

An aerial photograph of an airport runway and taxiway system. The runway is paved and marked with white dashed lines. The taxiway is also paved and marked with white dashed lines. The surrounding area is green and grassy, with some buildings and parking lots visible. The text "PART THREE" is overlaid in the center of the image in a large, white, serif font with a black outline. Below it, the text "The Aerospace Community" is overlaid in a smaller, white, serif font with a black outline.

# PART THREE

## The Aerospace Community



# Chapter 10 THE AIRPORT

*The aerospace subject is very large and diverse. As seen in previous chapters, there are many subject areas. So far you have learned about history, weather, space and aerodynamics. Now you will learn more about specific functions of aircraft, organizations, training and careers. Together these all make up the aerospace community. Only when all subject areas discussed in this book are working together do we see the whole picture. Each part may stand alone, but doesn't tell the whole story. Each plays a vital role in the aerospace community, but without them altogether, there would not be a synergistic effect. The loss or slowdown of progress in one area would have negative impacts across the entire community. A recent economic boom has invigorated the aerospace community. Commercial aviation is expanding at record paces. Technology has played a key role in this boom.*

*This boom has brought many challenges and benefits that will continue into the future. This will help to ensure the aerospace community will be more and more a part of everyone's life.*



The All-new, World-class Denver International Airport



## Objectives

- Identify** the different parts of a typical airport and describe their functions.
- Describe** how runways are numbered.
- Know** the difference between a controlled and uncontrolled airport.
- Describe** the different lights and their meanings on an airport.
- Describe** three concerns and challenges to a typical airport.



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## The Airport

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Airports come in all sizes and shapes. Some airports are grass fields located on farms, while others are downtown in major cities encompassing tens of square miles. Airports can be civilian, military or a combination of both. They can be for public, private or military use. They can also be for large commercial air carrier operations or for the smaller general aviation aircraft. Regardless of size and function, they all exist for the basic purpose of launching and recovering aircraft. They are made up of several parts, each providing an essential service to accomplish the basic functions of the airport.

### **Runway**

The most important part of the airport is the runway. With the exception of helicopters, the runway is needed for all aircraft to takeoff and land. The runway can be made of grass, gravel, concrete, or asphalt. All runways are identified by a number. The number is the first 2 digits of a compass direction rounded to the nearest 10 degrees. For example, if a runway faces west or 265 to 274 degrees, it is numbered 27. When going the opposite direction on the runway, it changes its number to the reciprocal compass heading. In this example, it would be 09 because 180 degrees from 270 is 090 degrees. Some airports have several runways with the same direction. These runways are given a letter to tell them apart from the other ones, such as 23L for left, or 23R for right. Runways also have other markings on them. A dashed, white line down the center identifies the centerline and a solid white line on each side marks the edge. Special markings identify the runway for use in bad weather. These markings are usually large white blocks that start at the approach end and stop several thousand feet down the runway. All of these different markings tell the pilot something about the runway, just as markings on a road tell drivers about the road.

At night, runways have steady white lights on the edges and sometimes down the middle. At the end of the runway are red lights and at the beginning are green lights. Larger runways can also have approach lighting. These are lights before the actual runway. Usually they are on poles that slope downward towards the threshold or beginning of the runway. They are used by the pilot to line up the airplane with the runway and, in bad weather, help the pilot to find the runway. The approach lights usually flash in sequence so a pilot can more easily see which direction the runway is pointing. Some lighting is pilot-controlled and is available at some smaller airports. Pilots tune in a specific radio frequency and key their microphone. The number of times the microphone is keyed determines the intensity of the lighting. To conserve electricity, the lights shut off automatically after about 15 minutes.

### **Taxiways**

Taxiways are the roads that aircraft use to get to the runway. Pilots taxi their aircraft from one spot on the airport to another by using these taxiways. Each airport has its own pattern of taxiways. The most common taxiway is called the parallel taxiway. It gets its name because it parallels the runway. Taxiways are usually narrower than runways and have different markings and names so pilots do not



**Aerial View of an Airport Showing Runways, Taxiways and the Ramp Area**

confuse them with runways. Letters instead of numbers name taxiways. An example of this would be taxiway “C.” The centerline is a solid yellow line instead of a dashed white line and solid yellow lines sometimes mark the sides.

