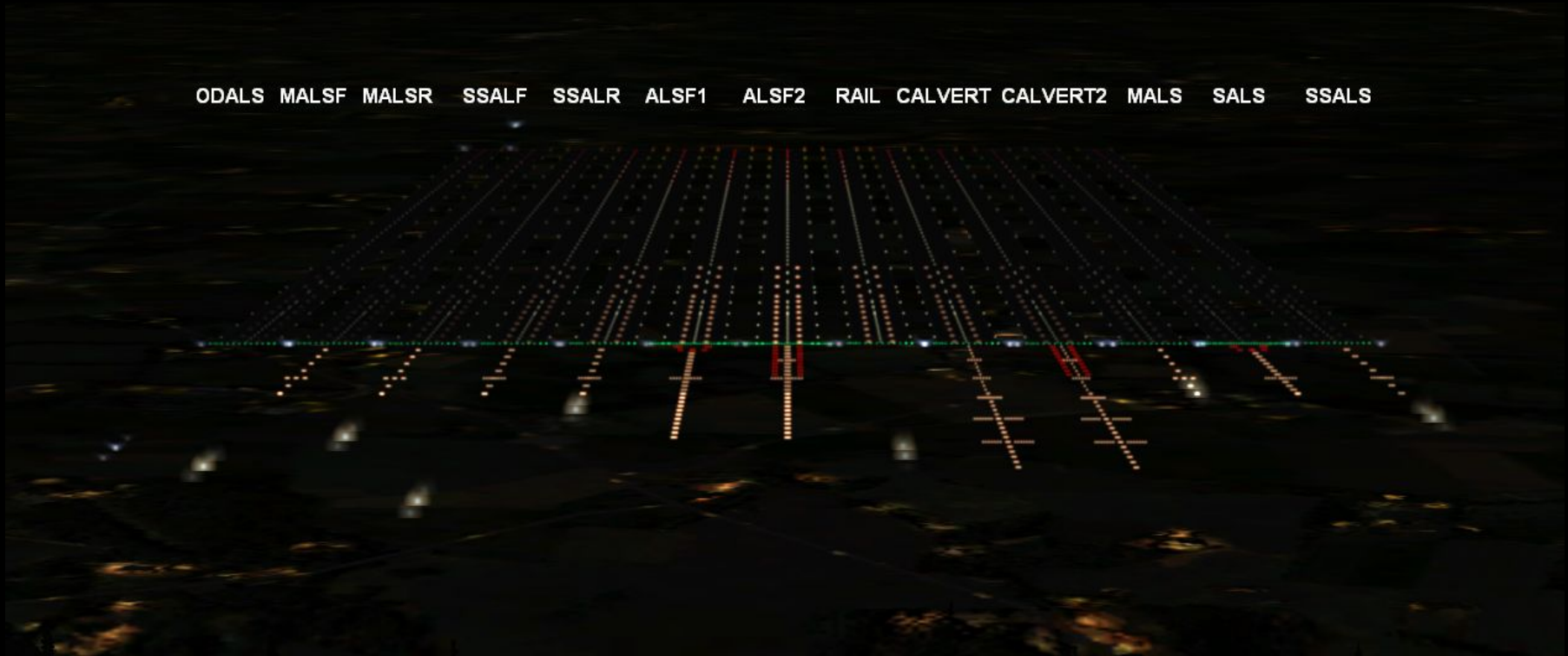


Approach Lighting



Approach Lighting System (ALS)

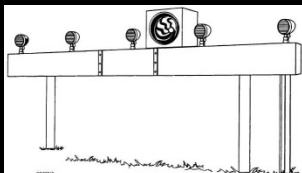
- The ALS is an airport lighting system that projects light in a directional pattern to help a pilot (i) identify a runway and (ii) align the aircraft with the runway on final approach and landing that:
 - Is installed at the approach end of a runway
 - Extends outward from the runway
- Consists of:
 - Series of light bars
 - Strobe lights, or a combination of the two.
- Usually installed on a runway with an instrument approach procedure

