Instrument Procedures Handbook

2017

U.S. Department of Transportation
FEDERAL AVIATION ADMINISTRATION
Flight Standards Service

FAA-H-8083-16B, Instrument Procedures Handbook, 2017

Summary of Changes

This handbook supersedes FAA-H-8083-16A, Instrument Procedures Handbook dated 2015, and contains several changes and updates. While this revision contains updated information, it retains the organization and the same order of presentation as earlier versions. Some updated graphics and editorial wording changes have been made for clarity or consistency. In multiple places, we corrected or updated terminology as follows: "instrument approach plates" to be "instrument approach charts"; "airplane" to "aircraft" where the context applies to all aircraft; Airport/Facility Directory (A/FD) to "Chart Supplement (CS)" or "Digital Chart Supplement (d-CS)" except where the context refers to the A/FD section of the CS or d-CS; and "Helicopter Emergency Medical Service (HEMS)" to "Helicopter Air Ambulance (HAA)". We suggest that the content changes, which are listed below, be thoroughly reviewed.

Chapter 1

- Reworded paragraph "Alternate Minimums for Commercial Operators," regarding requirements for Part 121 and 135 operators. Clarified a sentence indicating it pertains to alternate airports rather than all airports.
- Updated paragraph "Departures from Airports Without an Operating Control Tower" regarding obtaining information from a Flight Service Station (FSS). Changed references from "Automated Flight Service Station (AFSS)" to "Flight Service Station (FSS)." Added information about finding the phone number to use, when there is a direct line to the controlling Air Traffic Control (ATC) Facility, to obtain a clearance.

Chapter 2

- Added indication that area navigation (RNAV) specific information is sometimes depicted on Victor routes to paragraph "IFR En Route Low Altitude Chart."
- Updated figure 2-30, which depicts a Joint Victor/RNAV airway route, to be more realistic by removing a Global Navigation Satellite System (GNSS) minimum en route IFR altitude (MEA) that was a higher altitude than the conventional MEA for the same fix pair. The GNSS MEA should only be depicted when it is lower than the altitude of the conventional MEA.

Chapter 3

- Changed paragraph "Standard Terminal Arrival Routes (STARs)" to the following:
  - Clarified that STARs end at a fix that allows radar vectors and, at some locations, also allows the option to connect to an approach.
  - Explained that the descent gradient on a STAR will have to vary to meet altitude restrictions, if any, along the particular route.
  - Updated the explanation of descent gradient on a STAR based on new guidance in FAA Order 8260.3, U.S. Standard for Terminal Instrument Procedures (TERPS), that was changed in March 2016.
- Changed paragraph "RNAV STARs or STAR Transitions" to the following:
  - Updated the explanation of design guidance for an RNAV STAR.
  - Updated the explanation of the types of clearances for a STAR.
- Changed paragraph "Interpreting the STAR" updating some of the terminology used for a STAR.

Chapter 4

- Updated paragraph "Weather Sources," changing "Automated Flight Service Station (AFSS)" to be "Flight Service Station (FSS)." Changed access to Direct User Access Terminal System (DUATS) to be by any pilot rather than only those with a current medical certificate. Updated the internet address for DUATS. Updated references for "DUATS service" to "DUATS II service." Added information about finding the phone number to use for the Telephone Information Briefing Service (TIBS).
- Changed a reference in paragraph, "Minimum Descent Altitude (MDA), Decision Altitude (DA), and Decision Height (DH)" for Enhanced Flight Vision System (EFVS) to be 14 CFR Part 91 § 91.176.
- Updated figures 4-10a, 4-10b, and 4-10c, which depict EFVS, showing the view during an approach and depicting the operation using EFVS.
- Updated paragraph "Enhanced Flight Vision Systems (EFVS) and Instrument Approaches" incorporating changes to 14 CFR Part 91 and describe the EFVS operation.
- Updated a discussion of RNAV (GPS) approach chart lines of approach minimums in paragraph "Advantages of WAAS Enabled LPV Approaches."
- Changed reference in paragraph "Missed Approach" for EFVS to be 14 CFR Part 91 § 91.176.
- Deleted figure 4-23 due to outdated information. Renumbered subsequent figures and references.
- Updated paragraph "Maximum Acceptable Descent Rates" regarding descent after visual descent point (VDP).
- Reworded paragraph "Visual Approaches" regarding controller and pilot responsibilities.
- Updated paragraph "ILS Approaches" regarding simultaneous approach operations and moved some of the material to paragraph titled "Simultaneous Approaches to Parallel Runways."
- Changed paragraph "Approaches to Parallel Runways" to "Simultaneous Approaches to Parallel Runways" and updated regarding the classifications of simultaneous approach operations and operational requirements.
- Changed paragraph "Parallel (Dependent) Approaches" to "Simultaneous Dependent Approaches" and updated regarding dependent approach operations, the minimum separation distances used by ATC, and examples of chart notes.
- Changed paragraph "Simultaneous Parallel Approaches" to "Simultaneous Independent Approaches" and updated regarding simultaneous independent approach operations, aircraft equipment requirements (such as FD or AP), minimum runway spacing, and the lines of minimums that may be used.
- Updated paragraph "Simultaneous Close Parallel Precision Runway Monitor Approaches" regarding Close Parallel simultaneous independent approach operations. An updated list is provided showing differences for precision runway monitor (PRM) approaches compared to other simultaneous approaches, minimum runway spacing has decreased, and (as shown in figure 4-48) RNAV approaches may now be used for simultaneous close parallel operations based on safety studies in the past few years.
- Updated paragraph "Simultaneous Offset Instrument Approaches (SOIAs)" regarding SOIA operations, the types of approaches that are authorized, and the type of surveillance equipment required.
- Updated figure 4-43 depiction of simultaneous approach operations.
- Revised titles for figures 4-43 through 4-49 to match the type of ATC operation and/or the approach name or type that is depicted.
- Updated explanatory note on figure 4-45 showing the range of different simultaneous operations that might apply.
- Revised titles for figures 4-46 and 4-47; updated figures to show examples of simultaneous operations.
- Revised title for figure 4-48 and updated example of a simultaneous close parallel approach and the associated Attention All Users Page.
- Revised title for figure 4-49 and updated example of a simultaneous offset Instrument approach and the associated Attention All Users Page.

