

NIGHT OPERATIONS

FULFILLS AI.II.M

Objective	
The student shall understand the unique factors and hazards associated with night operations. The student shall become familiar with safe practices for operating at night.	
Instructor Actions	Student Actions
<ul style="list-style-type: none">- Discuss and show images of airport lighting configurations- Demonstrate attitude determination of other aircraft at night- Present the applicable regulations for night operations and clearly define the three definitions of night	<ul style="list-style-type: none">- Take notes and participate in instructor's discussion- Practice identifying relative position of other aircraft- Participate in instructor's scenario of night currency
Case Studies	Equipment
<ul style="list-style-type: none">- AOPA Accident Case Study – <u>Unintended Consequences (CFIT)</u>	<ul style="list-style-type: none">- Additional resources- Chart Supplement- Computer- FAR/AIM- PHAK- White Board
Completion Standards	
The student shall explain the requirements to operate an aircraft at night and considerations during preflight planning. The student shall demonstrate proficiency in identifying common night illusions.	

ELEMENTS

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RESOURCES

FAA-S-ACS-6C Private Pilot ACS - Area I Task H

FAA-S-ACS-7B Commercial Pilot ACS - Area I Task H

FAA-S-ACS-25 CFI ACS - Area II Task M

FAA-H-8083-2 Risk Management Handbook

FAA-H-8083-3C Airplane Flying Handbook

FAA-H-8083-9 Aviation Instructors Handbook

FAA-H-8083-25C PHAK Chapter 17: Aeromedical Factors

1. PHYSIOLOGICAL ASPECTS OF VISION RELATED TO NIGHT FLYING

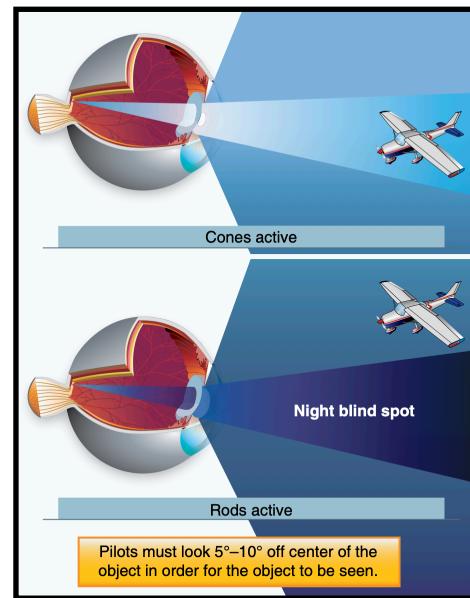
At altitudes as low as 4000 feet pressure altitude, the effects of hypoxia may be felt as diminished vision since the **rods require significant amounts of oxygen**.

Since the center of the fovea is exclusively covered in cones, a “night blind spot” emerges when the rods become the primary source of vision. As a result, pilots should use the near-peripheral vision to scan at night.

2. AIRPORT LIGHTING

Unlike the strict uniformity that regulate airport markings, airport lighting is standardized however its implementation varies on the volume and expected traffic at a particular airport. Larger, metropolitan airports serving airline traffic may have approach lighting systems, in-runway lighting, and other specialized lighting systems. Common lighting systems are discussed below.

At many airports, lights are turned off when not in use. Pilots, through the CTAF, can activate the lights to the desired intensity setting, 3 clicks on the mic for low intensity, 5 for medium, and 7 for high. More information can be found in [AIM 2-1-8](#).

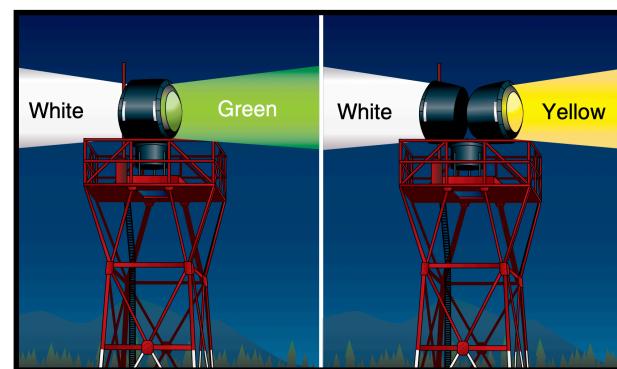
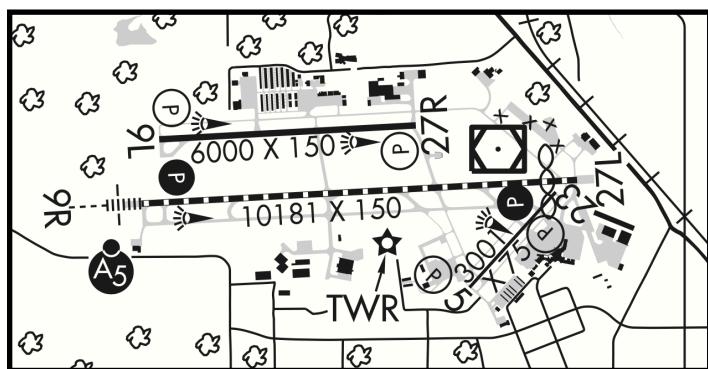