Approach Lighting System (ALS)

- Knowing the type of lights to expect can help you identify the correct runway and avoid landing on the wrong runway at an airport with parallel runways
- If you know the type of approach lighting available, other lighting in the airport's vicinity is less likely to cause confusion

ALS Components

- Threshold Bar - All ALSs begin with a row of green lights that indicate the approach end of the runway
- Runway Alignment Indicator Light (RAIL) consists of five sequenced white strobe lights located on the extended runway centerline, the first being located 200 feet beyond the approach end of the last steady-burning light bar (generally 1,000' from the threshold) with successive strobes at each 200-foot interval out to 2,400 feet from the threshold (may extend to 3,000 feet)
- Sequenced Flashing Light (SFL)
 - White sequenced strobe lights located on the last three light bar stations
- The RAIL and SFL strobes flash in sequence twice per second producing a ball of light streaking toward the approach end of the runway



Approach Lighting



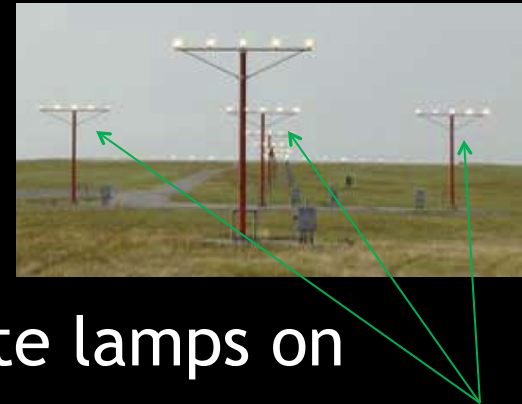
ALS Components

- RAIL and SFL provide early identification and alignment / displacement information when approaching a runway
- RAIL are not imbedded in the approach lights



ALS Components

Decision Bar

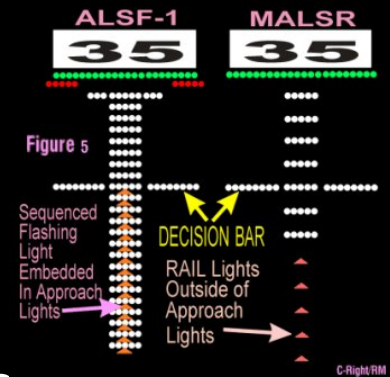


- Three light bars (5 steady-burning white lamps on each) that form a crossbar
- Serves several functions
 - Enables you to determine your physical location from the runway
 - On glideslope, when the decision bar passes directly underneath you, you should be approximately 100 feet above the TDZE
 - Decision bar is 1,000 feet from the threshold and will generally appear to slip below the airplane's nose at DH
 - Serves as an artificial horizon to help transitioning from IMC to VMC at decision height
 - Decision bar's horizontal spread of white lights acts like an external attitude indicator, providing you with visual bank references
 - Reference point used as a distance-to-go mark