Chapter 5

- Updated paragraph "Next Generation Air Transportation (NextGen) System" information about automatic dependent surveillance-broadcast (ADS-B).
- Updated paragraph "NextGen Existing Improvements" information about ADS-B.
- Updated description of ADS-B.
- Added a new paragraph, "Synthetic Vision Guidance System (SVGS)."
- Updated references in paragraph, "Enhanced Flight Vision System (EFVS)" to include AC 90 106, Enhanced Flight Vision Systems.
- Changed paragraph "Developing Combined Technology" to "Combined Vision System Technology" and discusses the concept of equivalent visual operations (EVO) where flight operations continue irrespective of the actual weather conditions.

Chapter 7

- Updated various paragraphs by changing "Helicopter Emergency Medical Service (HEMS)" to "Helicopter Air Ambulance (HAA)."
- Clarified in paragraph "Helicopter IFR Takeoff Minimums" regarding takeoff minimums and acceleration to minimum speed.
- Updated figure 7-7 regarding the visibility for "Class G 1200 feet or less above the surface" changing from "none" to "½ SM."
- Updated paragraph "Approach to a PinS" regarding proceeding VFR in uncontrolled airspace. Deleted figure 7-14 and references to the figure are deleted; information is already covered elsewhere in the paragraph.
- Reworded paragraph "Approach to a Specific VFR Heliport" indicating that some of the requirements stated in the first sub-paragraph apply only to public procedures.

Appendix B

- Updated "A/FD—Airport/Facility Directory section of the Chart Supplement (CS)."
- Updated "AFMS—Aircraft Flight Manual Supplements."
- Added "CS—Chart Supplement" and "D-CS—Digital Chart Supplement." and,
- Added "SVGS – Synthetic Vision Guidance System."

Glossary

- Updated "Airport/Facility Directory (A/FD)."
- Added "Chart Supplement (CS or d-CS for digital Chart Supplement)."
- Added "Closely Spaced Dependent Approaches."
- Added "EFVS operation."
- Added "Enhanced Flight Vision System (EFVS)."
- Updated "Positive Course Guidance (PCG)."
- Updated "Standard Terminal Arrival (STAR)."
- Updated "Positive Course Guidance (PCG)."

- Updated “Standard Terminal Arrival (STAR).”
- Added “Standard Terminal Arrival (STAR) Charts.”
- Added “Synthetic Vision Guidance System (SVGS.)”
- Updated “Synthetic Vision System (SVS).”

