BASICS FOR AIR TRAFFIC CONTROL – AIRPORTS

MODULE OVERVIEW

Purpose: The purpose of this module is to describe areas of an airport, the different types of airport markings, signs, lighting aids, and their uses.

MODULE OUTLINE

Lesson: Airport Markings

Purpose: The purpose of this lesson is to identify marking aids used by airports to provide guidance to pilots operating on the airport during arriving, departing, and taxiing procedures.

Objectives:

- Identify areas of an airport
- Identify airport markings

Topics:

- Airport
- Movement Areas/Non-Movement Areas
- Airport Marking Aids
- Pavement Markings
- Runway Designators
- Runway Centerlines
- Knowledge Check
- Runway Threshold Markings
- Runway Aiming Point Markings
- Runway Touchdown Zone Markings
- Approaches and Runway Markings
  - Runway with No Instrument Approach (Visual RWY)
  - Runway with a Non-Precision Instrument Approach
  - Runway with a Precision Instrument Approach
- Runway Side Stripe Markings
- Displaced Threshold
- Demarcation Bar and Chevrons
- Blast Pads, Stop-ways, and EMAS
- Closed Runway and Taxiway
  - Permanently Closed
  - Temporarily Closed
- Knowledge Check
- Review/Summary

Question and Answer Session – *Parking Lot*

Lesson: Airport Signs

Purpose: The purpose of this lesson is to identify signs used by airports to provide guidance to pilots.

Objective:

- Identify airport signs

Topics:

- Holding Signs and Taxiway Markings
- Runway Signs
  - Runway Location Sign
  - Runway Distance Remaining Sign
- Mandatory Instruction Signs
- Taxiway Location Signs
- Taxiway Direction Signs
- Combination of Taxiway Signs
- Surface Painted Taxiway Signs
- Recommended Markings for Helicopter Landing Areas
  - Civil Heliport
  - Hospital Heliport
  - Closed Heliport
- Knowledge Check
- Review/Summary

Question and Answer Session – *Parking Lot*

Activity – Airport Markings and Signs

Lesson: Airport Lighting

Purpose: The purpose of this lesson is to identify airport lighting that provides guidance to pilots during approach, departure, and taxiing.

Objective:

- Identify airport lighting

Topics:

- Airport Beacons
- Runway Lights
  - Runway End Identifier Lights (REILs)
  - Runway Edge Light System
  - In-Runway Lighting
- Knowledge Check
- Visual Glideslope Indicators
- Approach Light Systems (ALSs)
- Taxiway Lights
  - Runway Guard Lights
  - Stop Bar Lights
  - Lead-on Lights
  - Taxiway Edge Lights
  - Taxiway Centerline Lights
- Runway Status Lights
  - Runway Entrance Lights (RELs)
  - Takeoff Hold Lights (THLs)
- Knowledge Check
- Review/Summary

Question and Answer Session – *Parking Lot*
Activity – Airport Lighting
Question and Answer Session – *Parking Lot*
End-of-Module (EOM) Test

INTRODUCTION

LESSONS	■ Airport Markings ■ Airport Signs ■ Airport Lighting
TOTAL ESTIMATED RUN TIME	3 hrs. 37 mins.
MODULE CONTENT	■ Module Overview ■ Lesson: Airport Markings ■ Q&A Session – Parking Lot ■ Lesson: Airport Signs ■ Q&A Session – Parking Lot ■ Activity: Airport Markings and Signs ■ Lesson: Airport Lighting ■ Q&A Session – Parking Lot ■ Activity: Airport Lighting ■ Q&A Session – Parking Lot ■ End-of-Module Test

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ Instruct students to select the ***Airports*** module link within Blackboard ■ Instruct students to read the module introduction and then wait quietly for additional instructions	Blackboard
	EST. RUN TIME
	2 mins.

Flight safety is dependent on the proper airport markings and your knowledge of these markings.

Air traffic controllers must have a thorough understanding of airport markings and lighting systems, which ensure the safe and orderly movement of aircraft around the airport, to issue control instructions.

The purpose of this module is to describe areas of an airport, the different types of airport markings, signs, lighting aids, and their uses.

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ **ENABLE *Airport Markings*** lesson in Blackboard ■ Instruct students to navigate to the ***Airport Markings*** lesson in Blackboard ■ Instruct students to work individually through the lesson content ■ Upon completion of the lesson, students should review previously introduced content or wait quietly until other students have completed	Blackboard **EST. RUN TIME** 20 mins.

AIRPORT MARKINGS

Purpose: The purpose of this lesson is to identify marking aids used by airports to provide guidance to pilots operating on the airport during arriving, departing, and taxiing procedures.

Objectives:

- Identify areas of an airport
- Identify airport markings

References for this lesson are as follows:

- FAA Order JO 7110.65, Air Traffic Control
- Aeronautical Information Manual (AIM)
- Advisory Circular (AC) 150/5340-1

Airport

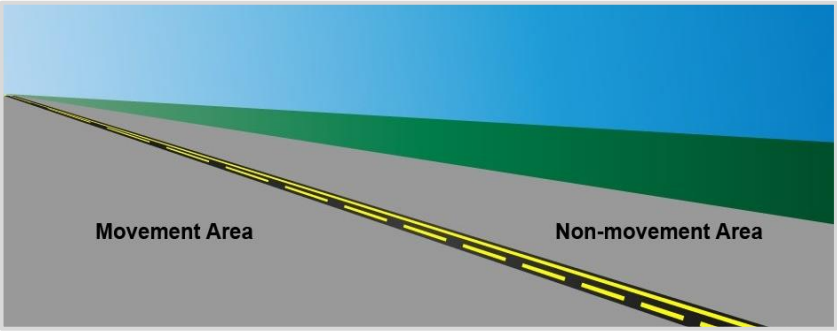
Airport	
An **airport** is an area on land or water that is used or intended to be used for the landing and takeoff of aircraft and includes its buildings and facilities, if any.	
Heliport/Helipad	
A **heliport** is an area on land or water that is used or intended to be used for the landing and takeoff of helicopters and includes its buildings and facilities, if any. A **helipad** is a small, designated area, usually with a prepared surface, on a heliport, airport, landing/takeoff area, apron/ramp, or movement area used for takeoff, landing, or parking of helicopters.	

Movement Areas/Non-Movement Areas

Airports and heliport/helipads contain both movement areas and non-movement areas.

Movement areas are the runways, taxiways, and other areas of an airport/heliport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas.

Non-movement areas are the taxiways and apron (ramp) areas not under the control of air traffic.



At those airports/heliports with a tower, specific approval for entry onto movement areas must be obtained from Air Traffic Control (ATC).

Movement of aircraft or vehicles on non-movement areas is the responsibility of the pilot, the aircraft operator, or the airport management.

Airport Marking Aids

Airport markings are used on runway and taxiway surfaces to identify a specific runway, runway threshold, centerline, hold line, etc.

Note: *Not all airport markings will be taught in this lesson. The markings covered in this lesson reflect current FAA recommended standards.*

Pavement Markings

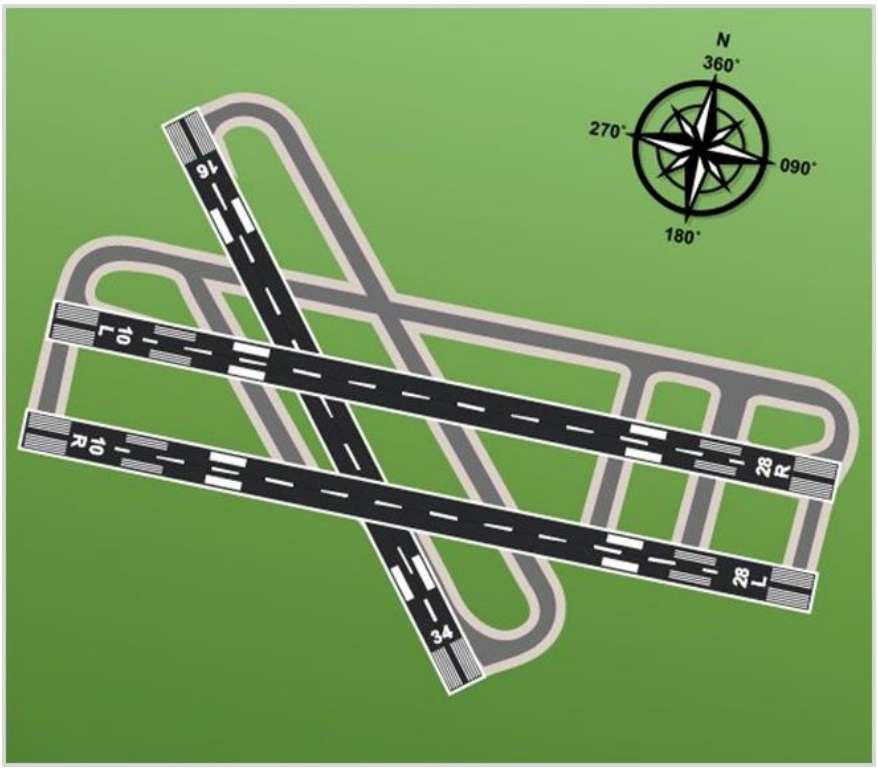
Colors of pavement markings identify airport areas as follows:

- White: Runways and landing areas (including heliports)
- Yellow: Taxiways, closed and hazardous areas, and holding positions

Runway Designators

Runway designators identify runways by a number or a number and letter determined with respect to the direction (heading) of approach.