ALS Components

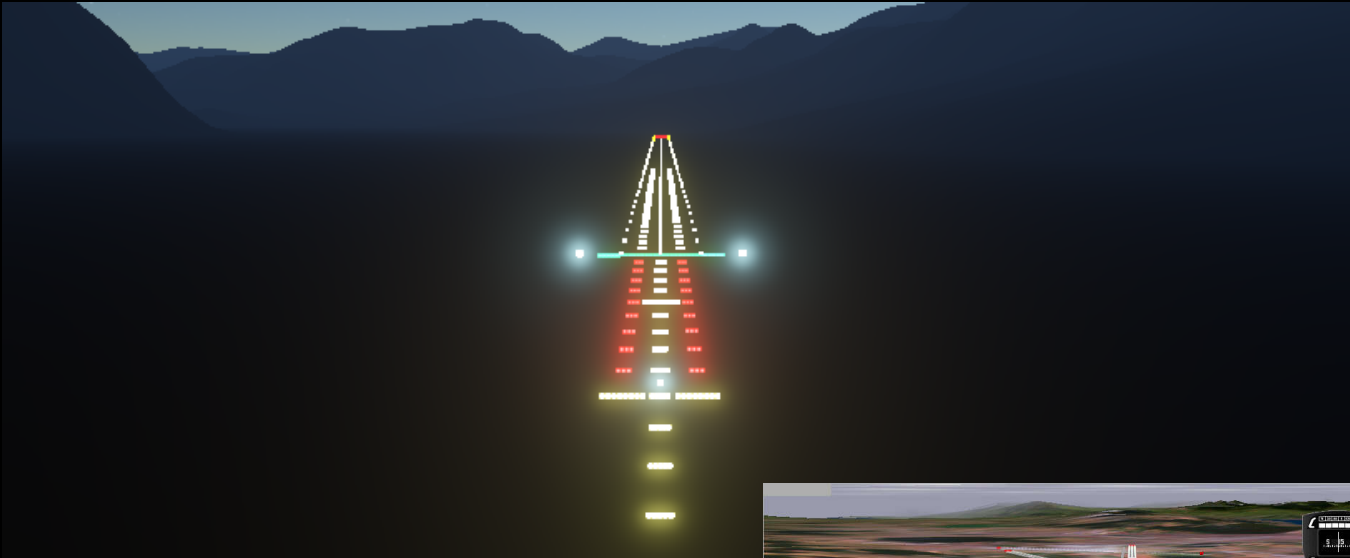
Decision Bar and Light Bars

- Allows you to make in-flight visibility estimates
 - Distance from the decision bar at DH
 - MALSR light bars are spaced at 200 foot intervals
 - ALSF 1 / 2 light bars are spaced at 100 foot intervals
- Flashing white lights will stop at or before the decision bar (from the approach side)



Decision Bar

Transition to Visual



Decision Bar acts as an external bank indicator and assists in the transition from Instruments to visual



ALS May Allow You to Determine Visibility

- At a standard decision height of 200' AGL for an ILS Category I approach you will be approximately 3,846' from the runway touchdown zone, or 2,846' from the runway threshold
 - on a 3° glide path, if the reported visibility is ½ SM or 2,500' - you will see very little of the runway environment, if any, other than approach lights

Visibility Determinations

- If an approach procedure requires $\frac{1}{2}$ statute mile flight visibility (+/- 2600'), then if you are able to identify the decision bar at the marker, you would know you have enough flight visibility to continue the procedure
- If the middle marker is closer you can use the MALSR and ALSF lights to judge further distances

ALS Components

- Red Terminating and side row bars - Allow descent below 100' above the touchdown zone - FAR 91.175(c)(3)(i)



ALS Components

- Omnidirectional approach lighting system (ODALS), a flashing light system, similar to a RAIL, but is visible from all directions
 - RAIL and sequenced flashing lights are visible only when you are approaching the runway
- Runway End Identifier Lights (REIL) - Synchronized flashing high intensity white lights placed in the vicinity of the runway threshold approximately 40 feet from the runway edge and in line with the threshold lights. The lights are directed toward the approach zone, enabling the pilot to identify the runway's threshold



Lead-In Lighting System

LDIN

- LDIN provides positive visual guidance along an approach path, either curving or straight, where special problems exist with hazardous terrain, obstructions, or noise abatement procedures
- Consists of one or more series of flashing lights installed along the approach path at or near ground level
- The groups of lights are positioned to be seen and followed by approaching aircraft
- Each light group contains at least three flashing lights in a linear or cluster configuration and may be augmented by steady-burning lights
- The lights generally flash in sequence toward the runway
- LDIN may be terminated at where the approach lighting system begins

What dictates the ALS

- Types of Approaches to the runway
 - ILS or LPV approach with visibility less than $\frac{3}{4}$ -mile, will be an ALSF-2 or 1, a SSALR or MALSR
 - CAT II and CAT III runway will have ALSF-2 or 1 lighting