Table of Contents

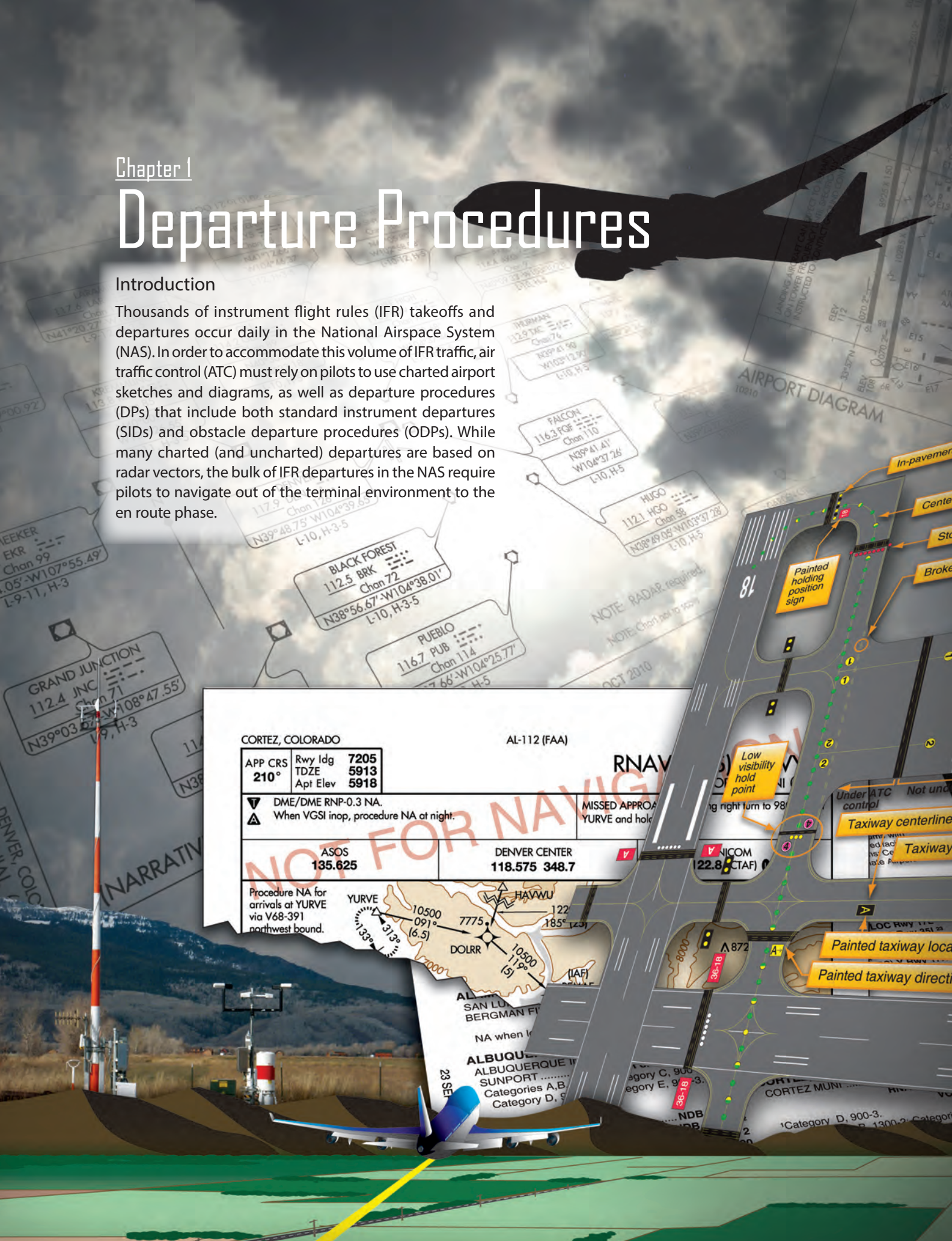
Chapter 4

Chapter 1

Departure Procedures

Introduction

Thousands of instrument flight rules (IFR) takeoffs and departures occur daily in the National Airspace System (NAS). In order to accommodate this volume of IFR traffic, air traffic control (ATC) must rely on pilots to use charted airport sketches and diagrams, as well as departure procedures (DPs) that include both standard instrument departures (SIDs) and obstacle departure procedures (ODPs). While many charted (and uncharted) departures are based on radar vectors, the bulk of IFR departures in the NAS require pilots to navigate out of the terminal environment to the en route phase.



IFR takeoffs and departures are fast-paced phases of flight, and pilots often are overloaded with critical flight information. While preparing for takeoff, pilots are busy requesting and receiving clearances, preparing their aircraft for departure, and taxiing to the active runway. During IFR conditions, they are doing this with minimal visibility, and they may be without constant radio communication if flying out of a non-towered airport. Historically, takeoff minimums for commercial operations have been successively reduced through a combination of improved signage, runway markings and lighting aids, and concentrated pilot training and qualifications. Today at major terminals, some commercial operators with appropriate equipment, pilot qualifications, and approved Operations Specifications (OpSpecs) may takeoff with visibility as low as 300 feet runway visual range (RVR). One of the consequences of takeoffs with reduced visibility is that pilots are challenged in maintaining situational awareness during taxi operations.

Surface Movement Safety

One of the biggest safety concerns in aviation is the surface movement accident. As a direct result, the FAA has rapidly expanded the information available to pilots, including the addition of taxiway and runway information in FAA publications, particularly the IFR U.S. Terminal Procedures Publication (TPP) booklets and the Chart Supplement (CS) volumes. The FAA has also implemented new procedures and created educational and awareness programs for pilots, ATC, and ground operators. By focusing resources to attack this problem head on, the FAA hopes to reduce and eventually eliminate surface movement accidents.

Airport Sketches and Diagrams

Airport sketches and diagrams provide pilots of all levels with graphical depictions of the airport layout. Aeronautical Information Services, formerly known as Aeronautical Products (AeroNav), provide an airport sketch on the lower left or right portion of every instrument approach chart. [Figure 1-1] This sketch depicts the runways, their length, width and slope, the touchdown zone elevation, the lighting system installed on the end of the runway, and taxiways. Graphical depictions of NOTAMS are also available for selected airports as well as for temporary flight restriction (TFRs) areas on the defense internet NOTAM service (DINS) website.

For select airports, typically those with heavy traffic or complex runway layouts, Aeronautical Information Services also prints an airport diagram. The diagram is located in the IFR TPP booklet following the instrument approach chart for a particular airport. It is a full page depiction of the airport that includes the same features of the airport sketch plus additional details, such as taxiway identifiers,