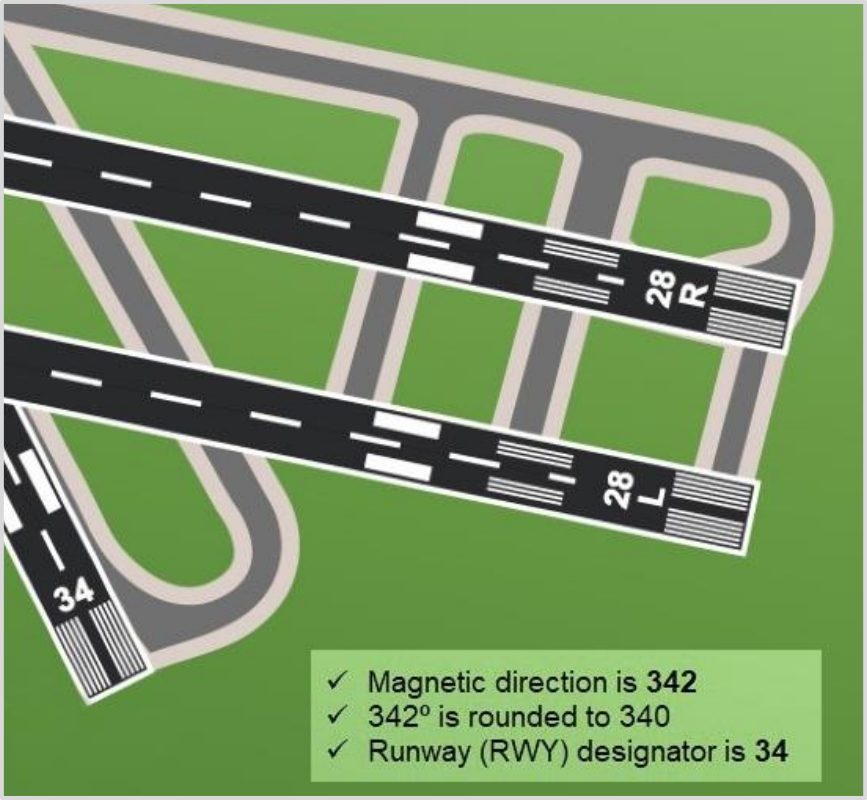
- Each runway has two designators, one at each end
- Each runway is determined by the runway centerline's magnetic direction (3 digits), rounded to the nearest 10 degrees
  - **4s** and lower are rounded down
  - **5s** could be either rounded up or down
  - **6s** and higher are rounded up



Example:

4s	The magnetic direction 163 is rounded down to 160 degrees, runway 16.
5s	The magnetic direction 345 is rounded down to 340 degrees, runway 34, or up to 350 degrees, runway 35.
6s	The magnetic direction 276 is rounded up to 280 degrees, runway 28.

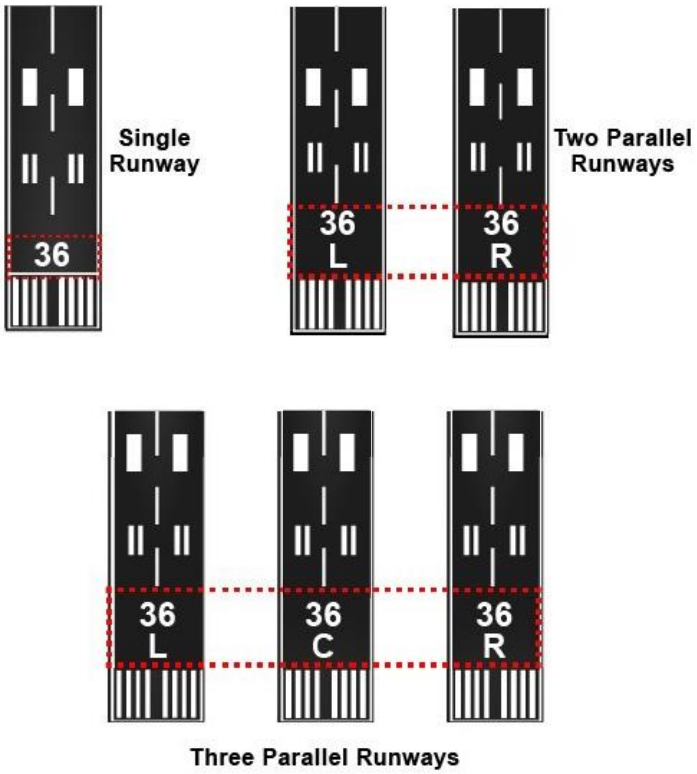
- Only the first two numbers of the magnetic direction are used to determine runway designators; however, if the first number is zero, it is deleted.
  - 360º and 000º are the same
  - In ATC, 000º is **NOT** used



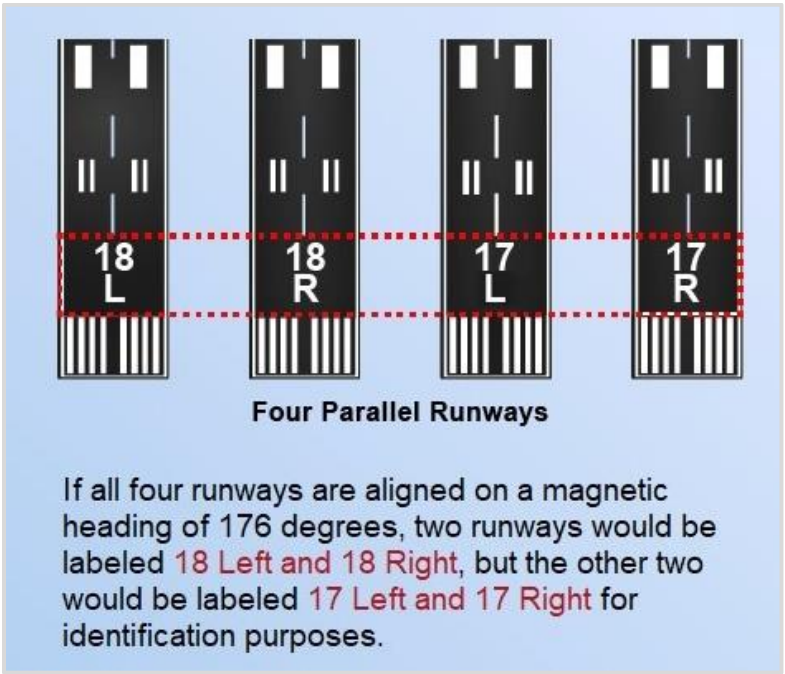
Example:

004º	=	360	=	RWY 36		
030º	=	030	=	RWY 03	=	RWY 3 *(leading zero dropped)*
086º	=	090	=	RWY 09	=	RWY 9 *(leading zero dropped)*
115º	=	120	=	RWY 12		
		110		RWY 11		

- Single runways are identified by numbers only
- Parallel runways use a supplemental letter in the order shown, from left to right
  - Two runways: L, R
  - Three runways: L, C, R
- If an airport has more than three parallel runways, they will **NOT** all have the same number, even if they are all aligned on the same magnetic heading
  - Four runways: L, R, L, R



Example:

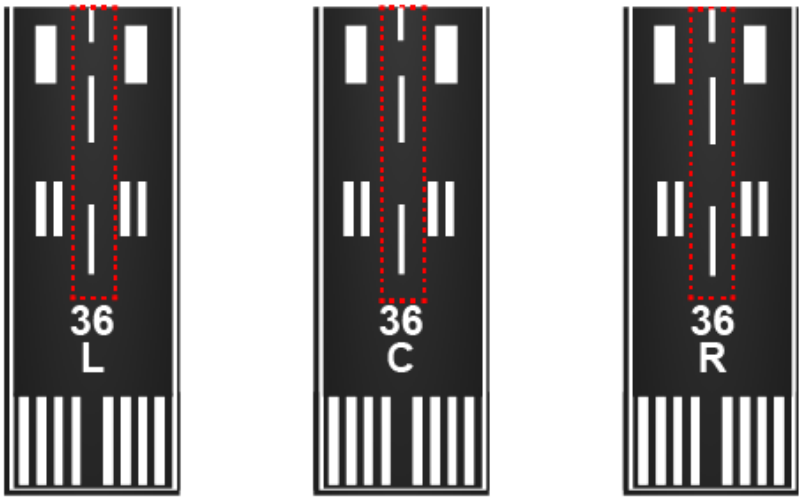


Runway Centerlines

Runway centerline markings identify the physical center of the runway and provide alignment guidance to pilots during takeoff and landing operations.

Runway centerlines consist of a line of uniformly spaced stripes and gaps.

- Runway centerline markings are white



Knowledge Check A

REVIEW what you have learned so far about airport marking aids and signs. ANSWER the questions below.

1. At an airport with a tower, when is movement permitted in a designated movement area? *(Select the correct answer.)*
   - ❑ Only after obtaining approval in areas not visible to ATC
   - ❑ Movement can occur at anytime
   - ❑ **Only after obtaining approval from ATC**

2. How would you designate a runway with a magnetic heading of 094 degrees? *(Select the correct answer.)*
   - ❑ RWY 90
   - ❑ **RWY 9**
   - ❑ RWY 09

3. How would you designate a runway with a magnetic heading of 005 degrees? *(Select the correct answer.)*
   - ❑ RWY 1
   - ❑ RWY 6 or 10
   - ❑ **RWY 36 or 1**

Runway Threshold Markings

Runway threshold markings closely identify the actual beginning point of the runway threshold used for landings.

Runway threshold markings consist of a pattern of longitudinal stripes of uniform dimension spaced symmetrically about the runway centerline.

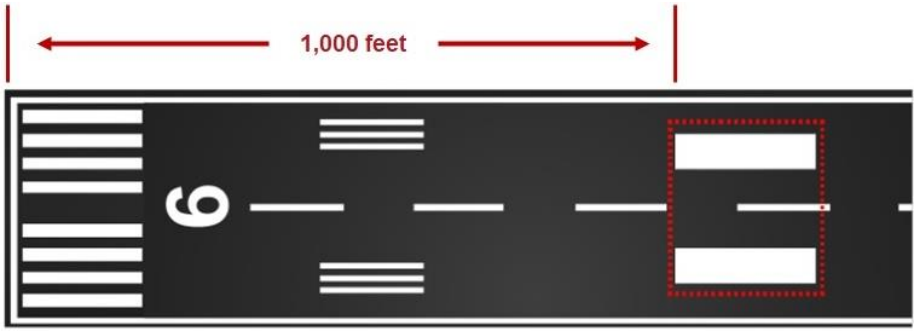
- Runway threshold markings are white
- The number of longitudinal stripes illustrates the runway width
- The standard length of the longitudinal stripes is 150 feet

Number of Stripes	Runway Width
4	60 feet
6	75 feet
8	100 feet
12	150 feet
16	200 feet

Runway Aiming Point Markings

The runway aiming point markings provide a visual aiming point for landing operations.

