

# Airports and Night Operations

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Gleim sections 3.1-6, 3.14, part of 11.4

## Airport Markings and Lights

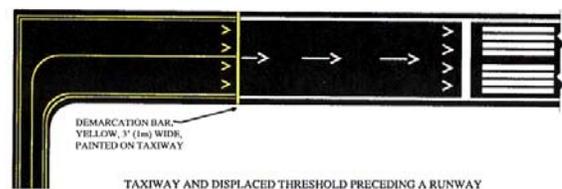
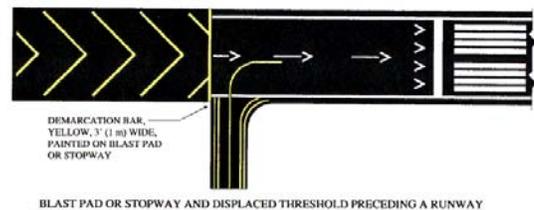
- See AIM Chapter 2 Section 3 for complete details

### Taxiway Markings

- The *taxiway center line* is painted yellow
- The *taxiway edge markings* are painted yellow
  - A double solid line indicates the edge of the taxiway – the area on the far side of the double solid line is not for use by aircraft
  - A double dashed line indicates the edge of the taxiway – the area on the far side of the double dashed line is for use by aircraft and aircraft may cross the double dashed line to get there
  - A double solid line next to a double dashed line indicates a hold position at the edge of a runway. Aircraft can taxi across the lines if the dashed lines are on their side. If the solid lines are on their side, an ATC clearance is required. When exiting a runway, an aircraft should move completely to the far side of the dashed/solid line to be clear of the runway
- Taxiway location signs are painted yellow on black
- Taxiway direction signs are painted black on yellow

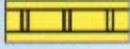
### Runway Markings

- Each runway has a number at either end. The numbers indicate the *magnetic* direction of the runway, if landing over the numbers, divided by 10. For example, when landing to the west, the runway number is 27. When landing to the north, the runway number is 360 (for 360 instead of 0 degrees).
- The runway numbers will always be different by 18 (180 degrees)
- Runway numbers are painted white
- The *runway center line* is painted white
- A *displaced threshold* consists of a series of white arrows leading to the runway threshold. It indicates an area not suitable for landing, but available for takeoff or landing in the opposite direction. It is usually used for noise abatement.
- A series of yellow chevrons indicates a blast pad or stopway which is not suitable for taxi, takeoff, or landing
- A yellow line before the start of a runway indicates a taxiway aligned with the runway
- An “X” on a runway indicates that the runway is closed



## Pilot Guide to Airport Signs and Markings

### Airport Signs — Action or Purpose

<p><b>4-22</b> TWY/RWY HOLD POSITION: Hold Short of Runway on Taxiway</p> <p>Also ... RWY/RWY HOLD POSITION: Hold Short of Intersecting Runway</p>		<p><b>RUNWAY BOUNDARY:</b> Exit Boundary of Rwy Protected Areas</p>
<p><b>8-APCH</b> RWY APCH HOLD POSITION: Hold Short for Act on Approach</p>		<p><b>ILS CRITICAL AREA BOUNDARY:</b> Exit Boundary of ILS Critical Area</p>
<p><b>ILS</b> ILS HOLD POSITION: Hold Short of ILS Critical Area</p>		<p><b>RUNWAY EXIT:</b> Defines Direction &amp; Designation of Exit Twy from Rwy</p>
<p> <b>NO ENTRY:</b> Identifies Paved Areas Where Aircraft Entry is Prohibited</p>	<p>Also ... <b>TWY DIRECTION:</b> Defines Direction &amp; Designation of Intersecting Taxiway(s)</p>	<p><b>22↑</b> <b>OUTBOUND DESTINATION:</b> Defines Directions to Take-Off Runways</p>
<p><b>B</b> <b>TAXIWAY LOCATION:</b> Identifies Taxiway on Which Aircraft is Located</p>		<p><b>↖MIL</b> <b>INBOUND DESTINATION:</b> Defines Directions for Arriving Aircraft</p>
<p><b>22</b> <b>RUNWAY LOCATION:</b> Identifies Runway on Which Aircraft is Located</p>		<p><b>TAXIWAY ENDING MARKER:</b> Indicates Twy Does Not Continue</p>
<p><b>4</b> <b>RUNWAY DISTANCE REMAINING:</b> Identifies Runway Length Remaining</p>		<p><b>DIRECTION SIGN ARRAY:</b> Identifies Location in Conjunction with Multiple Intersecting Taxiways</p>

If in Doubt Ask!

