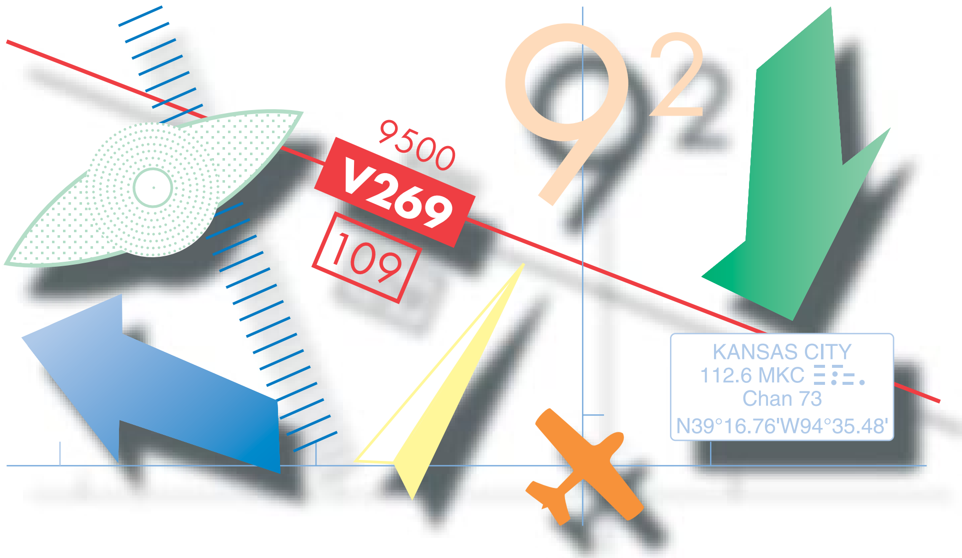
Chapter 10

IFR Flight



Introduction

No single procedure can be outlined that is applicable to the planning and preparation involved with all flights conducted under instrument flight rules (IFR). Once you understand the overall operation of IFR flight, the many procedural details can be put into the appropriate sequence. This chapter explains the sources for flight planning, the conditions associated with instrument flight, and the procedures used for each phase of IFR flight: departure, en route, and approach. The chapter concludes with an example IFR flight, which applies many of the procedures learned earlier in the chapter.

Sources of Flight Planning Information

In addition to current IFR en route charts, area charts, and United States (U.S.) Terminal Procedures Publications (TPP) published by the National Aeronautical Charting Office (NACO), the Federal Aviation Administration (FAA) publishes the *Aeronautical Information Manual* (AIM), the *Airport/Facility Directory* (A/FD), and the *Notices to Airmen Publication* (NTAP) for flight planning in the National Airspace System (NAS). Pilots should also consult the Pilot's Operating Handbook/Airplane Flight Manual (POH/AFM) for flight planning information pertinent to the aircraft to be flown.

Preflight Planning Reference

In addition to approach procedures, the U.S. Terminal Procedures (TPP) booklets contain a wealth of flight planning information including IFR takeoff and alternate minimums, standard terminal arrival procedures, and departure procedures.

Aeronautical Information Manual (AIM)

The AIM provides the aviation community with basic flight information and air traffic control (ATC) procedures used in the U.S. NAS. An international version called the *Aeronautical Information Publication* contains parallel information, as well as specific information on the international airports used by the international community.

Airport/Facility Directory (A/FD)

The A/FD contains information on airports, communications, and navigation aids pertinent to IFR flight. It also includes very-high frequency omnidirectional range (VOR) receiver checkpoints, automated flight service station (AFSS), weather service telephone numbers, and air route traffic control center (ARTCC) frequencies. Various special notices essential to IFR flight are also included, such as land and hold short (LAHSO) data, the civil use of military fields, continuous power facilities, and special flight procedures.

In the major terminal and en route environments, preferred routes have been established to guide pilots in planning their routes of flight, to minimize route changes, and to aid in the orderly management of air traffic using the federal airways. The A/FD lists both high and low altitude preferred routes.

Notices to Airmen Publication (NTAP)

The NTAP is a publication containing current Notices to Airmen (NOTAMs) which are essential to the safety of flight, as well as supplemental data affecting the other operational publications listed. It also includes current Flight Data Center (FDC) NOTAMs, which are regulatory in nature, issued to establish restrictions to flight or to amend charts or published instrument approach procedures (IAPs).

POH/AFM

The POH/AFM contain operating limitations, performance, normal and emergency procedures, and a variety of other operational information for the respective aircraft. Aircraft manufacturers have done considerable testing to gather and substantiate the information in the aircraft manual. Pilots should refer to it for information relevant to a proposed flight.

A review of the contents of all the publications listed will help you determine which material should be referenced for each flight and those you would consult less frequently. As you become more familiar with these publications, you will be able to plan your IFR flights quickly and easily.

IFR Flight Plan

As specified in Title 14 of the Code of Federal Regulations (14 CFR) part 91, no person may operate an aircraft in **controlled airspace** under IFR unless that person has filed an IFR flight plan. Flight plans may be submitted to the nearest AFSS or air traffic control tower (ATCT) either in person, by telephone (1-800-WX-BRIEF), by computer (using the direct user access terminal system (DUATS)), or by radio if no other means are available. Pilots should file

Form Approved OMB No. 2120-0026

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION **FLIGHT PLAN**	(FAA USE ONLY) ☐ PILOT BRIEFING ☐ VNR ☐ STOPOVER	TIME STARTED	SPECIALIST INITIALS

1. TYPE	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT	4. TRUE AIRSPEED	5. DEPARTURE POINT	6. DEPARTURE TIME PROPOSED (Z)	ACTUAL (Z)	7. CRUISING ALTITUDE
VFR X IFR DVFR	N1230A	C182/G	140 KTS	DTW	1300		4000

8. ROUTE OF FLIGHT
DCT LFD DCT CMI

9. DESTINATION (Name of airport and city)	10. EST. TIME ENROUTE HOURS	MINUTES	11. REMARKS
CMI-WILLARD AIRPORT SAVOY, IL	01	42	

12. FUEL ON BOARD HOURS	MINUTES	13. ALTERNATE AIRPORT(S)	14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE	15. NUMBER ABOARD
04	20	ALN	WARREN SMITH, 123 MAIN STREET DETROIT, MI 48123 217-555-1212 DTW 17. DESTINATION CONTACT/TELEPHONE (OPTIONAL)	2

16. COLOR OF AIRCRAFT	
BLUE/WHITE	CIVIL AIRCRAFT PILOTS. FAR Part 91 requires you file an IFR flight plan to operate under instrument flight rules in controlled airspace. Failure to file could result in a civil penalty not to exceed $1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended). Filing of a VFR flight plan is recommended as a good operating practice. See also Part 99 for requirements concerning DVFR flight plans.

FAA Form 7233-1 (8-82) CLOSE VFR FLIGHT PLAN WITH ____________ FSS ON ARRIVAL

Figure 10-1. *Flight plan form.*

Controlled airspace: An airspace of defined dimensions within which ATC service is provided to IFR and visual flight rules (VFR) flights in accordance with the airspace classification. Includes Class A, Class B, Class C, Class D, and Class E airspace.

IFR flight plans at least 30 minutes prior to estimated time of departure to preclude possible delay in receiving a departure clearance from ATC. The AIM provides guidance for completing and filing FAA Form 7233-1, Flight Plan. These forms are available at flight service stations (FSS's), and are generally found in flight planning rooms at airport terminal buildings. [Figure 10-1]

Filing in Flight

IFR flight plans may be filed from the air under various conditions, including:

1. A flight outside of controlled airspace before proceeding into IFR conditions in controlled airspace.
2. A VFR flight expecting IFR weather conditions en route in controlled airspace.

In either of these situations, the flight plan may be filed with the nearest AFSS or directly with the ARTCC. A pilot who files with the AFSS submits the information normally entered during preflight filing, except for "point of departure," together with present position and altitude. AFSS then relays this information to the ARTCC. The ARTCC will then clear the pilot from present position or from a specified navigation fix.

A pilot who files direct with the ARTCC reports present position and altitude, and submits only the flight plan information normally relayed from the AFSS to the ARTCC. Be aware that traffic saturation frequently prevents ARTCC personnel from accepting flight plans by radio. In such cases, you will be advised to contact the nearest AFSS to file your flight plan.

Canceling IFR Flight Plans

You may cancel your IFR flight plan any time you are operating in VFR conditions outside Class A airspace by stating "cancel my IFR flight plan" to the controller or air-to-ground station with which you are communicating. After canceling your IFR flight plan, you should change to the appropriate air-to-ground frequency, appropriate transponder code as directed, and VFR altitude/flight level.

ATC separation and information services (including radar services, where applicable) are discontinued. If you desire VFR radar advisory service, you must specifically request it. Be aware that other procedures may apply if you cancel your IFR flight plan within areas such as Class C or Class B airspace.

If you are operating on an IFR flight plan to an airport with an operating control tower, your flight plan is canceled automatically upon landing. If you are operating on an IFR flight plan to an airport without an operating control tower, you must cancel the flight plan. This can be done by telephone after landing if there is no operating FSS, or other means of direct communications with ATC. If there is no FSS and air-to-ground communications with ATC are not possible below a certain altitude, you may cancel your IFR flight plan while still airborne and able to communicate with ATC by radio. If you follow this procedure, be certain the remainder of your flight can be conducted under VFR. It is essential that you cancel your IFR flight plan expeditiously. This allows other IFR traffic to utilize the airspace.

Clearances

An ATC **clearance** allows an aircraft to proceed under specified traffic conditions within controlled airspace for the purpose of providing separation between known aircraft.

Examples

A flight filed for a short distance at a relatively low altitude in an area of low traffic density might receive a clearance as follows:

> "Cessna 1230 Alpha, cleared to Doeville airport direct, cruise 5,000."

The term "cruise" in this clearance means you are authorized to fly at any altitude from the minimum IFR altitude up to and including 5,000 feet. You may level off at any altitude within this block of airspace. A climb or descent within the block may be made at your discretion. However, once you have reported leaving an altitude within the block, you may not return to that altitude without further ATC clearance.

When ATC issues a **cruise clearance** in conjunction with an unpublished route, an appropriate crossing altitude will be specified to ensure terrain clearance until the aircraft reaches a fix, point, or route where the altitude information is available. The crossing altitude ensures IFR obstruction clearance to the point at which the aircraft enters a segment of a published route or IAP.

Clearance: Allows an aircraft to proceed under specified traffic conditions within controlled airspace, for the purpose of providing separation between known aircraft.

Cruise clearance: Used in an ATC clearance to allow a pilot to conduct flight at any altitude from the minimum IFR altitude up to and including the altitude specified in the clearance. Also authorizes a pilot to proceed to and make an approach at the destination airport.

Once a flight plan is filed, ATC will issue the clearance with appropriate instructions, such as the following:

> "Cessna 1230 Alpha is cleared to Skyline airport via the Crossville 055 radial, Victor 18, maintain 5,000. Clearance void if not off by 1330."

You may receive a more complex clearance, such as:

> "Cessna 1230 Alpha is cleared to Wichita Mid-continent airport via Victor 77, left turn after takeoff, proceed direct to the Oklahoma City VORTAC. Hold west on the Oklahoma City 277 radial, climb to 5,000 in holding pattern before proceeding on course. Maintain 5,000 to CASHION intersection. Climb to and maintain 7,000. Departure control frequency will be 121.05. Squawk 0412."

Suppose you are awaiting departure clearance at a busy metropolitan terminal (your first IFR departure from this airport). On an average day, the tower at this airport controls departures at a rate of one every 2 minutes to maintain the required traffic flow. Sequenced behind you are a number of aircraft ready for departure, including jet transports.

Clearance delivery may issue you the following "abbreviated clearance" which includes a **departure procedure (DP)**:

> "Cessna 1230 Alpha, cleared to La Guardia as filed, RINGOES 8 departure Phillipsburg transition, maintain 8,000. Departure control frequency will be 120.4, Squawk 0700."

This clearance may be readily copied in shorthand as follows:

> "CAF RNGO8 PSB M80 DPC 120.4 SQ 0700."

The information contained in this DP clearance is abbreviated using clearance shorthand (*see* appendix 1). You should know the locations of the specified navigation facilities, together with the route and point-to-point time, before accepting the clearance.

The DP enables you to study and understand the details of your departure before filing an IFR flight plan. It provides the information necessary for you to set up your communication and navigation equipment and be ready for departure before requesting IFR clearance from the tower.

Once the clearance is accepted, you are required to comply with ATC instructions. You may request a clearance different from that issued if you consider another course of action more practicable or if your aircraft equipment limitations or other considerations make acceptance of the clearance inadvisable.

Pilots should also request clarification or amendment, as appropriate, any time a clearance is not fully understood or considered unacceptable because of safety of flight. *The pilot is responsible for requesting an amended clearance* if ATC issues a clearance that would cause a pilot to deviate from a rule or regulation or would place the aircraft in jeopardy.

Clearance Separations

ATC will provide the pilot on an IFR clearance with separation from other IFR traffic. This separation is provided:

1. Vertically—by assignment of different altitudes.
2. Longitudinally—by controlling time separation between aircraft on the same course.
3. Laterally—by assignment of different flightpaths.
4. By radar—including all of the above.

ATC does *not* provide separation for an aircraft operating:

1. Outside controlled airspace;
2. On an IFR clearance:
   a. With "VFR-On-Top" authorized instead of a specific assigned altitude.
   b. Specifying climb or descent in "VFR conditions."
   c. At any time in VFR conditions, since uncontrolled VFR flights may be operating in the same airspace.

In addition to heading and altitude assignments, ATC will occasionally issue speed adjustments to maintain the required separations. For example:

> "Cessna 30 Alpha, slow to 100 knots."

Clearance delivery: Control tower position responsible for transmitting departure clearances to IFR flights.

Departure procedure (DP): Preplanned IFR ATC departure/obstacle avoidance procedures, published for pilot use in textual and graphic format.

See and Avoid

An IFR clearance does **not** relieve the pilot in command of responsibility to see and avoid traffic while operating in visual conditions.

Pilots who receive speed adjustments are expected to maintain that speed plus or minus 10 knots. If for any reason the pilot is not able to accept a speed restriction, the pilot should advise ATC.

At times, ATC may also employ visual separation techniques to keep aircraft safely separated. A pilot who obtains visual contact with another aircraft may be asked to maintain visual separation or to follow the aircraft. For example:

> "Cessna 30 Alpha, maintain visual separation with that traffic, climb and maintain 7,000."

The pilot's acceptance of instructions to maintain visual separation or to follow another aircraft is an acknowledgment that he or she will maneuver the aircraft, as necessary, to maintain safe separation. It is also an acknowledgment that the pilot accepts the responsibility for wake turbulence avoidance.

In the absence of radar contact, ATC will rely on **position reports** to assist in maintaining proper separation. Using the data transmitted by the pilot, the controller follows the progress of your flight. ATC must correlate your reports with all the others to provide separation; therefore, the accuracy of your reports can affect the progress and safety of every other aircraft operating in the area on an IFR flight plan.

Departure Procedures (DPs)

DPs are designed to expedite clearance delivery, to facilitate transition between takeoff and en route operations, and to ensure adequate obstacle clearance. They furnish pilots' departure routing clearance information in both graphic and textual form. To simplify clearances, DPs have been established for the most frequently used departure routes in areas of high traffic activity. A DP will normally be used where such departures are available, since this is advantageous to both users and ATC. [Figure 10-2]

DPs can be found in section C of each booklet published regionally by the NACO, **TPP**, along with "IFR Take-off Minimums." The following points are important to remember if you file IFR out of terminal areas where DPs are in use.

1. Pilots of IFR aircraft operating from locations where DP procedures are effective may expect an ATC clearance containing a DP. The use of a DP requires pilot possession of at least the textual description of the approved DP.
2. If you do not possess a preprinted DP or for any other reason do not wish to use a DP, you are expected to advise ATC. Notification may be accomplished by filing "NO DP" in the remarks section of the filed flight plan, or by advising ATC.
3. If you accept a DP in your clearance, you must comply with it.

Radar Controlled Departures

On your IFR departures from airports in congested areas, you will normally receive navigational guidance from departure control by radar vector. When your departure is to be vectored immediately following takeoff, you will be advised before takeoff of the initial heading to be flown. This information is vital in the event you experience a loss of two-way radio communications during departure.

