities), systems were developed and continue to evolve to manage the increasingly complex airspace.

A. Traffic Collision Avoidance System (TCAS)

TCAS is a midair collision avoidance system. TCAS equipment on board an aircraft operates an Airborne Secondary Surveillance Radar (ASSR) by interrogating the transponders of other aircraft on the same interrogation and reply frequencies.

A display in the aircraft alerts the pilot and provides the pilot with the heading and altitude of other aircraft equipped with ASSR transponders. Software advances are providing pilots with avoidance maneuvers both vertically and horizontally. When a nearby aircraft is detected, the TCAS computer sounds a warning using synthesized speech.

B. Direct User Access Terminal (DUAT)

This FAA sponsored system was implemented in 1990 and provides automated flight weather information and flight plan filing directly from a home or office computer. The FAA provides flight data information to two DUAT contractors who maintain internet site connections. DUAT is a tool that provides access to Notices To Airmen (NOTAMS). You must have a pilots license to log on to DUAT.

C. Global Positioning System (GPS)

The Global Positioning System is a navigation system consisting of satellites that transmit precise time and position information to anywhere on the globe. The GPS constellation consists of multiple satellites orbiting the earth in six fixed planes. Each satellite orbits the earth twice a day at an altitude of 10,800 nautical miles. This system is unaffected by weather.

GPS was developed and deployed by the U.S. Department of Defense primarily to provide continuous, world wide positioning and navigation data to U.S. and allied military forces around the globe. GPS has broad civilian and commercial applications including navigation, surveying, exploration and tracking.

One area of concern for agency personnel is the confusion over Datums when using GPS for positioning reporting. A datum refers to a set of measurements made on the ellipsoid model of the earth measuring horizontal positions on the earth's surface. There are a variety of datums in use for ground based applications which include NAD 83 (North American Datum 1983) and NAD 27. (NAD 27 is based upon Clarke 1866 ellipsoid model.) In March, 1989, the Council of International Civil Aviation (ICAO) accepted a recommendation from its Special Committee on Future Air Navigation Systems (FANS/4) which adopted WGS 84 (World Geodetic System 1984) as the international standard datum for Aviation positioning. The difference between datums can cause a difference in accuracy of positions. Additional information on GPS is available at *http://gps.faa.gov*.

GPS OUTAGES: Notams are now available for GPS Outages at *http://www.navcen.uscg.gov/gps/status_and_outage_info.htm*. Subscriptions are also available for outage notices. The US Coast Guard is planning an aviation NOTAM application with the US NOTAM office.

Agency personnel need to remember that various GPS units could be referring to different Datums. Note that ground based applications use a different datum than aviation based GPS units.

D. Transponder Codes/Code 1255

Transponder codes are a system of tracking used by the FAA. A computer located in the FAA's Air Route Traffic Control Center (ARTCC) will assign a transponder code to an aircraft. There are some transponder codes that

are reserved, such as the code 1200; which is reserved for VFR aircraft not in contact with an ATC.

In 1997, the FAA designated the transponder code 1255 for national use in aircraft firefighting operations. The purpose of this special code is to enable enroute and terminal radar service facilities to identify aircraft engaged in tactical fire suppression missions and if necessary, separate them from nonparticipating aircraft such as news media and transient aircraft. The letter designating the code states:

> *"Beginning July 17th, 1997, on a national basis, aircraft engaged in, or traveling to, fire fighting operations are approved to use a special beacon code, 1255. The code 1255 may be used by aircraft that are not in contact with air traffic control. Air traffic controllers have been briefed that the code would be equivalent to using the flashing lights and sirens on a fire engine. In other words, aircraft flying from Georgia to Colorado to help fight a fire would not use a squawk of 1255.* [Note: This is because the pilot is flying from point-to-point under ATC.] *The 1255 code will increase controller awareness of the firefighting mission, but will not assure any priority air traffic control services. If needed, special services should be requested from air traffic control. At that time subject to the controller's discretion, the 1255 code may be retained or another beacon code may be assigned.*"

This transponder code is not intended for use during reconnaissance, ferrying, VIP, transport or other non-tactical flights. It is not to be used for repositioning aircraft or during cross-country flights. It is specifically for flights that are tactical in nature and are actively involved in wildfire suppression efforts. See Appendix G for original letter.

E. The Initial Attack Management System (IAMS) Program (aka IAMs/ CAHIS)

In 1988, representatives from several Federal agencies began to study how the benefits of the USFS Computer Aided Navigation (CAN) program could be applied to the BLM Initial Attack Management System (IAMS). The CAN program was upgraded into CAHIS (Computer Aided Hazard Identification System). IAMS was a networked computerized system package of multiple applications designed to help managers more effectively dispatch initial attack resources to incident sites. BLM added CAHIS into the aviation portion of IAMS and referred to it as IAMS-MAPs. The network application was discontinued and many of the programs have been developed as stand alone applications. The airspace deconfliction

program is now a stand alone system available from the internet and is often called both IAMS or CAHIS or sometimes simply IAMS/CAHIS.

The IAMS/CAHIS program locates Military Training Routes and Special Use Airspace and identifies VORs, helibases, airtanker bases and other support locations. The program provides an accurate display for visual reference and analysis. The program's formats can be modified to suit specific needs and the customized information can be saved. A map can be printed out for aviation personnel and used as a permanent record.

The aviation portion of IAMS/CAHIS graphically displays selected geographic areas at various scales. Overlays containing specific information about that area can be added or removed. In addition, attributes can be changed for each overlay selected, much like a Geographic Information System (GIS) product.

The IAMS/CAHIS program has many overlays available, including:

Aviation Overlays

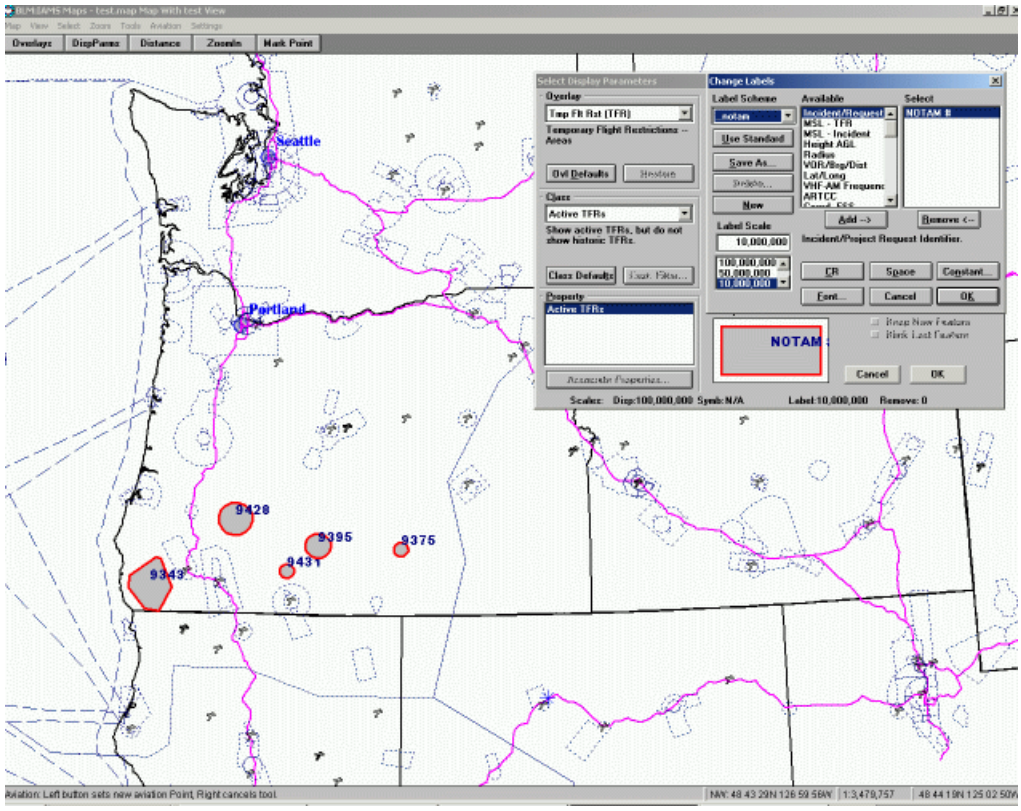
- Airports/airbases
- Airspace boundaries (ARTCC)
- Military Training Routes (boundaries, center lines and turning points)
- Navigation aids (VORs and VORTACs)
- Special Use Airspace
- Temporary Flight Restrictions

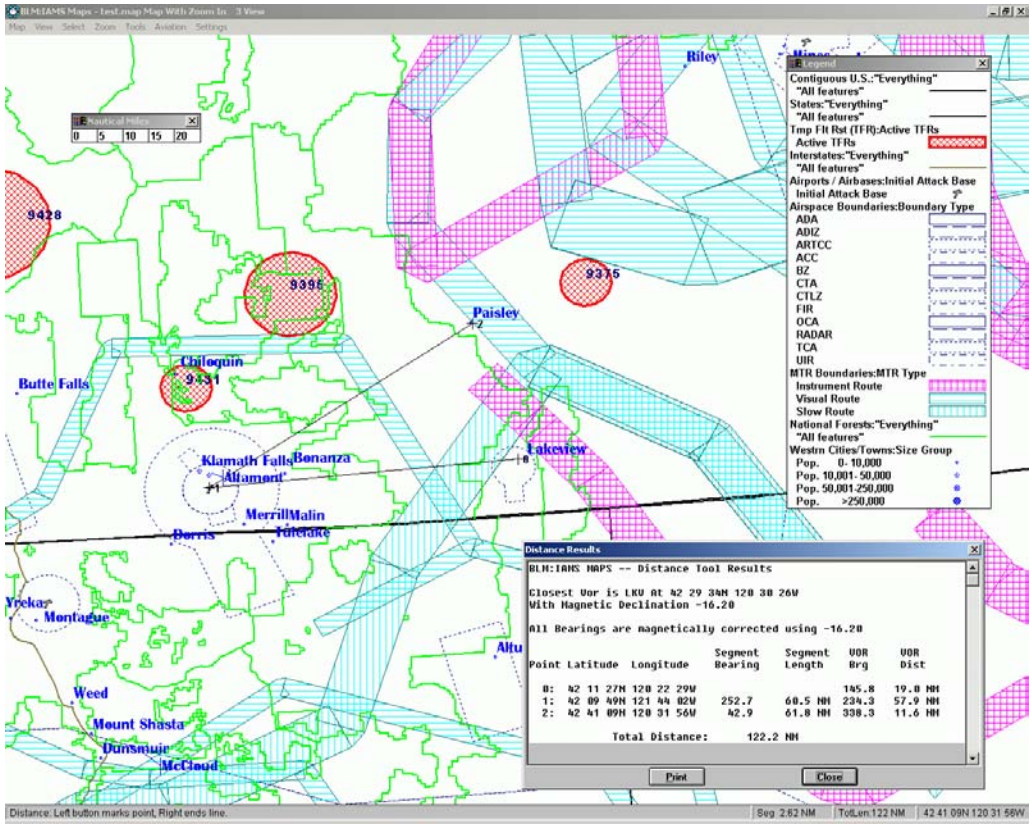
Non-Aviation Overlays

- States
- Counties
- Roads
- Interstate highways
- Rivers
- Lakes
- Administrative boundaries
- Railroads

The program is beneficial to both dispatchers and aviation personnel. Rather than the time consuming and error prone method of manually converting a fire from township, range and section to latitude/longitude, looking up VOR/DMEs and plotting fire locations, IAMS/CAHIS automates this task. The basis of IAMS/CAHIS is information from the FAA and the DOD AP/1B FLIP book. The AP/1B is available via Internet, and is updated in 28 and 56 day cycles. The user is notified if they are using out-

FIGURE 5-6 Two Representations of What IAMS/CAHIS Can Display





dated information when old data is flagged with red letters that identifies the date the data expires, which in turn prompts the user to down load new data.

The system may be used by anyone, in any situation (emergency or not). IAMS/CAHIS has become an important aviation safety tool. It serves the vital purpose of providing accurate, quick and easily accessible information to pilots, dispatchers, ground crews, the FAA, military installations and other agencies.

IAMS/CAHIS software may be downloaded from the Internet. The user needs to maintain the program by downloading updates on a 26-day cycle. The program and updates are available at *www.nifc.blm.gov* (click on aviation). It includes airbase updates (every 28 days), military updates (every 56 days) and the current IAMS/CAHIS user guide. Feedback from users of IAMS/CAHIS will help to further develop, customize and enhance the system. Users are encouraged to provide feedback and ideas to their agency aviation managers.

VI. Airspace Coordination Skills

When directing pilots to a location, or understanding their reports of location, some basic knowledge of aeronautical terminology is needed. To help dispatchers and other non-pilots develop practical skills and understand the common references used by the aviation community, a number of explanations are provided.