ALSF

- Most complex light structure
- Used on runways with CAT II or CAT III approaches
- Unique feature of the ALSF-1 and 2 is the red side row or red terminating bars.
 - If you can maintain visual contact with the red light bars you can descend below 100' above TDZE

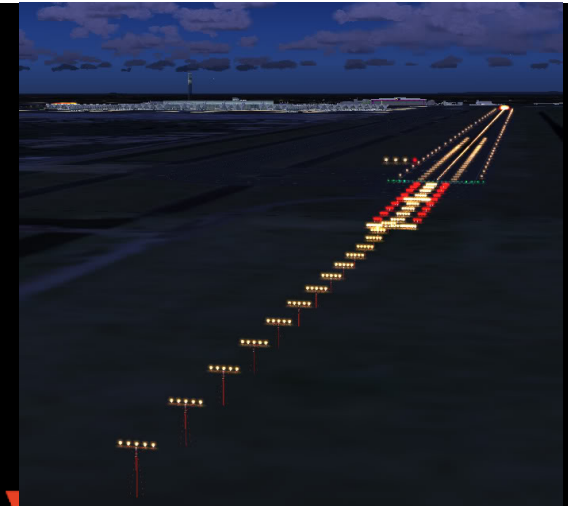
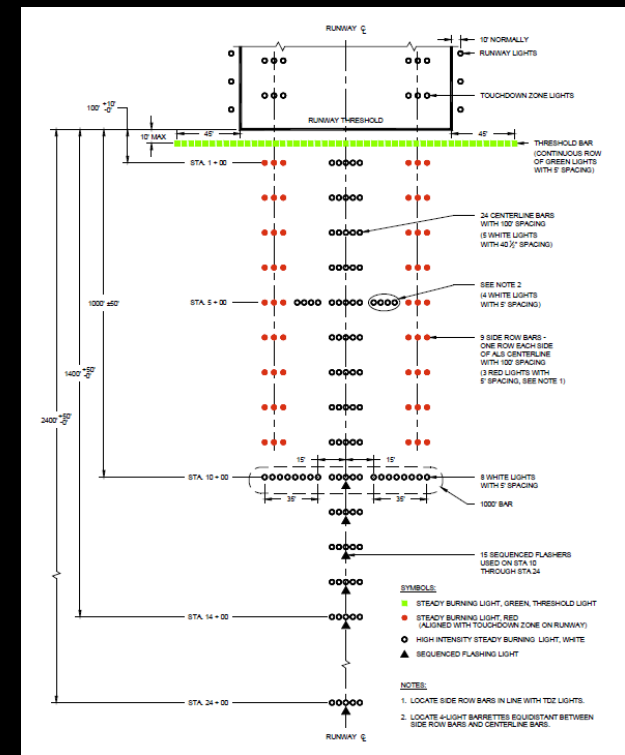
ALSF

- Most ALSF systems have five intensity levels, or steps
- Cat-I approaches only need the first three
 - CAT-I lights only reach medium intensity at full brightness, so they are called medium lighting
 - truncated e.g. MALSR. The “M” is for medium