The radar departure is normally simple. Following takeoff, you contact departure control on the assigned frequency when advised to do so by the control tower. At this time departure control verifies radar contact, and gives headings, altitude, and climb instructions to move you quickly and safely out of the terminal area. Fly the assigned headings and altitudes until the controller tells you your position with respect to the route given in your clearance, whom to contact next, and to "resume your own navigation."

Departure control will vector you to either a navigation facility or an en route position appropriate to your departure clearance, or you will be transferred to another controller with further radar surveillance capabilities. [Figure 10-2]

A radar controlled departure does not relieve you of your responsibilities as pilot in command. You should be prepared before takeoff to conduct your own navigation according to your ATC clearance, with navigation receivers checked and properly tuned. While under radar control, monitor your instruments to ensure that you are continuously oriented to the route specified in your clearance, and record the time over designated checkpoints.

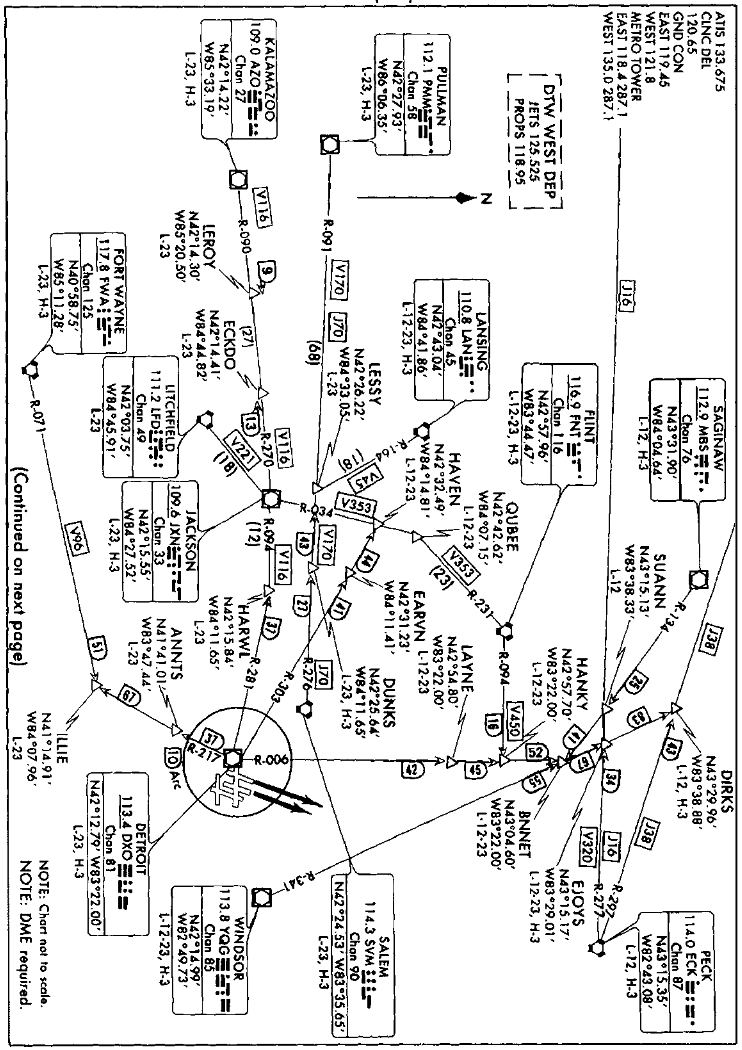
Position report: A report over a known location as transmitted by the pilot to ATC.

TPP: Booklets published in regional format by the NACO that include DPs, standard terminal arrivals (STARs), IAPs, and other information pertinent to IFR flight.

Obstacle Avoidance

When departing from airports without operating control towers in IFR conditions, adhere to the published obstacle departure procedure (DP), if applicable.

(VECTOR) 00167 DETROIT METROPOLITAN WAYNE COUNTY (DTW)
PALACE TWO DEPARTURE SL-119 (FAA) DETROIT, MICHIGAN



PALACE TWO DEPARTURE DETROIT METROPOLITAN WAYNE COUNTY (DTW) DETROIT, MICHIGAN
(VECTOR) 00167

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(VECTOR) 00167 DETROIT METROPOLITAN WAYNE COUNTY (DTW)
PALACE TWO DEPARTURE SL-119 (FAA) DETROIT, MICHIGAN

DEPARTURE ROUTE DESCRIPTION

TAKE-OFF RUNWAYS 3L AND 3C: Climb runway heading to 1100 feet before turning. Thence . . . .

TAKE-OFF ALL OTHER RUNWAYS: Thence. . . .
. . . . Climb on assigned heading for vectors to join the assigned Airway or Radial then proceed to the assigned departure fix, thence via the assigned route. Jets maintain 10,000 feet, cross the DXO 10 DME Arc at or above 5,000 feet for noise abatement. If unable to comply, advise ATC prior to departure. Props maintain 4000 feet or lower assigned altitude.
Expect clearance to filed altitude/flight level ten (10) minutes after departure.

SPECIAL INSTRUCTIONS: When using this departure, file the appropriate depicted departure fix and route. Aircraft landing/overflying Lansing (LAN) or overflying Flint (FNT) at 8,000 feet or below, file via EARVN. Aircraft landing Flint (FNT) at 8,000 feet or below, file via LAYNE.ANNTS, Jets only. Jets use Departure Control Frequency 125.525. Props use Departure Control Frequency 118.95.

PALACE TWO DEPARTURE DETROIT METROPOLITAN WAYNE COUNTY (DTW) DETROIT, MICHIGAN
(VECTOR) 00167

Figure 10-2. *Departure procedure (DP).*

Departures from Airports Without an Operating Control Tower

When you are departing from airports that have neither an operating tower nor an FSS, you should telephone your flight plan to the nearest ATC facility at least 30 minutes before your estimated departure time. If weather conditions permit, you could depart VFR and request IFR clearance as soon as radio contact is established with ATC. If weather conditions make it undesirable to fly VFR, you could again telephone and request clearance. In this case, the controller would probably issue a short-range clearance pending establishment of radio contact, and might restrict your departure time to a certain period. For example:

> "Clearance void if not off by 0900."

This would authorize you to depart within the allotted period and proceed in accordance with your clearance. In the absence of any specific departure instructions, you would be expected to proceed on course via the most direct route.

En Route Procedures

Procedures en route will vary according to the proposed route, the traffic environment, and the ATC facilities controlling the flight. Some IFR flights are under radar surveillance and controlled from departure to arrival and others rely entirely on pilot navigation.

Where ATC has no jurisdiction, it does not issue an IFR clearance. It has no control over the flight; nor does the pilot have any assurance of separation from other traffic.

ATC Reports

All pilots are required to report unforecast weather conditions or other information related to safety of flight to ATC. Pilots of aircraft operated in controlled airspace under IFR, are also required to immediately report to ATC any of the following equipment malfunctions occurring in flight:

1. Loss of VOR, tactical air navigation (TACAN) or automatic direction finder (ADF) receiver capability.
2. Complete or partial loss of instrument landing system (ILS) receiver capability.
3. Impairment of air-to-ground communications capability.

In each report, pilots are expected to include aircraft identification, equipment affected, and degree to which IFR operational capability in the ATC system is impaired. The nature and extent of assistance desired from ATC must also be stated.

Position Reports

Unless in radar contact with ATC, you are required to furnish a position report over certain reporting points. Position reports are required over each compulsory reporting point (shown on the chart as solid triangle figures ▲) along the route being flown regardless of altitude, including those with a VFR-On-Top clearance. Along direct routes, reports are required of all IFR flights over each point used to define the route of flight. Reports at reporting points (shown as open triangle figures △) are made only when requested by ATC.

Position reports should include the following items:

1. Identification.
2. Position.
3. Type of flight plan, if your report is made to an AFSS.
4. The estimated time of arrival (ETA) over next reporting point.
5. The name only of the next succeeding (required) reporting point along the route of flight.
6. Pertinent remarks.

En route position reports are submitted normally to the ARTCC controllers via direct controller-to-pilot communications channels, using the appropriate ARTCC frequencies listed on the en route chart.

Whenever an initial Center contact is to be followed by a position report, the name of the reporting point should be included in the callup. This alerts the controller that such information is forthcoming. For example:

> "Cleveland Center, Cessna 1230 Alpha at HARWL intersection."

VFR Departures

When departing VFR to receive an IFR clearance airborne, consider obstacle clearance, airspace, VFR cloud clearance requirements, and an alternate plan of action if an IFR clearance cannot be received.

Additional Reports

In addition to other required reports, the following reports should be made to ATC:

1. When vacating any previously assigned altitude or flight level (FL) for a newly assigned altitude or FL.
2. When an altitude change will be made, when operating on a VFR-On-Top clearance.
3. When an approach has been missed (request clearance for specific action (e.g., to altermate airport, another approach, etc.)).

(The following reports are not required if in radar contact with ATC:)

4. The time and altitude or FL reaching a holding fix or point to which cleared.
5. When leaving any assigned holding fix or point.
6. When leaving final approach fix (FAF) inbound on final approach.
7. A corrected estimate at any time it becomes apparent that an estimate previously submitted is in error in excess of 3 minutes.

Planning the Descent and Approach

ATC arrival procedures and cockpit workload are affected by weather conditions, traffic density, aircraft equipment, and radar availability.

When landing at airports with approach control services and where two or more IAPs are published, you will be provided in advance of arrival with information on the type of approach to expect or if you will be vectored for a visual approach. This information will be broadcast either on automated terminal information service (ATIS) or by a controller. It will not be furnished when the visibility is 3 miles or better and the ceiling is at or above the highest initial approach altitude established for any low altitude IAP for the airport.

The purpose of this information is to help you in planning arrival actions; however, it is not an ATC clearance or commitment and is subject to change. Fluctuating weather, shifting winds, blocked runway, etc., are conditions that may result in changes to the approach information you previously received. It is important to advise ATC immediately if you are unable to execute the approach, or if you prefer, another type of approach.

If the destination is an airport without an operating control tower, and has automated weather data with broadcast capability, you should monitor the automated surface observing system/automated weather observing system (ASOS/AWOS) frequency to ascertain the current weather for the airport. You should advise ATC once you have received the broadcast weather and state your intentions.

Once you know which approach you will execute, you should plan for the descent prior to the initial approach fix (IAF) or transition route depicted on the IAP. When flying the transition route, maintain the last assigned altitude until you hear "cleared for the approach" and have intercepted a segment of the approach. You may "request lower" to bring your transition route closer to the required altitude for the initial approach altitude. When ATC uses the phrase, "at pilot's discretion" in the altitude information of a clearance, you have the option to start a descent at any rate, and you may level off temporarily at any intermediate altitude. However, once you have vacated an altitude, you may not return to that altitude. When ATC has *not* used the term "at pilot's discretion" nor imposed any descent restrictions, you should initiate descent promptly upon acknowledgment of the clearance.

Descend at an optimum rate (consistent with the operating characteristics of the aircraft) to 1,000 feet above the assigned altitude. Then attempt to descend at a rate of between 500 and 1,500 feet per minute (fpm) until the assigned altitude is reached. If at anytime you are unable to descend at a rate of at least 500 fpm, advise ATC. Advise ATC if it is necessary to level off at an intermediate altitude during descent. An exception to this is when leveling off at 10,000 feet mean sea level (MSL) on descent, or 2,500 feet above airport elevation (prior to entering a Class B, Class C, or Class D surface area) when required for speed reduction.

Standard Terminal Arrival Routes (STARs)

Standard terminal arrival routes (as described in Chapter 8) have been established to simplify clearance delivery procedures for arriving aircraft at certain areas having high density traffic. A STAR serves a purpose parallel to that of a DP for departing traffic. [Figure 10-3] The following points regarding STARs are important to remember:

1. All STARs are contained in the TPP, along with the IAP charts for your destination airport. The AIM also describes STAR procedures.

Standard terminal arrival route (STAR): A preplanned IFR ATC arrival procedure published for pilot use in graphic and/or textual form.

P6 EC-1, 15 JUN 2000

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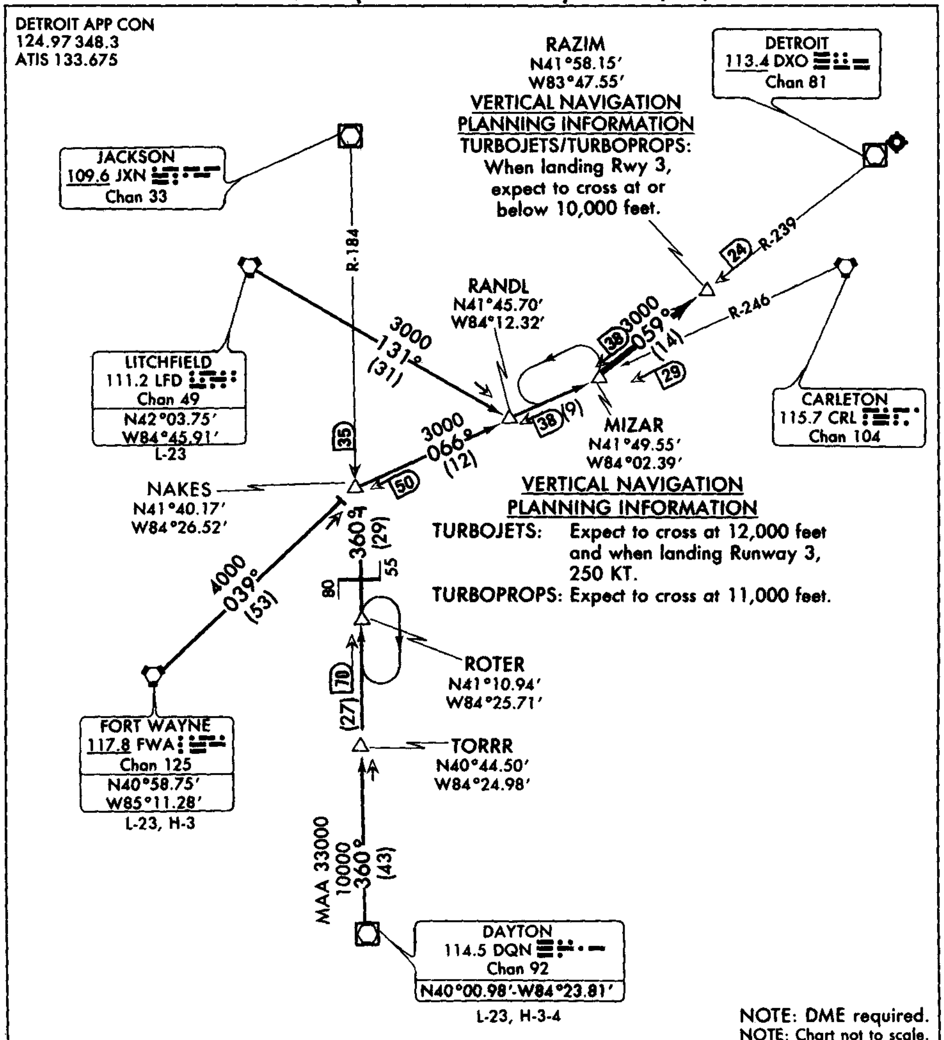
MIZAR THREE ARRIVAL (MIZAR.MIZAR3) ST-119 (FAA) — DETROIT METROPOLITAN WAYNE COUNTY, DETROIT, MICHIGAN



__DAYTON TRANSITION (DQN.MIZAR3)__: From over DQN VOR/DME via DQN R-360 and JXN R-184 to NAKES INT, then via CRL VORTAC R-246 to MIZAR DME. Thence. . . .
__FORT WAYNE TRANSITION (FWA.MIZAR3)__: From over FWA VORTAC via FWA R-039 to NAKES INT, then via CRL R-246 to MIZAR DME. Thence. . . .
__LITCHFIELD TRANSITION (LFD.MIZAR3)__: From over LFD VORTAC via LFD R-131 to RANDL INT, then via CRL R-246 to MIZAR DME. Thence. . . .
. . . . From over MIZAR DME via DXO VOR/DME R-239 to RAZIM DME. Expect radar vectors to final approach course.