A. Position, Direction, Heading and Distance

The term *position* refers to an identifiable location on earth or a point within a human designed system of artificial coordinates. A position may be in reference to a known geographical landmark, in relation to an Air Traffic Control Navigational Aid (NAVAID) facility, or in reference to lines drawn on a map (latitudes and longitudes).

A compass *direction* (e.g. east, west) is the position of one point or object in relation to another, without regard to distance.

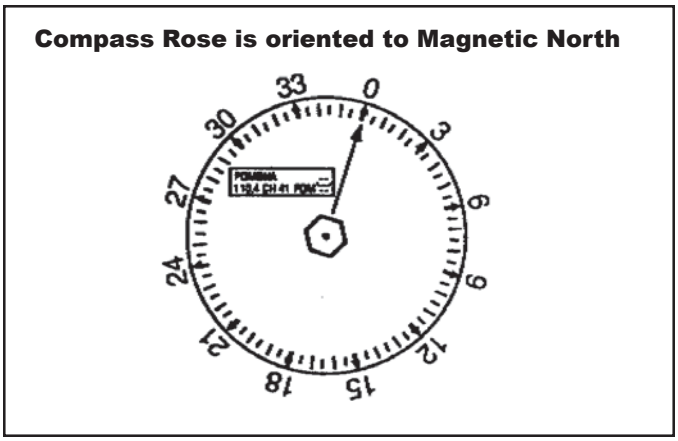
A *heading* (also known as a *bearing*) differs from a compass direction in that it describes the angle (in degrees) from the longitudinal axis of an aircraft to a reference line such as magnetic north.

Distance is the spatial separation between two points, without regard to direction. The customary units are nautical or statute miles, or kilometers.

The "mile" used in navigation is the international nautical mile (6,076 feet), which is approximately 15% longer than the customary statute mile used in land travel (5,280 feet).

B. Compasses

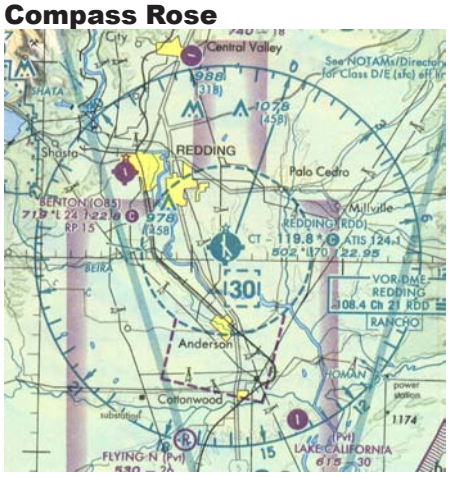
FIGURE 5-7 Compass Rose



Compasses are used to determine headings and directions. The simplest compass references use the cardinal point system of north, east, south and west. Intermediate points can be described (e.g. northeast or southwest), or subdivided again for even greater accuracy (e.g. north-northwest). The use of compass points to describe direction is relative to the point of reference. For example, a location as east of a prominent peak, it's understood that the starting point is the known peak and travel is in an easterly direction.

When the compass is divided into a 360-degree circle, each of the four major quadrants (e.g. north to east) becomes 90 degrees. Beginning at zero degrees (north), and proceeding clockwise, points are marked at even intervals until north is once again reached. At this point north serves as the ending point of 360 degrees. Using this system, direction can now be stated as a degree (e.g. east is 90 degrees, south is 180 degrees, west is 270 degrees), enabling even greater precision in navigation.

FIGURE 5-8 Sectional Compass Rose



C. Compass Declination

When using a compass remember that when the needle points north, it's actually using the magnetic force of the earth to find the northern magnetized pole, commonly referred to as *magnetic north*. Whereas *true north* is a map direction

toward the geographical North Pole, *magnetic north* is the compass direction toward the magnetic North Pole somewhere north of Hudson Bay.

The angle between magnetic north and true north is called the *variation* or *declination.* True north and magnetic north coincide along only one line in North America; it runs off the east coast of Florida, through Savannah, Georgia and Lake Michigan, to the magnetic North Pole. At any point between this line and the Pacific Ocean, the compass needle points east of true north and is read as "xx degrees east declination"; at any point between the line and the Atlantic Ocean, the needle points west of true north and is read as "xx degrees west declination".

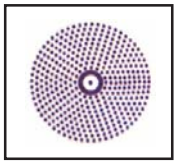
Consult sectional charts or the Airport Facility Directory for the declination for a desired area or NAVAID. Not accounting for the difference between a map's true north and a compass' magnetic north can complicate navigation, and may throw an aircraft off course.

D. Air Navigational Aids (NAVAIDs)

Various types of NAVAIDs are used today within the NAS. The following provides a brief description of those commonly used for navigation.

1. Non-Directional Radio Beacon (NDB)

FIGURE 5-9
NDB Symbol



The Non-Directional Radio Beacon (NDB) is a homing-type NAVAID used for en-route navigation and airport approach. This land-based facility provides a signal in all directions and the pilot "homes in" by keeping the noise of the aircraft pointed towards the sending location. NDBs are used with Airborne Direction-Finding (ADF) equipment that senses and directs the pilot with bearing information. Direction is indicated as a magnetic or relative *bearing* to the longitudinal axis of the aircraft. **NDB should not be used when plotting or describing a TFR.**

2. Omnidirectional NAVAIDs

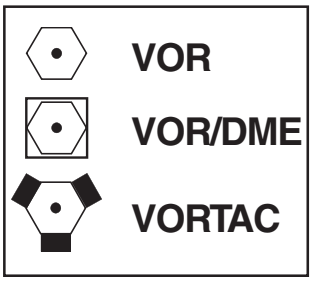
Omnidirectional NAVAIDs were designed for more specific bearing information that does not require flying toward the facility. They use 360 courses (like the 360 degrees of a compass) which are known as *radials,* and the number assigned gives the aircraft's relative bearing from the NAVAID facility. The facilities have the advantage of not being affected by weather and other factors common to interference of the NDB/ADF. The basic types of omni facilities are

the Very High Frequency Omnidirectional Range (VOR), the VOR/DME (distance measuring equipment), the Tactical Air Navigation (TACAN) system, and the combined VOR/TACAN.

When dealing with positions based on Omnidirectional NAVAIDs equipment, keep in mind these are limited to line of site/reception. Additionally, facilities are classified by power which affects usable range for reliable navigation. These classifications are terminals (T), low altitude (L) or high altitude (H). When calculating a navaid fix using charts or computer programs, compare the navaids classification to the calculated distance to determine if this reference is appropriate.

a. VOR

FIGURE 5-10
VOR Symbols



Sectionals have three symbols for VORs: VOR, VORTAC and VOR/DME. There is no difference between the three types of stations if you are using them for plotting on a sectional.