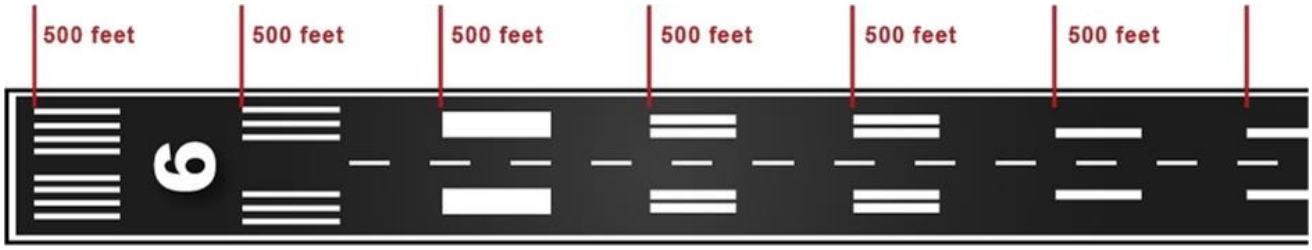
- Runway aiming point markings are white
- The beginning of the markings is approximately 1,000 feet from the landing threshold



Runway Touchdown Zone Markings

Runway touchdown zone markings identify the touchdown zone along a precision runway in 500-foot increments.

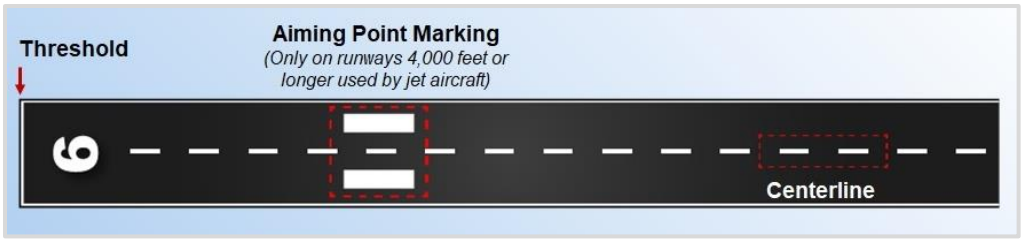
- Consist of symmetrically arranged pairs of rectangular bars in groups of one, two, and three along the centerline
- Touchdown zone markings are white
- The aiming point is included in the touchdown zone markings



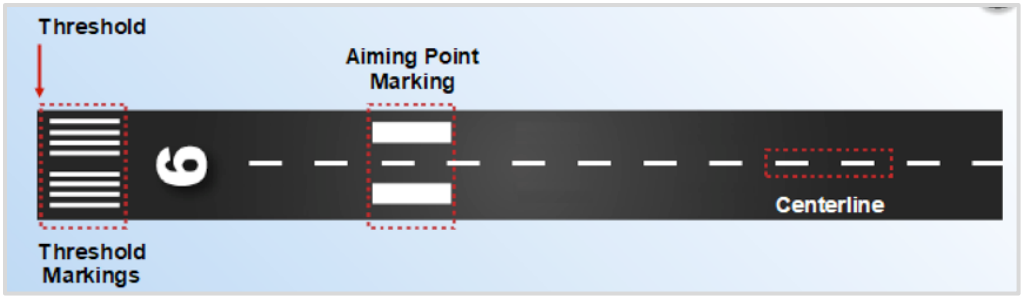
Approaches and Runway Markings

Runway markings are determined by the type of approach available for the runway.

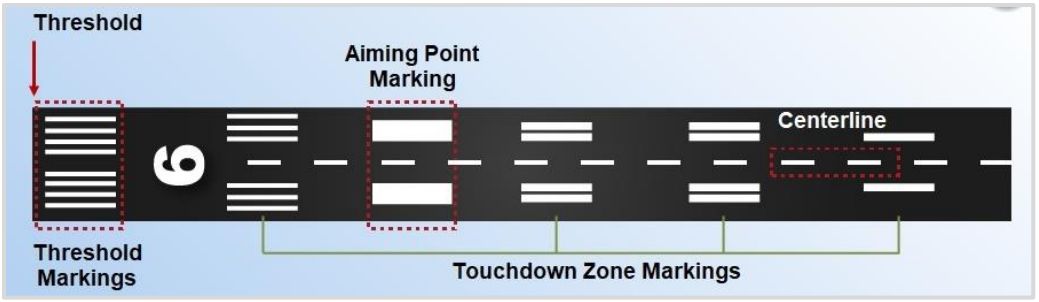
Runway with no instrument approach (Visual RWY)



Runway with a non-precision instrument approach



Runway with a precision instrument approach



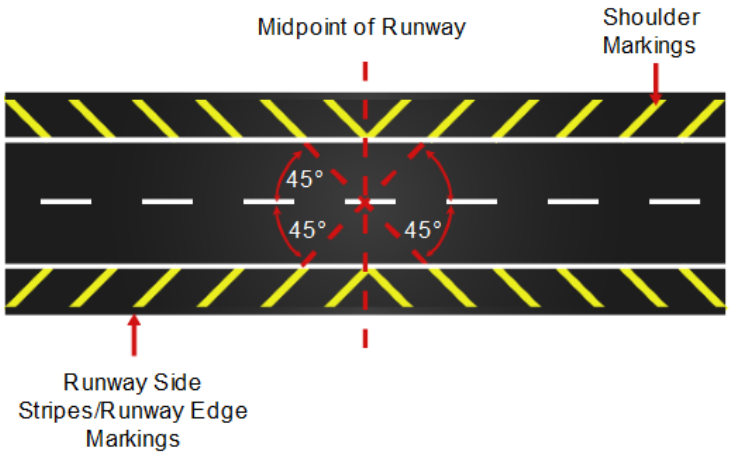
Runway Side Stripe Markings

Runway side stripe markings delineate the **edges of the runway**. They provide a visual contrast between the runway and abutting terrain or shoulders. Side stripes consist of continuous white stripes located on each side of the runway.

- Runway side stripes are white
- Runway side stripes extend the full length of the runway

The **runway shoulder marking** is used, when needed, as a supplement to further delineate a paved runway shoulder that pilots have mistaken or are likely to mistake as usable runway.

- Markings are yellow
- Stripes start at the **runway midpoint,** are slanted at a 45º angle to the runway centerline
- Are optional



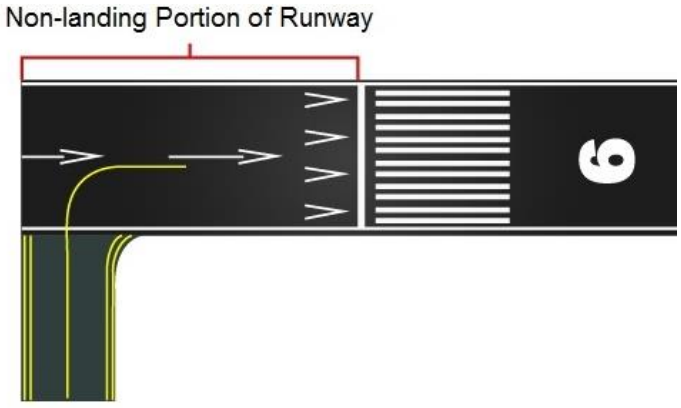
Displaced Threshold

A displaced threshold is a threshold located at a point on the runway other than the designated beginning of the runway.

- Reduces the length of runway available for landings

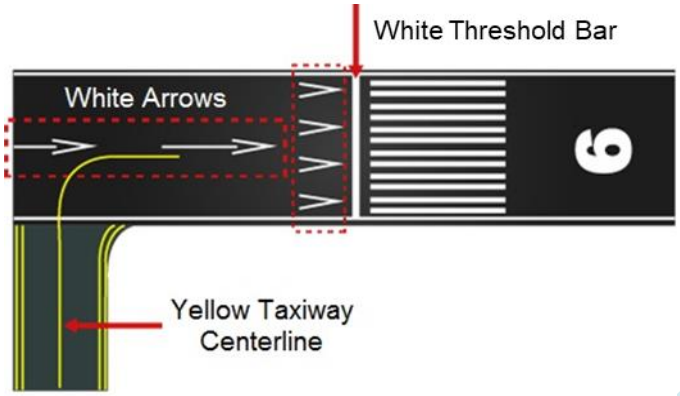
The portion of the runway that extends from the beginning of the runway to the displaced threshold is not available for landing, termed the **non-landing portion.** It is available for:

- Takeoffs in either direction
- Landing rollouts from the opposite direction



Displaced threshold markings are on the non-landing portion of the runway.

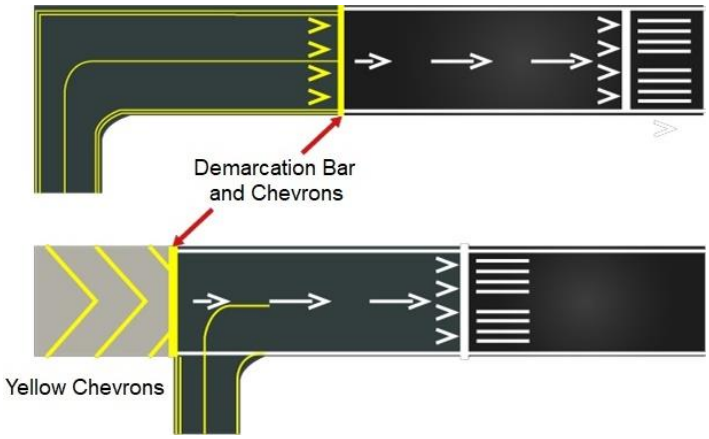
- A 10-foot wide **white threshold bar** is positioned perpendicular to the centerline across the width of runway at the point of displacement
- **Four white arrowheads** with uniform spacing are located adjacent to the threshold bar, pointing in the direction of landing
- White arrows are located along the centerline in the area between the beginning of the runway and the displaced threshold
- **Yellow taxiway centerline** markings may extend into the displaced area



Demarcation Bar and Chevrons

A **demarcation bar** delineates a runway with a displaced threshold from a blast pad, stop-way, or an aligned taxiway that precedes the runway.

The chevron marking identifies paved blast pads, stop-ways, and Engineered Materials Arresting Systems (EMASs) in relation to the end of the runway.



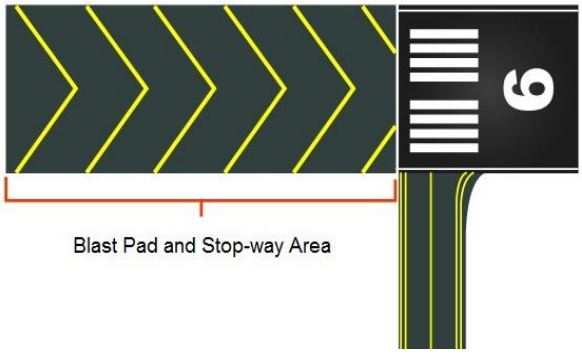
- The demarcation bar and chevrons are yellow

Blast Pads, Stop-ways, and EMAS

A **blast pad** is a surface adjacent to the ends of a runway provided to reduce the erosive effect of jet blast and propeller wash.