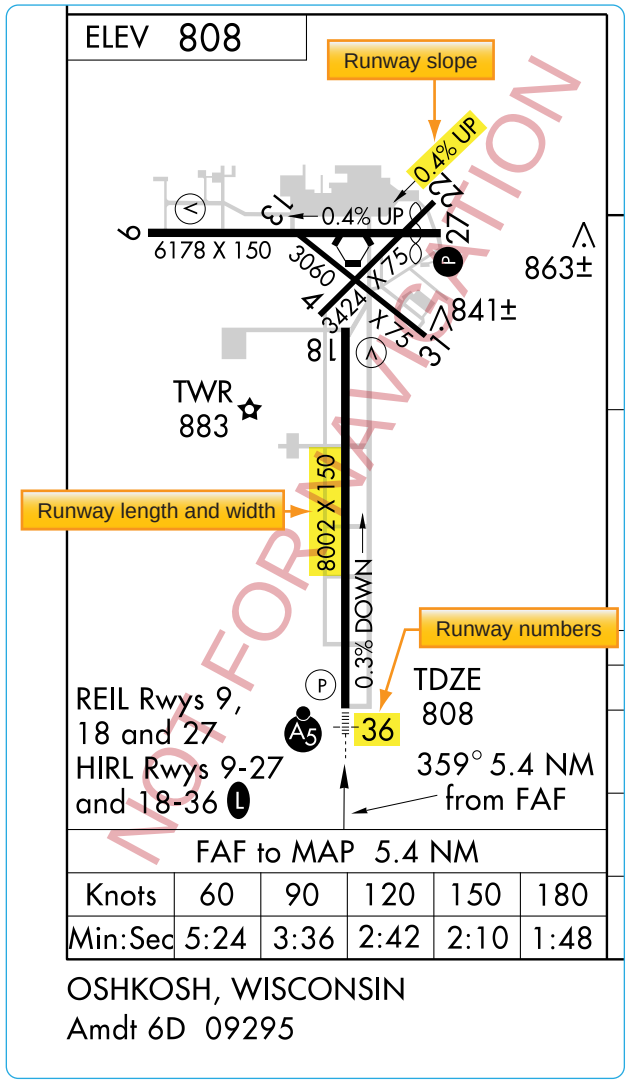


Figure 1-1. Airport diagram included on the Oshkosh, Wisconsin VOR RWY 9 Approach Chart as depicted in the IFR TPP.

airport latitude and longitude, and building identification. The airport diagrams are also available in the Airport/Facility Directory section of the Chart Supplement (CS) and on the Aeronautical Information Services' website, located at www.aeronav.faa.gov. [Figure 1-2]

Chart Supplements (CS)

In recent years, the former Airport/Facility Directory (A/FD) booklet was incorporated as a section in the Chart Supplement (CS). [Figure 2-14] The Chart Supplement (CS) is published by Aeronautical Information Services in regional booklets and online at: [https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/] The online version is known as the digital Chart Supplement (d-CS). The d-CS and the CS are identical and provide textual and graphic information about all airports, both Visual Flight Rules (VFR) and IFR. The Airport/Facility Directory (A/FD) section of the CS includes runway length

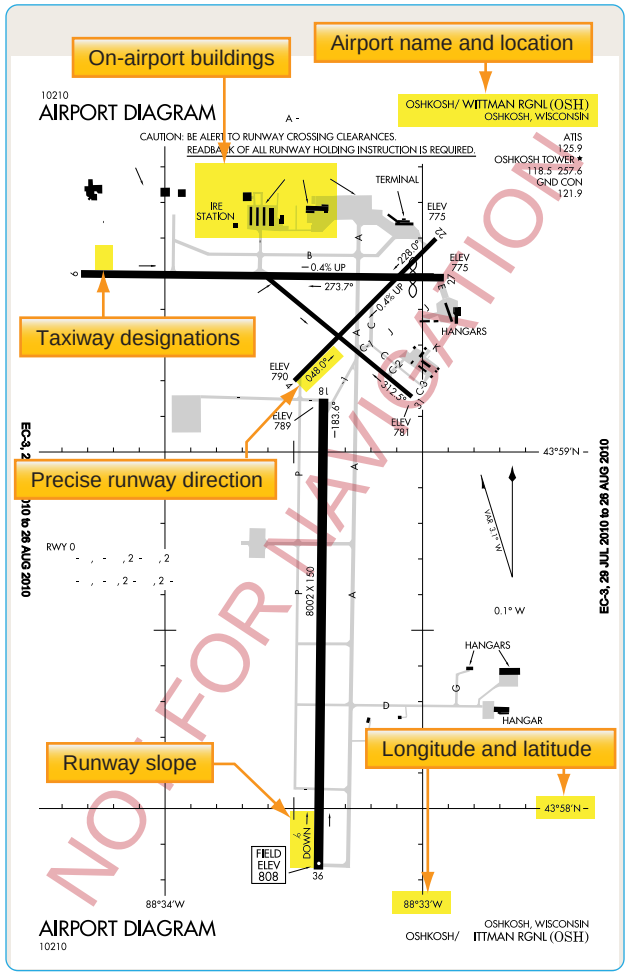


Figure 1-2. Airport diagram of Oshkosh, Wisconsin as depicted in the A/FD section of the CS.

and width, runway surface, load bearing capacity, runway slope, runway declared distances, airport services, and hazards, such as birds and reduced visibility. [Figure 1-3] Sketches of airports also are being added to aid VFR pilots in surface movement activities. In support of the FAA Runway Incursion Program, full page airport diagrams and "Hot Spot" locations are included in the A/FD section of the CS. These charts are the same as those published in the IFR TPP and are printed for airports with complex runway or taxiway layouts.

Surface Movement Guidance Control System (SMGCS)

The Surface Movement Guidance Control System (SMGCS) was developed to facilitate the safe movement of aircraft and vehicles at airports where scheduled air carriers were conducting authorized operations. Advisory Circular 120-57 was developed in 1992. In 2012, FAA Order 8000.94, Procedures for Establishing Airport Low-Visibility Operations and Approval of Low-Visibility Operations/Surface Movement Guidance and Control System Operations, was published to provide procedures for establishing Airport Low-Visibility Operations (LVO) and Surface Movement Guidance and Control Systems. It established the necessary FAA headquarters and operating services, roles, responsibilities, and activities for operations at 14 CFR Part 139 airports using RVRs of less than 1,200 feet for each runway. The order applies to all users of the system at all levels who are formally listed. The FAA requires the commissioning of an "FAA approved LVO/ SMGCS Operation" for all new Category III ILS supported runways. Since there are no regulatory takeoff minimums for 14 CFR Part 91 operations, the information provided by FAA AC 120-57 and FAA Order 8000.94 must be understood so that the general aviation pilot can understand LVO and SMGCS during day or night.