ALSAF-2

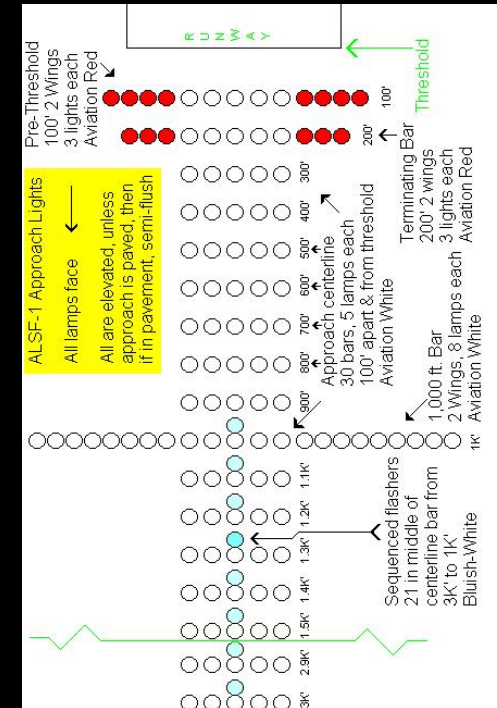
- ALSF-2 (Approach Lighting System with Sequenced Flashing Lights) is used on Category II runways during instrument landing approach to align the aircraft with the centerline of the runway and to establish vertical orientation
 - Steady white lights serve as a reference plane
 - Two rows of red side row barrettes increase the pilots horizontal perception
 - Sequential white strobe lights that fire in sequence and appear as a ball of light zipping down the ALS centerline, towards the runway, twice a second (aka the “rabbit”)
 - Rabbit helps you acquire the ALS and orient you to the runway
- This is the system with all the bells and whistles
 - 2400 feet up to the threshold
 - Approaches with slopes of less than 2.75 degrees get an extra six bars to reach 3000 feet
 - Gives the pilot a visual indication of crab angle and helps prepare for the landing
- But there are versions that are simplified and/or shortened





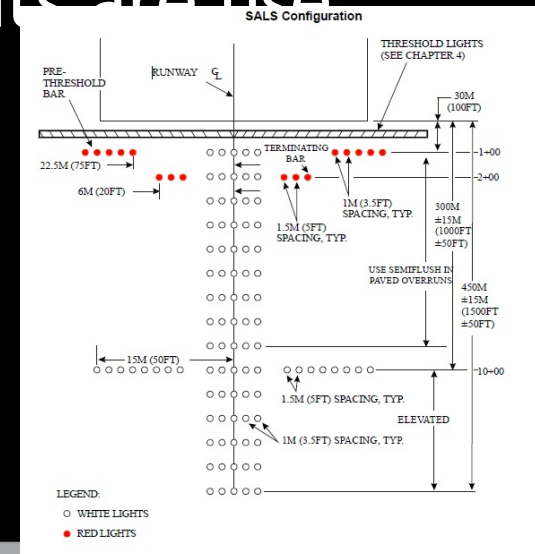
ALSF-1

- ALSF-1 - less common
- Is the same as the ALSF-2 up to the last 1000 feet
- ALSF-1 does not have the red side-row bars, but has a wing-shaped pattern of red lights in the last 200 feet to the threshold
 - These are the “terminating bars” referenced in FAR §91.175.
 - Red side-row lights (ALSF-2) or red terminating bars (ALSF-1)
 - Will never have both on the same ALS