### ***Ramp and Hangars***

The ramp and hangars are the parking spots for aircraft. The ramp is a large paved area for parking airplanes. Most large aircraft are parked outside on the ramp because of the large open space and expense of a hangar. Most smaller aircraft are placed in hangars. A hangar is nothing more than a garage for airplanes. It provides a protected place for the aircraft from weather damage.

It also is handy for aircraft maintenance. Aircraft parked on the ramp are usually tied down. This is true only for light aircraft because strong winds can easily lift a small airplane and damage it. The ramp is where loading and unloading of airplanes takes place. There are many vehicles on the ramp to perform services for the aircraft. They can bring fuel, baggage, passengers and maintenance personnel to the aircraft. It is a very dangerous place to be. A person on the ramp must constantly watch for aircraft taxiing or starting their engines. Vehicles driving on the ramp also pose a threat to people working on the ramp.



## Control Tower

The control tower is often the first thing noticed at an airport. It is usually the highest structure on the airfield. The height is necessary so the tower controllers can see all the movement on the airport. This helps them to reduce congestion between aircraft and vehicles moving about the airfield. The tower has many functions. Its primary function is to control the runway. It does this by giving permission to aircraft for takeoff or landing. Permission is also given to vehicles for maintenance on the runway. This could be to fix holes, remove snow or repair lights. The goal is to restrict all traffic on the runway to only those approved by the tower. The tower also controls the movement of aircraft on the ground. They watch all aircraft and give permission for them to move. They are like traffic police that direct the flow of aircraft to avoid collisions.

The tower is also the source of the Automated Terminal Information System (ATIS). ATIS is a voice recording of a tower controller. The recording tells pilots about the wind, clouds, visibility and any restrictions that the runways may have. It is updated at least every hour. During changing weather conditions, it is changed much more frequently. ATIS allows the tower controllers to direct their attention to controlling traffic rather than to discussing the weather and restrictions with aircraft. To perform all these functions, they use different radio frequencies. This ensures separation of the functions because different permission or information is given on different frequencies.



Control Tower

Some airports do not have control towers. There are many more airports without towers than with towers. These airports are called uncontrolled airports. At these airports, pilots must use common procedures to reduce the chances of collisions on the ground and in the air. Most of the uncontrolled airports are not very large and most small airplanes fly in and out of these airfields. Larger commercial airliners almost always land and takeoff at controlled airports. Some airports have towers, but may not operate 24 hours a day. During times when they are not operating, the airport changes from a controlled airport to an uncontrolled airport.

FBO is a term that many pilots and ground support use in daily conversations; however, few outside the aviation world know what it means. An FBO is a Fixed-base Operation. The FBO is basically a service station for airplanes. The FBO is where most of the activity occurs at smaller airports and it can be a small office or a large building complete with several hangars. The purpose of the FBO is to provide some essential services to pilots. They provide pilot training and instruction, fuel, maintenance, rental aircraft, aircraft sales and



charter flights. Not all FBOs offer all of these services, but most provide at least a few.

### **Passenger Terminal**

The passenger terminal is found at larger airports. At smaller airports, passengers are usually found at the FBO. Terminals are designed to handle people, baggage and cargo. Most have large waiting rooms for passengers to relax while waiting to board their aircraft. They have places to eat, purchase tickets and rent cars. Some large passenger terminals have jetways. These are long, square tubes that reach out to the aircraft and allow passengers to walk to the aircraft and board without stepping outside. Underneath the terminal are places for transferring baggage and cargo from one aircraft to another or to the baggage claim area. Aircraft park on the ramp next to the terminal at places called gates. Gates are places where passengers wait to board their airplane. Large terminals have many gates to accommodate all arriving and departing aircraft.



**Passenger Terminal**

### **Other Facilities**

There are numerous other facilities located at airports. One is the National Weather Service, which is found at medium and large airports. It provides weather information to Flight Service Stations (FSS). The FSS provides all types of weather information to pilots. It gives forecasts and current weather along the route of flight. The FSS also takes care of flight plans and can help pilots with special requests. Flight plans are a description of the planned route of flight an aircraft is going to take to get somewhere.

The fire station is an essential service at the airport in case of an accident. At larger airports, there are several stations located at different parts of the airport. Many large airports have what looks like a burned out aircraft surrounded by water. This is a fire training area. Firefighters occasionally set the aircraft on fire and practice putting the fire out to improve their skills.