VOR operates in the Very High Frequency (VHF) radio band and is the primary omnidirectional facility used by public and private aircraft. Each VOR station transmits a signal that is identifiable as 360 radials (or lines) of position that are oriented in relation to magnetic north. A compass rose aligned with magnetic north is placed at each VOR site on Sectional charts.

b. VOR/DME

Some VOR sites are equipped with a DME feature that measures distance from the aircraft to the DME equipment. This combined position information is also referred to as “radial/DME”. For the DME equipment to measure distance from every aircraft it needs corresponding equipment on board the aircraft that it can communicate with. The aircraft’s equipment is called an interrogator, because it sends out signals that seek distance information. The ground equipment, called a transponder, accepts the signals, calculates distance based on transmission times, then sends back the distance information to the aircraft.

c. TVOR

A TVOR is an airport terminal VOR. A low powered VOR located at or near an airport and used as an approach aid. **A TVOR should not be used when plotting or describing a TFR location.**

d. TACAN

TACAN facilities broadcast NAVAID information on Ultra High Frequencies (UHF), which are primarily used by the military. Unlike the VOR that needs the separate DME equipment for distance information, TACAN equipment is integrated for azimuth and DME. TACAN also uses the interrogator and transponder to communicate over paired frequencies to exchange information. At some sites in the NAS, collocated TACAN and VOR facilities (using the DME off the TACAN) are called VORTACs. Although differences do exist in operation of the VOR versus TACAN, the resulting information is basically the same. The advantage of collocating TACAN and VOR stations is that civilian pilots can use the distance-measuring feature of the TACAN with the direction indications of the VOR.

E. Using VOR/DME (Bearing/Distance)

There are 360 degrees of radials represented by a VOR station. The radials are the measured magnetic direction from the station and are depicted with a compass rose on aeronautical navigation charts (Sectionals, WAC, Etc.)

The 0 degree radial points directly toward magnetic north. The 90-degree radial is 90 degrees clockwise around the compass rose from magnetic north and points to a direction of magnetic east. Like a compass rose, radials always emanate from the station and not from the aircraft.

VOR's can be used for many purposes. The most important purpose for the dispatch organization is to determine a position location relative to the VOR. VOR/DME's are used in submitting TFRs to the FAA.

FIGURE 5-11 Manually Plotting Bearing and Distance

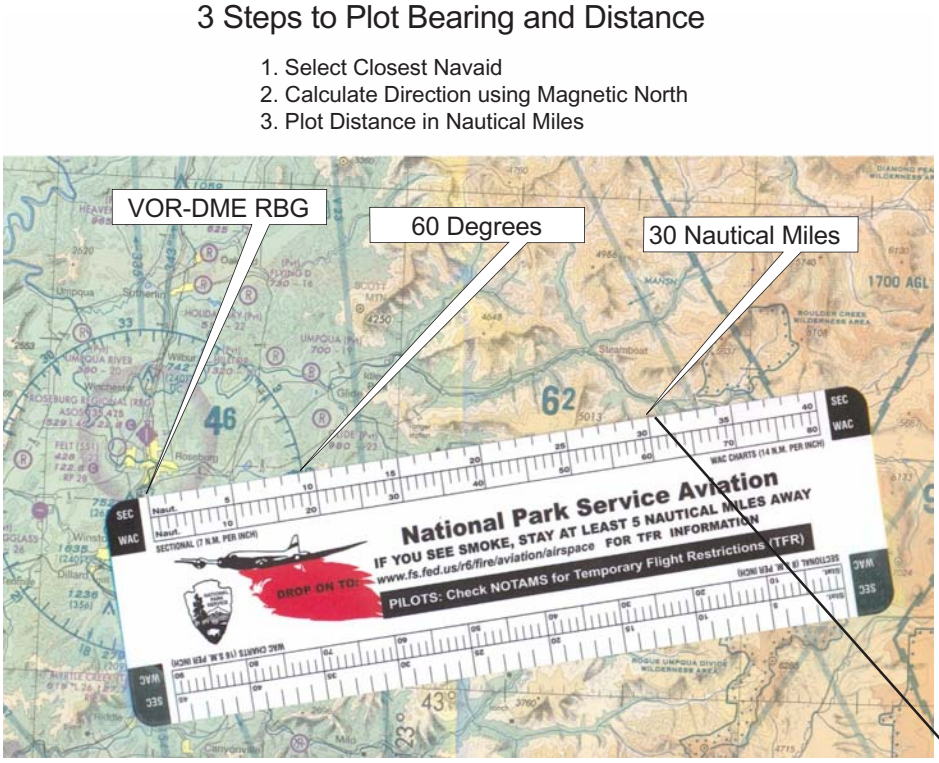
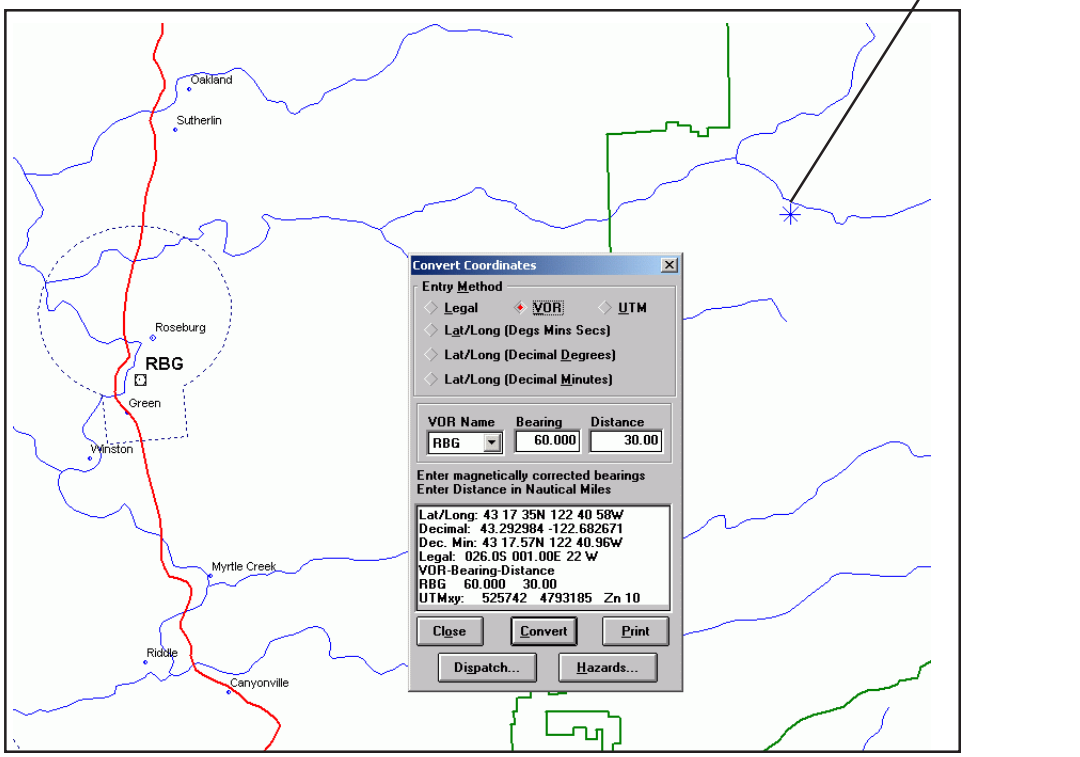
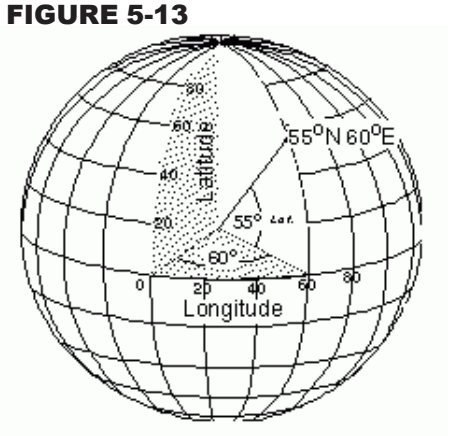