MIZAR THREE ARRIVAL (MIZAR.MIZAR3) DETROIT, MICHIGAN

00167 DETROIT METROPOLITAN WAYNE COUNTY

Figure 10-3. *Standard terminal arrival route (STAR).*

2. If your destination is a location for which STARs have been published, you may be issued a clearance containing a STAR whenever ATC deems it appropriate. You must possess at least the approved textual description.
3. It is your responsibility to either accept or refuse an issued STAR. If you do not wish to use a STAR, you should advise ATC by placing "NO STAR" in the remarks section of your filed flight plan or by advising ATC.
4. If you accept a STAR in your clearance, you must comply with it.

Substitutes for Inoperative or Unusable Components

The basic ground components of an ILS are the localizer, glide slope, outer marker, middle marker, and inner marker (when installed). A **compass locator** or precision radar may be substituted for the outer or middle marker. Distance measuring equipment (DME), VOR, or nondirectional beacon (NDB) fixes authorized in the standard IAP or surveillance radar may be substituted for the outer marker.

Additionally, IFR-certified global positioning system (GPS) equipment, operated in accordance with Advisory Circular (AC) 90-94, *Guidelines for Using Global Positioning System Equipment for IFR En Route and Terminal Operations and for Nonprecision Instrument Approaches in the U.S. NAS*, may be substituted for ADF and DME equipment, except for when flying NDB IAP. Specifically, GPS can be substituted for ADF and DME equipment when:

1. Flying a DME arc;
2. Navigating TO/FROM an NDB;
3. Determining the aircraft position over an NDB;
4. Determining the aircraft position over a fix made up of a crossing NDB bearing;
5. Holding over an NDB;
6. Determining aircraft position over a DME fix.

Holding Procedures

Depending upon traffic and weather conditions, holding may be required. **Holding** is a predetermined maneuver which keeps aircraft within a specified airspace while awaiting further clearance from ATC. A standard holding pattern uses right turns, and a nonstandard holding pattern uses left turns. The ATC clearance will always specify left turns when a nonstandard pattern is to be flown.

Standard Holding Pattern (No Wind)

The **standard holding pattern** is a racetrack pattern. [Figure 10-4] The aircraft follows the specified course inbound to the holding fix, turns 180° to the right, flies a parallel straight course outbound for 1 minute, turns 180° to the right, and flies the inbound course to the fix.

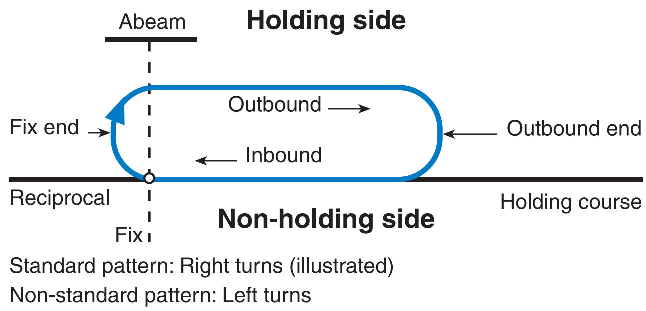


Figure 10-4. *Standard holding pattern—no wind.*

Standard Holding Pattern (With Wind)

In compliance with the holding pattern procedures given in the AIM, the symmetrical racetrack pattern cannot be tracked when a wind exists. Pilots are expected to:

1. Compensate for the effect of a known wind except when turning.
2. Adjust outbound timing so as to achieve a 1-minute (1-1/2 minutes above 14,000 feet) inbound leg.

Figure 10-5 illustrates the holding track followed with a left crosswind. The effect of wind is counteracted by applying drift corrections to the inbound and outbound legs and by applying time allowances to the outbound leg.

Compass locator: A low-power, low- or medium-frequency (L/MF) radio beacon installed at the site of the outer or middle marker of an ILS.

Holding: A predetermined maneuver that keeps aircraft within a specified airspace while awaiting further clearance from ATC.

Standard holding pattern: A holding pattern in which all turns are made to the right.

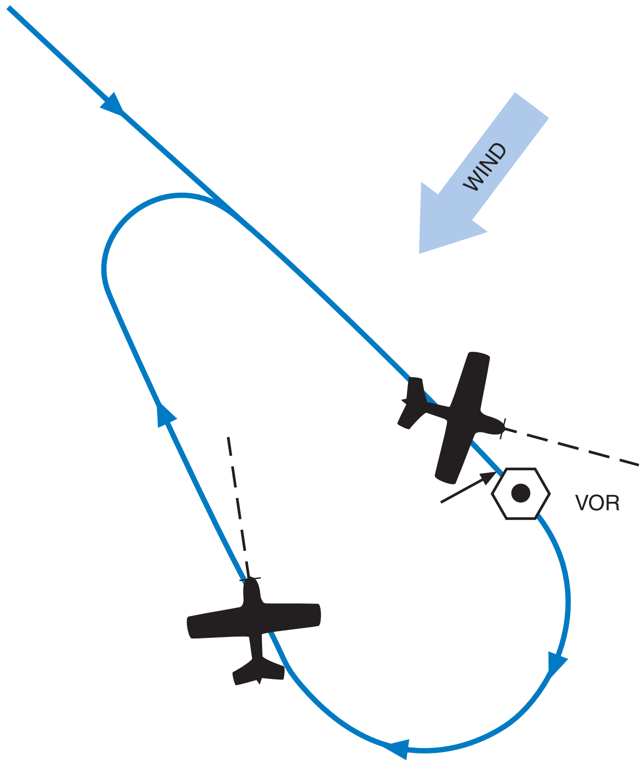


Figure 10-5. *Drift correction in holding pattern.*

Holding Instructions

If you arrive at your clearance limit before receiving clearance beyond the fix, ATC expects you to maintain the last assigned altitude and begin holding in accordance with the depicted holding pattern. If no holding pattern is depicted, you are expected to begin holding in a standard holding pattern on the course upon which you approached the fix. You should immediately request further clearance. Normally, when no delay is anticipated, ATC will issue holding instructions at least 5 minutes before your estimated arrival at the fix. Where a holding pattern is not depicted, the ATC clearance will specify the following:

1. Direction of holding from the fix in terms of the eight cardinal compass points (i.e., N, NE, E, SE, etc.).
2. Holding fix (the fix may be omitted if included at the beginning of the transmission as the clearance limit).
3. Radial, course, bearing, airway, or route on which the aircraft is to hold.
4. Leg length in miles if DME or area navigation (RNAV) is to be used (leg length will be specified in minutes on pilot request or if the controller considers it necessary).
5. Direction of turn if left turns are to be made, the pilot requests or the controller considers it necessary.
6. Time to **expect-further-clearance (EFC)** and any pertinent additional delay information.

ATC instructions will also be issued whenever:

1. It is determined that a delay will exceed 1 hour.
2. A revised EFC is necessary.
3. In a terminal area having a number of navigation aids and approach procedures, a clearance limit may not indicate clearly which approach procedures will be used. On initial contact, or as soon as possible thereafter, approach control will advise you of the type of approach you may anticipate.
4. Ceiling and/or visibility is reported as being at or below the highest "circling minimums" established for the airport concerned. ATC will transmit a report of current weather conditions and subsequent changes, as necessary.
5. Aircraft are holding while awaiting approach clearance, and pilots advise that reported weather conditions are below minimums applicable to their operation. In this event, ATC will issue suitable instructions to aircraft desiring either to continue holding while awaiting weather improvement or proceed to another airport.

Standard Entry Procedures

The entry procedures given in the AIM evolved from extensive experimentation under a wide range of operational conditions. The standardized procedures should be followed to ensure that you remain within the boundaries of the prescribed holding airspace.

Reduce airspeed to holding speed within 3 minutes of your ETA at the holding fix. The purpose of the speed reduction is to prevent overshooting the holding airspace limits, especially at locations where adjacent holding patterns are

Holding (With Wind)

To compensate for the effects of wind while holding, triple the outbound correction in the opposite direction of your inbound wind correction angle. For example, if you are holding an 8° left wind correction for the inbound course, correct 24° to the right on the outbound leg.

Expect-further-clearance (EFC):
The time a pilot can expect to receive clearance beyond a clearance limit.

close together. The exact time at which you reduce speed is not important as long as you arrive at the fix at your preselected holding speed within 3 minutes of your submitted ETA. If it takes more than 3 minutes for you to complete a speed reduction and ready yourself for identification of the fix, adjustment of navigation and communications equipment, entry to the pattern, and reporting, make the necessary time allowance.

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

Altitude (MSL)	*Airspeed (KIAS)*
MHA – 6,000 feet	200
6,001 – 14,000 feet	230
14,001 feet and above	265

The following are exceptions to the maximum holding airspeeds:

1. Holding patterns from 6,001 to 14,000 feet may be restricted to a maximum airspeed of 210 knots indicated airspeed (KIAS). This nonstandard pattern will be depicted by an icon.
2. Holding patterns may be restricted to a maximum airspeed of 175 KIAS. This nonstandard pattern will be depicted by an icon. Holding patterns restricted to 175 KIAS will generally be found on IAPs applicable to category A and B aircraft only.
3. Holding patterns at Air Force airfields only—310 KIAS maximum, unless otherwise depicted.
4. Holding patterns at Navy airfields only—230 KIAS maximum, unless otherwise depicted.
5. Advise ATC if you need to exceed a maximum holding speed.

You may want to use the maximum endurance speed when executing a holding pattern in order to save fuel. However, there are several reasons why you would not want to use the maximum endurance speed for holding. You should use a speed for holding patterns that will give you good aircraft control without increasing workload, minimizing fuel burn (as much as possible), and provides a safe margin above stall.

While other entry procedures may enable the aircraft to enter the holding pattern and remain within protected airspace, the parallel, teardrop and direct entries are the procedures for entry, and holding recommended by the FAA. [Figure 10-6]

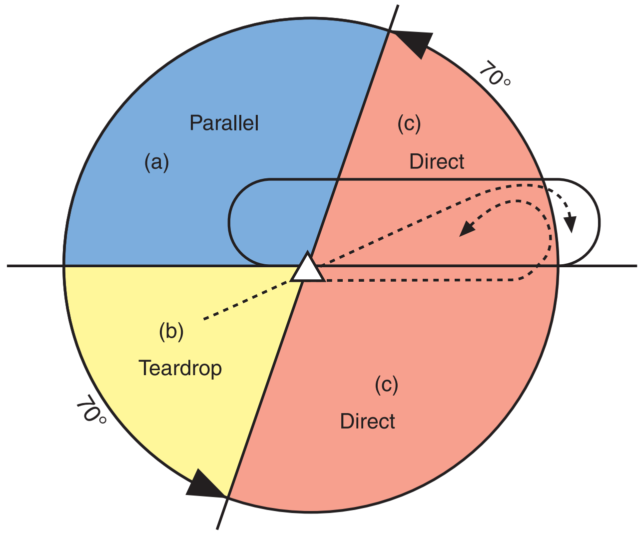


Figure 10-6. *Holding pattern entry procedures.*

1. Parallel procedure: When approaching the holding fix from anywhere in sector (a), turn to a heading to parallel the holding course outbound on the nonholding side for approximately 1 minute, turn in the direction of the holding pattern through more than 180°, and return to the holding fix or intercept the holding course inbound.
2. Teardrop procedure: When approaching the holding fix from anywhere in sector (b), fly to the fix, turn outbound using course guidance when available, or to a heading for a 30° teardrop entry within the pattern (on the holding side) for approximately 1 minute, then turn in the direction of the holding pattern to intercept the inbound holding course.
3. Direct entry procedure: When approaching the holding fix from anywhere in sector (c), fly directly to the fix and turn to follow the holding pattern.

Pilots should make all turns during entry and while holding at:

1. 3° per second, or
2. 30° bank angle, or
3. a bank angle provided by a flight director system.

Time Factors

The holding pattern entry time reported to ATC is the initial time of arrival over the fix. Upon entering a holding pattern, the initial outbound leg is flown for 1 minute at or below 14,000 feet MSL, and for 1-1/2 minutes above 14,000 feet MSL. Timing for subsequent outbound legs should be adjusted as necessary to achieve proper inbound leg time. Pilots should begin outbound timing over or abeam the fix, whichever occurs later. If the abeam position cannot be determined, start timing when the turn to outbound is completed. [Figure 10-7]

EFC times require no time adjustment since the purpose for issuance of these times is to provide for possible loss of two-way radio communications. You will normally receive further clearance prior to your EFC. If you do not receive it, request a revised EFC time from ATC.

Time leaving the holding fix must be known to ATC before succeeding aircraft can be cleared to the airspace you have vacated. Leave the holding fix:

1. When ATC issues either further clearance en route or approach clearance;
2. As prescribed in part 91 (for IFR operations; two-way radio communications failure, and responsibility and authority of the pilot in command); or
3. After you have canceled your IFR flight plan, if you are holding in VFR conditions.

DME Holding

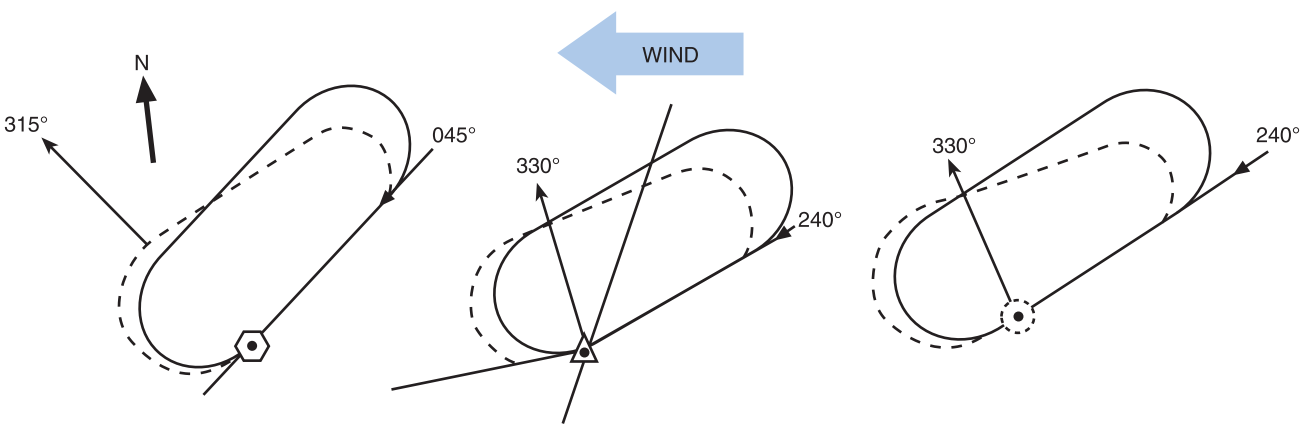
The same entry and holding procedures apply to DME holding except distances (nautical miles) are used instead of time values. The length of the outbound leg will be specified by the controller, and the end of this leg is determined by the DME readout.

Approaches

Compliance with Published Standard Instrument Approach Procedures

Compliance with the approach procedures shown on the approach charts provides necessary navigation guidance information for alignment with the final approach courses, as well as obstruction clearance. Under certain conditions, a course reversal maneuver or procedure turn may be necessary. However, this procedure is not authorized when:

1. The symbol "**NoPT**" appears on the approach course on the plan view of the approach chart.
2. Radar vectoring is provided to the final approach course.
3. A holding pattern is published in lieu of a procedure turn.
4. Executing a timed approach from a holding fix.
5. Otherwise directed by ATC.



VOR: Outbound timing starts when TO/FROM indicator reverses.

Airway Intersection: Outbound timing starts at completion of outbound turn, since 330° magnetic bearing cannot be determined.

Compass Locator: Outbound timing starts when ADF relative bearing is 90° minus drift correction angle.

Figure 10-7. *Holding—outbound timing.*

NoPT: No procedure turn.

Instrument Approaches to Civil Airports

Unless otherwise authorized, when an instrument letdown to an airport is necessary, pilots should use a standard IAP prescribed for that airport. IAPs are depicted on IAP charts and are found in the TPP.