Short Approach Lighting System SALS / SALSF

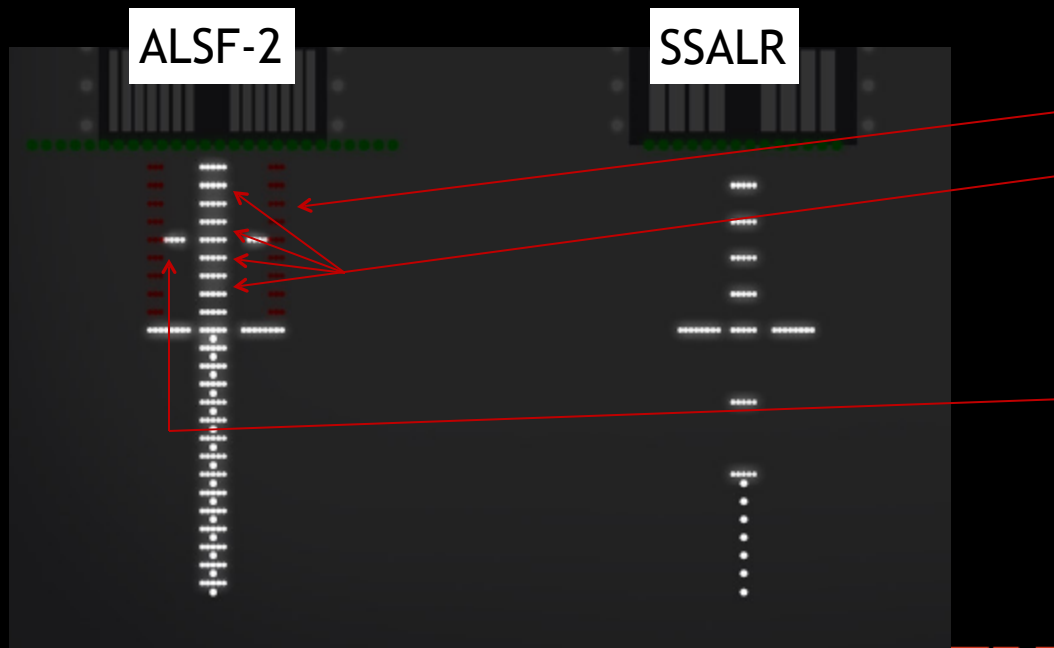
- ALSF-1 is never “simplified”
- Can be shortened to 1500’
 - Becomes a High Intensity Short Approach Lighting System (SALS) or SALSF, if sequenced flashing lights are used



Short Approach Lighting System with RAIL - SSALR



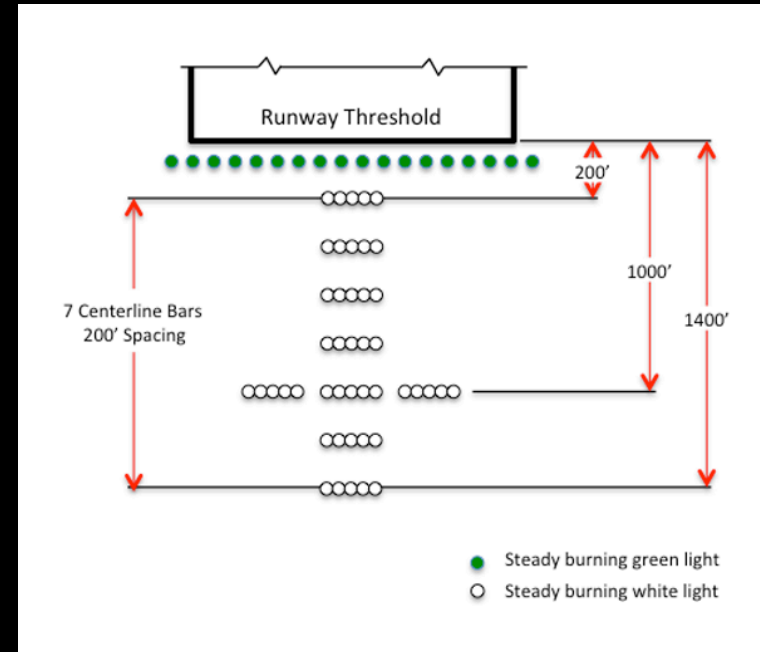
- 2400' - 3000' in length - similar to ALSF-2
- An ALSF-2 can, in appropriate weather, be lit as an SSALR