The SMGCS low visibility taxi plan includes the enhancement of taxiway and runway signs, markings, and lighting, as well as the creation of SMGCS visual aid diagrams. [Figure 1-4] The plan also clearly identifies taxi routes and their supporting facilities and equipment. Airport enhancements that are part of the SMGCS program include, but are not limited to:

- Controllable Stop bars lights—these consist of a row of red, unidirectional, in-pavement lights that can be controlled by ATC. They provide interactions with and aircraft that prevent runway incursions during takeoff operations. These are required for operations at less than 500 ft RVR.
- Non-Controllable Stop bars lights—these are red, unidirectinoal lights place at intersections where a restriction to movement is required. They must be in continuous operation at less than 500 ft RVR.
- Taxiway centerline lead-on lights—guide ground traffic under low visibility conditions and at night. These lights consist of alternating green/yellow in-pavement lights.
- Runway guard lights—either elevated or in-pavement, may be installed at all taxiways that provide access to an active runway. They consist of alternately flashing yellow lights. These lights are used to denote both the presence of an active runway and identify the location of a runway holding position marking.
- Geographic position markings—ATC verifies the position of aircraft and vehicles using geographic position markings. The markings can be used either as hold points or for position reporting. These checkpoints or "pink spots" are outlined with a black and white circle and designated with a number or a number and a letter.

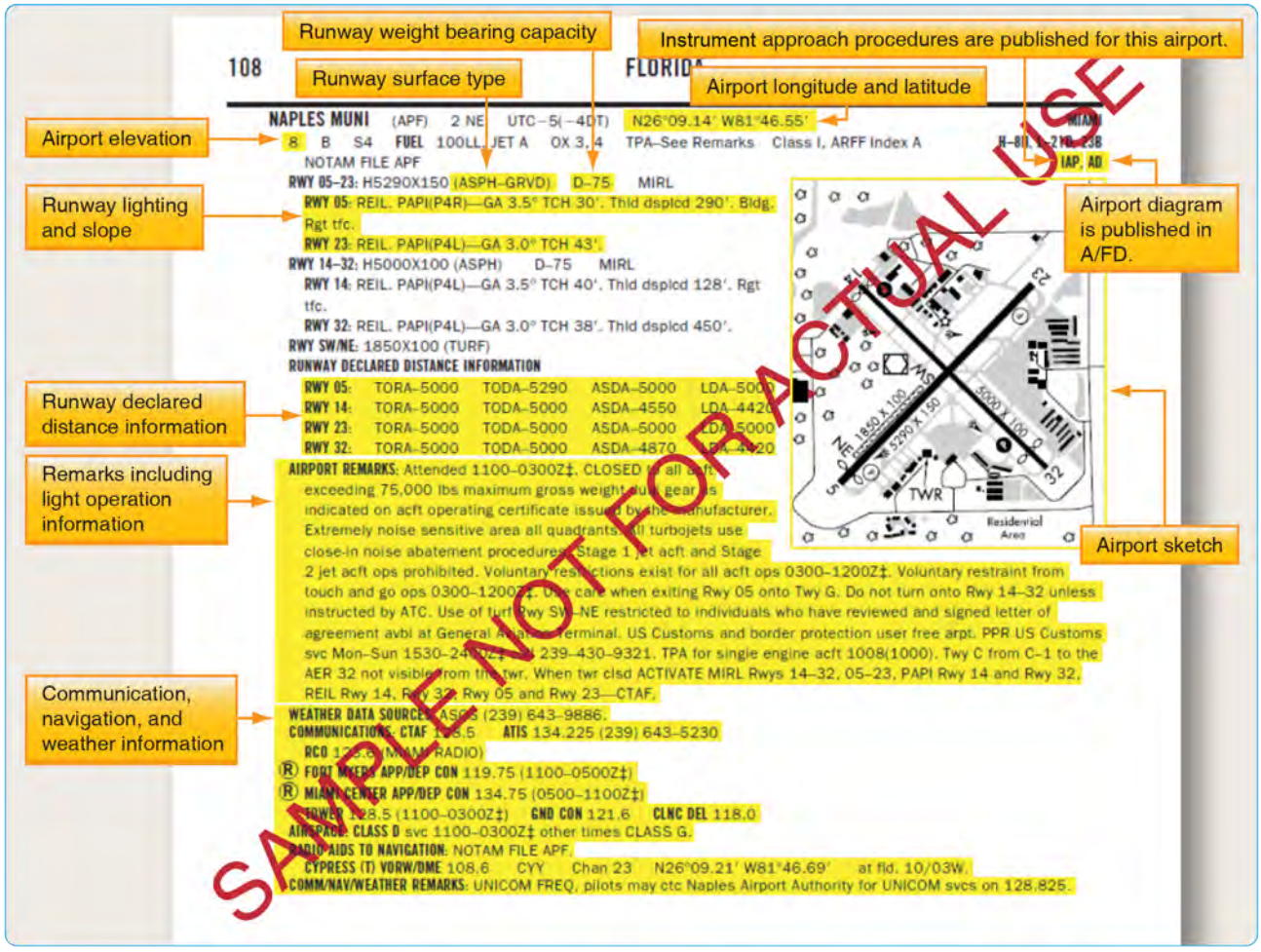


Figure 1-3. Excerpts from the Chart Supplement (Airport Facility Directory section) of Naples Muni, Naples, Florida.