ATC approach procedures depend upon the facilities available at the terminal area, the type of instrument approach executed, and the existing weather conditions. The ATC facilities, navigation aids (NAVAIDs), and associated frequencies appropriate to each standard instrument approach are given on the approach chart. Individual charts are published for standard approach procedures associated with the following types of facilities:

1. Nondirectional beacon (NDB)
2. Very-high frequency omnirange (VOR)
3. Very-high frequency omnirange with distance measuring equipment (VORTAC or VOR/DME)
4. Localizer (LOC)
5. Instrument landing system (ILS)
6. Localizer-type directional aid (LDA)
7. Simplified directional facility (SDF)
8. Area navigation (RNAV)
9. Global positioning system (GPS)

An IAP can be flown in one of two ways: as a full approach or with the assistance of radar vectors. When the IAP is flown as a full approach, pilots conduct their own navigation using the routes and altitudes depicted on the instrument approach chart. A full approach allows the pilot to transition from the en route phase, to the instrument approach, and then to a landing with minimal assistance from ATC. This type of procedure may be requested by the pilot but is most often used in areas without radar coverage. A full approach also provides the pilot with a means of completing an instrument approach in the event of a communications failure.

When an approach is flown with the assistance of radar vectors, ATC provides guidance in the form of headings and altitudes which positions the aircraft to intercept the final approach. From this point, the pilot resumes navigation, intercepts the final approach course, and completes the approach using the IAP chart. This is often a more expedient method of flying the approach, as opposed to the full approach, and allows ATC to sequence arriving traffic. A pilot operating in radar contact can generally expect the assistance of radar vectors to the final approach course.

Approach to Airport Without an Operating Control Tower

Figure 10-8 shows an approach procedure at an airport without an operating control tower. As you approach such a facility, you should monitor the AWOS/ASOS if available for the latest weather conditions. When direct communication between the pilot and controller is no longer required, the ARTCC or approach controller will clear you for an instrument approach and advise "change to advisory frequency approved." If you are arriving on a "cruise" clearance, ATC will not issue further clearance for approach and landing.

If an approach clearance is required, ATC will authorize you to execute your choice of standard instrument approach (if more than one is published for the airport) with the phrase "Cleared for the approach" and the communications frequency change required, if any. From this point on, you will have no contact with ATC. Accordingly, you must close your IFR flight plan before landing, if in VFR conditions, or by telephone after landing.

Unless otherwise authorized by ATC, you are expected to execute the complete IAP shown on the chart.

Approach to Airport With an Operating Tower, With No Approach Control

When you approach an airport with an operating control tower, but no approach control, ATC will clear you to an approach/outer fix with the appropriate information and instructions as follows:

1. Name of the fix;
2. Altitude to be maintained;
3. Holding information and expected approach clearance time, if appropriate; and
4. Instructions regarding further communications, including:
   a. facility to be contacted.
   b. time and place of contact.
   c. frequency/ies to be used.

If the tower has ATIS, you should monitor that frequency for such information as ceiling, visibility, wind direction and velocity, altimeter setting, instrument approach, and runways in use prior to initial radio contact with approach control. If there is no ATIS, ATC will, at the time of your first radio contact or shortly thereafter, provide weather information from the nearest reporting station to your destination.

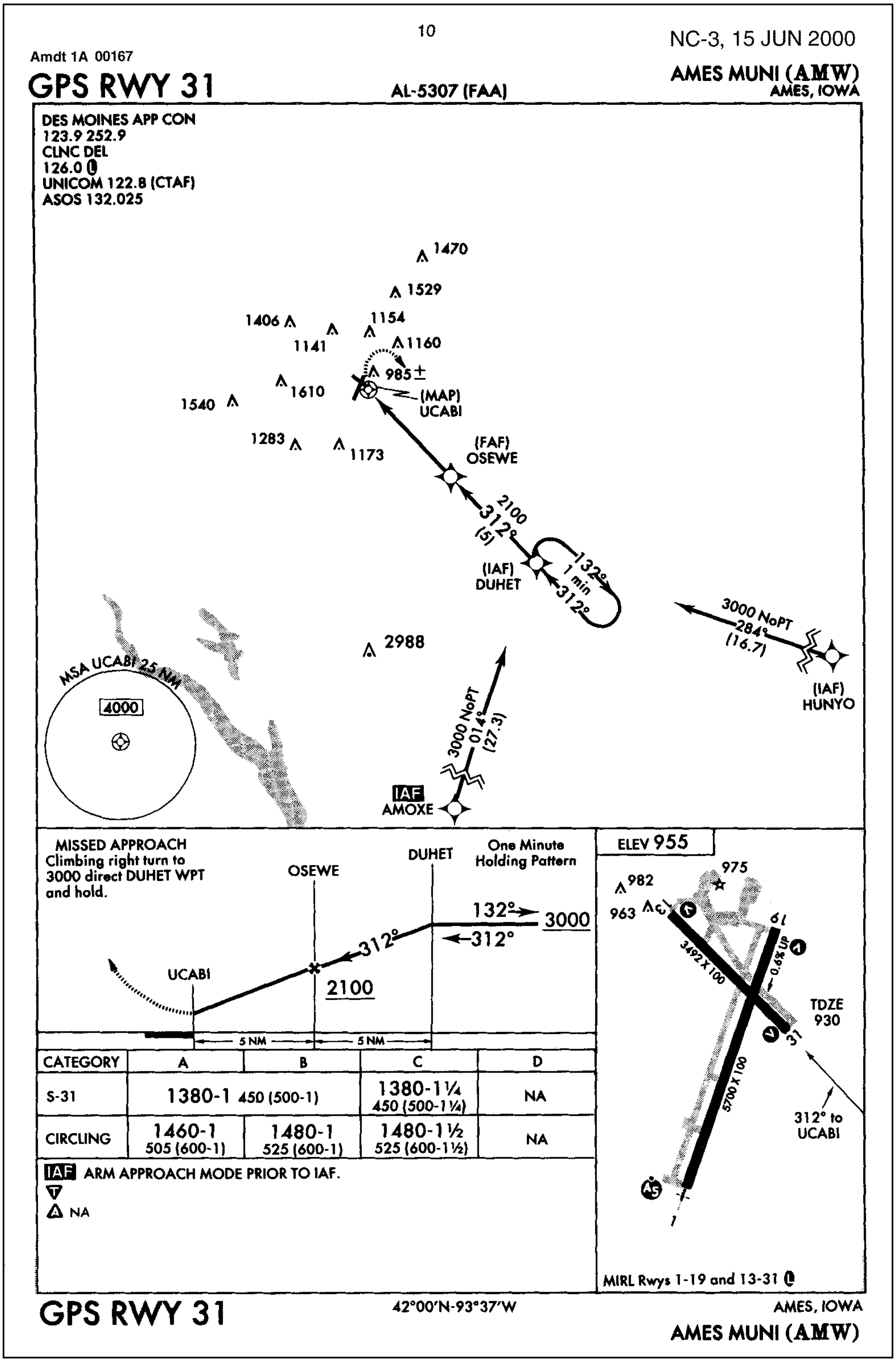


Figure 10-8. *Ames, Iowa (AMW) GPS Rwy 31 approach: an approach procedure at an airport without an operating control tower.*

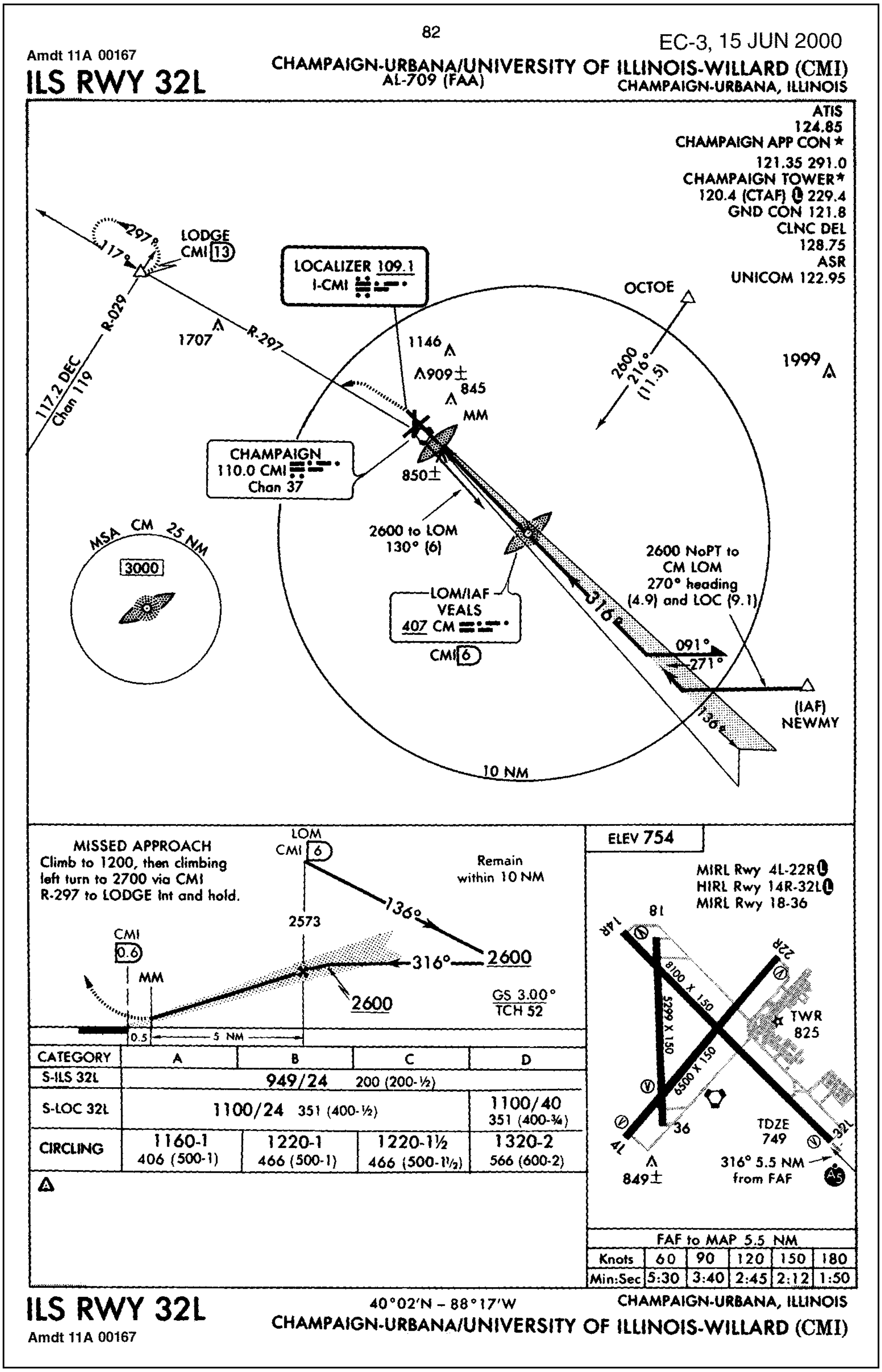


Figure 10-9. *Champaign, IL (CMI) ILS Rwy 32L approach: an instrument procedure chart with maximum ATC facilities available.*

Approach to an Airport With an Operating Tower, With an Approach Control

Where radar is approved for approach control service, it is used to provide vectors in conjunction with published IAPs. Radar vectors can provide course guidance and expedite traffic to the final approach course of any established IAP.

Figure 10-9 shows an IAP chart with maximum ATC facilities available.

Approach control facilities that provide this radar service operate in the following manner:

1. Arriving aircraft are either cleared to an outer fix most appropriate to the route being flown with vertical separation and, if required, given holding information; or,
2. When radar hand-offs are effected between ARTCC and approach control, or between two approach control facilities, aircraft are cleared to the airport, or to a fix so located that the hand-off will be completed prior to the time the aircraft reaches the fix.
    a. When the radar hand-offs are utilized, successive arriving flights may be handed-off to approach control with radar separation in lieu of vertical separation.
    b. After hand-off to approach control, aircraft are vectored to the appropriate final approach course.
3. Radar vectors and altitude/flight levels will be issued as required for spacing and separating aircraft; therefore, you must not deviate from the headings issued by approach control.
4. You will normally be informed when it becomes necessary to vector you across the final approach course for spacing or other reasons. If you determine that approach course crossing is imminent and you have not been informed that you will be vectored across it, you should question the controller. You should not turn inbound on the final approach course unless you have received an approach clearance. Approach control will normally issue this clearance with the final vector for interception of the final approach course, and the vector will be such as to enable you to establish your aircraft on the final approach course prior to reaching the final approach fix. In the event you are already inbound on the final approach course, you will be issued approach clearance prior to reaching the final approach fix.
5. After you are established inbound on the final approach course, radar separation will be maintained between you and other aircraft, and you will be expected to complete the approach using the NAVAID designated in the clearance (ILS, VOR, NDB, GPS, etc.) as the primary means of navigation.
6. After passing the final approach fix inbound, you are expected to proceed direct to the airport and complete the approach, or to execute the published **missed approach** procedure.
7. Radar service is automatically terminated when the landing is completed or the tower controller has your aircraft in sight, whichever occurs first.

Radar Approaches

With a radar approach, the pilot is "talked down" while a controller monitors the progress of the flight with radar. This is an option should the pilot experience an emergency or distress situation. These approaches require a radar facility and a functioning airborne radio.

Initial radar contact for either a surveillance or **precision approach radar (PAR)** is made with approach control. Pilots must comply promptly with all instructions when conducting either type of procedure. They can determine the radar approach facilities (surveillance and/or precision) available at a specific airport by referring to the appropriate En route Low Altitude Chart and IAP chart. Surveillance and precision radar minimums are listed alphabetically by airport on pages with the heading, "Radar Instrument Approach Minimums," in each TPP. Note that both straight-in and circling minimums are listed. [Figure 10-10]

When your instrument approach is being radar monitored, the radar advisories serve only as a secondary aid. Since you have selected a NAVAID such as the ILS or VOR as the primary aid for the approach, the minimums listed on the approach chart apply.

Missed approach: A maneuver conducted by a pilot when an instrument approach cannot be completed to a landing.

Precision approach radar (PAR): An instrument approach in which ATC issues azimuth and elevation instructions for pilot compliance, based on aircraft position in relation to the final approach course, glide slope, and distance from the end of the runway as displayed on the controller's radar scope.

FORT HUACHUCA/SIERRA VISTA, AZ Amdt. 20A, NOV 14, 1999 ELEV**4716**

SIERRA VISTA MUNI-LIBBY AAF

RADAR 1 - 134.45 327.15

	RWY GS/TCH/RPI	CAT	DH/ MDA-VIS	HAT/ HAA	CEIL-VIS	CAT	DH/ MDA-VIS	HAT/ HAA	CEIL-VIS
PAR	8	ABCDE	**4916**-¾	200	(200-¾)				
	26	ABCDE	**4826**-¾	200	(200-¾)				
ASR	26	ABCDE	**4900**-1	274	(200-1)				
CIRCLING		A	**5100**-1	384	(400-1)	B	**5180**-1	464	(500-1)
		C	**5180**-1½	464	(500-1½)	DE	**5280**-2	564	(600-2)
ASR	8	AB	**5440**-1	724	(800-1)	C	**5440**-2	724	(800-2)
		D	**5440**-2¼	724	(800-2¼)	E	**5440**-2½	724	(800-2½)
CIRCLING		AB	**5440**-1	724	(800-1)	C	**5440**-2	724	(800-2)
		D	**5440**-2¼	724	(800-2¼)	E	**5440**-2½	724	(800-2½)

PAR/ASR opr 1500-2300 Monday-Friday, except for holidays.
No NOTAM maintenance period 1500-1900 on the first Thursday of the month.
Circling not authorized south of ruways 8 and 29.

NA

SW-1

RADAR INSTRUMENT APPROACH MINIMUMS

Figure 10-10. *Radar instrument approach minimums for Ft. Huachuca, AZ (FHU).*

At a few FAA radar locations and military airfields, instrument approaches have been established on NAVAIDs whose final approach course from the final approach fix to the runway coincides with the PAR course. At such locations, your approach will be monitored and you will be given radar advisories whenever the reported weather is below basic VFR minimums (1,000 and 3), at night, or at your request. Before starting the final approach, you will be advised of the frequency on which the advisories will be transmitted. If for any reason radar advisories cannot be furnished, you will be advised.

Surveillance Approach

On an **airport surveillance radar approach (ASR)**, the controller will vector you to a point where you can begin a descent to the airport or to a specific runway. During the initial part of the approach, you will be given communications failure/missed approach instructions. Before you begin your descent, the controller will give you the published straight-in **minimum descent altitude (MDA)**. You will not be given the circling MDA unless you request it and tell the controller your aircraft category.

