AIRPORTS, AIR TRAFFIC CONTROL, AND AIRSPACE

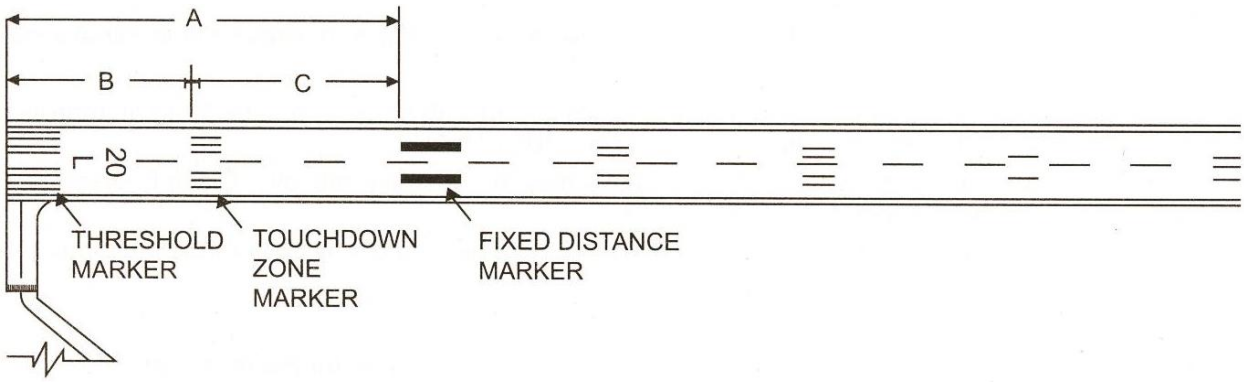
PRECISION INSTRUMENT RUNWAY MARKINGS

1. The figure below depicts a precision instrument runway.

    a. The distance from the runway threshold to the fixed distance marker is 1,000 ft. (distance A).

    b. The distance from the runway threshold to the touchdown zone marker is 500 ft. (distance B).

    c. The distance from the beginning of the touchdown zone marker to the beginning of the fixed distance marker is 500 ft. (distance C).

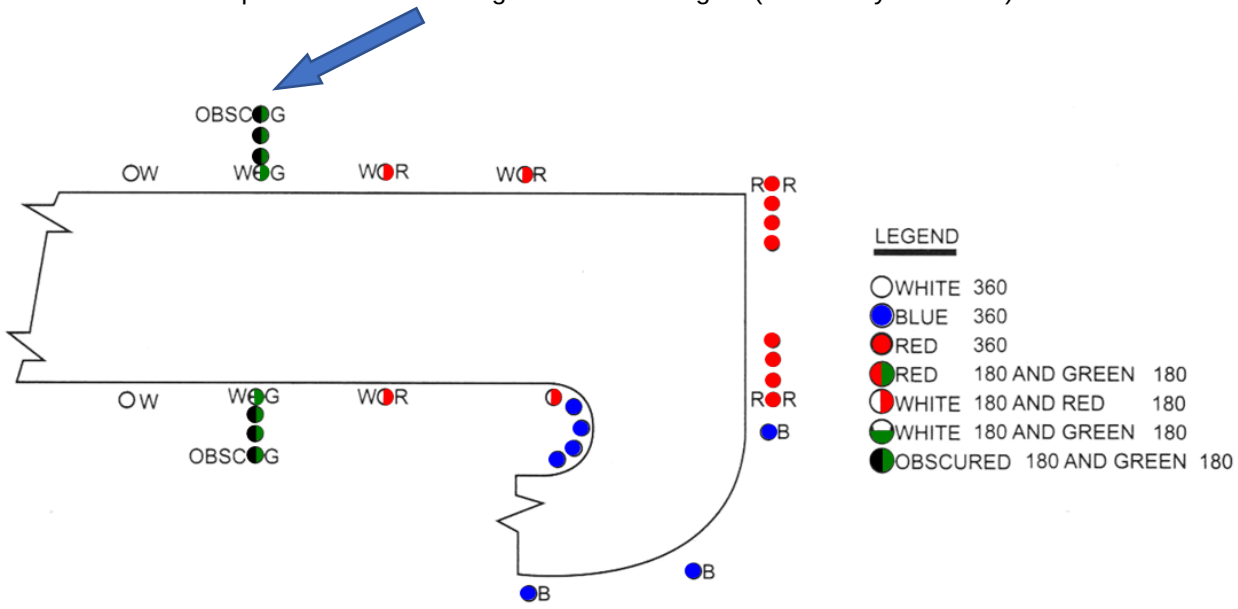


PRECISION INSTRUMENT RUNWAY

2. A displaced threshold is a threshold that is not at the beginning of a runway. It is indicated by arrows in the middle of the runway pointing to a broad, solid line across the runway. The remainder of the runway, following the displaced threshold, is the landing portion of the runway.

    a. The paved area before the displaced threshold is available for taxiing, the landing rollout, and the takeoff of aircraft, but not for landing.

    b. In the runway diagram below, the approach end of the runway is on the right. Thus, taxiing and takeoff are permitted toward the green threshold lights (marked by the arrow).