- Clearance bar lights—three yellow in-pavement clearance bar lights used to denote holding positions for aircraft and vehicles. When used for hold points, they are co-located with geographic position markings.

Both flight and ground crews, Part 121 and 135 operators, are required to comply with SMGCS plans when implemented at their specific airport. All airport tenants are responsible for disseminating information to their employees and conducting training in low visibility operating procedures. Anyone operating in conjunction with the SMGCS plan must have a copy of the low visibility taxi route chart for their given airport as these charts outline the taxi routes and other detailed information concerning low visibility operations. These charts are available from private sources outside of the FAA. Government sources for SMGCS charts may be available in the future. Part 91 operators are expected to comply with the guidelines listed in AC 120-57, and should expect "Follow Me" service (when available) when low visibility operations are in use. Any SMGCS outage that would adversely affect operations at the airport is issued as a Notice to Airmen (NOTAM).

Advanced Surface Movement Guidance Control System (A-SMGCS)

With the increasing demand for airports to accommodate higher levels of aircraft movements, it is becoming more difficult for the existing infrastructure to safely handle greater capacities of traffic in all weather conditions. As a result, the FAA is implementing runway safety systems, such as Airport Surface Detection Equipment-Model X (ASDE-X) and Advanced Surface Movement Guidance and Control System (A-SMGCS) at various airports. The data that these systems use comes from surface movement radar and aircraft transponders. The combination of these data sources allows the systems to determine the position and identification of aircraft on the airport movement area and decreases the potential of collisions on airport runways and taxiways.

Additional information concerning airport lighting, markings, and signs can be found in the Aeronautical Information Manual (AIM) and the Pilot's Handbook of

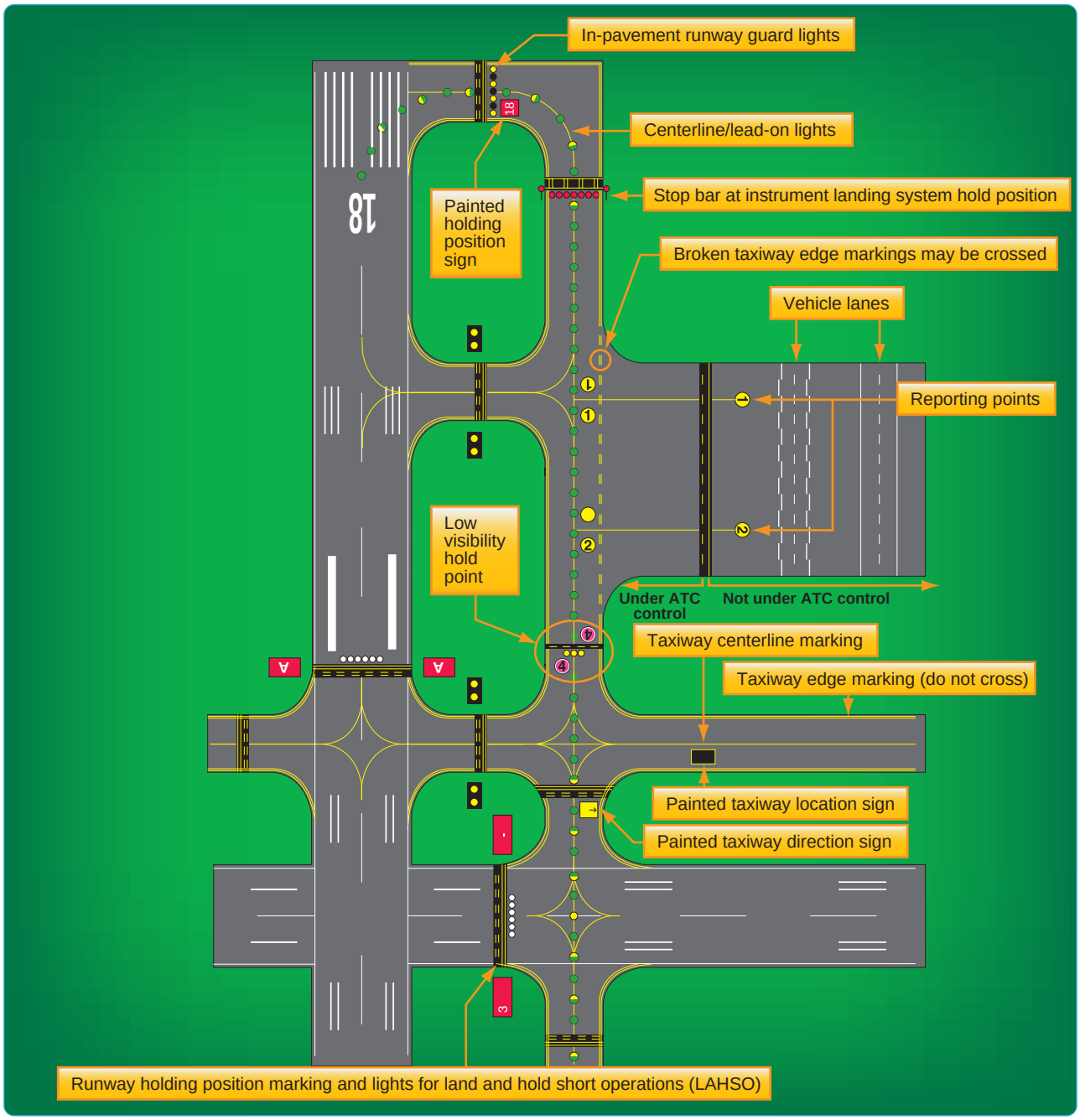


Figure 1-4. Key airport lighting and markings.