A **stop-way** is an area beyond the takeoff runway able to support the airplane during an aborted takeoff.

EMASs are constructed of high energy-absorbing materials of selected strength and are located in the safety area beyond the end of the runway.



- Blast pad, stop-way, and EMAS areas are marked with large yellow chevrons pointing in the direction of the threshold

Closed Runway and Taxiway

A closed runway or taxiway is one that is unusable and may be hazardous even though it may appear usable.

Permanently Closed

- During permanent closings:
  - Lighting circuits are disconnected
  - Yellow crosses are painted at each end of the runway and at 1,000-foot intervals
  - Threshold, runway designation, and touchdown zone markings are obliterated

Temporarily Closed

- During temporary closings:
  - The airport operator may use a raised-lighted yellow “X” on each runway end
  - The airport operator may choose to place a yellow “X” at each end of the runway over the runway designation markings

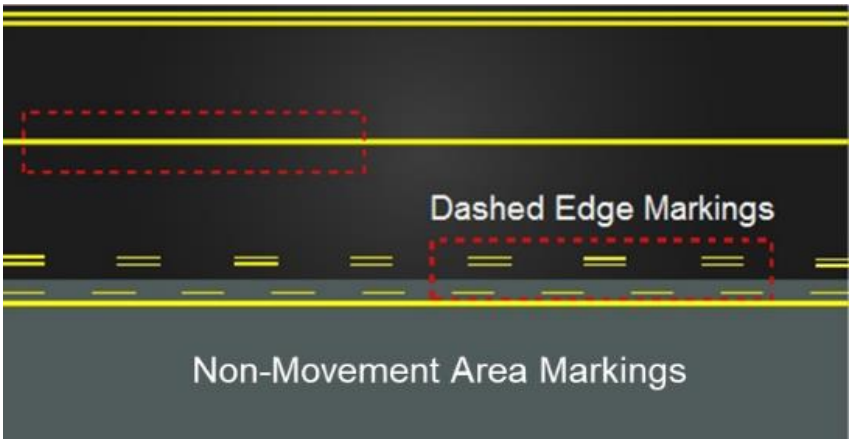
- Temporarily closed taxiways are usually treated as hazardous areas:
  - No aircraft may enter
  - The taxiway is marked with a yellow “X” or blocked with barricades

Taxiway Markings

- The taxiway centerline marking provides pilots continuous visual guidance to permit taxiing along a designated path.
  - All taxiways, regardless of their width, have a painted taxiway centerline
  - Taxiway centerline marking is a continuous yellow line
- Taxiway edge markings alert pilots where the demarcation line exists between usable pavement for taxi operations and unusable pavement.
  - Continuous taxiway edge markings are used to delineate the taxiway edge from the shoulder or some other area not intended for use by pilots
  - Dashed taxiway edge markings are used to indicate an area where pilots are permitted to cross over this surface marking

Continuous Edge Markings

- Non-Movement Area Boundary Marking
  - Delineates the movement area from the non-movement area
  - Consists of one dashed and one solid yellow line
  - Solid line is on the non-movement area side
  - Non-movement area markings are optional for the airport operator
  - All taxiway markings are yellow; in some cases, black borders may be painted along the taxiway markings



Knowledge Check B

REVIEW what you have learned so far about airport marking aids and signs. ANSWER the questions below.

1. A runway with a non-precision approach does **NOT** have which of the following runway markings? *(Select the correct answer.)*
   - ❑ Threshold
   - ❑ **Touchdown zone**
   - ❑ Aiming point

2. Where are displaced threshold markings located on a runway? *(Select all correct answers that apply.)*
   - ❑ **At a point on the runway other than the designated beginning of the runway**
   - ❑ Extending the full length of the runway
   - ❑ **At the end of the non-landing portion of the runway**

3. Which surface on a runway is marked with large yellow chevrons? *(Select the correct answer.)*
   - ❑ **Blast pad**
   - ❑ Closed runway
   - ❑ Displaced threshold

Airport Markings Summary

Much of the risk of aircraft collision occurs on the ground, not in the air. It may be an aircraft or an airport vehicle that is not where it's supposed to be, or that it is positioned too close to an active runaway. Uniformity in airport markings enhances safety and improves efficiency. As a controller, you must monitor airport traffic to ensure they follow and obey all airport marking aids.

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ Review content presented in the ***Airport Markings*** lesson ■ Navigate to the ***Parking Lot*** link within Blackboard, and review any student questions ■ Address ***Parking Lot*** questions and facilitate a brief discussion of the lesson content	Facilitated Discussion **EST. RUN TIME** 15 mins.

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ **ENABLE *Airport Signs*** lesson in Blackboard ■ Instruct students to navigate to the ***Airport Signs*** lesson in Blackboard ■ Instruct students to work individually through the lesson content ■ Upon completion of the lesson, students should review previously introduced content or wait quietly until other students have completed	Blackboard **EST. RUN TIME** 15 mins.

AIRPORT SIGNS

Purpose: The purpose of this lesson is to identify signs used by airports to provide guidance to pilots.

Objective:

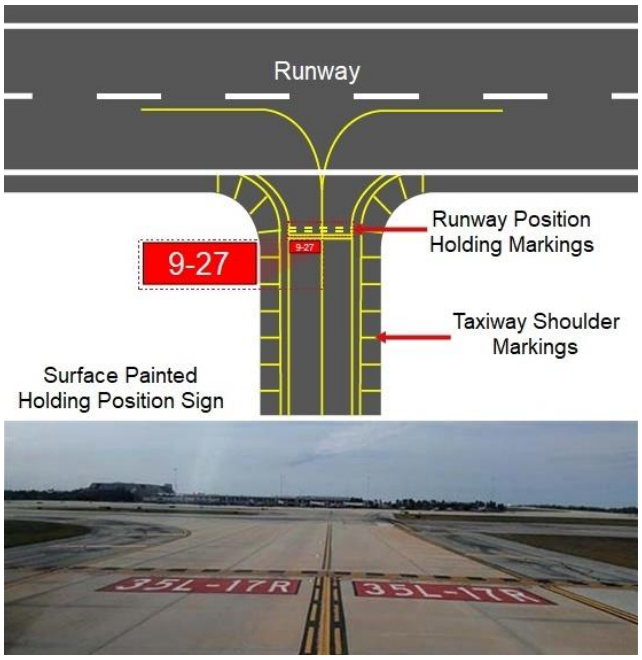
- Identify airport signs

References for this lesson are as follows:

- FAA Order JO 7110.65, Air Traffic Control
- Aeronautical Information Manual (AIM)

Holding Signs and Taxiway Markings

- **Taxiway shoulder markings** indicate that the pavement is **NOT** intended for use by aircraft and may be unable to support an aircraft.
  - These markings are optional and are painted yellow
- The **surface painted holding position sign** is an example of a mandatory instruction sign.
  - They have a red background with white text
  - The one in this graphic indicates that the aircraft shall hold short of RWY 9-27 at an intersection
- **Runway holding position markings** consist of four yellow lines, two solid and two dashed, extending across the width of the taxiway or runway.
  - The solid lines are always on the side where the aircraft is to hold



Runway Signs

Runway Location Sign	Runway Distance Remaining Sign
	
Runway location signs have a black background with yellow inscriptions and a yellow border. ■ The inscription is the designator of the runway on which the aircraft is located	**Runway distance remaining signs** have a black background with white inscriptions. ■ These signs inform the pilot of the distance (in thousands of feet) of landing runway remaining ■ They are also used by tower controllers to apply runway separation standards

Mandatory Instruction Signs

Mandatory instruction signs have a red background with a white inscription. They are used to denote an entrance to a runway or critical area, and areas where an aircraft is prohibited from entering without an ATC clearance.

Typical mandatory signs and application are:

- Runway holding position
- Runway approach area holding position
- ILS critical holding area
- No entry sign, typically this sign would be located on a taxiway intended to be used in only one direction

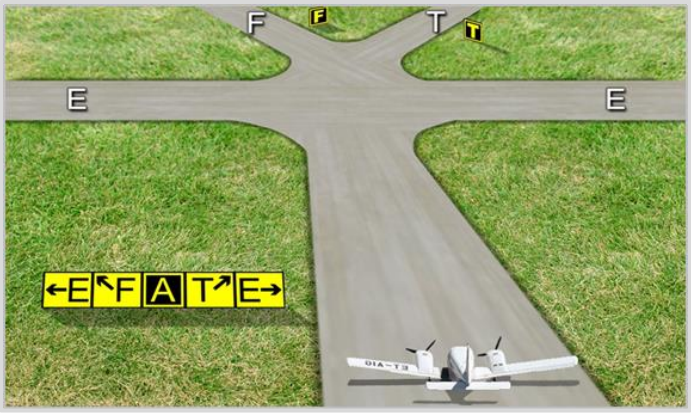
Taxiway Signs

Taxiway signs provide visual cues for aircraft taxiing along a designated path, and are usually located along the side of the taxiway.

Taxiway Location Sign	Taxiway Direction Sign
	
Taxiway location signs indicate which taxiway the aircraft is on. ■ Marked by a black background with a yellow inscription and yellow border	**Taxiway direction signs** indicate the direction the aircraft must turn in order to get to the desired taxiway. ■ Marked by a yellow background with a black inscription ■ Always have an arrow

Combination of Taxiway Signs

Combinations of taxiway location and direction signs can be used.



Surface Painted Taxiway Signs

Both types of taxiway signs may be surface-painted on the taxiway when other signs are impractical, or to supplement those signs.

Surface Painted Taxiway Location Sign	Surface Painted Taxiway Direction Sign
	
The **surface painted taxiway location sign** is normally located on the right side of the taxiway centerline in the direction of travel.	The **surface painted taxiway direction sign** is located on the side of the taxiway that the aircraft travels. Left side indicates a left turn ahead; right side indicates a right turn ahead.

Recommended Markings for Helicopter Landing Areas

The markings of heliport landing areas indicate their use.

The letter “H” in the markings is oriented to align with the intended direction of approach.