3. Hydroplaning occurs when an aircraft's tires are separated from the runway by water. a. It usually occurs at high speeds when water is standing on a smooth runway. $9x\sqrt{Tire\ Pressure\ (in\ psi)}$

AIRPORT SIGNS AND MARKINGS

1. Mandatory airport instruction signs have a red background with white lettering. Mandatory instruction signs include

   a. Runway approach area holding position signs and runway holding position signs

      1) These signs denote an entrance to a runway from a taxiway or from an intersecting runway.

   b. No entry signs (example on the next page)

      1) These signs denote paved areas where aircraft entry is prohibited.

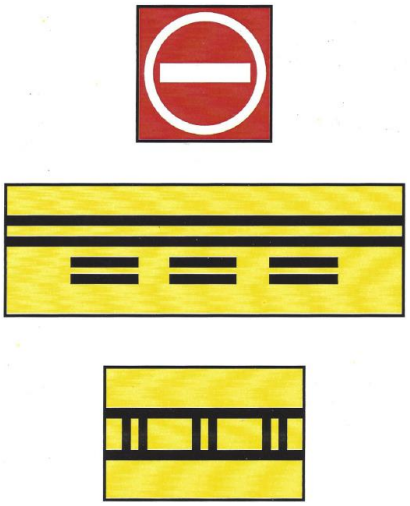
2. Runway holding position markings (hold lines) at the intersection of taxiways and runways consist of four yellow lines, two solid and two dashed, that extend across the width of the taxiway with the dashed lines nearest the runway.

   a. These markings identify where an aircraft is to hold short of the runway.

3. The ILS critical area boundary sign identifies the edge of the ILS critical area.

   a. These signs indicate the area where, when an ILS is in use, aircraft must hold short to prevent blocking or interfering with the ILS glide slope antenna installed at the airport.

   b. These signs have a yellow background and black lines that look like a sideways ladder.



Direction signs consist of black lettering on a yellow background.

   a. A taxiway directional sign indicates the designation (name) and direction (orientation) of taxiways leading out of an intersection.

   b. A runway exit sign indicates the designation and direction of an exit taxiway from the runway.

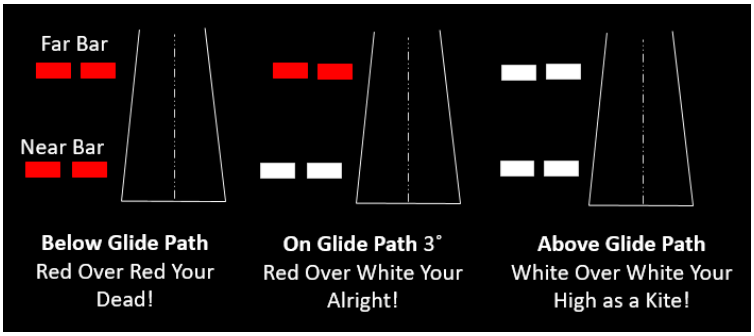
5. Destination signs direct pilots to a destination on the airport, such as runways, taxiways, aprons, terminals, FBOs, cargo areas, civil aviation areas, and military areas.

VISUAL APPROACH SLOPE INDICATOR (VASI)

1. Visual approach slope indicators (VASts) are a system of lights that provide visual descent information during the approach to a runway.

2. The standard VASI consists of a two-barred tier of lights.

a. If both light bars appear red, you are below the glide path. Remember this with the mnemonic, "red means dead."



3. Actually, each light bar marks a separate glide path. The far light bar marks a higher glide path than the glide path extended from the nearer light bar. You are between them when you are below the higher glide path and above the lower glide path.

    a. Remember that red over white (if it helps, R before W alphabetically) is the desired sequence.

        1) White over red is impossible.

4. VASIs also may have three light bars, which provide a lower glide path and a higher glide path. The higher glide path marked by the middle and far light bars is intended for use by high cockpit aircraft.

    a. If the nearest light bar is white and the two farther light bars are red, you are on the lower glide path, usually 3°.