2.1. Airport Beacons ([AIM 2-1-9](#))

An airport located in the heart of a populated area hardly stands out against the dense city lights. Beacons are bright, oscillating lights that help pilots locate airports from several miles away, without relying on just ground lighting. The colors of the beacon vary depending on the type of airport. Beacon availability is depicted with a “B” on the chart supplement, and shown on the airport diagram with a \star , or a \odot if pilot controlled. Often the beacon is located on top of the tower, as seen at MLB.

Note that military airports utilize two white flashes followed by a green flash.

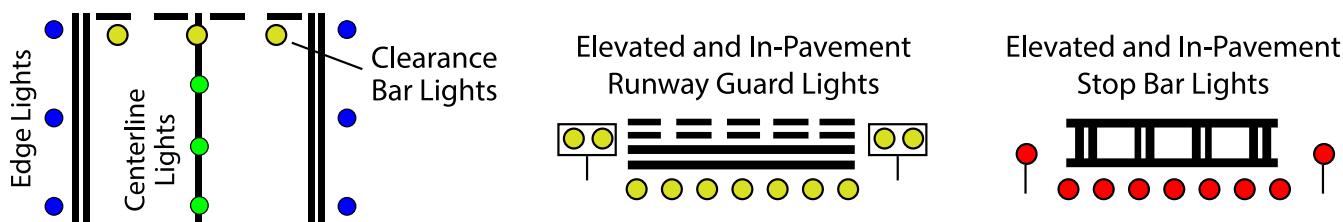
MELBOURNE ORLANDO INTL (MLB)(KMLB) 2 NW UTC-5(-4DT) N28°06.17' W80°38.72'	JACKSONVILLE H-8I, L-24F IAP AD
33 B ARFF Index—See Remarks NOTAM FILE MLB RWY 09R-27L H10181X150 (ASPH-GRVD) S-100 D-165 2D-300	



Airport Beacons
Left – Airport, Right – Seaport

2.2. Taxiway Lights (AIM 2-1-10)

The edges of a taxiway are demarcated by blue, steady burning lights. Sometimes, steady green centerline lights are also present.



At taxiway/runway intersections, there may be yellow flashing lights in the ground or at the taxiway edges. These are also known as 'wig-wags'

Stop bar lights are most common at larger airports. Pilots should never cross the red stop bar lights UNTIL they are extinguished by ATC.

2.3. Runway Lighting (AIM 2-1-3, 2-1-4, 2-1-5)

Runway lighting can vary significantly. The individual features remain standardized, but whether a runway incorporates certain features depends on the volume, availability of approaches, and other factors.

Runway End Identification Lights A pair of synchronized flashing lights located laterally on each side of the runway threshold. REILs may be either omnidirectional or unidirectional facing the approach area.

Runway Centerline Lights Runway centerline lights are installed at 50 foot intervals on some precision approach runways. Centerline lights are red for the final 1000 feet, alternating white and red for 2000 feet preceding that, and white for the remainder.

Touchdown Zone Lights Touchdown zone lights are installed on some precision approach runways to indicate the touchdown zone. They consist of two rows of light bars placed symmetrically about the runway centerline. The system consists of steady-burning white lights which start 100 feet beyond the landing threshold and extend to 3,000 feet beyond the landing threshold or to the midpoint of the runway, whichever is less.

Land and Hold Short Lights Land and hold short lights are used to indicate the hold short point on certain runways which are approved for Land and Hold Short Operations (LAHSO). Land and hold short lights consist of a row of pulsing white lights installed across the runway at the hold short point. Where installed, the lights will be on anytime LAHSO is in effect. These lights will be off when LAHSO is not in effect.

Runway Edge Lights Runway edge lights are used to outline the edges of runways and are classified according to the intensity or brightness they are capable of producing: high, medium, and low intensity runway lights (HIRL, MIRL, LIRL). The runway edge lights are white, except on instrument runways yellow replaces white on the last 2,000 feet or half the runway length, whichever is less.

Threshold Lights The lights marking the ends of the runway emit red light toward the runway to indicate the end of runway to a departing aircraft and emit green outward from the runway end to indicate the threshold to landing aircraft.