ATCT Light Gun Signals	
Color and Type of Signal	Aircraft on the Ground
<b>STEADY GREEN</b> 	<b>Cleared for Takeoff</b>
<b>FLASHING GREEN</b> 	<b>Cleared to Taxi</b>
<b>STEADY RED</b> 	<b>STOP</b>
<b>FLASHING RED</b> 	<b>Taxi Clear of the Runway in Use</b>
<b>FLASHING WHITE</b> 	<b>Return to Starting Point on Airport</b>
<b>ALTERNATING RED/GREEN</b> 	<b>Exercise Extreme Caution</b>



Elevated Guard Lights Hold Short      In-Pavement Guard Lights Hold Short

(CONTINUED ON REVERSE SIDE)

# Pilot Guide to Airport Signs and Markings

## Airport Markings

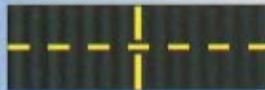
Help Prevent Runway Incursions  
**"READ BACK"**  
Your Air Traffic Clearance!



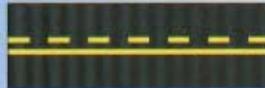
**HOLDING POSITION:**  
Hold Short of Intersecting Rwy  
Also Land and Hold Short Marking



**ILS CRITICAL AREA:**  
Hold Short During IMC Conditions



**TAXIWAY/TAXIWAY HOLDING POSITION:** Hold Short of Intersecting Taxiway When Directed by ATC



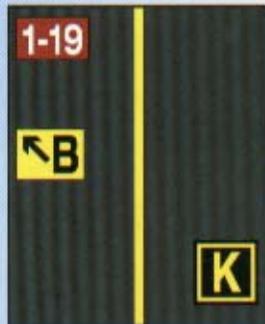
**MOVEMENT AREA BOUNDARY:**  
Defines Boundary of Movement Area and Non-Movement Area



**TAXIWAY EDGE:** Defines Edge of Usable Full Strength Taxiway Pavement. Adjoining Pavement NOT Usable



**DASHED TAXIWAY EDGE:** Defines Edge Taxiway Where Adjoining Pavement or Apron IS Available for Taxi



**SURFACE PAINTED HOLDING POSITION:** Hold Short of Intersecting Runway on Twy

**SURFACE PAINTED TAXIWAY DIRECTION:** Direction & Designation of Intersecting Twy

**SURFACE PAINTED TAXIWAY LOCATION:** Identifies Twy on Which Aircraft is Located

(Graphics not to scale)

References: Aeronautical Information Manual (AIM), AC 90-67B, AC 150/5340-1H, and AC 150/5340-18C.

## Lights

- A airport may have a rotating beacon
  - Civilian airports alternate white and green
  - **Military airports alternate double-white and green**
  - **Heliports alternate green, yellow, and white**
  - **When a beacon is operated during the daytime, it often indicates that the weather is below basic VFR minimums (1000/3).** However, there is no regulatory requirement for this.
- Runways *may* have any of various lights
  - A horizontal line of green lights at the approach end
  - A horizontal line of red lights at the departure end
  - White runway edge lights
  - Yellow runway edge lights for the last 2,000 feet or half of the runway, whichever is less
  - White center-line lights, except for red lights for the last 1,000 feet of the runway, and alternating red and white lights for the previous 2,000 feet of the runway
- **Taxiways *may* have blue edge lights**
- Airport lights may be controllable by the pilot using the radio tuned to the CTAF or other designated frequency. First click the microphone 7 times in 5 seconds, wait, then:
  - To set low intensity, click the microphone 3 times
  - **To set medium intensity, click the microphone 5 times**
  - To set high intensity, click the microphone 7 times