During the final approach, the controller will provide navigational guidance in azimuth only. Guidance in elevation is not possible, but you will be advised when to begin descent to the MDA, or if appropriate, to the intermediate "stepdown fix" MDA and subsequently to the prescribed MDA. In addition, you will be advised of the location of the missed approach point (MAP) and your position each mile from the runway, airport, or MAP as appropriate. If you so request, the controller will issue recommended altitudes each mile, based on the descent gradient established for the procedure, down to the last mile that is at or above the MDA.

You will normally be provided navigational guidance until you reach the MAP. The controller will terminate guidance and instruct you to execute a missed approach at the MAP, if at that point you do not have the runway or airport in sight, or if you are on a point-in-space approach in a helicopter, the prescribed visual reference with the surface is not established. If at any time during the approach the controller considers that safe guidance cannot be provided for the remainder of the approach, the approach will be terminated, and you will be instructed to execute a missed approach. Guidance termination and missed approach will be effected upon pilot request, and the controller may terminate guidance

Airport surveillance radar approach (ASR): An instrument approach in which ATC issues instructions for pilot compliance, based on aircraft position in relation to the final approach course, and the distance from the end of the runway as displayed on the controller's radar scope.

Minimum descent altitude (MDA): The lowest altitude to which descent is authorized on final approach, or during circle-to-land maneuvering in execution of a nonprecision approach.

when the pilot reports the runway, airport/heliport, or visual surface route (point-in-space approach) in sight or otherwise indicates that continued guidance is not required. Radar service is automatically terminated at the completion of the radar approach.

Precision Approach

The installations that have PAR are joint civil/military airports and usually provide service to civilian pilots flying IFR only with prior permission, except in an emergency.

A PAR serves the same purpose as an ILS, except that guidance information is presented to the pilot through aural rather than visual means. If a PAR is available, it is normally aligned with an ILS. During a PAR approach, pilots are provided highly accurate guidance in both azimuth and elevation.

The precision approach begins when your aircraft is within range of the precision radar and contact has been established with the PAR controller. Normally this occurs approximately 8 miles from touchdown, a point to which you are vectored by surveillance radar or are positioned by a nonradar approach procedure. You will be given headings to fly, to direct you to, and to keep your aircraft aligned with, the extended centerline of the landing runway.

Before intercepting the glidepath, you will be advised of communications failure/missed approach procedures and told not to acknowledge further transmissions. You will be told to anticipate glidepath interception approximately 15 to 30 seconds before it occurs and when to start your descent. The published **decision altitude/decision height (DA/DH)** will be given only if you request it.

During the final approach, the controller will give elevation information as "slightly/well above" or " slightly/well below" glidepath, and course information as "slightly/well right" or "slightly/well left" of course. Extreme accuracy in maintaining and correcting headings and rate of descent is essential. The controller will assume the last assigned heading is being maintained and will base further corrections on this assumption. Range from touchdown is given at least once each mile. If your aircraft is observed by the controller to proceed outside of specified safety zone limits in azimuth and/or elevation and continue to operate outside these prescribed limits, you will be directed to execute a missed approach or to fly a specified course unless you have the runway environment in sight. You will be provided navigational guidance in azimuth and elevation to the DA/DH. Advisory course and glidepath information will be furnished by the controller until your aircraft passes over the runway threshold, at which point you will be advised of any deviation from the runway centerline. Radar service is automatically terminated at the completion of the approach.

No-Gyro Approach Under Radar Control

If you should experience failure of your heading indicator or other stabilized compass, or for other reasons need more positive radar guidance, ATC will provide a no-gyro vector or approach on request. Before commencing such an approach, you will be advised as to the type of approach (surveillance or precision approach and runway number) and the manner in which turn instructions will be issued. All turns are executed at standard rate, except on final approach—then, at half-standard rate. The controller tells you when to start and stop turns, recommends altitude information and provides guidance and information essential for the completion of your approach. You can execute this approach in an emergency with an operating communications receiver and primary flight instruments.

Timed Approaches From a Holding Fix

Timed approaches from a holding fix are conducted when many aircraft are waiting for an approach clearance. Although the controller will not specifically state "timed approaches are in progress," the assigning of a time to depart the FAF inbound (nonprecision approach), or the outer marker or fix used in lieu of the outer marker inbound (precision approach), indicates that timed approach procedures are being utilized.

In lieu of holding, the controller may use radar vectors to the final approach course to establish a distance between aircraft that will ensure the appropriate time sequence between the FAF and outer marker, or fix used in lieu of the outer marker and the airport. Each pilot in the approach sequence will be given advance notice as to the time they should leave the holding point on approach to the airport. When a time to leave the holding point is received, the pilot should adjust the flightpath in order to leave the fix as closely as possible to the designated time.

Decision altitude (DA): A specified altitude in the precision approach, charted in "feet MSL," at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Decision height (DH): A specified altitude in the precision approach, charted in "height above threshold elevation," at which a decision must be made to either continue the approach or to execute a missed approach.

Timed approaches may be conducted when the following conditions are met:

1. A control tower is in operation at the airport where the approaches are conducted.
2. Direct communications are maintained between the pilot and the Center or approach controller until the pilot is instructed to contact the tower.
3. If more than one missed approach procedure is available, none require a course reversal.
4. If only one missed approach procedure is available, the following conditions are met:
   a. Course reversal is not required; and,
   b. Reported ceiling and visibility are equal to or greater than the highest prescribed circling minimums for the IAP.
5. When cleared for the approach, pilots should not execute a procedure turn.

Approaches to Parallel Runways

Procedures permit ILS instrument approach operations to dual or triple parallel runway configurations. Parallel approaches are an ATC procedure that permits parallel ILS approaches to airports with parallel runways separated by at least 2,500 feet between centerlines. Wherever parallel approaches are in progress, pilots are informed that approaches to both runways are in use.

Simultaneous approaches are permitted to runways:

1. With centerlines separated by 4,300 to 9,000 feet;
2. That are equipped with final monitor controllers;
3. That require radar monitoring to ensure separation between aircraft on the adjacent parallel approach course.

The approach procedure chart will include the note "simultaneous approaches authorized RWYS 14L and 14R," identifying the appropriate runways. When advised that simultaneous parallel approaches are in progress, pilots must advise approach control immediately of malfunctioning or inoperative components.

Parallel approach operations demand heightened pilot situational awareness. The close proximity of adjacent aircraft conducting simultaneous parallel approaches mandates strict compliance with all ATC clearances and approach procedures. Pilots should pay particular attention to the following approach chart information: name and number of the approach, localizer frequency, inbound course, glide-slope intercept altitude, DA/DH, missed approach instructions, special notes/procedures, and the assigned runway location and proximity to adjacent runways. Pilots also need to exercise strict radio discipline, which includes continuous monitoring of communications and the avoidance of lengthy, unnecessary radio transmissions.

Side-Step Maneuver

ATC may authorize a side-step maneuver to either one of two parallel runways that are separated by 1,200 feet or less, followed by a straight-in landing on the adjacent runway. Aircraft executing a side-step maneuver will be cleared for a specified nonprecision approach and landing on the adjacent parallel runway. For example, "Cleared ILS runway 7 left approach, side-step to runway 7 right." Pilots are expected to commence the side-step maneuver as soon as possible after the runway or runway environment is in sight. Landing minimums to the adjacent runway will be based on nonprecision criteria and therefore higher than the precision minimums to the primary runway, but will normally be lower than the published circling minimums.

Circling Approaches

Landing minimums are listed on the approach chart under "CIRCLING." Circling minimums apply when it is necessary to circle the airport or maneuver for landing, or when no straight-in minimums are specified on the approach chart. [Figure 10-11]

The circling minimums published on the instrument approach chart provide a minimum of 300 feet of obstacle clearance in the circling area. During a **circling approach**, you should maintain visual contact with the runway of intended landing and fly no lower than the circling minimums until you are in position to make a final descent for a landing. Remember—circling minimums are just that—minimums. If the ceiling allows it, fly at an altitude that more nearly approximates your VFR traffic pattern altitude. This will make any maneuvering safer and bring your view of the landing runway into a more normal perspective.

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

Approach Category	Radius (miles)
A	1.3
B	1.5
C	1.7
D	2.3
E	4.5

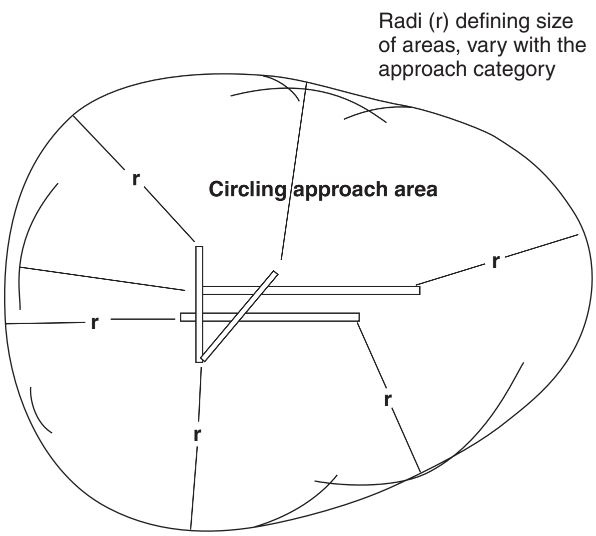


Figure 10-11. *Circling approach area radii.*

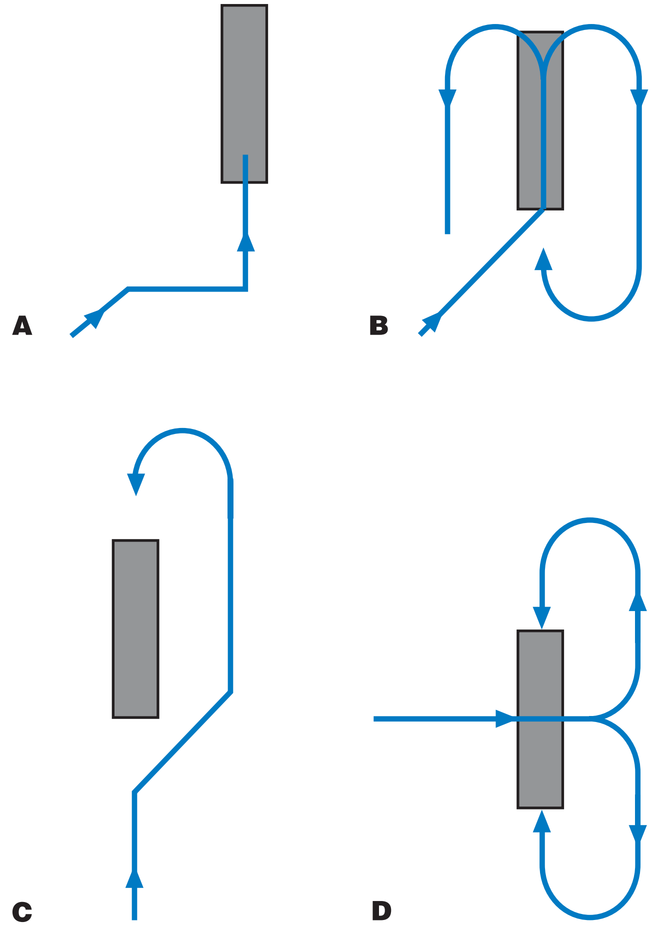


Figure 10-12. *Circling approaches.*

Figure 10-12 shows patterns that can be used for circling approaches. Pattern "A" can be flown when your final approach course intersects the runway centerline at less than a 90° angle, and you sight the runway early enough to establish a base leg. If you sight the runway too late to fly pattern "A," you can circle as shown in "B." You can fly pattern "C" if it is desirable to land opposite the direction of the final approach, and the runway is sighted in time for a turn to downwind leg. If the runway is sighted too late for a turn to downwind, you can fly pattern "D." Regardless of the pattern flown, the pilot must maneuver the aircraft so as to remain within the designated circling area. Refer to section A ("Terms and Landing Minima Data") in the front of each TPP, for a description of circling approach categories.

Sound judgment and knowledge of your capabilities and the performance of your aircraft are the criteria for determining the pattern to be flown in each instance, since you must consider all factors: airport design, ceiling and visibility, wind direction and velocity, final approach course alignment, distance from the final approach fix to the runway, and ATC instructions.

IAP Minimums

Pilots may not operate an aircraft at any airport below the authorized MDA or continue an approach below the authorized DA/DH unless:

1. The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal descent rate using normal maneuvers;
2. The flight visibility is not less than that prescribed for the approach procedure being used; and
3. At least one of the following visual references for the intended runway is visible and identifiable to the pilot:
    a. Approach light system
    b. Threshold
    c. Threshold markings
    d. Threshold lights

e. Runway end identifier lights (REIL)

f. Visual approach slope indicator (VASI)

g. Touchdown zone or touchdown zone markings

h. Touchdown zone lights

i. Runway or runway markings

j. Runway lights

Missed Approaches

A missed approach procedure is formulated for each published instrument approach and allows the pilot to return to the airway structure while remaining clear of obstacles. The procedure is shown on the approach chart in text and graphic form. Since the execution of a missed approach occurs when your cockpit workload is at a maximum, the procedure should be studied and mastered before beginning the approach.

When a MAP is initiated, a climb pitch attitude should be established while setting climb power. You should configure the aircraft for climb, turn to the appropriate heading, advise ATC that you are executing a missed approach, and request further clearances.

If the missed approach is initiated prior to reaching the MAP, unless otherwise cleared by ATC, continue to fly the IAP as specified on the approach plate to the MAP at or above the MDA or DA/DH before beginning a turn.

If visual reference is lost while circling-to-land from an instrument approach, execute the appropriate MAP. You should make the initial climbing turn toward the landing runway and then maneuver to intercept and fly the missed approach course.

Pilots should immediately execute the missed approach procedure:

1. Whenever the requirements for operating below DA/DH or MDA are not met when the aircraft is below MDA, or upon arrival at the MAP and at any time after that until touchdown;
2. Whenever an identifiable part of the airport is not visible to the pilot during a circling maneuver at or above MDA;
3. When so directed by ATC.

Missed Approach Caution

Acceleration forces and poor visual cues can cause sensory illusions during the execution of a missed approach. A well-developed instrument cross-check is necessary to safely carry out the procedure.

The missed approach procedures are related to the location of the FAF. When the FAF is not located on the field, the missed approach procedure will specify the distance from the facility to the MAP. The airport diagram on the IAP shows the time from the facility to the missed approach at various groundspeeds, which you must determine from airspeed, wind, and distance values. This time determines when you report and execute a missed approach if you do not have applicable minimums. Missed approach instructions will be provided prior to starting the final approach of either an ASR or PAR approach.

Landing

According to part 91, no pilot may land when the flight visibility is less than the visibility prescribed in the standard IAP being used. ATC will provide the pilot with the current visibility reports appropriate to the runway in use. This may be in the form of **prevailing visibility**, **runway visual value (RVV)**, or **runway visual range (RVR)**. However, only the pilot can determine if the flight visibility meets the landing requirements indicated on the approach chart. If the flight visibility meets the minimum prescribed for the approach, then the approach may be continued to a landing. If the flight visibility is less than that prescribed for the approach, then the pilot must execute a missed approach, regardless of the reported visibility.

The landing minimums published on IAP charts are based on full operation of all components and visual aids associated with the instrument approach chart being used. Higher minimums are required with inoperative components or visual aids. For example, if the ALSF-1 approach lighting system were inoperative, the visibility minimums for an ILS must be increased by one-quarter mile. If more than one component is inoperative, each minimum is raised to the highest minimum required by any single component that is inoperative. ILS glide-slope inoperative minimums are published on instrument approach charts as localizer minimums. Consult the "Inoperative Components or Visual Aids Table" (printed on the inside front cover of each TPP), for a complete description of the effect of inoperative components on approach minimums.

Prevailing visibility: The greatest horizontal visibility equaled or exceeded throughout at least half the horizon circle (which is not necessarily continuous).

Runway visibility value (RVV): The visibility determined for a particular runway by a transmissometer.

Runway visual range (RVR): An instrumentally derived value, based on standard calibrations, that represents the horizontal distance a pilot will see down the runway from the approach end.