Aeronautical Knowledge, appendix 1, as well as on the FAA's website at http://www.faa.gov/airports/runway_safety/.

Airport Signs, Lighting, and Markings

Flight crews use airport lighting, markings, and signs to help maintain situational awareness. These visual aids provide information concerning the aircraft's location on the airport, the taxiway in use, and the runway entrance being used. Overlooking this information can lead to ground accidents that are entirely preventable. If you encounter unfamiliar markings or lighting, contact ATC for clarification and, if necessary, request progressive taxi instructions. Pilots are encouraged to notify the appropriate authorities of erroneous, misleading, or decaying signs or lighting that would contribute to the failure of safe ground operations.

Runway Incursions

On any given day, the NAS may handle almost 200,000 takeoffs and landings. Due to the complex nature of the airport environment and the intricacies of the network of people that make it operate efficiently, the FAA is constantly

looking to maintain the high standard of safety that exists at airports today. Runway safety is one of its top priorities. The FAA defines a runway incursion as: "Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."

The four categories of runway incursions are listed below:

- Category A—a serious incident in which a collision was narrowly avoided.
- Category B—an incident in which separation decreases and there is a significant potential for collision that may result in a time critical corrective/evasive response to avoid a collision.
- Category C—an incident characterized by ample time and/or distance to avoid a collision.
- Category D—an incident that meets the definition of runway incursion, such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and takeoff of aircraft but with no immediate safety consequences.

The FAA recommends that you:

- **Receive and understand all NOTAMs, particularly those concerning airport construction and lighting.**
- **Read back, in full, all clearances involving holding short, line up and wait, and crossing runways to ensure proper understanding.**
- **Abide by the sterile cockpit rule.**
- **Develop operational procedures that minimize distractions during taxiing.**
- **Ask ATC for directions if you are lost or unsure of your position on the airport.**
- **Adhere to takeo and runway crossing clearances in a timely manner.**
- **Position your aircraft so landing tra c can see you.**
- **Monitor radio communications to maintain a situational awareness of other aircraft.**
- **Remain on frequency until instructed to change.**
- **Make sure you know the reduced runway distances and whether or not you can comply before accepting a land and hold short clearance or clearance for shortened runway.**
- **Report confusing airport diagrams to the proper authorities.**
- **Use exterior taxi and landing lights when practical.**

NOTE:
The sterile cockpit rule refers to a concept outlined in 14 CFR Part 121, § 121.542 and 135.100 that requires ight crews to refrain from engaging in activities that could distract them from the performance of their duties during critical phases of ight.

Figure 1-5. FAA recommendations for reducing runway incursions.

Figure 1-5 highlights several steps that reduce the chances of being involved in a runway incursion.

In addition to the SMGCS program, the FAA has implemented additional programs to reduce runway incursions and other surface movement issues. They identified runway hotspots, designed standardized taxi routes, and instituted the Runway Safety Program.

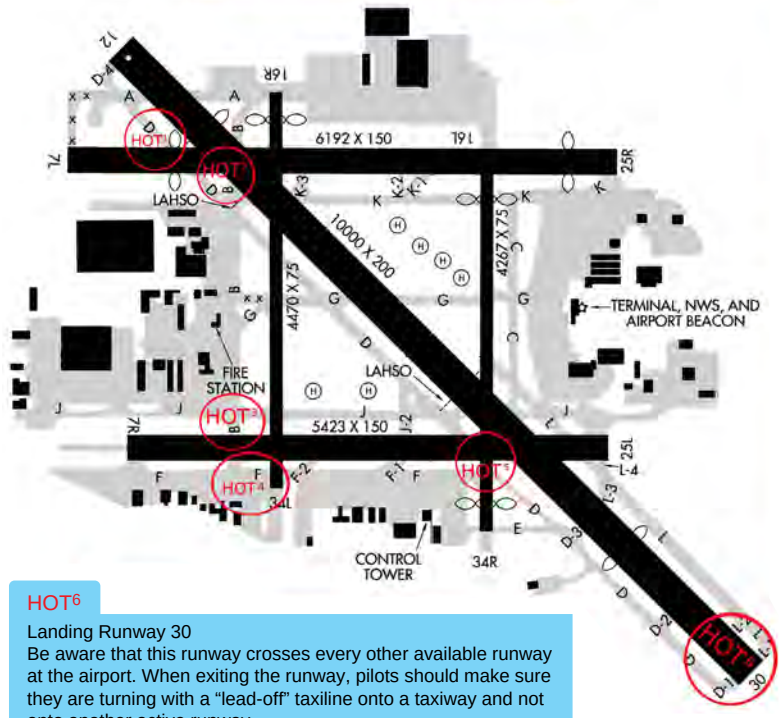
Runway Hotspots

ICAO defines runway hotspots as a location on an aerodrome movement area with a history or potential risk of collision or runway incursion and where heightened attention by pilots and drivers is necessary. Hotspots alert pilots to complex or potentially confusing taxiway geometry that could make surface navigation challenging. Whatever the reason, pilots need to be aware that these hazardous intersections exist, and they should be increasingly vigilant when approaching and taxiing through these intersections. These hotspots are depicted on some airport charts as circled areas. [Figure 1-6] The FAA Office of Runway Safety has links to the FAA regions that maintain a complete list of airports with runway hotspots at http://www.faa.gov/airports/runway_safety.