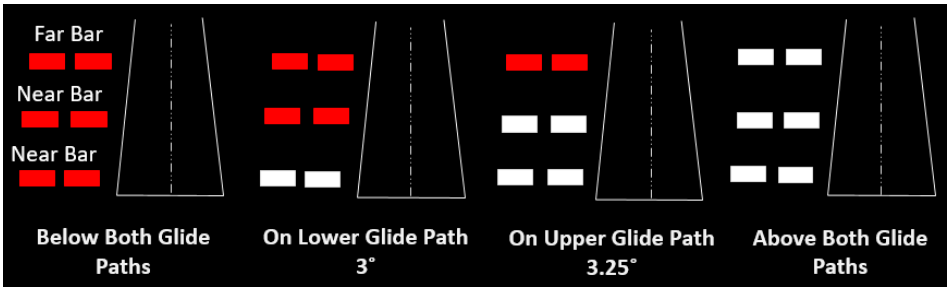
    b. If the farthest light bar is red and the two nearer light bars are white, you are on the upper glide path, usually 3.25°.

    c. Above both glide paths, all lights will be white. Below both glide paths, all lights will be red.

5. If all VASI lights appear red as you reach the MDA, you should level off momentarily to intercept the proper glide path.

6. VAS I provides only glide path guidance and safe obstruction clearance within ±10° of the extended runway centerline from as far as 4 NM from the runway threshold.

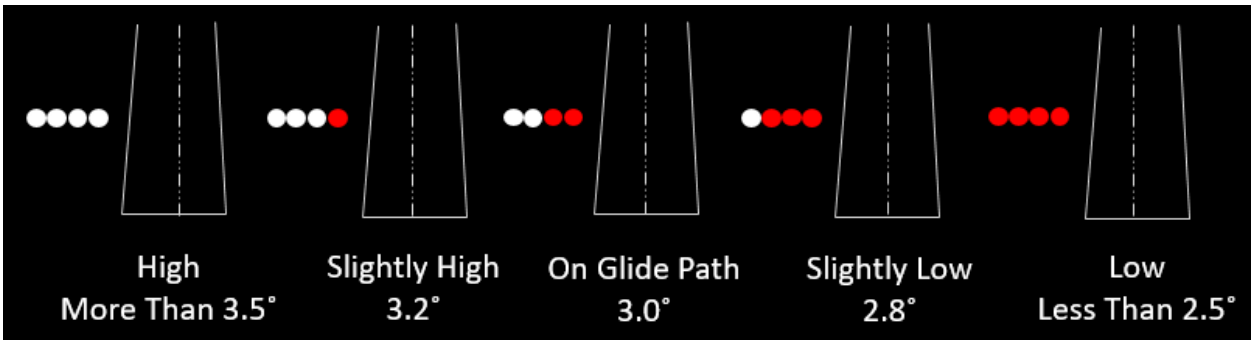
    a. It does not provide information on alignment with the runway.



PRECISION APPROACH PATH INDICATOR (PAPI)

1. PAPIlights are similar to VASIs but are installed in a single row of either two or four lights.

2. The glide path indications are depicted below.



RUNWAY LIGHT SYSTEMS

1. **Runway End Identifier Lights (REIL)**

   a. The REIL system consists of a pair of synchronized flashing lights located laterally on each side of the runway threshold.

   b. The lights are either omnidirectional or unidirectional facing the approach area.

   c. The lights are effective for

      1) Identification of a runway surrounded by a preponderance of other lighting,

      2) Identification of a runway which lacks contrast with surrounding terrain, and

      3) Identification of a runway during reduced visibility.

2. **Runway Edge Lights Systems**

   a. Runway edge lights are used to outline the edges of runways during periods of darkness or restricted visibility conditions.

   b. The lights are classified according to the intensity they are capable of producing.

      1) High Intensity Runway Lights (HIRL)

      2) Medium Intensity Runway Lights (MIRL)

      3) Low Intensity Runway Lights (URL)

   c. HIRL and MIRL systems have variable intensity controls.

   d. Runway edge lights are white, except on instrument runways where yellow replaces white on the last 2,000 feet or half of the runway length, whichever is less.

   e. Light marking the ends of the runway emit

1) Red light toward the runway to indicate the end of the runway to a departing aircraft and

2) Green light outward from the runway end to indicate the threshold to landing aircraft.

3. **In-Runway Lighting**

a. Runway Centerline Lighting System (RCLS)

1) This system is installed on some instrument precision approach runways to facilitate landing under adverse visibility conditions.

2) They are located along the runway centerline and are spaced at 50-foot intervals.

3) They are white until the last 3,000 feet of the runway when viewed from the landing threshold.

4) White lights begin to alternate with red for the next 2,000 feet, and for the last 1,000 feet of the runway, all centerline lights are red.

b. Touchdown Zone Lights (TDZL)

1) These lights are installed on some precision approach runways to indicate the touchdown zone when landing in adverse visibility conditions.

2) They consist of two rows of transverse light bars disposed symmetrically about the runway centerline.

3) The system consists of steady-burning white lights that start 100 feet beyond the landing threshold and extend to 3,000 feet beyond the landing threshold or to the midpoint of the runway, whichever is less.

c. Taxiway Centerline Lead-Off Lights

1) These lights provide visual guidance to persons exiting the runway.