Civil Heliport	Hospital Heliport	Closed Heliport
		
Civil heliports have a white “H”.	**Hospital heliports** have a red “H” inside a large red-outlined cross.	**Closed heliports** have a yellow “X” through the “H”.

Knowledge Check C

REVIEW what you have learned so far about airport marking aids and signs. ANSWER the questions below.

1. Which markings indicate that the pavement is **NOT** intended for use by aircraft? *(Select the correct answer.)*
   - ❑ Runway holding position markings
   - ❑ **Taxiway shoulder markings**
   - ❑ Surface painted holding position sign

2. The centerline of a taxiway is marked with what type of line? *(Select the correct answer.)*
   - ❑ Dashed yellow
   - ❑ **Continuous yellow**
   - ❑ Continuous white

3. What is indicated by a taxiway direction sign? *(Select the correct answer.)*
   - ❑ Alert pilots where the demarcation line exists
   - ❑ Which taxiway the aircraft is on
   - ❑ **Which direction the aircraft must turn to get to the desired taxiway**

4. What does the orientation of the letter "H" indicate on a helicopter landing area? *(Select the correct answer.)*
   - ❑ **Aligns with the intended direction of approach**
   - ❑ Informs the pilot of the distance of landing
   - ❑ Indicates area where an aircraft is prohibited from entering

Airport Signs Summary

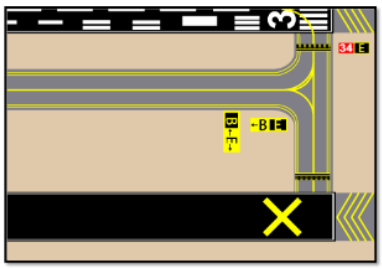
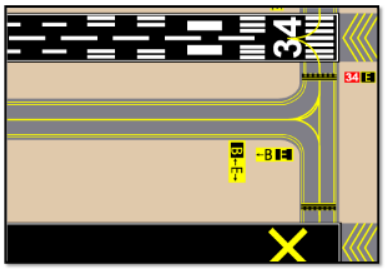
Airport pavement markings and signs are designed to provide critical information to a pilot, but they may not always be followed. A controller shares the responsibility to guide aircraft and support pilot awareness to acknowledge directional signs on the airport surfaces.

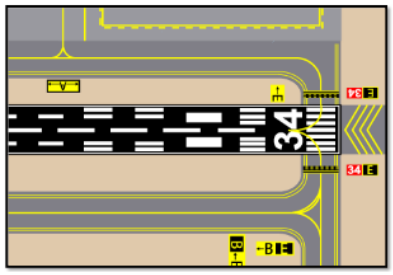
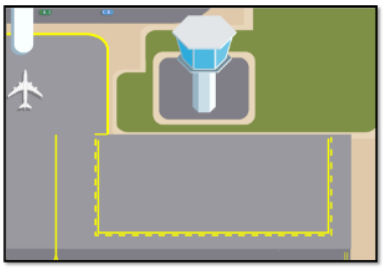
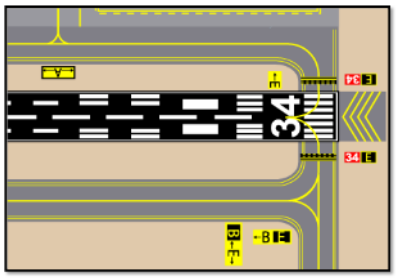
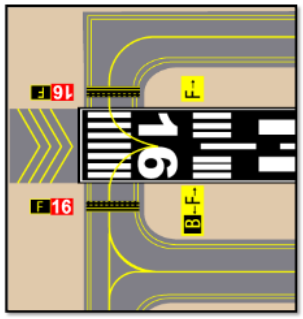
FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ Review content presented in ***Airport Signs*** lesson ■ Navigate to the ***Parking Lot*** link within Blackboard, and review any student questions ■ Address ***Parking Lot*** questions and facilitate a brief discussion of the lesson content	Facilitated Discussion **EST. RUN TIME** 15 mins.

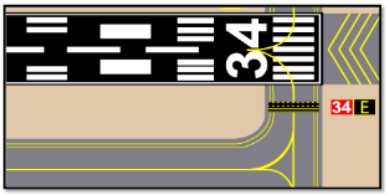
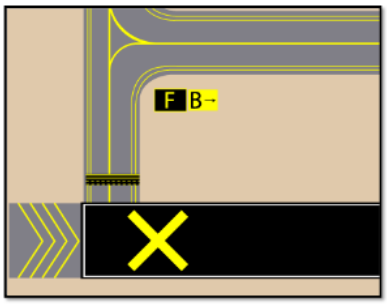
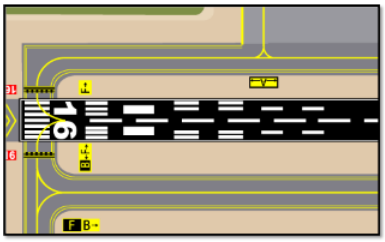
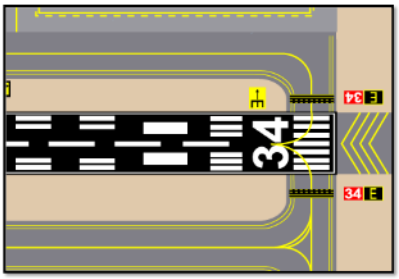
FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ **ENABLE *Airport Markings and Signs*** activity in Blackboard ■ Instruct students to navigate to the ***Exercises and Activities*** folder in Blackboard ■ Instruct students to locate student activity ***Airport Markings and Signs*** ■ The activity will be performed individually ■ Instruct students to answer each question ■ At the end of the activity, the activity will evaluate the students' performance ■ Suggest allowing opportunities to repeat the activity during periods of down time	Activity **EST. RUN TIME** 20 mins.

ACTIVITY: AIRPORT MARKINGS AND SIGNS (ANSWER KEY)

Note: *The questions in the key and their distractors may appear in a different order than displayed here due to activity question randomization.*

Question	Answer
1. Consists of a single continuous yellow line and provides a visual cue to permit taxiing along a designated path. 	**<u>Taxiway centerline</u>** Runway centerline Pavement marking Runway designators
2. Lighting circuits will be disconnected, touchdown markings are obliterated, and yellow crosses are placed at each end of the runway at 1,000-foot intervals. 	**<u>Permanently closed runways</u>** Temporarily closed taxiways Temporarily closed runways and taxiways Permanently closed runways

Question	Answer
3. Consists of two rectangular white stripes, one on each side of the runway centerline and approximately 1,000 feet from landing threshold. 	**Runway aiming point** Runway touchdown zone markings Precision approach runway No instrument approach runway
4. Areas not under control of ATC on the airport. 	**Non-movement areas** Movement areas Permanently closed runways Displaced threshold
5. Markings that identify runways by a number, or a number and a letter, determined with respect to the direction (heading) of an approach. 	**Runway designators** Taxiway direction signs Runway distancing remaining signs Surface painted taxiway signs
6. Signs that have a red background with a white inscription, and are used to denote an entrance to a runway, a critical area, or areas where an aircraft is prohibited from entering. 	**Mandatory instruction signs** Runway location signs Runway distance remaining signs Taxiway location signs

Question	Answer
7. Alert pilots where the demarcation line exists between usable pavement for taxi operations and unusable pavement.  	**Taxiway edge markings** Non-movement area boundary marking Runway position holding markings Taxiway centerline
8. Identifies paved blast pads, stop-ways, and EMASs in relation to the end of the runway.  	**Chevron** Demarcation bar Threshold markings Aiming point
9. Consists of a pattern of longitudinal stripes of uniform dimension spaced symmetrically about the runway centerline.  	**Runway threshold markings** Instrument approach marking Runway touchdown zone markings Runway aiming point markings
10. Consists of four yellow lines, two solid and two dashed, extending across the width of the taxiway or runway.  	**Runway holding position markings** Taxiway shoulder markings Surface painted markings Continuous edge markings

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ **ENABLE *Airport Lighting*** lesson in Blackboard ■ Instruct students to navigate to the ***Airport Lighting*** lesson in Blackboard ■ Instruct students to work individually through the lesson content ■ Upon completion of the lesson students should review previously introduced content or wait quietly until other students have completed	Blackboard **EST. RUN TIME** 25 mins.

AIRPORT LIGHTING

Purpose: The purpose of this lesson is to identify airport lighting that provides guidance to pilots during approach, departure, and taxiing.

Objective:

- Identify airport lighting

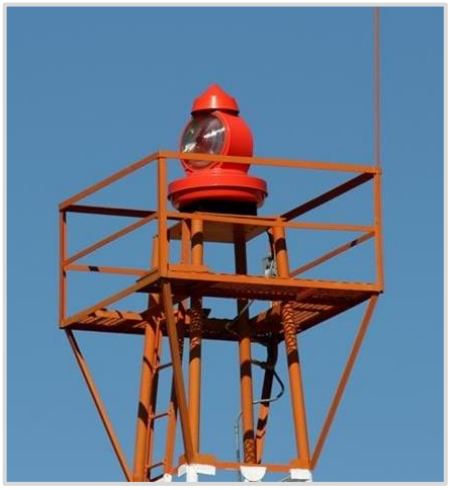
References for this lesson are as follows:

- FAA Order JO 7110.65, Air Traffic Control
- Aeronautical Information Manual (AIM)

Airport Beacons

Rotating airport beacons help the pilot identify the type of airport.

- Can be on top of the control tower or some other tall structure located on the airport
- Flashes, or appears to flash, at regular intervals



The rotating beacon is turned on at night or during restricted weather conditions.

Operations during the day indicate that the surface visibility is less than 3 statute miles and/or the ceiling is less than 1,000 feet.

Note: *All airports are owned and operated by different cities, counties, and organizations. Their budgets determine the lighting available. Not all types of airport lighting will be taught in this lesson.*

A combination of colors identifies the type of airport.