FIGURE 5-12 Using IAMS/CAHIS to Plot Bearing and Distance



F. Latitudes and Longitudes

FIGURE 5-13



Positions are determined in reference to map lines. On a globe there are *parallels of latitude (east-west)* or *meridians of longitude (north-south)*, represented by the lines which go completely around the world. Related to a map/chart depiction of an area, these lines are simply referred to as latitudes or longitudes. The maps will show these lines as flat and labeled in terms of degree with subunits expressed in minutes and seconds.

1. Latitude

Latitude is the angular measurement of a location expressed in degrees north and south of the equator. Latitudes run from 0 degrees at the equator to 90 degrees north (N) or 90 degrees south (S) at the respective poles.

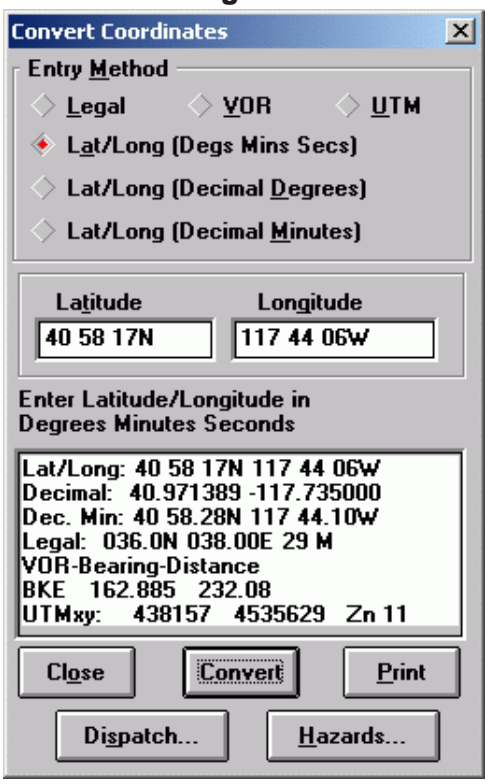
2. Longitude

Longitude is the angular measurement of a location east or west of the prime meridian. All lines of longitude run through both poles. To set a place of reference, the line which passes through Greenwich, England was selected as the prime or Greenwich meridian. Longitudes run from 0 degrees at the prime meridian to 180 degrees east (E) or west (W), halfway around the globe.

3. Units of Measure

Degrees and minutes are units of measurement for latitudes and longitudes. A degree will always be depicted on a map but because of the convergence of lines to the poles, the corresponding mileage/metric value differs. Latitudes are equal-distant from each other (also called parallels) and each degree is equivalent to 69 statute miles (111 km or 60 nm). Because meridians converge at the poles, the length of a degree can vary from 69 miles at the equator to 0 miles at the poles.

FIGURE 5-14 IAMS/CAHIS Conversion Program



To determine a location in smaller than degree units, minutes are used to subdivide each degree into 60 units. Each minute can be further subdivided into 60 units called seconds. When writing a location in terms of latitude and longitude, list the degree 2 or 3 digit number followed by a small circle similar to a footnote character (°), then minutes (2 digits) followed by a single apostrophe (‘), and then seconds (2 digits) followed by a quotation mark (“). The latitude value is always listed first, followed by it’s direction (N or S) from the equator and then the longitude value, followed by it’s direction (E or W) from Greenwich.

Sometimes a different description using a decimal fraction of a value is used. When using this method, remember that each tenth of a value (degrees, minutes or seconds) should be multiplied times 6 to get the value at the next lower sub-unit.

The IAMS/CAHIS program has a useful tool for converting coordinates. For example, Winnemucca, Nevada, can be displayed in the following formats:

Degrees, Minutes, Seconds: 40°58’17”N, 117°44’06”W
Decimal, Degrees: 40.971389, -117.735000
Decimal, Minutes: 40 58.28N, 117 44.10W

The US NOTAM office will only accept TFR requests in a Degrees, Minutes, Seconds format. An internal memo within the FAA states the following:

“Effective immediately insure that all NOTAMs containing latitude and longitude information utilize Degrees, Minutes, Seconds and includes a reference to North latitude (N) and West longitude (W). If seconds are not available, add two zeros for the second spaces. Do not include spaces, commas, dashes or any other symbols. The standardized format shall be: ddmmssN/dddmmssW.”

For example, the above reference to Winnemucca, Nevada, would be: 405817N/1174406W.

FIGURE 5-15 Six Steps to Plotting Latitude and Longitudes

Six Steps to Plotting Latitude and Longitudes

1. Look at a map and identify the latitude lines–look for labeled value. Remember if moving north of the equator the numbers will get larger as you go north. The opposite would be true if one is south of the equator, the numbers increase southbound there.