MALS and SSAL

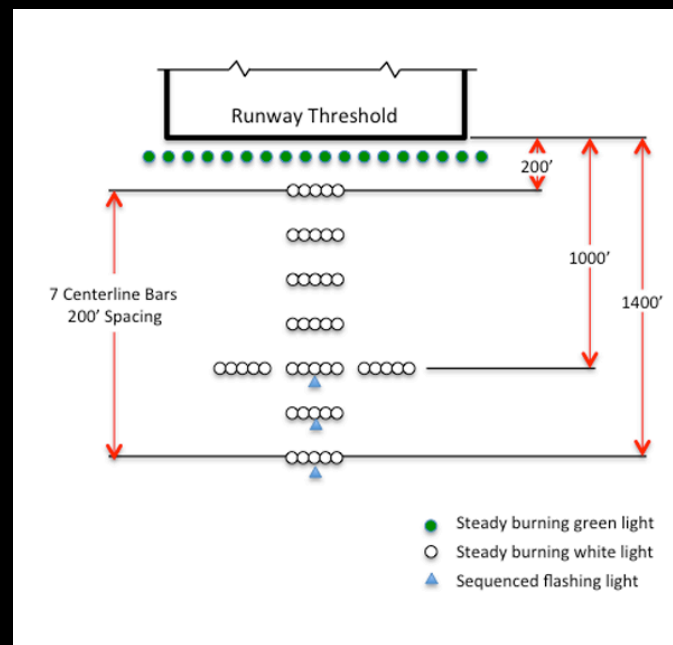
- MALSR (Medium Intensity Approach Lighting System)
- SSAL (Simplified Short Approach Lighting System)
- Provides visual information to pilots on runway alignment, height perception, roll guidance, and horizontal references generally for category I Precision Approaches





MALSF and SSALF

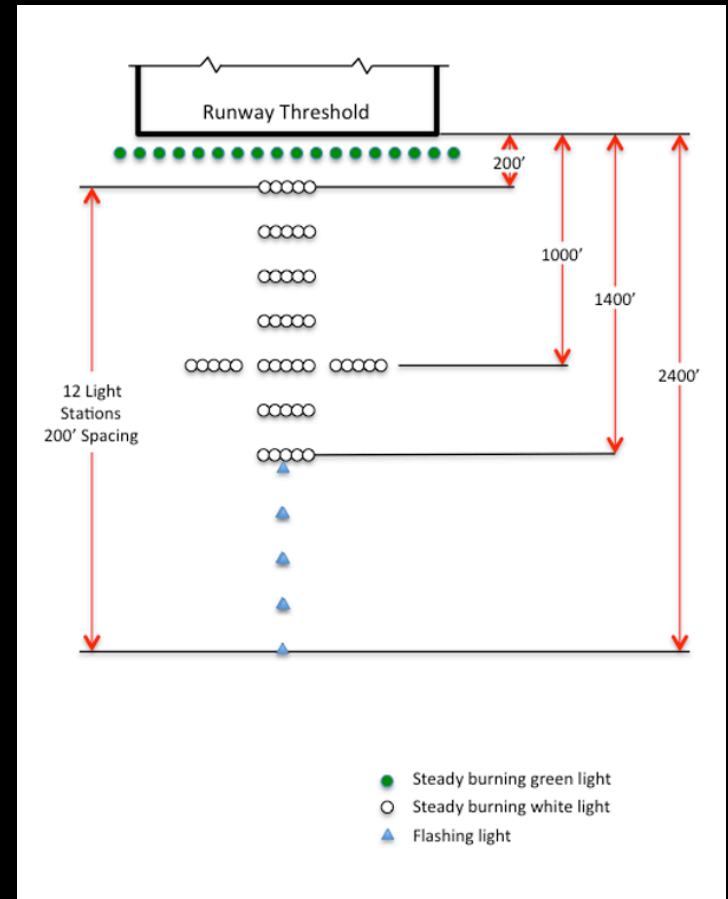
- Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF)
- Same as MALS BUT has three sequenced flashing lights on last 3 light bars
- Used where approach area identification is difficult