Type of Airport	Colors
Lighted Land Airport	Flashing white and green
Lighted Water Airport	Flashing white and yellow
Lighted Heliport	Flashing white, yellow, and green
Military Airport	Two quick white flashes followed by a green flash

Runway Lights

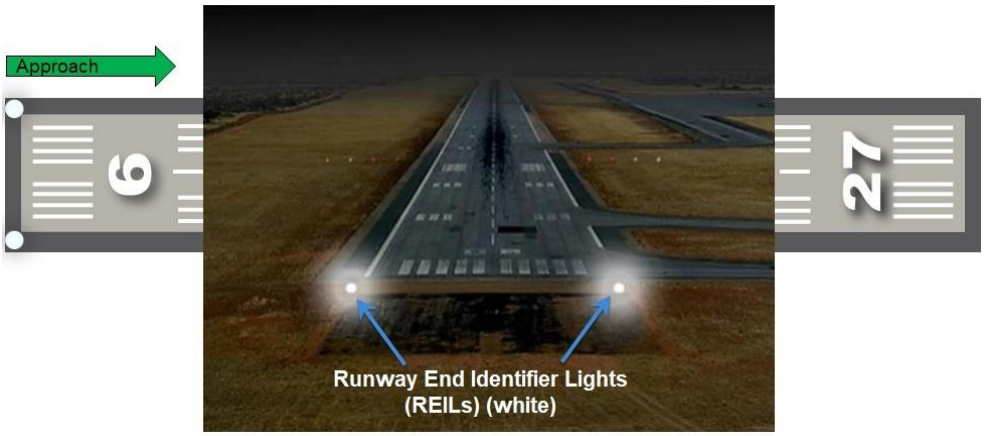
There are three types of runway lights:

- Runway End Identifier Lights (REILs)
- Runway Edge Light System
- In-Runway Lighting

Note: *The lights in the following graphics show a top view. These lights appear in different colors depending on the direction from which the aircraft is approaching.*

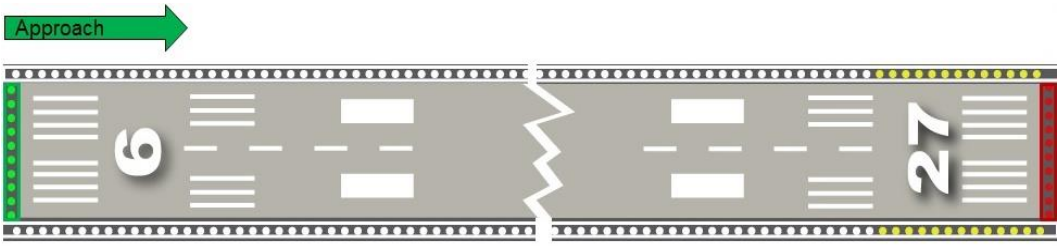
Runway End Identifier Lights (REILs)

Runway End Identifier Lights (REILs) consist of a pair of synchronized white flashing strobe lights located laterally on each side of the runway threshold facing the incoming traffic.



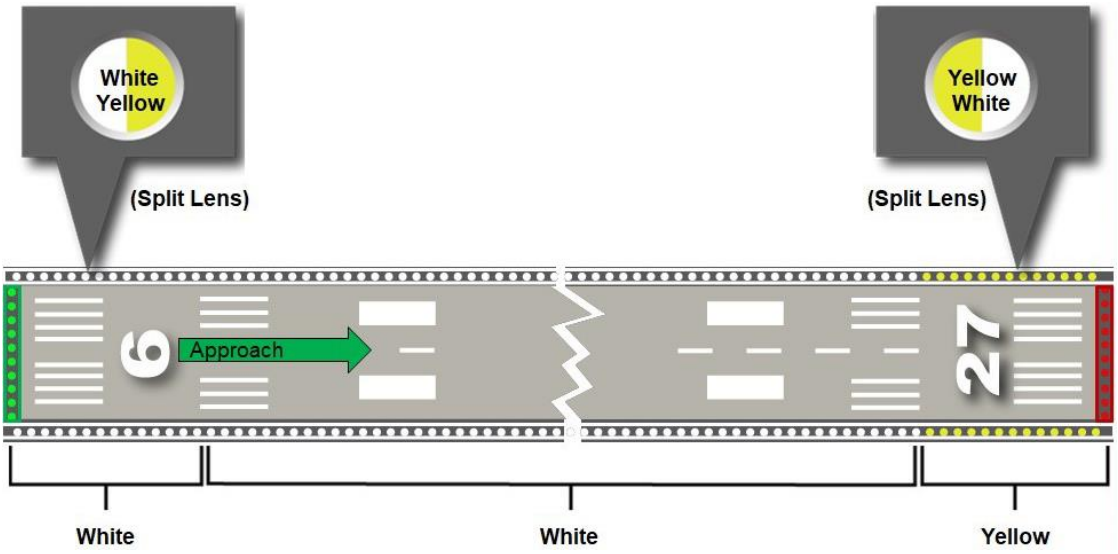
Runway Edge Light System

The runway edge light system outlines all edges of runways. The lights are classified according to their intensity or brightness capability.

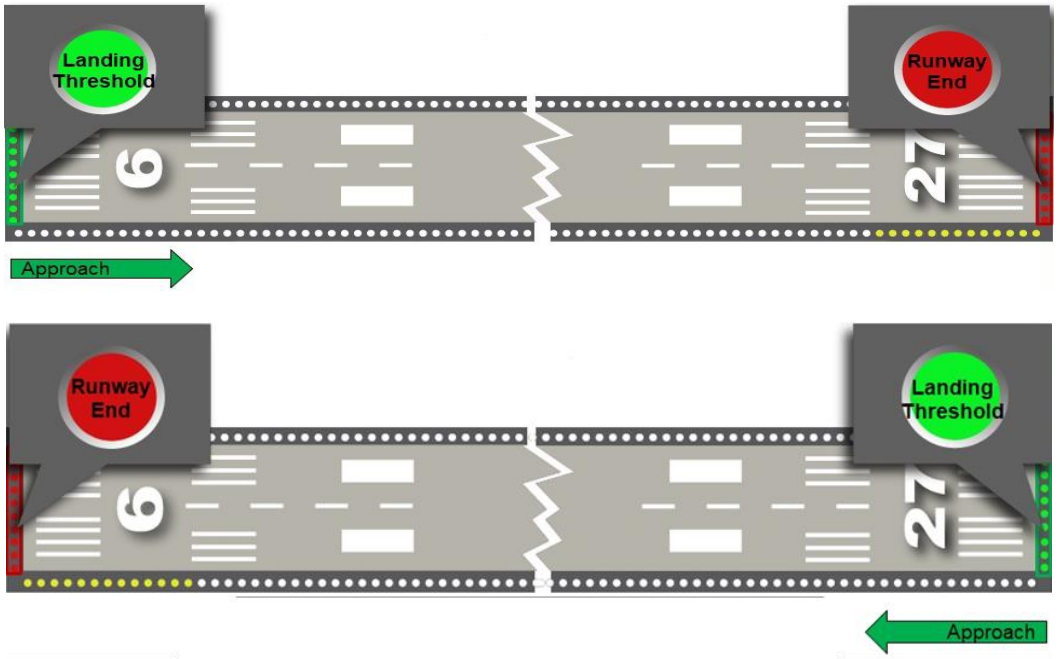


Runway edge lights are white except for runways with approved instrument approaches.

Yellow replaces white on the last 2,000 feet or half of the runway length, whichever is less.



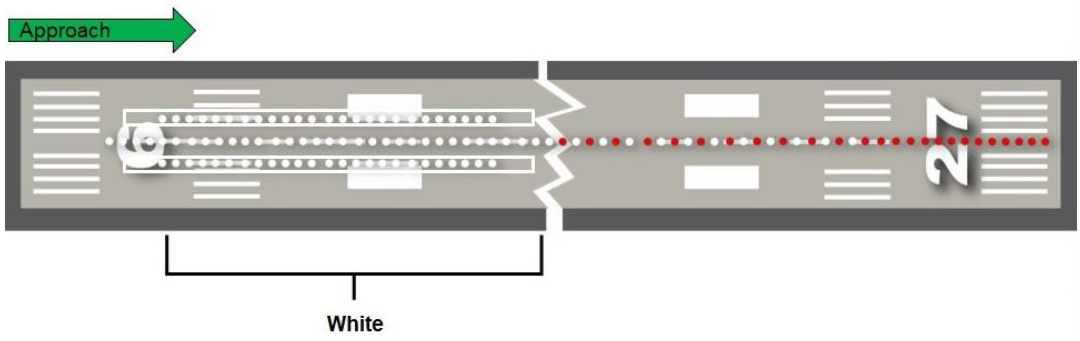
- Lights marking the ends of the runway emit:
  - Red light toward the runway to indicate the end of the runway
  - Green light outward from the runway to indicate the landing threshold – only green lights are known as "**Threshold Lights"**



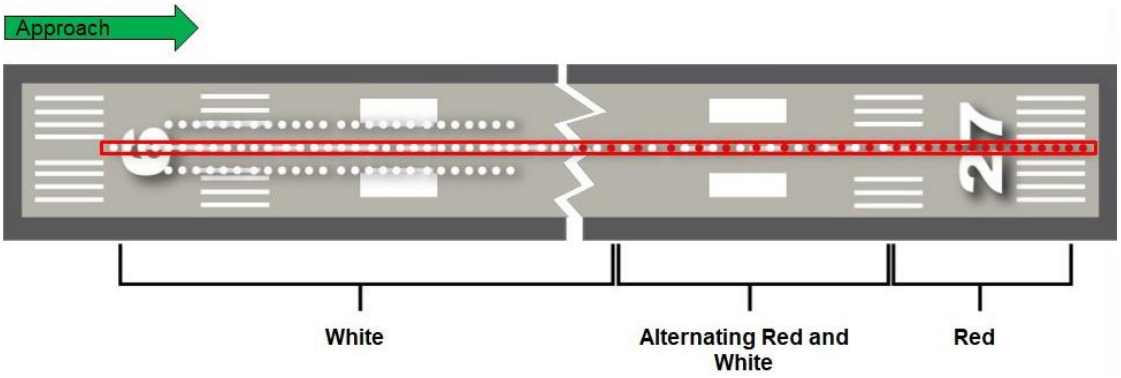
In-Runway Lighting

There are two types of in-runway lighting: Touchdown Zone Lighting (TDZL) and Runway Centerline Lighting System (RCLS).

- **Touchdown Zone Lighting (TDZL)** consists of two rows of lights; one on each side and parallel to the runway centerline lights.
  - Starts 100 feet from the landing threshold
  - Extends to 3,000 feet from the threshold or midpoint of the runway, whichever is less



- **Runway Centerline Lighting System (RCLS**) consists of lights spaced at 50-foot intervals.
  - White until last 3,000 feet
  - White alternating with red for the next 2,000 feet
  - All red the last 1,000 feet



Knowledge Check D

REVIEW what you have learned so far about airport lighting. ANSWER the questions below.