2. Next find a line that runs perpendicular through the latitude line, this is the longitude line. Looking north on the map, find hashmarks along the longitude line, dividing the area to the next crossing (not labeled) latitude line into three groups of ten, making up 30 minutes. Each hashmark above the latitude will be distinct and the hashmarks between the units of ten will be smaller. Within each ten hashmarks, the midpoint (at 5) will stick out a little further to make it easier to read. This makes it easier to read the value at a glance versus counting up each of the hashmarks from the latitude line. Be careful to not get confused counting in reference from the midpoint (30') between lines of latitude–using a highlighter to mark the values of lines to keep track is helpful.

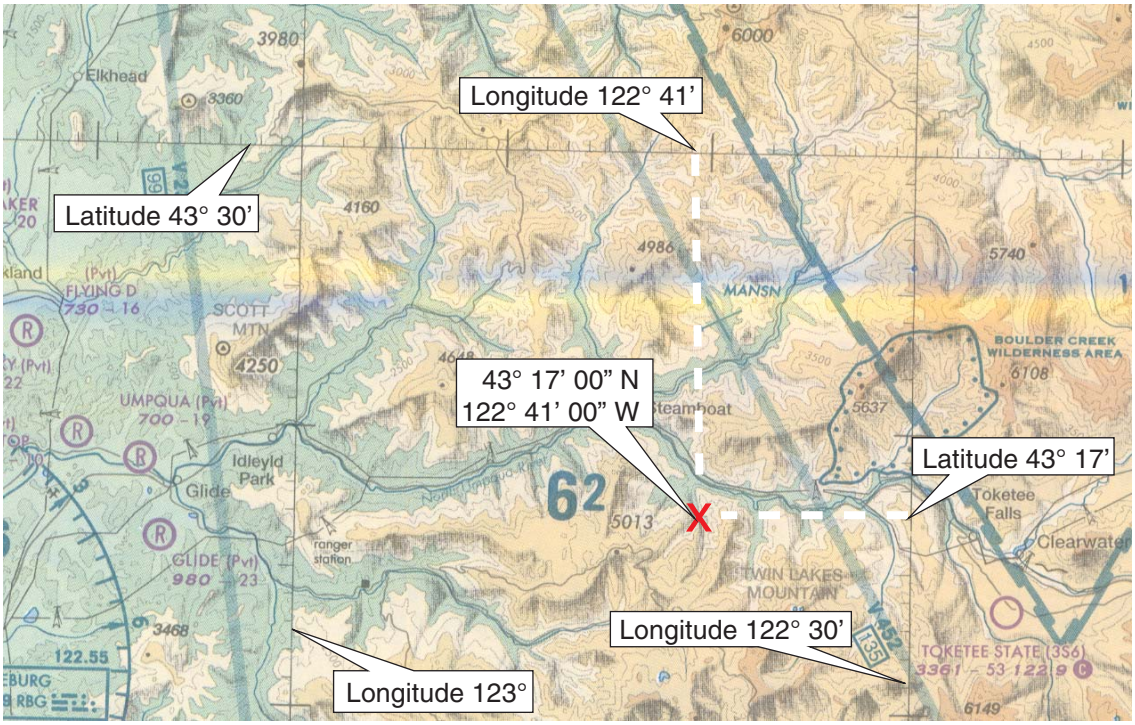
3. Most aviation maps will easily depict the degrees and minutes values but not the seconds. It really depends on the scale.

4. After plotting the latitude, keep that reference while you look for the longitude. A simple way is to use a straightedge (you can use a sheet of paper with a clean, straight end)) to follow along that point or else pencil a faint line.

5. Do the same steps 1–3, only this time look at lines of longitude. The values will increase moving westbound and decrease moving eastbound from Greenwich. Find the degrees by marked references and then use the hashmarks along the closest latitude line to count minutes. Identify where the north south line runs into the line of latitude and that's the location point. When accomplished one can get used to doing this and be able to eyeball a map, knowing the degrees for latitude and longitude and break it down from there. Again, the scale of the map will make it easier or harder.

6. If you know the location and need to plot the lat/long (also called coordinates), it's a similar process. Find the closest labeled reference line and work from there. It may be harder to read the lines on busy map backgrounds, like on some Sectionals, use pencil marks or rulers/papers to keep place until you get the coordinates. Write the final position with latitude first followed by direction from equator (US will always be N) and then latitude followed by direction from Greenwich, England (US will always be W).

FIGURE 5-16 Understanding Latitudes and Longitudes



G. Coordinated Universal Time (UTC) (Formerly known as Greenwich Mean Time or Zulu)

In communicating with DoD or FAA agencies, reference may be made to Greenwich Mean Time (GMT), also called Coordinated Universal Time (UTC) or “Zulu” time. However, by International agreement the term UTC is recommended and the terms GMT and Zulu are discouraged.

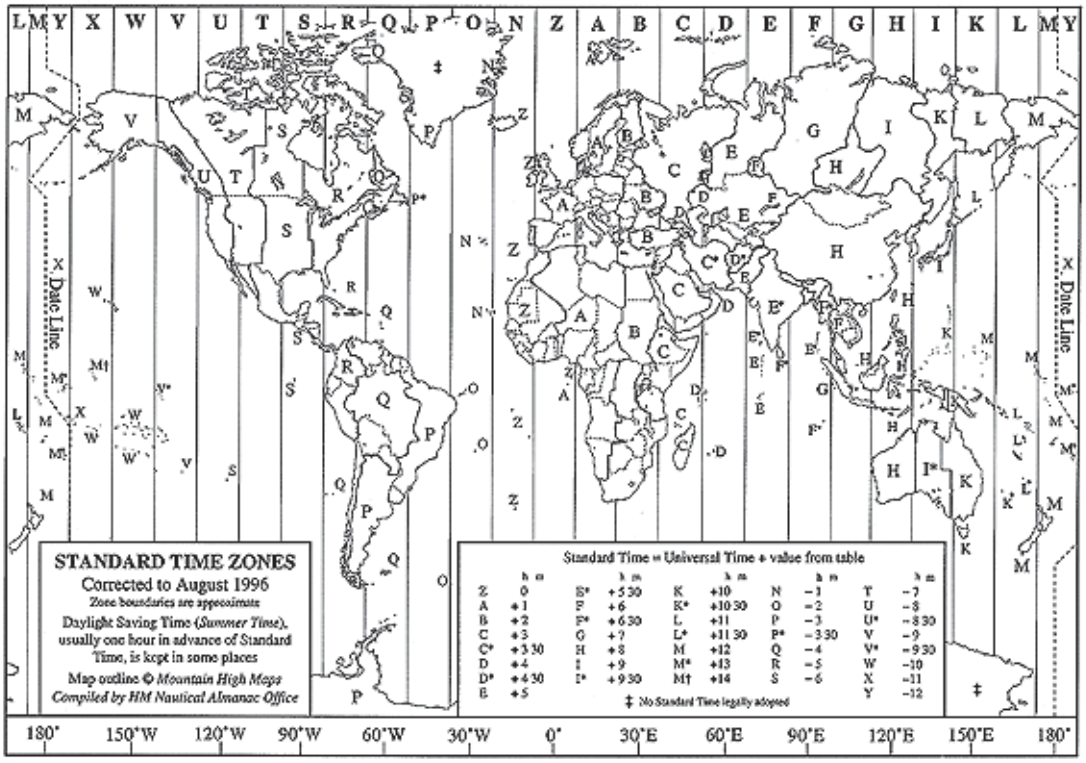
The world is divided into 24 time zones. For easy reference, a letter of the alphabet has been assigned to each time zone. Greenwich, England was selected as the prime meridian for standardized reference and a single time reference was created to be used throughout the world. From Greenwich, England, the earth is divided into twenty four bands fifteen degrees apart. Each band (or 15 degree section) represents one hour difference from the zero meridian at Greenwich; subtract to the west and add to the east to arrive at local time. Greenwich, England, is located in Zone ‘Z’ hence the common name “Zulu” time was created.