2) They are color-coded to warn pilots and vehicle drivers that they are within the runway environment or instrument landing system (ILS) critical area (whichever is more restrictive).

3) They consist of alternate green and yellow lights, beginning with green from the runway centerline.

d. Taxiway Centerline Lead-On Lights

1) These lights provide visual guidance to persons entering the runway.

2) "Lead-on" lights are color-coded in the same pattern as lead-off lights.

3) They are color-coded to warn pilots and vehicle drivers that they are within the runway environment or instrument landing system (ILS) critical area (whichever is more restrictive).

4) They are bidirectional, i.e., one side emits light for the lead-on function, while the other side emits light for the lead-off function.

e. Land and Hold Short Lights

1) These lights are used to indicate the hold short point on certain runways which are approved for Land and Hold Short Operations (LAHSO).

2) They consist of a row of pulsing white lights installed across the runway at the hold short point.

3) Where installed, the lights will be on anytime LAHSO is in effect and off when it is not.

WAKE TURBULENCE

1. The greatest vortex strength occurs behind heavy, clean, and slow aircraft (e.g., during the takeoff of a jet transport because it has a high gross weight and a high angle of attack).

2. Light quartering tailwinds prolong the hazards of wake turbulence the longest because they move the vortices of preceding aircraft forward to the touchdown zone and hold the upwind vortex on the runway.

a. A light crosswind of 1 to 5 kt. would result in an upwind vortex tending to remain over the runway.

3. When landing behind a large aircraft on the same runway, stay at or above the other aircraft's final approach flight path and land beyond that airplane's touchdown point.

COLLISION AVOIDANCE

1. When climbing to an assigned altitude on an airway, use the centerline except to avoid other aircraft when in VFR conditions.

2. During climbs and descents in VFR conditions, execute gentle banks left and right to permit continual scanning of surrounding airspace.

3. When weather conditions permit, i.e., in VFR conditions, you must assume the responsibility to see and avoid other aircraft, regardless of whether operating under IFR or VFR.

4. ADS-B (Automatic Dependent Surveillance-Broadcast) is technology that allows air traffic controllers (and ADS-B equipped aircraft) to see traffic with more precision. Instead of relying on old radar technology, ADS-B uses highly accurate GPS signals. Because of this, ADS-B works where radar often will not.

a. This system

1) Works in remote areas such as mountainous terrain

2) Functions at low altitudes and even on the ground

3) Can be used to monitor traffic on the taxiways and runways

4) Allows air traffic controllers as well as aircraft with certain equipment to receive ADS-B traffic

5) Provides subscription-free weather information to all aircraft flying over the U.S.

b. ADS-B will be required in 2020. This system helps make our skies safer.

IFR FLIGHT PLANNING INFORMATION

1. Every pilot should receive a preflight briefing from a Flight Service Station (FSS), whether by telephone, radio, or personal visit.

    a. The briefing should contain weather advisories and notices about en route airports and other navigational aids.

2. The **Notice to Airmen (NOTAM) System** disseminates time-critical aeronautical information that is temporary in nature or not known in time to publish on charts or in procedural publications.

    a. NOTAMs include airport or primary runway closures, changes in the status of navigational aids, instrument landing systems, radar service availability, and other information that could affect a pilot's decision to make a flight.

3. NOTAMs are grouped into five types:

    a. **NOTAMs (D),** sometimes called "distant" NOTAMs, include information such as airport or primary runway closures; changes in the status of navigational aids, ILSs, and radar service availability; and other information essential to planned en route, terminal, or landing operations. Also included is information on airport taxiways, aprons, ramp areas, and associated lighting.

    b. **FDC NOTAMs** are issued by the Flight Data Center and contain regulatory information such as amendments to published instrument approach charts and other current aeronautical charts.

    c. **Pointer NOTAMs** reduce total NOTAM volume by pointing to other NOTAMs (D) and FDC NOTAMs rather than duplicating potentially unnecessary information for an airport or NAVAID. They allow pilots to reference NOTAMs that might not be listed under a given airport or NAVAID identifier.

    d. **SAA NOTAMs** are issued when Special Activity Airspace (SAA) will be active outside the published schedule times and when required by the published schedule, although pilots must still check published schedule times for SAA as well as any other NOTAMs for that airspace.

    e. **Military NOTAMs** reference military airports and NAVAIDs and are rarely of any interest to civilian pilots.

4. NOTAMs are disseminated by two means:

    a. The most current data are disseminated via telecommunications. They are included as part of a routine pilot weather briefing given by an FSS specialist.

    b. The *Notices to Airmen Publication,* also known as NTAP (formerly Class" NOTAMs), is published every 28 days. The NTAP contains all current NOTAMs (D) and FOC NOTAMs, except FDC NOTAMs for temporary flight restrictions. Once published, these NOTAMs are not provided during pilot weather briefing unless specifically requested.