MALSR / SSALR

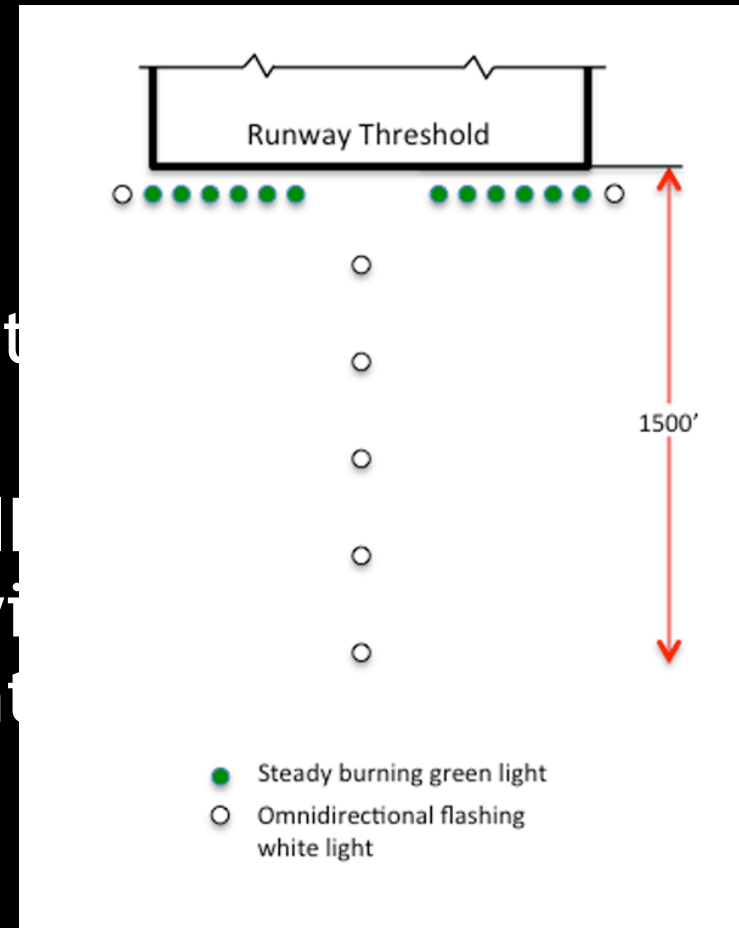
- Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR)
 - Used for CAT I runways
- The Simplified Short Approach Lighting System with Runway Alignment Indicator Lights (SSALR) appears identical to the MALSR





ODALS

- Omni-Directional ALS (ODALS)
 - Runway end identifier light (REIL) are part of ODALS
 - ODAL adds a 1500-foot RAIL leading to the threshold with no other solid-burning light



Approach Plate Presentation

- Shown in the information bar
 - Symbol
 - Graphic depiction
 - Textual label

HOUSTON, TEXAS AL-198 (FAA) 14205

LOC/DME I-PRQ 111.3 Chan 50	APP CRS 131°	Rwy Idg 6568 TDZE 46 Apt Elev 46	ILS or LOC RWY 12R WILLIAM P. HOBBY (HOU)	
Inop table does not apply to 54LS 12R. DME or RADAR required. Helicopter visibility reduction below 3/4 SM NA. For inop MALSR, increase S-LOC 12R Cat A and B visibility to RVR 5000 and Cat E to 1 1/4.		MISSED APPROACH: Climb to 800 then climbing right turn to 2200 direct VUH VORTAC.		
ATIS 124.6	HOUSTON APP CON 120.05 379.1 EAST 124.35 316.15 WEST	HOBBY TOWER 118.7 256.9	GND CON 121.9	CLNC DEL 125.45

MSA HUB 25 NM

HOUSTON, TEXAS AL-198 (FAA) 14205

LOC/DME I-HUB 109.9 Chan 36	APP CRS 041°	Rwy Idg 7602 THRE 42 Apt Elev 46	ILS RWY 4 (CAT II & III) WILLIAM P. HOBBY (HOU)	
ALSF-2 MISSED APPROACH: Climb to 2000 on HUB VOR/DME R-040 RAYCI/HUB 1.5 DME and hold.				
ATIS 124.6	HOUSTON APP CON 120.05 379.1 EAST 124.35 316.15 WEST	HOBBY TOWER 118.7 256.9	GND CON 121.9	CLNC DEL 125.45

MSA HUB 25 NM

GPS or RADAR REQUIRED

Approach Lighting

- <https://www.youtube.com/watch?v=Kzs7wmTpgSw>
- What type of lighting is this?