## VASI

- A VASI (Visual Approach Slope Indicator) is a visual indication to a landing aircraft of the recommended approach glide slope
- There are several different types of VASIs
- **A standard two-bar VASI will indicate red over red when below glidepath, red over white when on glidepath, and white over white when above glidepath**
- **A tri-color VASI will indicate red when below glidepath, green when on glidepath, and amber when above glidepath**
- **A pulsating VASI will indicate pulsing red when below glidepath, steady white when on glidepath, and pulsating white when above glidepath**
- **A precision approach path indicator (PAPI) will indicate red/red/red/red when well below the glidepath, red/red/red/white when slightly below the glidepath, red/red/white/white when on the glidepath, red/white/white/white when slightly above the glidepath, and white/white/white/white when well above the glidepath**
- **When approaching to land on a runway served by a VASI, the pilot shall remain at or above the glideslope until a lower altitude is necessary for landing [91.129]**

## ATC Light Signals

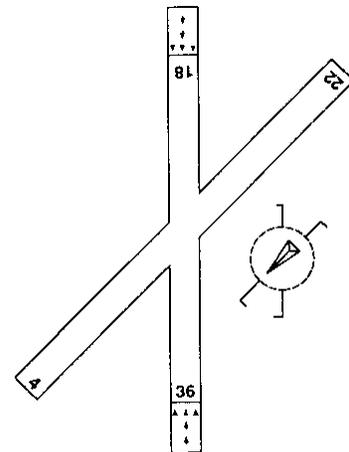
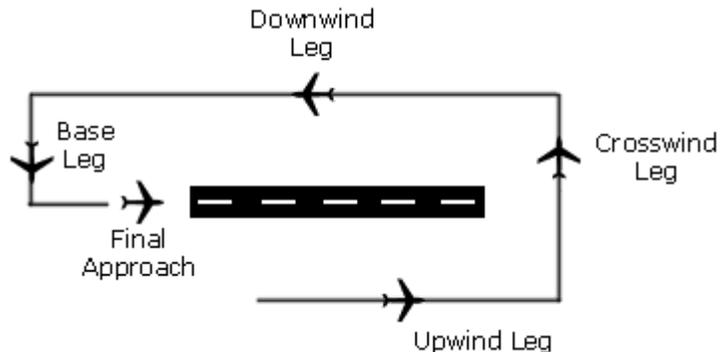
- **[91.125] When an aircraft is operating at or near a towered airport and has lost communication ability, ATC may use the following light signals to control the aircraft**

	Aircraft on surface	Aircraft in flight
<b>Steady green</b>	Cleared for takeoff	Cleared to land
<b>Flashing green</b>	Cleared to taxi	Return for landing
<b>Steady red</b>	Stop	Give way and continue circling
<b>Flashing red</b>	Taxi clear of runway	Airport unsafe – do not land
<b>Flashing white</b>	Return to starting location	N/A
<b>Alternating red/green</b>	Exercise extreme caution	Exercise extreme caution

- **When approaching to land at an airport when communication has been lost, the proper procedure is:**
  - 1) **Observe the traffic flow**
  - 2) **Enter the pattern**
  - 3) **Look for light signals**