5. The best source of airport conditions would be to combine data available from the Chart Supplement and NOTAMs (D).

6. **Automatic Terminal Information Service (ATIS)** broadcasts are updated whenever any official weather data are received, regardless of content change or reported values, or when there is a change in other pertinent data, such as active runway, instrument approach in use, etc.

a. Absence of the sky condition and visibility from the ATIS broadcast specifically implies that the ceiling is more than 5,000 ft. and visibility is more than 5 SM.

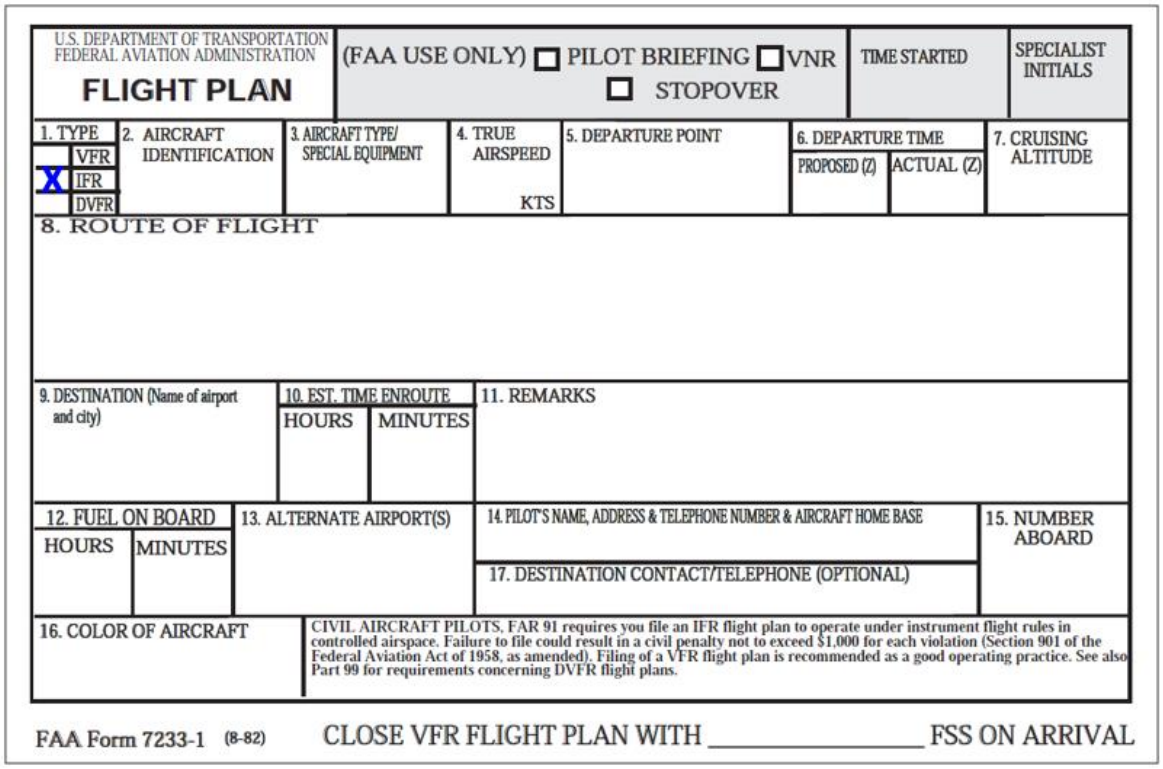
7. In Class B, C, D, and E surface areas, operation of an airport beacon during daylight hours usually indicates IFR weather conditions (ground visibility less than 3 SM and/or ceiling less than 1,000 ft.).

IFR FLIGHT PLAN

Authors' Note: At the time of publication, the FAA had not updated the test supplement to reflect the ICAO flight plan, which will be testable on the knowledge test in 2017. Therefore, we left the FAA standard flight plan here. Check our updates page for the latest information.

1. To operate under instrument flight rules in controlled airspace, you are required to file an IFR flight plan.

    a. The FAA's standard flight plan form appears below.



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		7. CRUISING ALTITUDE
VFR / X IFR / DVFR			KTS		PROPOSED (Z)	ACTUAL (Z)	

8. ROUTE OF FLIGHT

9. DESTINATION (Name of airport and city)	10. EST. TIME ENROUTE HOURS	MINUTES	11. REMARKS

12. FUEL ON BOARD HOURS	MINUTES	13. ALTERNATE AIRPORT(S)	14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE / 17. DESTINATION CONTACT/TELEPHONE (OPTIONAL)	15. NUMBER ABOARD

16. COLOR OF AIRCRAFT	CIVIL AIRCRAFT PILOTS, FAR 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

2. When you file a composite (part VFR, part IFR) flight plan, you should check both VFR and IFR in block 1. Your IFR flight plan must include all points of transition from one airway to another, fixes defining direct route segments, and the clearance limit fix.