Instrument Weather Flying

Flying Experience

The more experience, the better — both VFR and IFR. Night flying promotes both instrument proficiency and confidence. Progressing from night flying under clear, moonlit conditions to flying without moonlight, natural horizon, or familiar landmarks, you learn to trust your instruments with a minimum dependence upon what you can see outside the aircraft. The more VFR experience you have in terminal areas with high traffic activity, the more capable you can become in dividing your attention between aircraft control, navigation, communications, and other cockpit duties. It is your decision to go ahead with an IFR flight or to wait for more acceptable weather conditions.

Recency of Experience

Your currency as an instrument pilot is an equally important consideration. You may not act as pilot in command of an aircraft under IFR or in weather conditions less than VFR minimums unless you have met the requirements of part 61. Remember, these are minimum requirements. Whether they are adequate preparation for you, personally, is another consideration.

Airborne Equipment and Ground Facilities

Regulations specify minimum equipment for filing an IFR flight plan. It is your responsibility to decide on the adequacy of your aircraft and navigation/communication (NAV/COM) equipment for the proposed IFR flight. Performance limitations, accessories, and general condition are directly related to the weather, route, altitude, and ground facilities pertinent to your flight, as well as to the cockpit workload you can expect.

Weather Conditions

In addition to the weather conditions that might affect a VFR flight, an IFR pilot must consider the effects of other weather phenomena (e.g., thunderstorms, turbulence, icing, and visibility).

Turbulence

In-flight turbulence can range from occasional light bumps to extreme airspeed and altitude variations in which aircraft control is difficult. To reduce the risk factors associated with turbulence, pilots must learn methods of avoidance, as well as piloting techniques for dealing with an inadvertent encounter.

Turbulence avoidance begins with a thorough preflight weather briefing. Many reports and forecasts are available to assist the pilot in determining areas of potential turbulence. These include the Severe Weather Warning (WW), **SIGMET** (WS), **Convective SIGMET** (WST), **AIRMET** (WA), Severe Weather Outlook (AC), Center Weather Advisory (CWA), Area Forecast (FA), and Pilot Reports (UA or **PIREPs**). Since thunderstorms are always indicative of turbulence, areas of known and forecast thunderstorm activity will always be of interest to the pilot. In addition, clear air turbulence (CAT) associated with jet streams, strong winds over rough terrain, and fast moving cold fronts are good indicators of turbulence.

Pilots should be alert while in flight for the signposts of turbulence. For example, clouds with vertical development such as cumulus, towering cumulus, and cumulonimbus are indicators of atmospheric instability and possible turbulence. Standing lenticular clouds lack vertical development but indicate strong mountain wave turbulence. While en route, pilots can monitor hazardous in-flight weather advisory service (HIWAS) broadcast for updated weather advisories, or contact the nearest AFSS or En Route Flight Advisory Service (EFAS) for the latest turbulence-related PIREPs.

To avoid turbulence associated with strong thunderstorms, circumnavigate cells by at least 20 miles. Turbulence may also be present in the clear air above a thunderstorm. To avoid this, fly at least 1,000 feet above the tops for every 10 knots of wind at that level, or fly around the storm. Finally, do not underestimate the turbulence underneath a thunderstorm. Never attempt to fly under a thunderstorm even if you can see through to the other side. The possible results of turbulence and wind shear under the storm could be disastrous.

When you encounter moderate to severe turbulence, aircraft control will be difficult, and it will take a great deal of concentration to maintain an instrument scan. [Figure 10-13] Pilots should immediately reduce power and slow the aircraft to the recommended turbulence penetration speed as described in the POH/AFM. To minimize the load factor

SIGMET: A weather advisory issued concerning weather significant to the safety of all aircraft.

Convective SIGMET: Weather advisory concerning convective weather significant to the safety of all aircraft.

AIRMET: In-flight weather advisory issued as an amendment to the area forecast, concerning weather phenomena of operational interest to all aircraft which are potentially hazardous to aircraft with limited capability due to lack of equipment, instrumentation, or pilot qualifications.

Pilot report (PIREP): Report of meteorological phenomena encountered by aircraft in flight.

imposed on the aircraft, the wings should be kept level and the aircraft's pitch attitude should be held constant, while the altitude of the aircraft is allowed to fluctuate up and down. Maneuvering to maintain a constant altitude will only increase the stress on the aircraft. If necessary, the pilot should advise ATC of the fluctuations and request a block altitude clearance. In addition, the power should remain constant at a setting that will maintain the recommended turbulence penetration airspeed.

Figure 10-13. *Maintaining an instrument scan in severe turbulence may be difficult.*

The best source of information on the location and intensity of turbulence are PIREPs. Therefore, pilots are encouraged to familiarize themselves with the turbulence reporting criteria found in the AIM, which also describes the procedure for volunteering PIREPs relating to turbulence.

Structural Icing

The very nature of IFR requires flight in visible moisture such as clouds. At the right temperatures, this moisture can freeze on the aircraft causing increased weight, degraded performance, and unpredictable aerodynamic characteristics. Understanding, avoidance, and early recognition followed by prompt action are the keys to avoiding this potentially hazardous situation.

Structural icing refers to the accumulation of ice on the exterior of the aircraft and is broken down into three classifications: **rime ice**, **clear ice**, and **mixed ice**. For ice to form, there must be moisture present in the air, and the air must be cooled to a temperature of 0 °C (32 °F) or less. Aerodynamic cooling can lower the surface temperature of an airfoil and cause ice to form on the airframe even though the ambient temperature is slightly above freezing.

Rime ice forms if the droplets are small and freeze immediately when contacting the aircraft surface. This type of ice usually forms on areas such as the leading edges of wings or struts. It has a somewhat rough-looking appearance and a milky-white color.

Clear ice is usually formed from larger water droplets or freezing rain that can spread over a surface. This is the most dangerous type of ice since it is clear, hard to see, and can change the shape of the airfoil.

Mixed ice is a mixture of clear ice and rime ice. It has the bad characteristics of both types and can form rapidly. Ice particles become imbedded in clear ice, building a very rough accumulation. The table in figure 10-14 lists the temperatures at which the various types of ice will form.

Outside Air	Temperature Range	Icing Type
0 °C to	-10 °C	Clear
-10 °C to	-15 °C	Mixed clear and rime
-15 °C to	-20 °C	Rime

Figure 10-14. *Temperature ranges for ice formation.*

Structural icing is a condition that can only get worse. Therefore, during an inadvertent icing encounter, it is important the pilot act to prevent additional ice accumulation. Regardless of the level of **anti-ice** or **deice** protection offered by the aircraft, the first course of action should be to get out of the area of visible moisture. This might mean descending to an altitude below the cloud bases, climbing to an altitude that is above the cloud tops, or turning to a different course. If this is not possible, then the pilot must move to an altitude where the temperature is above freezing. Report icing conditions to ATC and request new routing or altitude if icing will be a hazard. Refer to the AIM for information on reporting icing intensities.

Rime ice: Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.

Clear ice: Glossy, clear, or translucent ice formed by the relatively slow freezing of large supercooled water droplets.

Mixed ice: A mixture of clear ice and rime ice.

Anti-ice: System designed to prevent the accumulation of ice on an aircraft structure.

Deice: System designed to remove ice accumulation from an aircraft structure.

Fog

Instrument pilots must learn to anticipate conditions leading to the formation of fog and take appropriate action early in the progress of the flight. Before a flight, close examination of current and forecast weather should alert the pilot to the possibility of fog formation. When fog is a consideration, pilots should plan adequate fuel reserves and alternate landing sites. En route, the pilot must stay alert for fog formation through weather updates from EFAS, ATIS, and ASOS/AWOS sites.

Two conditions will lead to the formation of fog. Either the air is cooled to saturation, or sufficient moisture is added to the air until saturation occurs. In either case, fog can form when the temperature/dewpoint spread is 5° or less. Pilots planning to arrive at their destination near dusk with decreasing temperatures should be particularly concerned about the possibility of fog formation.

Volcanic Ash

Volcanic eruptions create volcanic ash clouds containing an abrasive dust that poses a serious safety threat to flight operations. Adding to the danger is the fact that these ash clouds are not easily discernible from ordinary clouds when encountered at some distance from the volcanic eruption.

When an aircraft enters a volcanic ash cloud, dust particles and smoke may become evident in the cabin, often along with the odor of an electrical fire. Inside the volcanic ash cloud, the aircraft may also experience lightning and St. Elmo's fire on the windscreen. The abrasive nature of the volcanic ash can pit the windscreens, thus reducing or eliminating forward visibility. The pitot-static system may become clogged, causing instrument failure. Severe engine damage is probable in both piston and jet-powered aircraft.

Every effort must be made to avoid volcanic ash. Since volcanic ash clouds are carried by the wind, pilots should plan their flights to remain upwind of the ash-producing volcano. Visual detection and airborne radar are not considered a reliable means of avoiding volcanic ash clouds. Pilots witnessing volcanic eruptions or encountering volcanic ash should immediately pass this information along in the form of a pilot report. The National Weather Service monitors volcanic eruptions and estimates ash trajectories. This information is passed along to pilots in the form of SIGMETs.

Like many other hazards to flight, the best source of volcanic information comes from PIREPs. Pilots who witness a volcanic eruption or encounter volcanic ash in flight should immediately inform the nearest agency. Volcanic Ash Forecast Transport and Dispersion (VAFTAD) charts are also available; these depict volcanic ash cloud locations in the atmosphere following an eruption, and also forecast dispersion of the ash concentrations over 6- and 12-hour time intervals. *See* AC 00-45, *Aviation Weather Services.*

Thunderstorms

A thunderstorm packs just about every weather hazard known to aviation into one vicious bundle. Turbulence, hail, rain, snow, lightning, sustained updrafts and downdrafts, and icing conditions are all present in thunderstorms. Do not take off in the face of an approaching thunderstorm or fly an aircraft that is not equipped with thunderstorm detection in clouds or at night in areas of suspected thunderstorm activity. [Figure 10-15]

Figure 10-15. *A thunderstorm packs just about every weather hazard known to aviation into one vicious bundle.*

Thunderstorm Avoidance

Aircraft without airborne weather detection equipment should not operate in IMC near areas of suspected thunderstorm activity.

There is no useful correlation between the external visual appearance of thunderstorms and the severity or amount of turbulence or hail within them. All thunderstorms should be considered hazardous, and thunderstorms with tops above 35,000 feet should be considered extremely hazardous.

Weather radar, airborne or ground based, will normally reflect the areas of moderate to heavy precipitation (radar does not detect turbulence). The frequency and severity of turbulence generally increases with the radar reflectivity closely associated with the areas of highest liquid water content of the storm. A flightpath through an area of strong or very strong radar echoes separated by 20 to 30 miles or less may not be considered free of severe turbulence.

The probability of lightning strikes occurring to aircraft is greatest when operating at altitudes where temperatures are between -5 °C and +5 °C. In addition, an aircraft flying in the clear air near a thunderstorm is also susceptible to lightning strikes. Thunderstorm avoidance is always the best policy.

Wind Shear

Wind shear can be defined as a change in wind speed and/or wind direction in a short distance. It can exist in a horizontal or vertical direction and occasionally in both. Wind shear can occur at all levels of the atmosphere but is of greatest concern during takeoffs and landings. It is typically associated with thunderstorms and low-level temperature inversions; however, the jet stream and weather fronts are also sources of wind shear.

As figure 10-16 illustrates, while an aircraft is on an instrument approach, a shear from a tailwind to a headwind will cause the airspeed to increase and the nose to pitch up with a corresponding balloon above the glidepath. A shear from a headwind to a tailwind will have the opposite effect and the aircraft will sink below the glidepath.

A headwind shear followed by a tailwind/downdraft shear is particularly dangerous because the pilot has reduced power and lowered the nose in response to the headwind shear. This leaves the aircraft in a nose-low, power-low configuration when the tailwind shear occurs, which makes recovery more difficult, particularly near the ground. This type of wind shear scenario is likely while making an approach in the face of an oncoming thunderstorm. Pilots should be alert for indications of wind shear early in the approach phase and be ready to initiate a missed approach at the first indication. It may be impossible to recover from a wind shear encounter at low altitude.

To inform pilots of hazardous wind shear activity, some airports have installed a Low-Level Wind Shear Alert System (LLWAS) consisting of a centerfield wind indicator and several surrounding boundary-wind indicators. With this system, controllers are alerted of wind discrepancies (an indicator of wind shear possibility) and provide this information to pilots. A typical wind shear alert issued to a pilot would be:

> "Wind shear alert, Centerfield wind 230 at 8, south boundary wind 170 at 20."

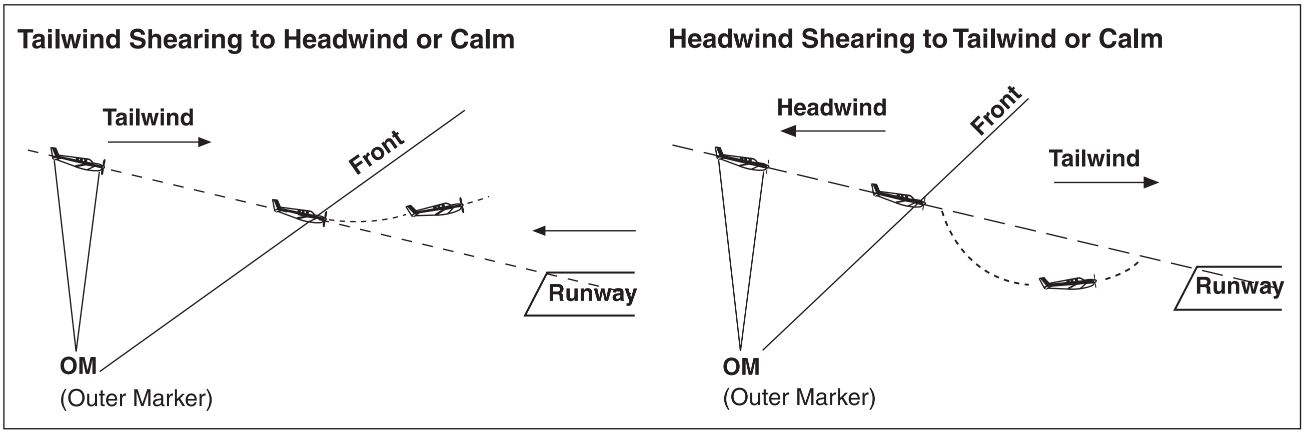


Figure 10-16. *Glide-slope deviations due to wind shear encounter.*

Pilots encountering wind shear are encouraged to pass along pilot reports. Refer to AIM for additional information on wind shear PIREPs.

VFR-On-Top

Pilots on IFR flight plans operating in VFR weather conditions may request **VFR-On-Top** in lieu of an assigned altitude. This permits them to select an altitude or flight level of their choice (subject to any ATC restrictions).

Pilots desiring to climb through a cloud, haze, smoke, or other meteorological formation and then either cancel their IFR flight plan or operate VFR-On-Top may request a climb to VFR-On-Top. The ATC authorization will contain either a top report (or a statement that no top report is available), and a request to report upon reaching VFR-On-Top. Additionally, the ATC authorization may contain a clearance limit, routing, and an alternative clearance if VFR-On-Top is not reached by a specified altitude.

A pilot on an IFR flight plan, operating in VFR conditions, may request to climb/descend in VFR conditions. When operating in VFR conditions with an ATC authorization to "maintain VFR-On-Top/maintain VFR conditions" pilots on IFR flight plans must:

1. Fly at the appropriate VFR altitude as prescribed in part 91.
2. Comply with the VFR visibility and distance-from-cloud criteria in part 91.
3. Comply with IFRs applicable to this flight (e.g., minimum IFR altitudes, position reporting, radio communications, course to be flown, adherence to ATC clearance, etc.).

Pilots operating on a VFR-On-Top clearance should advise ATC before any altitude change to ensure the exchange of accurate traffic information.

ATC authorization to "maintain VFR-On-Top" is not intended to restrict pilots to operating only above an obscuring meteorological formation (layer). Rather, it permits operation above, below, between layers, or in areas where there is no meteorological obscuration. It is imperative pilots understand, however, that clearance to operate "VFR-On-Top/VFR conditions" does not imply cancellation of the IFR flight plan.

Pilots operating VFR-On-Top/VFR conditions may receive traffic information from ATC on other pertinent IFR or VFR aircraft. However, when operating in VFR weather conditions, it is the pilot's responsibility to be vigilant to see-and-avoid other aircraft.