1. Match each classification of airport with its airport beacon.

c	Lighted land airport	a.	Flashing white and yellow
d	Lighted heliport	b.	Two quick white flashes and green
b	Military airport	c.	Flashing white and green
a	Lighted water airport	d.	Flashing white, yellow, and green

2. Which lights consist of two white flashing strobe lights located on each side of the runway threshold? *(Select the correct answer.)*
   - ❑ In-runway lighting
   - ❑ Runway edge light system
   - ❑ **Runway end identifier lights**

3. Which lights mark the beginning of the runway for an approaching aircraft? *(Select the correct answer.)*
   - ❑ **Threshold lights**
   - ❑ Runway edge lights
   - ❑ Centerline lights

4. Which type of lighting consists of two rows of lights on each side of runway centerline lights? *(Select the correct answer.)*
   - ❑ Runway edge lights
   - ❑ **Touchdown zone lighting**
   - ❑ Threshold lighting

Visual Glideslope Indicators

Visual Approach Slope Indicators (VASI) and Precision Approach Path Indicators (PAPIs) are systems of lights arranged to provide visual descent guidance during the approach to a runway.

- These lights are visible from 3–5 miles away during the day and 20 miles away or more at night
- Provide safe obstruction clearance
- Descent should **NOT** be initiated until aircraft is visually lined up with the runway
- Lateral course guidance is provided by the runway or runway lights

PAPI

Obstruction clearance to roughly 3.4 miles, within 10 degrees of runway centerline

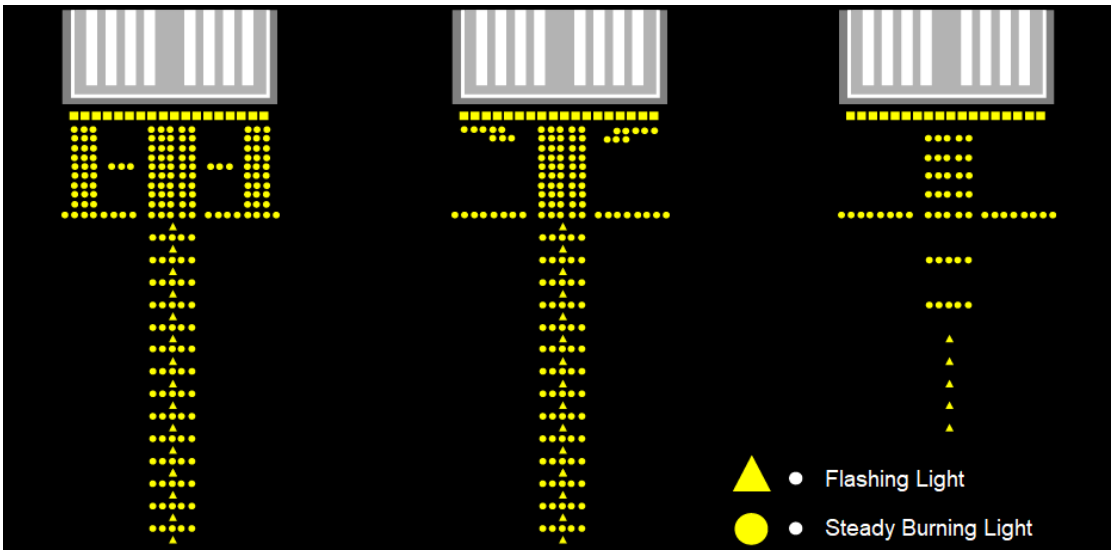
VASI

Obstruction clearance to roughly 4 miles, within 10 degrees of runway centerline

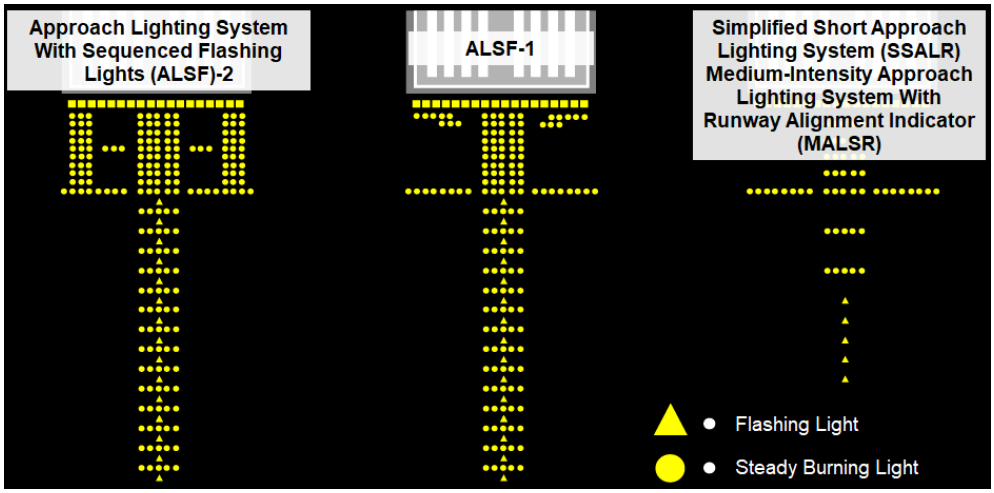
Approach Light Systems (ALSs)

Approach Light Systems (ALSs) provide the basic means to transition from instrument flight to visual flight for landing by radiating light beams in a directional pattern.

Note: *Actual light sequence runs from the approach side of the runway to the end of the runway.*



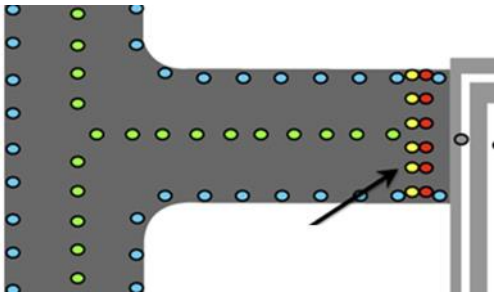
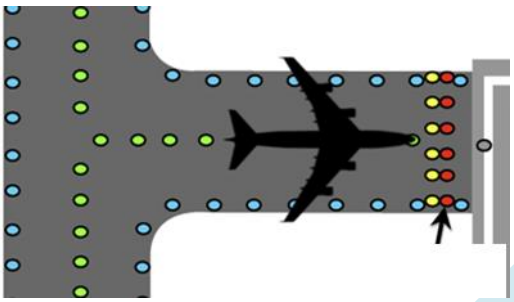
- The pilot uses these beams to align the aircraft with the extended centerline of the runway on the final approach for landing
- Flashing Lights (SFLs) may be installed in conjunction with the ALS at some airports
- Operational requirements dictate the sophistication and configuration of the ALS for a particular runway

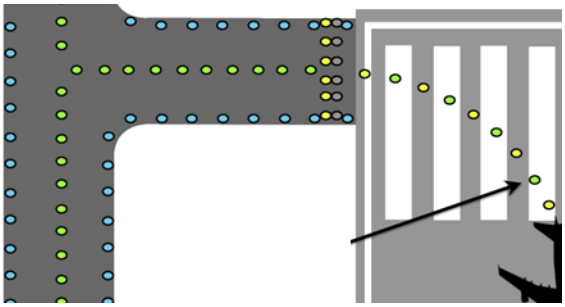
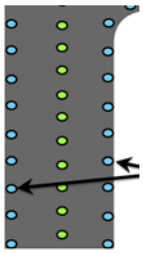
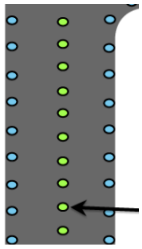


- ALSs are a configuration of signal lights starting at the landing threshold and extending into the approach area a distance of:
  - 2,400–3,000 feet for precision instrument runways
  - 1,400–1,500 feet for non-precision instrument runways
- Some systems include SFLs that appear to the pilot as a ball of light traveling towards the runway at high speed (twice a second)

Taxiway Lights

Taxiway lights are used to guide the aircraft to and from the runway after landing and before departure. The colors and locations of taxiway lights have different purposes.

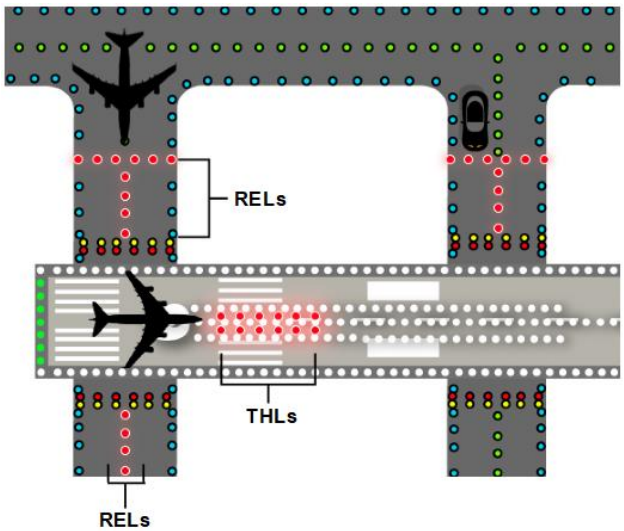
Runway guard lights are installed at holding positions to further attract attention in low visibility conditions. They consist of a row of in-pavement yellow lights across a taxiway (some locations may use a pair of elevated flashing lights on either side of the taxiway).	
Stop bar lights are used to confirm the air traffic control (ATC) clearance to enter or cross the active runway in low visibility conditions. ■ They consist of a row of red, unidirectional, in-pavement lights installed across the entire taxiway at the runway holding position, and elevated steady-burning red lights on each side ■ They are operated in conjunction with the taxiway centerline lead-on lights ■ The stop bar lights are automatically reset by a sensor or backup timer	

Lead-on lights consist of a row of alternating yellow and green, unidirectional, in-pavement lights that extend from the stop bar toward the runway. ■ Following the ATC clearance to proceed, stop bar lights are turned off and lead-on lights are turned on ■ The lead-on lights are automatically reset by a sensor or backup timer	
Taxiway edge lights outline the edges of taxiways during periods of darkness and restricted visibility. Taxiway edge lights emit a blue light.	**Taxiway centerline lights** are used to facilitate ground traffic under low visibility. Taxiway centerline lights emit a steady green light.
	

Runway Status Lights

Runway status lights tell pilots and vehicle operators to stop when runways are not safe.