3. In block 3, you are to indicate the aircraft type and special equipment.

    a. After the aircraft type, a slash is followed by a letter indicating the combination of

        1) Usable transponder
        2) DME
        3) Area navigation (RNAV) equipment

    b. Not reported is airborne radar capability.

4. When an IFR flight plan has different altitudes for different legs, you should enter the altitude only for the first leg in block 7.

5. Time en route (block 10) should be based on arrival at the point of first intended landing.

6. The fuel-on-board time (block 12) should be based upon the total usable fuel on board.

7. On composite flight plans for which the first portion of the flight is IFR, the flight plan should be a standard IFR flight plan, including

a. Points of transition from one airway to another

    b. Fixes defining direct route segments

    c. The clearance limit fix, i.e., the point at which you will begin the VFR portion of the flight

8. When transitioning from VFR to IFR on a composite flight plan, you should contact the nearest FSS to close the VFR portion and request an ATC IFR clearance. a. You must obtain an IFR clearance before entering IFR conditions.

9. IFR flight plans can be canceled only if you are flying in VFR conditions outside Class A airspace.

10. When landing at an airport without a control tower or FSS on the field, the pilot must initiate IFR flight plan cancelation. The pilot may cancel

    a. By radio while airborne if conditions are VFR

    b. By radio or telephone as soon as (s)he is on the ground

11. A waypoint on an IFR flight is a predetermined geographical position used for an RNAV route or RNAV instrument approach identification or progress reporting. It is defined relative to a VORTAC position **or** by longitude and latitude; l.e., it does not have to be relative to a VORTAC.

5.10 ATC CLEARANCES

1. Pilots of airborne aircraft should read back ATC clearances concerning altitude assignments and/or vectors and any part requiring verification.

2. An abbreviated IFR clearance includes

    a. Destination airport

    b. The route of flight, given fix-by-fix or "as filed"

    c. Initial altitude

d. DP (instrument departure procedure) name, number, and/or transition, if appropriate

3. When a departure clearance from an airport without an operating control tower contains a void time, the pilot must advise ATC as soon as possible (but no later than 30 min. after the void time) if a decision is made NOT to take off.

4. A cruise clearance assigns a pilot a block of airspace from the minimum IFR altitude up to and including the altitude specified in the cruise clearance.

    a. Climb and descent within the block are at the discretion of the pilot.

    b. However, once the pilot starts descent and verbally reports leaving an altitude in the block, the pilot may not return to that altitude without additional ATC clearance.

5.11 ATC COMMUNICATION PROCEDURES

1. You should state your position on the airport when calling the tower for takeoff from a runway intersection (Le., an intersection other than at the end of the runway).

2. When flying IFR, the pilot must maintain continuous contact with assigned ATC frequencies.

    a. All radio frequency changes are made at the direction of ATC.

3. When climbing or descending per ATC clearance, the pilot should use the optimum rate consistent with the aircraft to 1,000 ft. above or below the assigned altitude and then climb or descend at the rate of between 500 and 1,500 fpm until attaining the assigned altitude.

    a. It is sufficient to use a cruise climb rather than a maximum angle of climb.

    b. If you cannot climb or descend at least 500 fpm, you should notify ATC.

    c. You should lead your turns so that you remain in the center of the airway.

4. The reports that a pilot must make to ATC without a specific ATC request include

    a. At all times:

        1) Inability to climb or descend at a rate of at least 500 fpm

        2) Change in the average true airspeed at cruising altitude when it varies by more than the greater of 5% or 10 kt. from that filed in your flight plan

        3) Change from assigned altitude

        4) Missed approach

        5) Departure from any assigned holding fix or point

        6) The time and altitude when reaching holding fix or clearance limit

        7) Loss of communication or navigation capability or anything else affecting the safety of flight

    b. When not in radar contact:

        1) Departure from final approach fix inbound on final approach

2) Correction of an estimate which appears to be more than 3 min. in error

3) Passage over certain reporting points:

a) Compulsory reporting points as marked by solid black triangles on en route charts

b) Each fix used in the flight plan to define the route of flight on a direct flight not flown on radials or courses of established airways or routes

5. Your Mode C transponder should always be set to Mode C and turned ON unless otherwise requested by ATC.

6. When receiving traffic advisories from ATC, remember that the controller sees only the airplane's direction of travel, not the airplane heading.

a. You must adjust traffic reports for any wind correction you are holding.

7. **Radar contact** means your airplane has been identified on the radar screen and radar flight following will be provided until radar identification is terminated by the controller.

8. **Resume own navigation** means that you continue to be under ATC radar surveillance but are responsible for your own navigation. No more vectors will be given.

a. You are still in radar contact with ATC. Thus, you do not need to make position reports.