This clearance must be requested by the pilot on an IFR flight plan. VFR-On-Top is not permitted in certain areas, such as Class A airspace. Consequently, IFR flights operating VFR-On-Top must avoid such airspace.

VFR Over-The-Top

VFR Over-The-Top must not be confused with VFR-On-Top. VFR-On-Top is an IFR clearance that allows the pilot to fly VFR altitudes. VFR Over-The-Top is strictly a VFR operation in which the pilot maintains VFR cloud clearance requirements while operating on top of an undercast layer. This situation might occur when the departure airport and the destination airport are reporting clear conditions, but a low overcast layer is present in between. The pilot could conduct a VFR departure, fly over the top of the undercast in VFR conditions, then complete a VFR descent and landing at the destination. VFR cloud clearance requirements would be maintained at all times, and an IFR clearance would not be required for any part of the flight.

Conducting an IFR Flight

To illustrate some of the concepts introduced in this chapter, follow along on a typical IFR flight from the Detroit Metropolitan Airport (DTW) to the University of Illinois — Willard Airport located near Champaign, IL (CMI). [Figure 10-17] For this trip, a Cessna 182 with a call sign of N1230A will be flown. The aircraft is equipped with dual navigation and communication radios, DME, ADF, a transponder, and a GPS system approved for IFR en route operations to be used during the flight.

Preflight

The success of the flight depends largely upon the thoroughness of the preflight planning. The evening before the flight, pay close attention to the weather forecast and begin planning the flight.

VFR-On-Top: ATC authorization for an IFR aircraft to operate in VFR conditions at any appropriate VFR altitude.

VFR Over-The-Top: A VFR operation in which an aircraft operates in VFR conditions on top of an undercast.

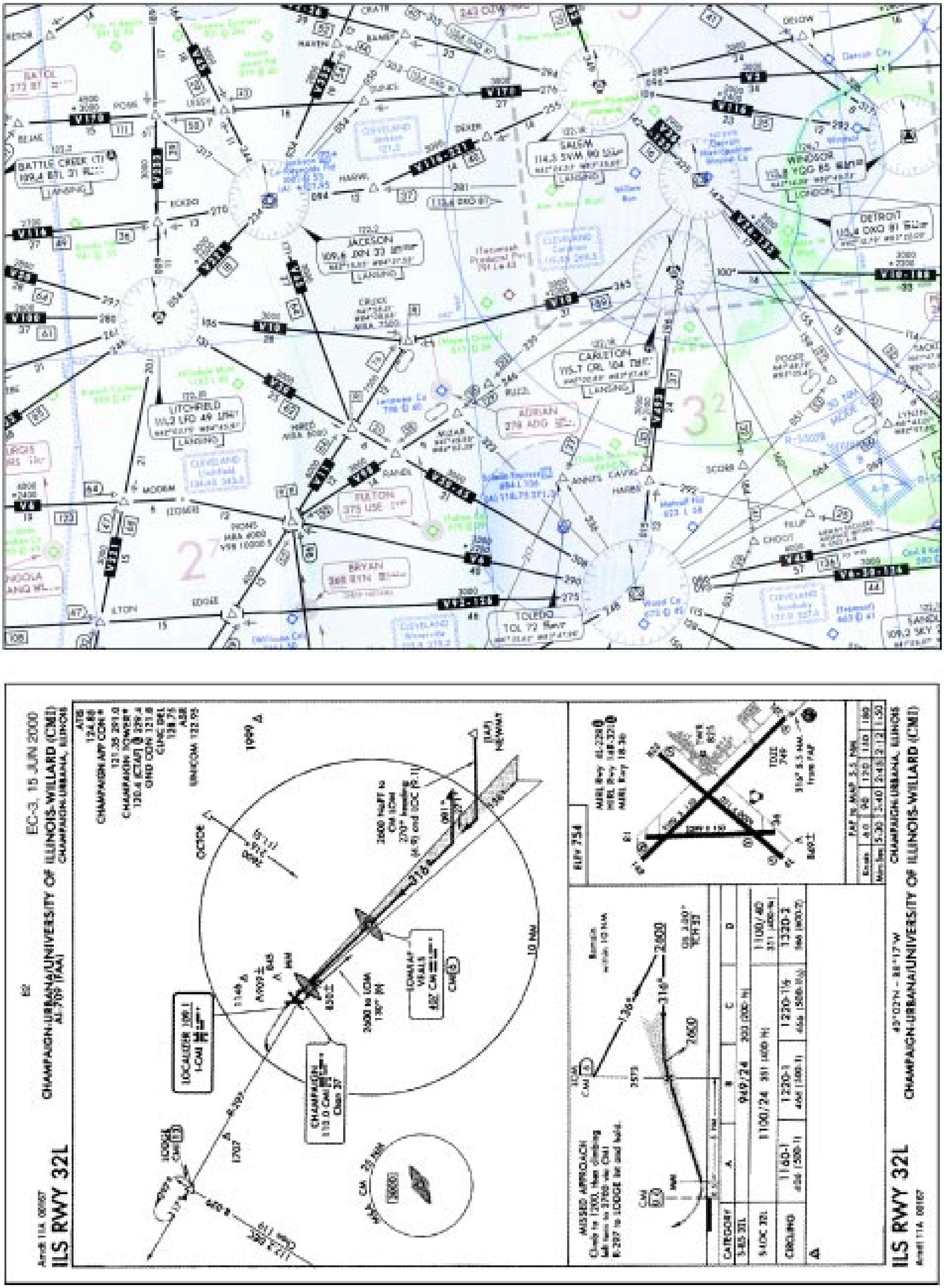


Figure 10-17. *Route planning.*

The Weather Channel indicates a large low-pressure system has settled in over the Midwest, pulling moisture up from the Gulf of Mexico and causing low ceilings and visibility, with little chance for improvement over the next couple of days. To begin planning, gather all the necessary charts and materials, and verify everything is current. This includes en route charts, approach charts, DPs, STAR charts, as well as an A/FD, some navigation logs, and the aircraft's POH/AFM. The charts cover both the departure and arrival airports, as well as any contingency airports that will be needed if you cannot complete the flight as planned. This is also a good time to consider your recent flight experience, proficiency as a pilot, fitness, and personal weather minimums to fly this particular flight.

To begin planning, go to the A/FD to become familiar with the departure and arrival airport and check for any preferred routing between DTW and CMI. Next, review the approach plates and any DP or STAR that pertain to the flight. Finally, review the en route charts for potential routing, paying close attention to the minimum en route and obstacle clearance altitudes.

After this review, you decide your best option is to fly the Palace Two DP (*see* figure 10-2) out of DTW direct to HARWL intersection, V116 to Jackson VOR (JXN), V221 to Litchfield VOR (LFD), then direct to CMI using the GPS. You also decide that an altitude of 4,000 feet will meet all the regulatory requirements and falls well within the performance capabilities of your aircraft.

Next, call 1-800-WX-BRIEF to obtain an outlook-type weather briefing for your proposed flight. This provides forecast conditions for your departure and arrival airports as well as the en route portion of the flight including forecast winds aloft. This also is a good opportunity to check the available NOTAMs.

The weather briefer confirms the predictions of the weather channel giving forecast conditions that are at or near minimum landing minimums at both DTW and CMI for your proposed departure time. The briefer also informs you of some NOTAM information for CMI indicating that the localizer back-course approach to runway 14 right is scheduled to be out of service for tomorrow, and that runway 4/22 is closed.

Somewhat leery of the weather, you continue flight planning and begin to transfer some preliminary information onto the navigation log, listing each fix along the route and the appropriate distances, frequencies, and altitudes. Consolidating this information onto an organized navigation log keeps your workload to a minimum during the flight. With your homework complete, now it is time to get a good night's sleep and see what tomorrow brings.

The next morning you awaken to light drizzle and low ceilings. You use the computer to print a standard weather briefing for the proposed route. A check of current conditions indicates low IFR conditions at both the departure airport and at the destination, with visibility of one-quarter mile:

```
SURFACE WEATHER OBSERVATIONS

METAR KDTW 111147Z VRB04KT 1/4SM FG –RN
VV1600 06/05 A2944 RMK AO2 SLP970

METAR KCMI 111145Z 27006KT 1/4SM FG OVC001
08/07 A2962 RMK AO2 SLP033
```

The small temperature/dewpoint spread is causing the low visibility and ceilings. As the temperatures increase, conditions should improve later in the day. A check of the terminal forecast confirms this theory:

```
TERMINAL FORECASTS

TAF KDTW 101146Z 101212 VRB04KT 1/4SM FG
OVC001 TEMPO 1316 3/4SM VV1800

FM1600 VRB05KT 2SM BR OVC007 TEMPO 1720
3SM DZ BKN009

FM2000 24008KT 3SM BR OVC015 TEMPO 2202
3SM BR OVC025

FM0200 25010KT P6SM OVC025

FM0800 27013KT P6SM BKN030 PROB40 1012
2SM -RN OVC030

TAF KCMI 101145Z 101212 2706KT 1/4SM FG
VV1600 BECMG 1317 3SM BR OVC004

FM1700 2910KT 3SM BR OVC005

FM0400 2710KT 5SM SCT080 TEMPO 0612 P6SM
SKC
```

In addition to the terminal forecast, the area forecast also indicates gradual improvement along the route. Since the terminal forecast only provides information for a 5-mile radius around a terminal area, checking the area forecast provides a better understanding of the overall weather picture along the route and alerts you to potential hazards:

SYNOPSIS AND VFR CLOUDS/WEATHER FORECASTS

CHIC FA 111045

SYNOPSIS AND VFR CLDS/WX

SYNOPSIS VALID UNTIL 120500

CLDS/WX VALID UNTIL 112300...OTLK VALID 112300-120500

ND SD NE KS MN IA MO WI LM LS MI LH IL IN KY

SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.

TS IMPLY SEV OR GTR TURB SEV ICE LLWS AND IFR CONDS.

NON MSL HGTS DENOTED BY AGL OR CIG.

SYNOPSIS...AREA OF LOW PRESSURE CNTD OVR AL RMNG GENLY STNRY BRNGNG MSTR AND WD SPRD IFR TO GRT LKS RGN. ALF...LOW PRES TROF ACRS CNTR PTN OF THE CHI FA WILL GDLY MOV EWD DURG PD...KITE...

MO

CIG BKN020 TOPS TO FL180. VIS 1-3SM BR. SWLY WND. 18Z BRK030. OTLK...MVFR CIG.

WI LS LM MI LH IN

CIG OVC001-OVC006 TOPS TO FL240. VIS 1/4-3/4SM FG. SWLY WND. 16Z CIG OVC010 VIS 2SM BR. OCNL VIS 3-5SM -RN BR OVC009. OTLK...MVFR CIG VIS

IL

NRN 1/2 CIG OVC001 TOPS LYRD TO FL250. VIS 1/4-1SM FG BR. WLY WND THRUT THE PD. 16Z CIG OVC006. SCT -SHRN. OTLK...IFR. SRN 1/2...CIG SCT-BKN015 TOPS TO FL250. WLY WND THRUT THE PD. 17Z AGL BRK040. OTLK...MVFR CIG VIS.

At this time, there are no SIGMETs or PIREPs reported. However, you note several AIRMETs, one for IFR conditions and one for turbulence that covers the entire route and another for icing conditions which covers an area just north of the route:

AIRMET TURB...MN WI MI LM IN IL IA MO OH

FROM MSP TO TVC TO CLE TO FAM TO BUM TO MSP

OCNL MOD TURB BLW 080. CONDS CONTG BYD 11Z THRU 17Z.

AIRMET ICE...WI MI MN

FROM MBS TO MSN TO INL TO AFW TO MBS

LGT-OCNL MOD RIME ICGIC BTN 040 AND 100. CONDS CONTG BYD 11Z THRU 18Z.

FRZLVL...SFC-040 NRN MN SLPG 050-100 RMNDR FA AREA FM NW TO SE.

AIRMET IFR...IA MO IL IN WI LM LS MI LH MN

FROM INL TO AFW TO PIT TO BNA TO ICT TO INL

OCNL CIG BLW 010/VIS BLW 3SM PCPN/BR/FG. CONDS CONTG BYD 09Z THRU 15Z. RMNDR...NO WDSPRD IFR EXP.

A recheck of NOTAMs confirms that the localizer back-course approach for runway 14R at Champaign is out of service and that runway 22/4 is closed. You also learn of another NOTAM that was not mentioned in the telephone briefing, concerning the Palace-Two departure. If you use runway 21 for the departure, you should confirm that you are able to adhere to the climb restriction. This Palace-Two Departure NOTAM (below) is a good example of why it is important to check the second column of airport identifiers for the NOTAM location. If you only looked at the first column of identifiers, you might mistakenly think this NOTAM applied to USD rather than DTW:

USD 11/004 DTW PALACE TWO DEPARTURE: PROP AIRCRAFT DEPARTING RWY 21 WESTBOUND CROSS DXO 3.5 DME AT OR ABOVE 2500 MSL. IF UNABLE TO MAKE THE CLIMB RESTRICTION ADVISE DTW TOWER PRIOR TO DEPARTURE.

CMI 12/006 CMI RWY 22R/4L CLSD

CMI 12/008 CMI LOCBAC 14R OTS

Flight Planner

AIRCRAFT	N	TIME OFF	1308	BLOCK START	1258	BLOCK END	1455
ATIS CODE	KILO	SKY 7OVC	3 MILES	TEMP	+8 C	WIND	090@8
En Route		ALTIMETER	29.87	RUNWAY	3C	EST GPH	11

Preflight

TRUE COURSE	ALTITUDE	PREDICTED WIND DIRECTION	PREDICTED WIND VELOCITY	TEMP	PLAN TAS	WIND CORR ANGLE -L +R	TRUE HEADING / -E +W VAR	MAG HEADING / ± DEV
275	4000	116	23	+02	140	-3L	272 / +6	278 / +2
269	4000	116	23	+02	140	-4L	265 / +5	270 / +2
229	4000	116	23	+02	140	-9L	220 / +5	225 / +2
236	4000	116	23	+02	140	-8L	228 / +4	232 / +2
230	4000	116	23	+02	140	-9L	221 / +0	221 / +2

Checkpoints

Checkpoints (DEPARTURE / ARRIVAL)	COMPASS HEADING	DIST LEG / REM	GS EST / ACT	ETE / ATE	ETA / ATA	FUEL USED / FUEL REM.	VOR FREQ / IDENT	VOR BEARING / TO/FROM	TRANSPONDER CODES "SQUAWKS"
DTW – HARWL	ZV / 280°	38 / 230	161	14		3gAL	113.4 / :::	281 / FROM	0321
HARWL – JXN	V116 / 272°	12 / 218	160	05		1gAL	109.6 / :::	274 / TO	
JXN – LFD	V221 / 227°	18 / 200	147	07		2gAL	111.2 / :::	234 / TO	
LFD – CMI	DCT / 234°	200 / 0	150	01+20		15gAL	GPS / DCT	239 / TO	
TOTALS →		268		01+40		21gAL			
ALTERNATE CMI – ALN	DCT / 223°	107 / 107	148	00+43		8gAL			
RESERVE				00+45					
TOTALS →				3+14		29gAL			

Terminal Information

Field	Elevation	Runways	Radio Frequencies
DTW	640	3/21 9/27	133.67 ATIS 120.68 CLNC 119.45G (184(T)) 118.95 DEP
ALN	544	11/29 17/35	125.8 ATIS 124.2 APR 126.0T 120.2 GND
CMI	754	32L-14R	124.85 ATIS 121.35(A) 120.4(T) 21.8(G)

Notes: MINIMUM FUEL REQUIRED = 50 GALLONS
CMI: LOC BAC 14R 05 RWY 22R/4L CLOSED

Pilot Report FLIGHT WATCH 122.0 OR NEAREST FLIGHT SERVICE STATION	**1** AIRCRAFT	**2** POSITION	**3** TIME (Z)	**FLIGHT PLAN & WEATHER LOG ON REVERSE SIDE**
	4 CONDITIONS	**5** CLOUDS	**6** ALTITUDE	

ASA-FP-2

Figure 10-18. *Navigation log.*

Weather Briefing

LOCATION	TERMINAL AERODROME FORECASTS
DTW	AFTER 8AM 7OVC/3 WIND 090@8
CMI	AFTER 10AM 6OVC/4 WIND 140@9
ALN	20OVC/3 WIND 140@8

LOCATION	WINDS & TEMPERATURES ALOFT FORECASTS			
	ALT 3	ALT 6	ALT 9	ALT
EWA	110@20	130@30	135@35	

LOCATION	PIREPS/SIGNIFICANT WEATHER/NOTAMS
CMI	14R LOC BAC OS RWY 22/4 CLSD

Weight and Balance

	WEIGHT	X ARM	= MOMENT
EMPTY WEIGHT AIRCRAFT	1802		139988
FRONT PASSENGERS	378	81	30618
REAR PASSENGERS	—	—	—
FUEL GAL x 6#/GAL=	420	95	39900
BAGGAGE	55	142	7810
TOTAL GROSS WEIGHT	2655	TOTAL MOMENT	218316

CG = TOTAL MOMENT / TOTAL WEIGHT = 82.2

GROSS WEIGHT AND CG WITHIN LIMITS? YES

Figure 10-18. *Navigation log. (continued)*

The good news is that the weather is substantially better south of your route, making Alton Regional Airport a good alternate with current conditions and a forecast of marginal VFR.