Standardized Taxi Routes

Standard taxi routes improve ground management at high-density airports, namely those that have airline service. At these airports, typical taxiway traffic patterns used to move aircraft between gate and runway are laid out and coded. The ATC specialist (ATCS) can reduce radio communication time and eliminate taxi instruction misinterpretation by simply clearing the pilot to taxi via a specific, named route. An example of this would be Los Angeles International Airport (KLAX), where North Route is used to transition to Runway 24L. [Figure 1-7] These routes are issued by ground control, and if unable to comply, pilots must advise ground control on initial contact. If for any reason the pilot becomes uncertain as to the correct taxi route, a request should be made for progressive taxi instructions. These step-by-step routing directions are also issued if the controller deems it necessary due to traffic, closed taxiways, airport construction, etc. It is the pilot's responsibility to know if a particular airport has preplanned taxi routes, to be familiar with them, and to have the taxi descriptions in their possession. Specific information about airports that use coded taxiway routes is included in the Notices to Airmen Publication (NTAP).

At Long Beach/Daugherty Field Airport, the following areas have been designated as hot spots, posing a special challenge to pilots.



HOT1

Runway 25R and Taxiway D
Aircraft exiting runway 30 at taxiway A turn left on taxiway D, anticipate reaching their destination, and fail to hold short of runway 25R.

HOT2

Runway 12 and Taxiway B
Aircraft northbound on taxiway B for departure on runway 16R at taxiway intersection D miss the right turn onto taxiway D and enter runways 12, 7L, and 25R.

HOT3

Runway 25L/7R at Taxiway B
Aircraft southbound on taxiway B anticipate reaching their destination parking ramp and fail to hold short of runway 25L/7R.

HOT4

Runway 16R/34L at Taxiway F
Aircraft taxiing to runway 16R from the southwest ramp miss the left turn onto taxiway B, continue eastbound onto taxiway F, and enter runway 16R/34L.

HOT5

Runway 25L at Taxiway D
After completing a runup on inactive runway 34R, aircraft fail to hold short of runway 25L.

HOT6

Landing Runway 30
Be aware that this runway crosses every other available runway at the airport. When exiting the runway, pilots should make sure they are turning with a "lead-off" taxiline onto a taxiway and not onto another active runway.

Figure 1-6. Example of runway hot spots located at Long Beach/Daugherty Field Airport (KLGB).

Standardized Taxi Routes for Los Angeles International Airport (KLAX)
The following Standardized Taxi routes may be issued to all taxiing aircraft.

North Route

Taxi via Charlie (C) towards taxiway Sierra (S) taxi northbound on taxiway Sierra (S), and at Check-point-1 contact Ground Control on frequency 121.65, hold short of taxiway Delta (D). When advised by the north Ground Control, the North Route continues on taxiway Echo (E) to Runway 24L or the gate, whichever applies.

South Route

If the aircraft is west of taxiway Romeo (R), taxi eastbound on taxiway Echo (E) and turn right on taxiway Romeo (R), if the aircraft is east of taxiway Romeo (R), taxi westbound on taxiway Echo (E) and turn left on taxiway Romeo (R). And at Check-point-2, contact Ground Control on frequency 121.75, hold short of taxiway Charlie (C).

West Route

Taxi via taxiway Charlie (C) west-bound, hold short of taxiway Alfa Alfa (AA), contact Ground Control on frequency 121.65 when number one approaching Taxiway AA.

Bridge Route

Taxi via taxiway Echo (E) then south on taxiway Alfa Alfa (AA), and at Check-point-3 contact Ground Control on frequency 121.75, hold short of taxiway Charlie (C). **(AJV-W2 4/23/2010)**

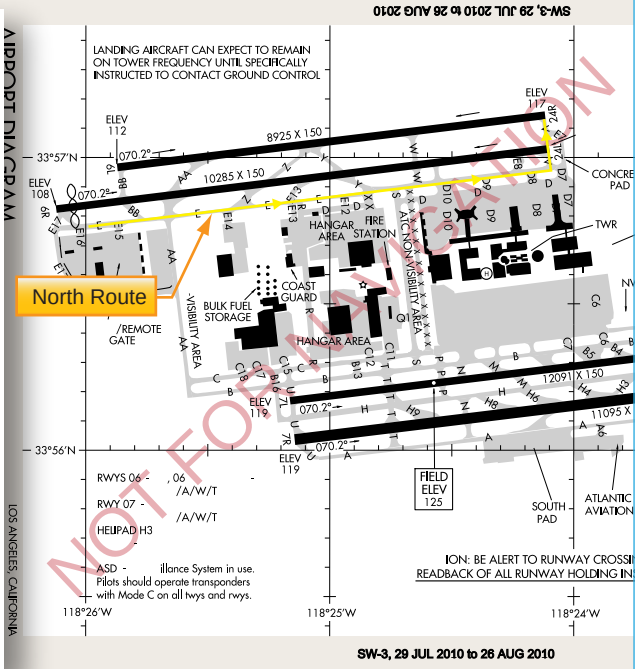


Figure 1-7. Los Angeles International Airport diagram, North Route, and standardized taxi route.