## Airport Traffic Patterns

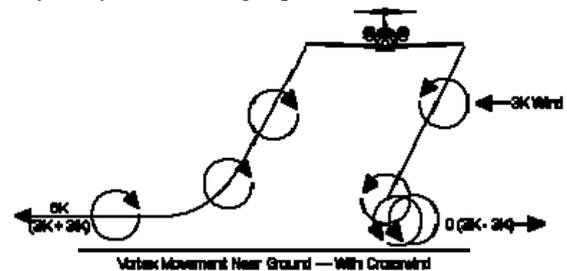
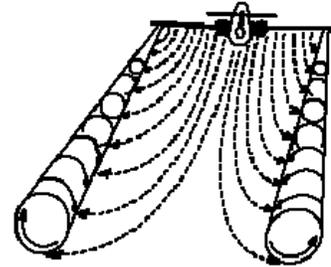
- See AIM Chapter 4 Section 3 for complete details
- A standard airport traffic pattern has five legs:
  - *Upwind* starts from the departure end of the runway
  - *Crosswind* is a 90° turn from upwind
  - *Downwind* is parallel to the runway, flying opposite the direction of runway use
  - *Base* is a 90° turn from downwind toward the runway
  - *Final* is aligned with the runway, flying towards the approach end
- The turns can be made to the right or the left
- Generally speaking, the runway direction to use allows the airplane to fly into the wind (a headwind) instead of with the wind (a tailwind) for shorter takeoff and landing distances
- The standard entry is on a 45 degree angle to intercept the downwind leg at midfield at traffic pattern altitude (TPA). This is called “right traffic” or “left traffic” as appropriate.
- At an untowered airport:
  - Make turns to the left, unless there is an indication to the contrary (entry in AF/D, notation on chart, or segmented circle indicates otherwise)
  - A segmented circle on the ground may indicate the direction of traffic for each runway
  - A tetrahedron, if present, will indicate the runway in use. Land in the direction the small part of the tetrahedron is pointing.
  - **Use the FAA recommended departure procedure, if one exists**
- At a towered airport:
  - ATC will tell you how to enter the traffic pattern and which direction to turn
- There are various ways to read the wind to determine which runway to use:
  - A *wind sock* will point downwind and you should land on a runway in the direction most closely aligned towards the mouth of the sock
  - A *wind tee* will point upwind and you should land on a runway in the direction most closely aligned away from the pointed part of the tee



## Airport Operations

### Wake Turbulence

- **Wingtip vortices are produced by any wing producing lift**
- They are caused by air moving from the high pressure under the wing, around the wingtip, to the low pressure on top of the wing
- Wingtip vortices produced by a large aircraft are extremely dangerous to small aircraft and can cause violent uncommanded rolls
- **Wingtip vortices tend to sink slowly below the aircraft generating wake turbulence below the flight path.** The vortices sink at 100-200 ft/min and usually dissipate within 500-1000 feet.
- **The greatest strength vortices are generated when the airplane is heavy, clean, and slow.** This is because the angle of attack is the highest in these cases, and the most air is being moved
- When wingtip vortices strike the ground, they tend to move laterally away from the flight path at 3-6 KTS
- A light crosswind can keep the vortices over the same location
- A light quartering tailwind will tend to keep wingtip vortices on the runway for the longest period of time
- When departing behind a heavy aircraft, you should stay above and upwind from the flight path until able to turn
- When landing behind a heavy aircraft, you should stay above the flight path and land beyond the aircraft's touchdown point



## Airplane Lights and Collision Avoidance

- **Responsibility for collision avoidance rests with the pilot**
- Many airplanes have lights for use at night. These lights may include:
  - A red light on the left wingtip, visible only forward and to the side
  - A green light on the right wingtip, visible only forward and to the side
  - A red rotating beacon on the top or bottom
  - A steady white light pointing backwards on the tail
  - A bright landing light pointing forwards
  - An omnidirectional strobe on each wingtip
- The cones in the eye provide high-resolution vision. They are concentrated in the fovea (a small area in the center of the retina) and work only during the day. **When scanning for traffic during the day, short, regularly space eye movements should be made covering 10 degrees each.** This allows each sector to be viewed by the cones in the fovea.
- The rods in the eye provide vision in low light, and are concentrated away from the fovea. The cones do not generally work at night. **When scanning for traffic at night, the peripheral vision should be used to scan small sectors with off-center viewing.** This allows each sector to be viewed by the rods.
- **Another aircraft is on a collision course if there is no apparent relative motion**
- **Prior to starting any flight maneuver, the pilot should visually scan the entire area**
- **When climbing or descending on a VFR airway, gentle banks to the left and right should be made to allow continuous scanning**

## Night Operations

- Night approaches and landing should be conducted exactly the same as day operations