There are also facilities for storing auxiliary equipment. This equipment is used to service aircraft before and after flights. It also requires a place for storage and maintenance.

One navigation aid that is very familiar at night is the rotating beacon. This beacon is used by pilots to help them locate the airport at night or in bad weather. At civilian airports, it consists of a green light and a white light. It is frequently located atop the tower or on top of another tall structure, such as a water tower. It rotates in a circle and can be seen for many miles. A military field also has a beacon, but has a device that splits the white light into two beams. When viewed, it looks like a green flash, then two quick white flashes. This difference helps pilots to distinguish between the two types of airports.



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## Airport Concerns and Challenges

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One of the biggest concerns of airports is wildlife. Sometimes animals, especially birds, wander into the path of aircraft on the runway. Aircraft striking wildlife has caused many aircraft accidents. Birds are the biggest problem.

Larger game animals are another wildlife hazard. Airports sometimes use cattle grates and fences to keep animals away from the runway. Grates are placed across roads where the road passes through a fence. Sometimes these efforts fail and animals are tranquilized and moved, or simply killed.



**Birdstrike Damage**

The noise factor is another concern. Airplanes are not very quiet when operating near the ground. When encroachment becomes a problem, airports develop noise abatement procedures. These usually involve a very quick climb by the aircraft after takeoff. The aircraft also try not to fly over certain areas on the ground. Communities can help to minimize the encroachment problem by not allowing building near airports.

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## A Look at the Future

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An aircraft known as the *tiltrotor* may revolutionize both military and commercial aviation in the near future. Because of its vertical takeoff and landing capabilities, it has the potential to serve without an airport. Because of its high speed, once it reaches straight and level flight, it can travel between airports much faster than a helicopter. It has the potential to fly from the center of one city to the center of another population center almost as quickly as a turboprop aircraft. This aircraft may be the future of short-term air travel, and airports may be used only for very long-distance flight operations.



*The Tiltrotor (Bell Helicopter Textron)*



## Key Terms and Concepts

- airports
- uncontrolled airports
- runways
- runway designations
- threshold
- taxiways
- ramps
- hangars
- control tower
- Automated Terminal Information System (ATIS)
- Fixed-Base Operation (FBO)
- passenger terminal
- Flight Service Station (FSS)
- encroachment
- noise abatement procedures



## ? Test Your Knowledge ?

### MATCHING

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1. Match the terms:

- |                           |                                                                     |
|---------------------------|---------------------------------------------------------------------|
| a. runway                 | (1) planes use these to get from one place to another on an airport |
| b. control tower          | (2) parking area for aircraft                                       |
| c. taxiways               | (3) place to protect smaller aircraft from the elements             |
| d. ramp                   | (4) primary function is to control the runway                       |
| e. passenger terminal     | (5) similar to a service station for aircraft                       |
| f. FBO                    | (6) place to board aircraft and retrieve baggage                    |
| g. hangar                 | (7) provides weather forecasts to pilots, assists with flight plans |
| h. Flight Service Station | (8) surface aircraft use to takeoff and land                        |

### FILL IN THE BLANK

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- An airport with an operating control tower is a \_\_\_\_\_ field.  
An airport without a control tower is an \_\_\_\_\_ field.
- A \_\_\_\_\_ field has a beacon with one green and two white rotating lights.
- Taxiway lights are \_\_\_\_\_ colored.
- The lights used by the pilots to line up with the runway are \_\_\_\_\_ lights.
- Runway edge lighting is \_\_\_\_\_ colored.

### TRUE OR FALSE

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- Some runways have lights that can be adjusted in intensity by the pilot tuning the designated frequency and then keying his microphone.
- Taxiways are the same width as runways, but are identified by a letter rather than a number.
- Aircraft starting engines, taxiing aircraft and numerous vehicles are several of the dangers posed to personnel working on the ramp of an airport.

### SHORT ANSWER

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- Your airplane lines up on the runway and the compass heading reads 257 degrees. What is the runway number? After landing on another runway, your compass reads 033 degrees. What is that runway number? How are parallel runways delineated?
- What does the acronym ATIS stand for? What is it? How does it help the congested environment near an airport?
- List the three major challenges facing airports today.