- The lights automatically turn red when other traffic makes it dangerous to enter, cross, or begin takeoff
- The lights provide direct, immediate alerts and require **NO** input from controllers
- The system is designed to be compatible with existing procedures and is comprised of Runway Entrance Lights (RELs) and Takeoff Hold Lights (THLs)

RELs – Pilots and drivers must stop at the runway hold line and remain stopped when the RELs are on. ■ ATC clearance is still required to cross or enter runways **THLs** – THLs are lit when an aircraft is waiting to take off in the takeoff hold area and another aircraft is on the runway. ■ These lights turn off when the departing aircraft is **NO** longer on the runway ■ ATC clearance is still required for takeoff	

To learn more visit: https://www.faa.gov/air_traffic/technology/rwsl/

Knowledge Check E

REVIEW what you have learned so far about airport lighting. ANSWER each question listed below.

1. Which light system provides visual descent guidance during runway approaches? *(Select the correct answer.)*
   - ❑ In-runway lighting system
   - ❑ Approach light system
   - ❑ **Visual glideslope indicators**

2. Which lights are used to confirm ATC clearance to enter the active runway? *(Select the correct answer.)*
   - ❑ Threshold lights
   - ❑ **Stop bar lights**
   - ❑ Runway guard lights

3. Match each taxiway light with its designated color. Enter your answers in the spaces below.

d	Runway guard lights	a.	Red
a	Stop bar lights	b.	Blue
c	Lead-on lights	c.	Yellow and green
b	Taxiway edge lights	d.	Yellow
e	Taxiway centerline lights	e.	Green

4. Which type of lights tell pilots and vehicle operators to stop when runways are not safe? *(Select the correct answer.)*
   - ❑ **Runway status lights**
   - ❑ Stop bar lights
   - ❑ Runway guard lights

Airport Lighting Summary

Among the key landing and ground-movement visual aids are those located in the pavement of runways and taxiways. These lighted aids are needed for landing, rollout, take-off, ground-movement, traffic control, high-speed exits from runways, and apron guidance.

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ Review content presented in the ***Airport Lighting*** lesson ■ Navigate to the ***Parking Lot*** link within Blackboard, and review any student questions ■ Address ***Parking Lot*** questions and facilitate a brief discussion of the lesson content	Facilitated Discussion **EST. RUN TIME** 15 mins.

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ **ENABLE *Airport Lighting*** activity in Blackboard ■ Instruct students to navigate to the ***Exercises and Activities*** folder in Blackboard ■ Instruct students to locate student activity ***Airport Lighting*** ■ The activity will be performed individually ■ Instruct students to answer each question ■ At the end of the activity, the activity will evaluate the students' performance ■ Suggest allowing opportunities to repeat the activity during periods of down time	Activity **EST. RUN TIME** 20 mins.

ACTIVITY: AIRPORT LIGHTING (ANSWER KEY)

Note: *The questions in the key and their distractors may appear in a different order than displayed here due to activity question randomization.*

Question		Answer
Airport Beacon		
1. What is the purpose of an airport rotating beacon light?		**Identify the type of airport** Identify the size of the airport Identify the elevation of the airport Identify whether the airport is open
2. Which type of airport is this signal identifying?	*Flashing white and yellow*	**Lighted water airport** Lighted land airport Lighted heliport Military airport
3. Which type of airport is this signal identifying?	*Flashing white and green*	**Lighted land airport** Lighted water airport Lighted heliport Military airport
4. Which type of airport is this signal identifying?	*Two quick white flashes followed by a green flash*	**Military airport** Lighted land airport Lighted water airport Lighted heliport

Runway Light System	
5. Identify the runway lights.	**1. <u>Runway Centerline Lights</u>** **2. <u>Runway Edge Lights</u>** **3. <u>Runway End Identifier Lights (REILs)</u>** **4. <u>Runway Touchdown Zone Lights (TDZLs)</u>** **5. <u>Runway Threshold Lights</u>**
6. Which type of lights are REILs?	**<u>Strobe lights</u>** Rotating beacons Fluorescent lights Green lights
7. Which runways have edge lights that change to yellow and white and then solid yellow starting at 2,000 feet from the end of the runway?	**<u>Runways with approved instrument approaches</u>** Runways that have status light systems Runways without approved instrument approaches Runways that are designated for military use only
8. The green threshold lights indicate _____.	**<u>The beginning of the runway</u>** The end of the runway The runway is closed The runway is in use

Taxiway Light System	
9. Identify the taxiway lights.	**1. <u>Runway guard</u>** **2. <u>Stop bar</u>** **3. <u>Lead-on</u>** **4. <u>Taxiway edge</u>** **5. <u>Taxiway centerline</u>**
10. Stop bar lights are operated in conjunction with _____.	**<u>Lead-on lights</u>** Taxiway centerline lights Runway guard lights Taxiway edge lights
11. What is the purpose of lead-on lights?	**<u>Direct aircraft onto the runway when it is safe</u>** Hold the aircraft until it's their turn to take off Direct aircraft across a runway when it is safe Direct aircraft to exit the runway in a timely manner
12. Taxiway centerline lights emit _____.	**<u>A steady green light</u>** A flashing green light Green only when it is okay to go A flashing yellow and green light

Approach Light System	
13. What are the purposes of an ALS?	**Aid the transition from instrument flight to visual flight** **Align the aircraft with the runway on the final approach** Provide a visual aid when taking off at night Guide aircraft to the runway when preparing for taking off
14. ALS configurations are dictated by_____.	**Operational requirements** Department of Transportation (DOT) Airport Federal Aviation Administration (FAA)
15. For precision instrument runways, ALSs start at the landing threshold and extend into the approach area how far?	**2,400–3,000 feet** 1,400–1,500 feet 2,000–2,400 feet 3,000–3,500 feet
16. For non-precision instrument runways, ALSs start at the landing threshold and extend into the approach area how far?	**1,400–1,500 feet** 1,000–1,200 feet 1,500–1,800 feet 2,000–2,100 feet

Runway Status Lights	
17. What do runway status lights tell pilots and vehicle operators?	**To stop when runways are not safe** When aircraft will be landing Location of aircraft on the runways Location of aircraft on the taxiways
18. When the runway hold line lights are off, pilots and drivers must _____.	**Obtain ATC clearance to cross or enter the runway** Go ahead and cross or enter the runway Look both ways and then cross or enter the runway Wait for an airport employee to tell them to go
19. When the takeoff hold lights are lit, _____.	**An aircraft is waiting to take off** **Another aircraft is on the runway** The aircraft may proceed with caution The waiting aircraft may take off
20. When the takeoff hold lights are **NOT** lit, _____.	**ATC clearance is still needed for take off** The aircraft is okay for take off The aircraft must wait 5 minutes The aircraft must exit the runway

SUMMARY

This module described areas of an airport, the different types of airport markings, signs, lighting aids, and their uses.

In accordance with FAA Order JO 7110.65, Air Traffic Control; Aeronautical Information Manual (AIM); and Advisory Circular, AC 150/5340-1, you should now be able to:

- Identify areas of an airport
- Identify airport markings
- Identify airport signs
- Identify airport lighting

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ Navigate to the ***Parking Lot*** link within Blackboard, and review any student questions ■ Address ***Parking Lot*** questions and facilitate a brief discussion of the lesson content ■ Instruct students to prepare for the End-of-Module test by putting away their Student Guides	Facilitated Discussion **EST. RUN TIME** 25 mins.

FACILITATOR INSTRUCTIONS	DELIVERY METHOD
■ **ENABLE *Airports End-of-Module Test*** in Blackboard ■ Instruct students: ○ Clear desks ○ Do not write anything during or after the test ○ Navigate to the ***Airports End-of-Module Test*** link in Blackboard ○ Once they are satisfied with their responses, click “Save and Submit;” do not click “OK” to review results until directed to do so ○ Choose “Cancel” if they receive a warning message that the test has unanswered questions; choosing OK will submit the test and not allow them to go back and answer the questions ○ Leave the room after submitting the test and return at the “Be Back” time ■ ***Note:*** *This test is scored but not graded* ■ During test, monitor students to ensure a secure testing environment ■ Identify the most commonly missed questions by reviewing student statistics in Blackboard ■ Instruct students to click “View Results” when ready to review commonly missed questions ■ Review commonly missed questions with students	Blackboard Assessment **EST. RUN TIME** 15 mins.

END-OF-MODULE TEST (ANSWER KEY)

Note: *Test questions in Blackboard are presented to the students in random order. Please be aware the test key question order will not match the student version.*

1. Who provides an aircraft specific approval for entry onto movement areas on an airport? *(Select the correct answer.)*
   - ❑ **ATC**
   - ❑ Pilot
   - ❑ ATCC
   - ❑ Aircraft marshals

   Reference(s): JO 7110.65, Pilot Controller Glossary

2. What runway marking extends the full-length runway pavement area? *(Select the correct answer.)*
   - ❑ **Runway side stripes**
   - ❑ Dash side stripes
   - ❑ Runway centerlines
   - ❑ Dashed centerlines

   Reference(s): AIM, Chap. 2

3. What does the following sign indicate when posted on an airport? *(Select the correct answer.)*
   - ❑ **Denotes an entrance to a runway or critical area, aircraft are prohibited from entering without an ATC clearance**
   - ❑ Denotes numbers of upcoming crossing runways, aircraft should proceed with caution
   - ❑ Indicates the combination of taxiway locations
   - ❑ Denotes an entrance to taxiways or critical area, aircraft are prohibited from entering without an ATC clearance

   Reference(s): JO 7110.65, Chaps. 5 and 10

4. Lighted land airports have rotating beacons that _____. *(Select the correct answer.)*
   - ❑ **Flash white and green**
   - ❑ Flash two white and one green
   - ❑ Flash white
   - ❑ Flash green

   Reference(s): AIM, Chap. 2

5. What color are threshold lights? *(Select the correct answer.)*
   - ❑ **Green**
   - ❑ White
   - ❑ Yellow
   - ❑ Red

   Reference(s): AIM, Chap. 2

6. The basic means to transition from instrument flight to visual flight for landing is provided by _____. *(Select the correct answer.)*
   - ❑ **ALSs**
   - ❑ REILs
   - ❑ Runway centerline lights
   - ❑ VASIs lights

   Reference(s): JO7110.65, Chap. 3; AIM, Chap. 2