METAR KALN 111049Z 25010KT 2SM BKN014 OVC025 03/M03 A2973

TAF KSTL 101045Z 101212 2510KT 2SM BR OVC020 BECMG 1317 3SM BR OVC025

FM1700 2710KT 4SM BR OVC030

FM0400 2714KT 5SM OVC050 TEMPO 0612 P6SM OCV080

At this point, with weather minimums well below personal minimums, you make the decision to delay your departure for a couple of hours to wait for improved conditions; this gives you more time to continue with your preflight planning.

You can now complete your navigation log. [Figure 10-18] Use the POH/AFM to compute a true airspeed, cruise power setting, and fuel burn based on the forecast temperatures aloft and your cruising pressure altitude. Also, compute weight-and-balance information, and determine your takeoff and landing distance. You will have a slight tailwind if weather conditions require a straight-in landing on the ILS to runway 32L at CMI. Therefore, compute your landing distance assuming a 10-knot tailwind, and determine if the runway length is adequate to allow a downwind landing. Continuing in your navigation log, determine your estimated flight time and fuel burn using the winds aloft forecast and considering Alton, IL, as your alternate airport. With full tanks, you can make the flight nonstop, with adequate fuel for your destination, alternate, and a 1-hour and 10-minute reserve.

A look at the surface analysis chart provides the big picture and shows where you will find the pressure systems. The weather depiction chart shows areas of IFR conditions; you can use this to find areas of improving conditions. This is good information should you need to divert to VFR conditions. The radar depicts precipitation along the route, and the latest satellite photo confirms what the weather depiction chart showed.

With the navigation log finished, you can now complete the flight plan in preparation for filing with flight service. [Figure 10-19]

A couple of hours have passed, and a look out the window shows the weather appears to be improving. Calling AFSS for an update weather briefing, you learn that conditions have indeed improved. Detroit Metro airport is now 700 overcast with 3 miles visibility and Champaign is now 400 overcast with 2 miles visibility. The alternate, Alton Regional Airport, continues to report adequate weather conditions with 2,000 overcast and 3 miles visibility in light rain.

Several pilot reports have been submitted for light icing conditions; however, all the reports are north of the route of flight corresponding to the AIRMET that was issued earlier. You inquire about cloud tops, but the briefer states no pilot reports have included cloud tops, at this time; however, the area forecast was predicting cloud tops to flight level 240. Since the weather conditions appear to be improving and you have the weather briefer on the telephone, file your flight plan using the completed form.

Form Approved OMB No. 2120-0026

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION **FLIGHT PLAN**	(FAA USE ONLY) ☐ PILOT BRIEFING ☐ VNR ☐ STOPOVER	TIME STARTED	SPECIALIST INITIALS

1. TYPE	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT	4. TRUE AIRSPEED	5. DEPARTURE POINT	6. DEPARTURE TIME PROPOSED (Z)	6. DEPARTURE TIME ACTUAL (Z)	7. CRUISING ALTITUDE
VFR / X IFR / DVFR	N1230A	C182/G	140 KTS	DTW	1300		4000

8. ROUTE OF FLIGHT

DCT LFD DCT CMI

9. DESTINATION (Name of airport and city)	10. EST. TIME ENROUTE HOURS	10. EST. TIME ENROUTE MINUTES	11. REMARKS
CMI-WILLARD AIRPORT SAVOY, IL	01	42	

12. FUEL ON BOARD HOURS	12. FUEL ON BOARD MINUTES	13. ALTERNATE AIRPORT(S)	14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE	15. NUMBER ABOARD
04	20	ALN	WARREN SMITH, 123 MAIN STREET DETROIT, MI 48123 217-555-1212 DTW	2
			17. DESTINATION CONTACT/TELEPHONE (OPTIONAL)	

16. COLOR OF AIRCRAFT	
BLUE/WHITE	CIVIL AIRCRAFT PILOTS. FAR Part 91 requires you file an IFR flight plan to operate under instrument flight rules in controlled airspace. Failure to file could result in a civil penalty not to exceed $1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended). Filing of a VFR flight plan is recommended as a good operating practice. See also Part 99 for requirements concerning DVFR flight plans.

FAA Form 7233-1 (8-82) CLOSE VFR FLIGHT PLAN WITH ____________ FSS ON ARRIVAL

Figure 10-19. *Flight plan form.*

Analyzing the latest weather, you decide to proceed with the trip. The weather minimums are now well above your personal minimums. With the absence of icing reported along the route and steadily rising temperatures, you are confident you will be able to avoid structural icing. However, make a note to do an operational check of the pitot heat during preflight and to take evasive action immediately should you encounter even light icing conditions in flight. This may require returning to DTW or landing at an intermediate spot before reaching CMI. Your go/no-go decision will be constantly reevaluated during the flight. With these thoughts you grab your flight bag and head for the airport.

At the airport you pull Cessna 1230A out of the hangar and conduct a thorough preflight inspection. A quick check of the logbooks indicates all airworthiness requirements have been met to conduct this IFR flight including an altimeter, static, and transponder test within the preceding 24-calendar months. In addition, a log on the clipboard indicates the VOR system has been checked within the preceding 30 days. Turn on the master switch and pitot heat, and quickly check the heating element before it becomes too hot. Then complete the rest of the walk-around procedure. Since this will be a flight in actual IFR conditions, place special emphasis on IFR equipment during the walk-around, including the alternator belt and antennas. After completing the preflight, you organize your charts, pencils, paper, and navigation log in the cockpit for quick, easy access. You are ready to fly!

Departure

After starting the engine, tune in ATIS and copy the information to your navigation log. The conditions remain the same as the updated weather briefing with the ceiling at 700 overcast, and visibility at 3 miles. Call clearance delivery, and receive your clearance:

> "Departure Clearance, Cessna 1230A IFR to Champaign with information Kilo, ready to copy."

> "Cessna 1230A is cleared to Champaign via the PALACE 2 departure, HARWL, Victor 116 Jackson, Victor 221 Litchfield, then direct. Climb and maintain 4,000. Squawk 0321."

Read back the clearance and review the DP. Although a departure frequency was not given in the clearance, you note that in the description of the DPs, it instructs propeller-driven aircraft to contact departure control frequency on 118.95. Since you are anticipating a departure from runway three center, you also note the instruction to climb to 1,100 prior to turning. The NOTAM received earlier applies only to runway 21 departures and will not be a factor. After tuning in the appropriate frequencies and setting up your navigation equipment for the departure routing, you contact ground control (noting that you are IFR), and receive the following clearance:

> "Cessna 1230A taxi to runway 3 center via taxiways Sierra 4, Sierra, Foxtrot, and Mike. Hold short of runway 3 right at taxiway Foxtrot."

Read back the clearance including the hold short instruction and your aircraft call sign. After a review of the taxi instructions on your airport diagram, begin your taxi and check your flight instruments for proper indications as you go. As you are holding short of runway three right at Foxtrot, ground control calls with the following clearance:

> "Cessna 30A taxi to runway 3 center via Foxtrot and Mike."

Continue taxi to runway three center and complete your before takeoff checklist and engine runup, then call the tower and advise them you are ready for takeoff. The tower gives the following clearance:

> "Cessna 30A cleared for takeoff runway 3 center. Turn left heading 270. Caution wake turbulence for departing DC9."

Taxi into position, note your time off on the navigation log, verify your heading indicator and magnetic compass are in agreement, the transponder is in the ALT position, all the necessary lights are on, and start the takeoff roll. Since you will be operating in the clouds, also turn on your pitot heat prior to departure. The takeoff roll will be substantially shorter than that of the DC9, so you are able to stay clear of its wake turbulence.

En Route

After departure, climb straight ahead to 1,100 feet as directed by the Palace 2 Departure, then turn left to the assigned heading of 270 and continue your climb to 4,000 feet. As you roll out of the turn, tower contacts you:

> "Cessna 30A contact Departure."

Acknowledge the clearance and contact departure on the frequency designated by the DP. Provide your altitude so the departure controller can check your encoded altitude against your indicated altitude:

> "Detroit Departure Cessna 1230A climbing through 2,700 heading 270."

Departure replies:

> "Cessna 30A proceed direct to HARWL intersection and resume your own navigation. Contact Cleveland Center on 125.45."

Acknowledge the clearance, contact Cleveland Center, and proceed direct to HARWL intersection, using your IFR-approved GPS equipment, complete the appropriate checklists, and then on to Jackson and Litchfield VORs. At each fix you note your arrival time on the navigation log to monitor your progress. Upon reaching Litchfield VOR, proceed direct to CMI again using the GPS to navigate:

Cleveland replies:

> "Cessna 30A radar contact. Fort Wayne altimeter 29.87. Traffic at your 2:00 position and 4 miles is a Boeing 727 descending to 5,000."

Even when on an IFR flight plan, pilots are still responsible for seeing and avoiding other aircraft. Since you are in IFR conditions at the time the traffic advisory is issued, you should notify ATC:

> "Roger, altimeter setting 29.87. Cessna 30A is in IMC."

At this point you decide to get an update of the weather at the destination and issue a pilot report. To find the nearest AFSS, locate a nearby VOR and check above the VOR information box for a frequency. In this case, the nearest VOR is Goshen (GSH) which lists a receive-only frequency of 121.1. Request a frequency change from Cleveland Center and then attempt to contact Terre Haute 122.1 while listening over the Goshen VOR frequency of 113.7:

> "Terre Haute Radio Cessna 1230A receiving on frequency 113.7, over."

> "Cessna 30A, this is Terre Haute, go ahead."

"Terre Haute Radio, Cessna 30A is currently 20 miles southeast of the Goshen VOR at 4,000 feet en route to Champaign, IL. Requesting an update of en route conditions and current weather at CMI, as well as ALN."

"Cessna 30A, Terre Haute Radio, current weather at Champaign is 300 overcast with 3 miles visibility in light rain. The winds are from 140 at 7 and the altimeter is 29.86. Weather across your route is generally IFR in light rain with ceilings ranging from 300 to 1,000 overcast with visibilities between 1 and 3 miles. Alton weather is much better with ceilings now at 2,500 and visibility 6 miles. Checking current NOTAMs at CMI shows the localizer back-course approach out of service and runway 4/22 closed."

"Roger, Cessna 30A copies the weather. I have a PIREP when you are ready to copy."

"Cessna 30A go ahead with your PIREP."

"Cessna 30A is a Cessna 182 located on the Goshen 130 degree radial at 20 miles level at 4,000 feet. I am currently in IMC conditions with a smooth ride. Outside air temperature is plus 1-degree Celsius. Negative icing."

"Cessna 30A thank you for your PIREP."

With the weather check and PIREP complete, return to Cleveland Center:

"Cleveland Center, Cessna 30A is back on your frequency."

"Cessna 30A, Cleveland Center roger, contact Chicago Center now on frequency 135.35."

"Roger, contact Chicago Center frequency 135.35, Cessna 30A."

"Chicago Center, Cessna 1230A level at 4,000 feet."

"Cessna 30A, Chicago Center radar contact."

A review of the weather provided by AFSS shows some deterioration of the CMI weather. In fact, the weather is right at your personal minimums. To further complicate matters, the only approach available is the ILS to runway 32L and the current weather does not allow for a circling approach. With the current winds at 140° and 7 knots, it means you will be flying the approach and landing with a tailwind. Re-evaluating your go/no-go decision, you decide to continue toward CMI. If the weather deteriorates further by the time you receive the CMI ATIS, you will proceed to the alternate of ALN which continues to report good weather.

Continuing toward Champaign, you discover a small trace of mixed ice beginning to form on the leading edge of the wing and notice the outside air temperature has dropped to 0 °C. You decide the best option is to climb to a higher altitude and request a climb to 5,000 feet from Chicago Center. Although this is the wrong altitude for your direction of flight, Chicago Center approves the request and you begin an immediate climb. Reaching 5,000 you are now between two cloud layers. A check of the outside air temperature shows a reading of 2 °C indicating a temperature inversion. Pass this information to Chicago Center in the form of a pilot report.

Arrival

You are now approximately 50 miles northeast of CMI. Ask the Center controller for permission to leave the Center frequency, tune in the ATIS frequency, and you learn there has been no change in the weather since you talked to AFSS. ATIS is advertising ILS runway 32L as the active approach. After returning to Center, you begin reviewing the approach chart, placing special emphasis on the missed approach procedure. If the weather improves, you will want to circle for a landing on runway 14 right, so you should also review the circle to land minimums. You should complete the appropriate checklists.

Chicago Center hands you off to Champaign approach control and you contact approach:

"Champaign Approach, Cessna 1230A level 5,000 feet with information TANGO."

"Cessna 30A, Champaign Approach, descend and maintain 3,000 feet, turn left heading 240 for radar vectors to the ILS approach to runway 32 left."

"Descend to 3,000, turn left to 240, radar vectors to ILS 32l, Cessna 30A."

Turn to 240° and begin your descent to 3,000. Since you are now on radar vectors, begin to configure your navigation radios for the approach. Tune in the ILS frequency of 109.1 on the number one navigation radio, and set in the final approach course of 316° on the OBS. Then set in the VOR frequency of 110.0 on your number two navigation radio, and set in the 297° radial on the OBS in anticipation of a missed approach. Finally, tune in the VEALS compass locator frequency of 407 on your ADF, identify each navigation signal, then tune in Champaign tower on your number two communication radio. You are ready to fly the approach when approach contacts you:

> "Cessna 30A your position is 7 miles from VEALS, turn right heading 290 maintain 3,000 feet until intercepting the localizer, cleared for the ILS runway 32 left approach."

Read back the clearance and concentrate on flying the aircraft. Intercept the localizer and descend to 2,600 as depicted on the approach chart. Champaign approach control hands you off to Champaign tower:

> "Cessna 30A contact Tower on 120.4."

> "120.4, Cessna 30A."

> "Champaign Tower, Cessna 1230A outside VEALS on the ILS runway 32 left."

> "Cessna 30A Champaign Tower, the weather is improving at Champaign. The ceiling is now 600 overcast and the visibility is 4 miles. Plan to circle north of the field, cleared to land runway 14 right."

> "Circle north, cleared to land runway 14 right, Cessna 30A."

Intercepting the Course

If you are on a vector to intercept the localizer and the controller has not yet issued an approach clearance, do not proceed inbound upon localizer intercept, but do query the controller: "Cessna 1230 Alpha is intercepting." The controller will then either issue the approach clearance or clarify why the flight is being vectored through the localizer.

Continue the approach, complete the appropriate checklists, cross the outer marker, and begin your descent on the glide slope. At 1,600 feet MSL you break out of the clouds and make visual contact with the airport. Even though circling minimums are 1,160 feet, you decide to conduct your circling approach at an altitude of 1,500 since the ceiling and visibility will allow it. You circle north of the field on a left downwind for runway 14 right and begin the descent abeam the touchdown to allow a normal descent to landing. As you touch down on the runway, Champaign Tower gives further instructions:

> "Cessna 30A turn left at taxiway Bravo and taxi to the ramp on this frequency."

> "Roger, Cessna 30A."

As you taxi clear of the runway and complete the appropriate checklists, there is a great sense of accomplishment in having completed the flight successfully. Tower cancels your IFR flight plan with no further action on your part. Your thorough preflight planning has made this a successful trip.