9. **Radar service terminated** means that you are no longer under ATC radar surveillance and must resume position reports at compulsory reporting points.

10. IFR flights receive separation from all IFR aircraft and participating VFR aircraft operating within the outer area of Class C airspace.

11. When flying VFR on practice instrument approaches, you must avoid IFR conditions. You do not have an IFR clearance.

12. While you should comply with all headings and altitudes assigned by ATC, you should feel free to question any assigned altitude or heading believed to be incorrect. The pilot has ultimate responsibility for safe flight.

13. When ATC requests a specified airspeed, you are expected to maintain the speed plus or minus 10 kt. based upon indicated airspeed.

14. If you cancel your IFR flight plan 10 mi. from your destination airport (located in Class D airspace), you must establish communications with the tower prior to entering the Class D airspace.

15. Pilots never have to accept a controller's clearance, regardless of meteorological conditions.

a. A pilot should only accept a LAHSO (Land and Hold Short Operation) clearance provided (s)he feels (s)he can land the plane within the available distance without compromising safety.

16. **Minimum fuel** is just an advisory to ATC that indicates an emergency situation is possible should any undue delay occur.

RADIO COMMUNICATION FAILURE

1. In the event of two-way communications failure, ATC will assume the pilot is operating in accordance with 14 CFR 91.185.

    a. As always, pilot judgment is the final determinant of safest flying.

2. According to 14 CFR 91.185, if you lose two-way communications

    a. When you are holding and you receive an expected further clearance (EFC) time, you should leave the holding pattern at the EFC time.

    b. When you are on an IFR flight in VFR weather conditions, you should continue your flight under VFR and land as soon as practicable.

    c. When you are in IFR conditions, you should continue on the route specified in your clearance (for each leg of your flight) at the highest of

        1) The last assigned altitude

        2) Expected altitude per ATC

        3) MEA (minimum en route altitude)

3. When losing radio communications, you should alert ATC by setting your transponder code to 7600.

    a. If you are in an emergency situation, you should set and leave the transponder at 7700.

NAVIGATION RADIO FAILURE

1. If your DME fails above FL 240, you should notify ATC of the failure and continue to the next airport of intended landing at which repairs or replacement of the equipment can be made.

2. When operating under IFR, you must immediately report to ATC the loss of VOR, TACAN, or LF navigation receiver capability; complete or partial loss of ILS receiver; and/or any impairment of radio communications capability.

TYPES OF AIRSPACE

1. En Route Low-Altitude Charts show the limits of controlled airspace, military training routes, and special-use airspace.

    a. However, they do not show Class A airspace.

2. Class G (uncontrolled) airspace is airspace where ATC does not control air traffic.

3. Transition areas are Class E airspace and are used to transition between the terminal area and en route flight.

    a. When designated in conjunction with an airport with a prescribed instrument approach, Class E airspace extends upward from 700 ft. AGL.

    b. When designated in conjunction with airway route structures, etc., Class E airspace extends upward from 1,200 ft. AGL.

c. Both types of transition areas terminate at the base of overlying controlled airspace, i.e., Class A airspace.

4. Class A airspace is from 18,000 ft. MSL to FL 600.

5. Military operations areas (MOA) consist of airspace established for the purpose of separating certain military training activities from IFR traffic.

6. The maximum altitude at which Class G airspace will exist is 14,500 ft. MSL (excluding the airspace less than 1,500 ft. AGL).