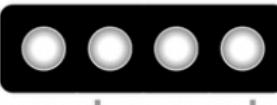
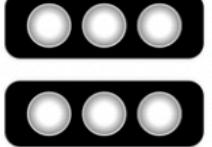
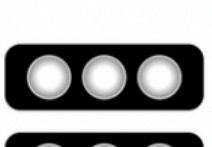
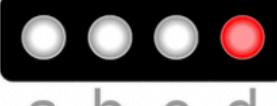
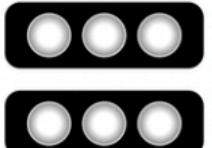
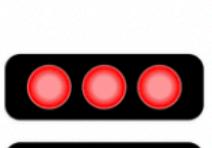
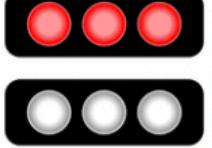
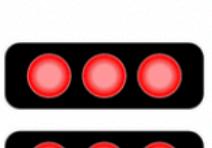
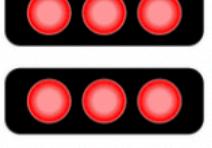
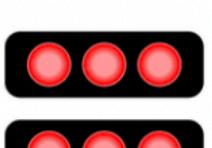
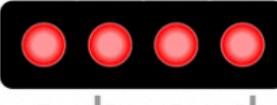
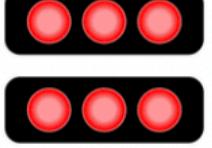
2.4. Visual Glideslope Indicators (AIM 2-1-2)

Information about an airports visual glideslope indicator can be found on the chart supplement. Filled in circles  indicate pilot controlled lighting, where hollow circles  indicate continuous lighting.

Visual Approach Slope Indicator (VASI)

Red over red you're dead. Red over white, you're alright.

Precision Approach Path Indicator (PAPI)

	PAPI	VASI
1. Too high	 a b c d	 
2. Slightly high	 a b c d	 
3. On glide slope	 a b c d	 
4. Slightly low	 a b c d	 
5. Too low	 a b c d	 

3. AIRPLANE LIGHT REQUIREMENTS

Per [91.209](#), lighted position lights are required between sunset and sunrise. Their standardization allows identifying the orientation of other aircraft at night.

Recall that landing lights are only required during ‘for-hire’ operations. An aircraft owner receiving instruction in their own aircraft does not fall into this category, but a flight school aircraft does.



4. PERSONAL EQUIPMENT AND COCKPIT LIGHTING

The Piper Tomahawk used in training has minimal interior lighting. As a result, a headlamp is required. The functional panel lights and screen brightness should be kept as low as possible.

4.1. Adjusting Avionics Brightness

5. ADJUSTING AND MAINTAINING NIGHT VISION EFFECTIVENESS

Adjusting to night vision can take upwards of 30 minutes to adjust. A red headlamp should be used to not disturb night vision. If not available, use the dimmest light possible.

The hormone, Rhodopsin, is generated in the rods in the dark, but is almost immediately deteriorated when exposed to bright lights. It returns in about 30 minutes.

6. USE OF INSTRUMENTS TO VERIFY THE AIRCRAFT ATTITUDE AT NIGHT

Usually, the first indication of flying into restricted visibility conditions is the gradual disappearance of lights on the ground. If the lights begin to appear surrounded by a halo or glow, further flight in the same direction calls for caution. Such a halo or glow around lights on the ground is indicative of ground fog. If a descent occurs through clouds, smoke, or haze in order to land, the horizontal visibility is considerably less when looking through the restriction than it is when looking straight down through it from above.

Aircraft attitude should be continuously cross referenced using a properly-developed instrument scan.

7. NIGHT ILLUSIONS

The airplane flying handbook lists common night illusions.

- i. False Horizon – rely on instruments
- ii. Autokinesis – stop fixation
- iii. Featureless Terrain – utilize visual or electronic glideslopes
- iv. Ground Lights – utilize visual or electronic glideslopes

These are discussed in depth in Lesson Plan II.A Human Factors.

8. NIGHT REGULATIONS

61.57(b) governs the night currency requirement. It is important to note that landings must be either **full stop** or **stop and go**. Additionally, these takeoffs and landings must be conducted between 1 hour after sunset and 1 hour before sunrise.

Night time, however, is defined in 1.1 as the end of evening civil twilight to the beginning of morning civil twilight. A pilot can log night time without any night takeoffs or landings.

Position lights are required equipment according to 91.205(c) and must be illuminated between sunset and sunrise per 91.209. Anti-collision lights are also required equipment at night according to 91.205(c) and per 91.209 must be used at all times (including night).