If you are in a zone that uses daylight savings time, to convert from local time, you’d need to subtract an hour when clocks are set ahead and then return to the normal calculation when clocks are set back.

The ATC system (worldwide) uses this standard to calculate actual flight time when crossing time zones results in artificially adding or subtracting hours. By using a standard, one can know the actual time differences without regard to these changes. The military and many pilots use this standard for similar reasons. When working with flight operations, especially in areas where the time zone changes, agency personnel will probably deal with these references. A conversion chart is located at *https//hurricanes/noaa.gov/zulu-utc.html*.

Agency personnel working with military schedulers should communicate in the UTC time frame. It is helpful to have a separate clock set to UTC time. When not using UTC, add the word "local" after time designations.

FIGURE 5-17 UTC Time Zones



VII. Additional Airspace Deconfliction Tools

A. Airspace Videos

There are two videos available for agency personnel usage.

1. Aviators and Wildfire

This is a six minute video developed by the USFS (Coconino NF) that is aimed at general aviation. It discusses the need to stay away from TFR areas.

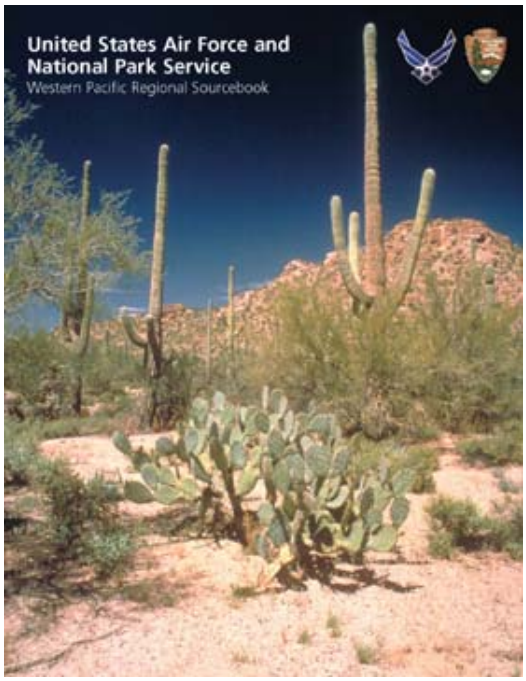
2. Flying in Special Use Airspace

This 14 minute training video from the FAA discusses Special Use Airspace and Temporary Flight Restrictoins. It may be useful for training agency personnel as well.

B. National Park Service and the US Air Force Western Pacific Sourcebook

The USAF and the NPS have published the first of a series of airspace "Sourcebooks" for geographical regions of the United States. The sourcebooks are designed to share information about airspace users and appropriate NPS units. The objectives of the sourcebooks are to foster communication and promote the building of relationships between USAF airspace managers and NPS park managers. The sourcebooks are a wealth of local airspace information and is recommended reading for any agency personnel involved in airspace coordination. The Western Pacific Regional Sourcebook is available at *www.afranges.net/sourcebook.html*.

FIGURE 5-18 Sourcebook Cover



C. Posters

Several outstanding posters exist for outreach to both DoD and general aviation with a “stay away, stay alive” message regarding TFR avoidance. Units may also choose to prepare smaller posters for posting at local airports to display current TFR information.

Figures 5-3 through 5-7 are examples of these awareness posters.