7. Generally, the maximum altitude for Class B airspace is 10,000 ft. MSL.

8. The normal lateral limit for Class D airspace is 4 NM.

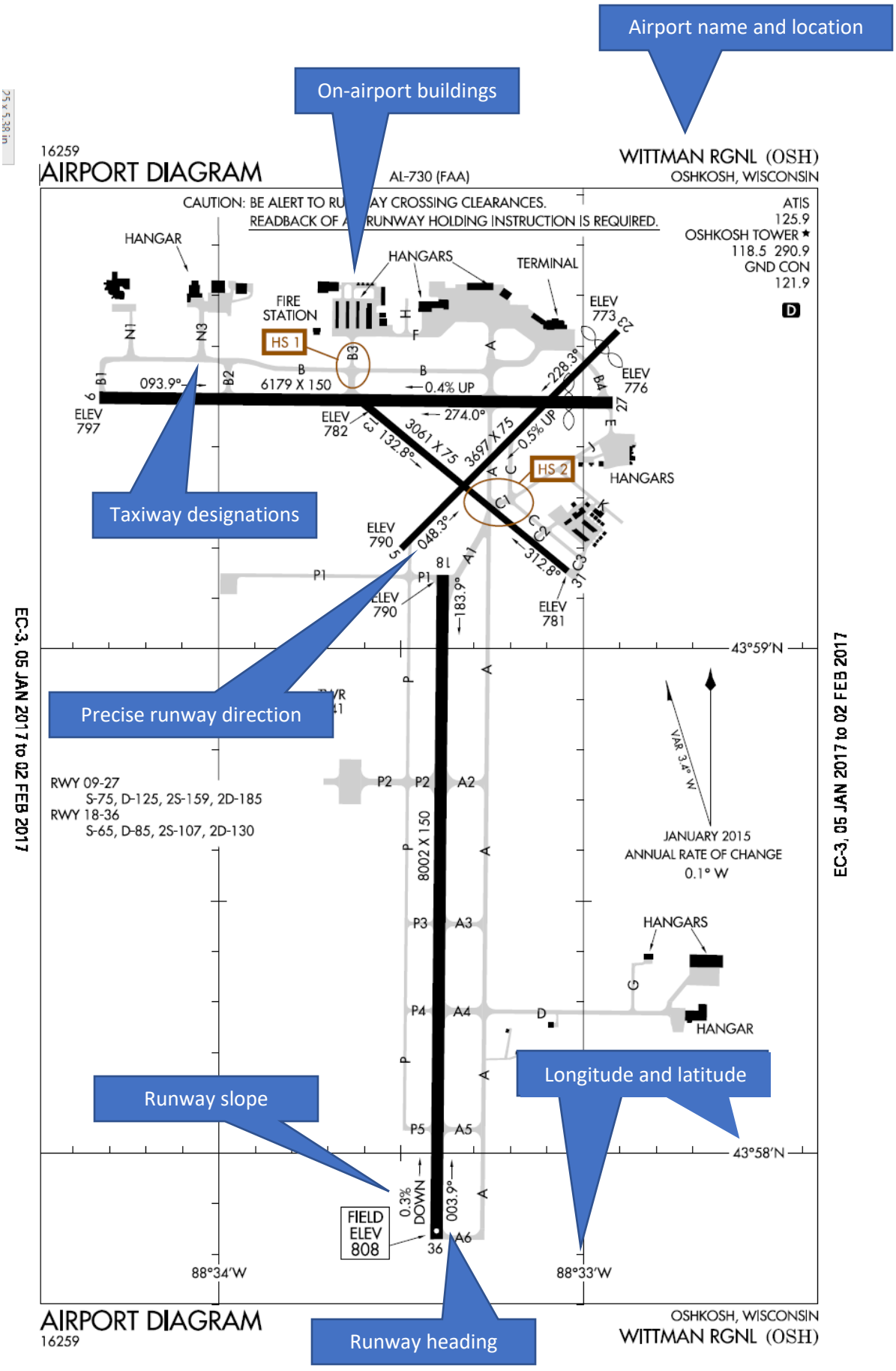
9. The normal upper limit of Class D airspace is 2,500 ft. AGL.

10. Class C airspace consists of controlled airspace within which all aircraft are subject to the operating rules and equipment requirements specified in FAR Part 91.

a. Aircraft must be equipped with two-way radio communications and a Mode C transponder.

AIRPORT DIAGRAM - CHART SUPPLEMENT

1. Airport Diagrams, published in regional booklets, provide information about airports, both VFR and IFR. The Chart Supplement Airport Diagram includes information such as runway slope (e.g., 0.3% DOWN) and runway heading (e.g., 003.6°). Review the Chart Supplement Airport Diagram illustration below for more information.


Airport name and location
On-airport buildings
Taxiway designations
Precise runway direction
Runway slope
Longitude and latitude
Runway heading
16259
AIRPORT DIAGRAM
AL-730 (FAA)
WITTMAN RGNL (OSH)
OSHKOSH, WISCONSIN
CAUTION: BE ALERT TO RU AY CROSSING CLEARANCES.
READBACK OF A RUNWAY HOLDING INSTRUCTION IS REQUIRED.
ATIS
125.9
OSHKOSH TOWER
118.5 290.9
GND CON
121.9
HANGAR
HANGARS
TERMINAL
FIRE STATION
HS 1
HS 2
ELEV 773
ELEV 776
ELEV 797
ELEV 782
ELEV 790
ELEV 781
093.9°
274.0°
228.3°
132.8°
048.3°
312.8°
183.9°
003.9°
6179 X 150
3061 X 75
3697 X 75
8002 X 150
0.4% UP
0.5% UP
0.3% DOWN
FIELD ELEV 808
RWY 09-27
S-75, D-125, 2S-159, 2D-185
RWY 18-36
S-65, D-85, 2S-107, 2D-130
VAR 3.4° W
JANUARY 2015
ANNUAL RATE OF CHANGE
0.1° W
43°59'N
43°58'N
88°34'W
88°33'W
EC-3, 05 JAN 2017 to 02 FEB 2017
EC-3, 05 JAN 2017 to 02 FEB 2017
AIRPORT DIAGRAM
16259
OSHKOSH, WISCONSIN
WITTMAN RGNL (OSH)