FIGURE 5-19 Example of a Customized Poster

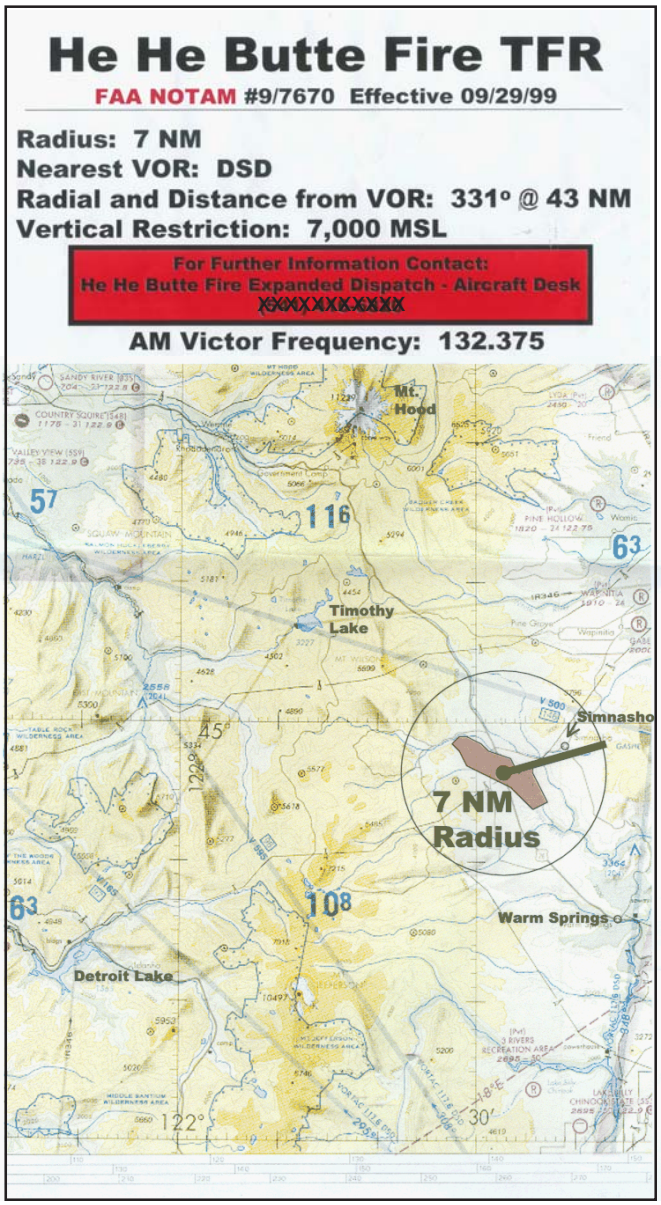


FIGURE 5-20 Example of a Customized Poster

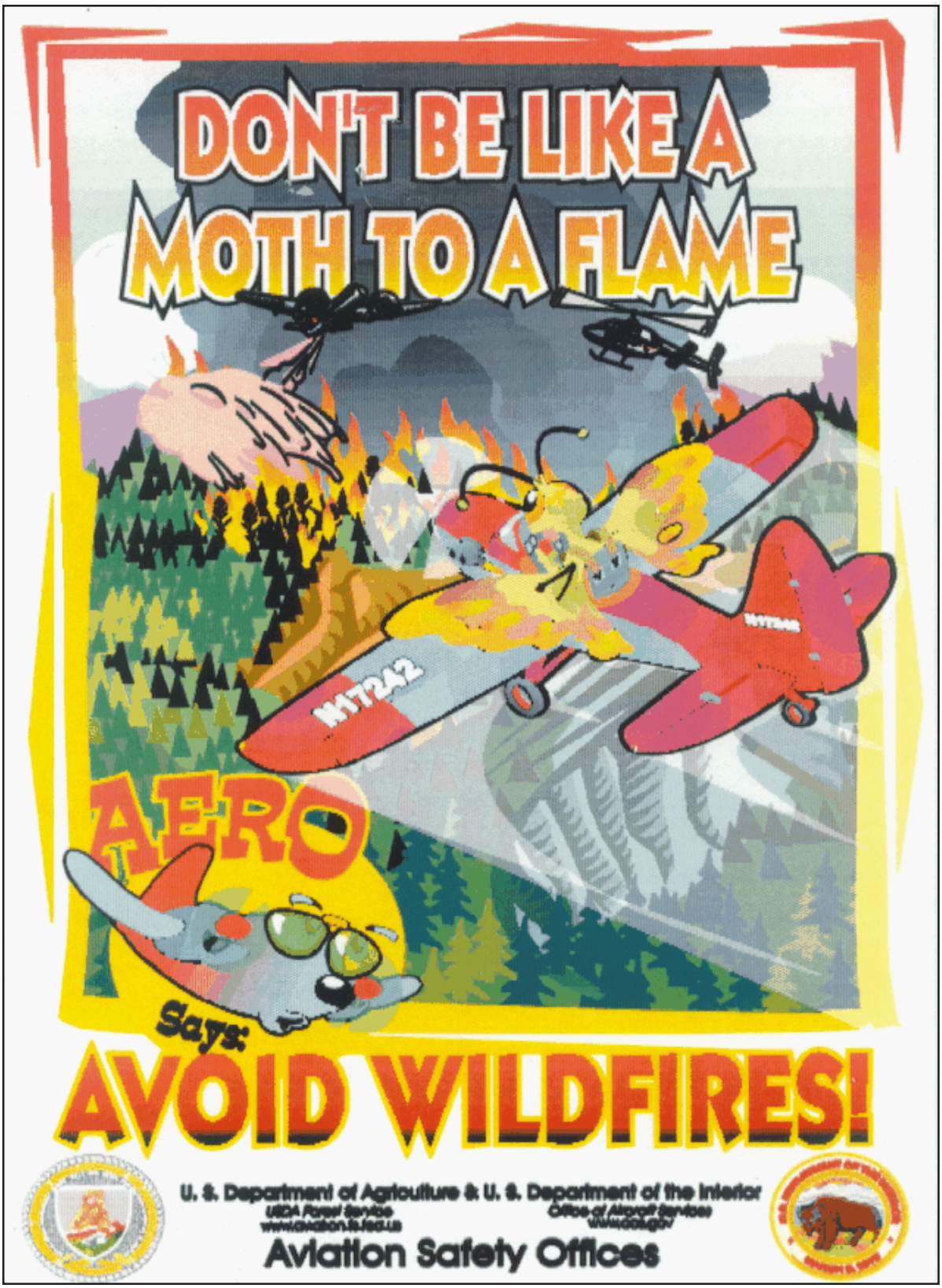


FIGURE 5-21 Example of a Customized Poster

FIGURE 5-22 Example of 8x11 Poster Mailed to Airports

GENERAL AVIATION ADVISORY

Due to the current number of wildfires in the Western United States, pilots are advised to FLY SAFELY CLEAR OF FIRES.

Many Temporary Flight Restrictions (TFR's) (14 CFR 91.137) are currently in effect. Not all wildland fires have TFR's in place, but all constitute a hazardous environment to aviators. Aerial firefighting operations may be taking place on any fire, whether or not a NOTAM has been issued.

Firefighting hazards include but are not limited to the following:

- Reduced visibility with marginal VFR conditions.
- Turbulence from convection currents.
- Hazardous airspace with firefighting helicopters, large low-flying aircraft in unusual flight patterns.
- Temporary control towers at previously uncontrolled airports.

If a fire is spotted stay clear and contact your FSS with a location report.

Agencies involved in firefighting will continue their efforts to minimize the impacts upon the General Aviation community, but they need your cooperation in order to provide for Firefighter and public safety.

Please visit: **www.fs.fed.us/r6/fire/aviation/airspace**

Interagency Airspace Coordination 2002

FIGURE 5-23 Example of Local Airspace Deconfliction Poster

FLY CLEAR
of WILDFIRES and SMOKE
for your safety and the safety of the aerial firefighters

- **Do not approach to investigate.**
- **Do not risk a violation.**
- **Report suspicious smoke to nearest flight service station.**
- **Airspace surrounding a wildfire may be restricted. (FAR 91.137)**
- **Restrictions vary with the size of the incident.**
- **Even a single smoke could have aerial firefighters already on site.**

Your local Division of Forestry

Field Unit _____

Phone No. _____

For additional information visit www.fl-dof.com
Florida Department of Agriculture and Consumer Services
BOB CRAWFORD, Commissioner

FIGURE 5-24 Example of Airspace Deconfliction Tools (printed in Business Card Format)

FIGURE 5-25 Airspace Training Rulers (do not use for navigational purposes)