

# INSTRUMENT LANDING SYSTEM (ILS)

## Precision Approach

Precision Approach (PA). An instrument approach based on a navigation system that provides course and glidepath deviation information meeting the precision standards of ICAO Annex 10. For example, PAR, ILS, and GLS are precision approaches.

### Guidance Information



Localizer UHF



Glideslope VHF

### Range Information



Marker Beacon



DME



Precision Radar

### Visual Information



Approach Lights



Runway Lights

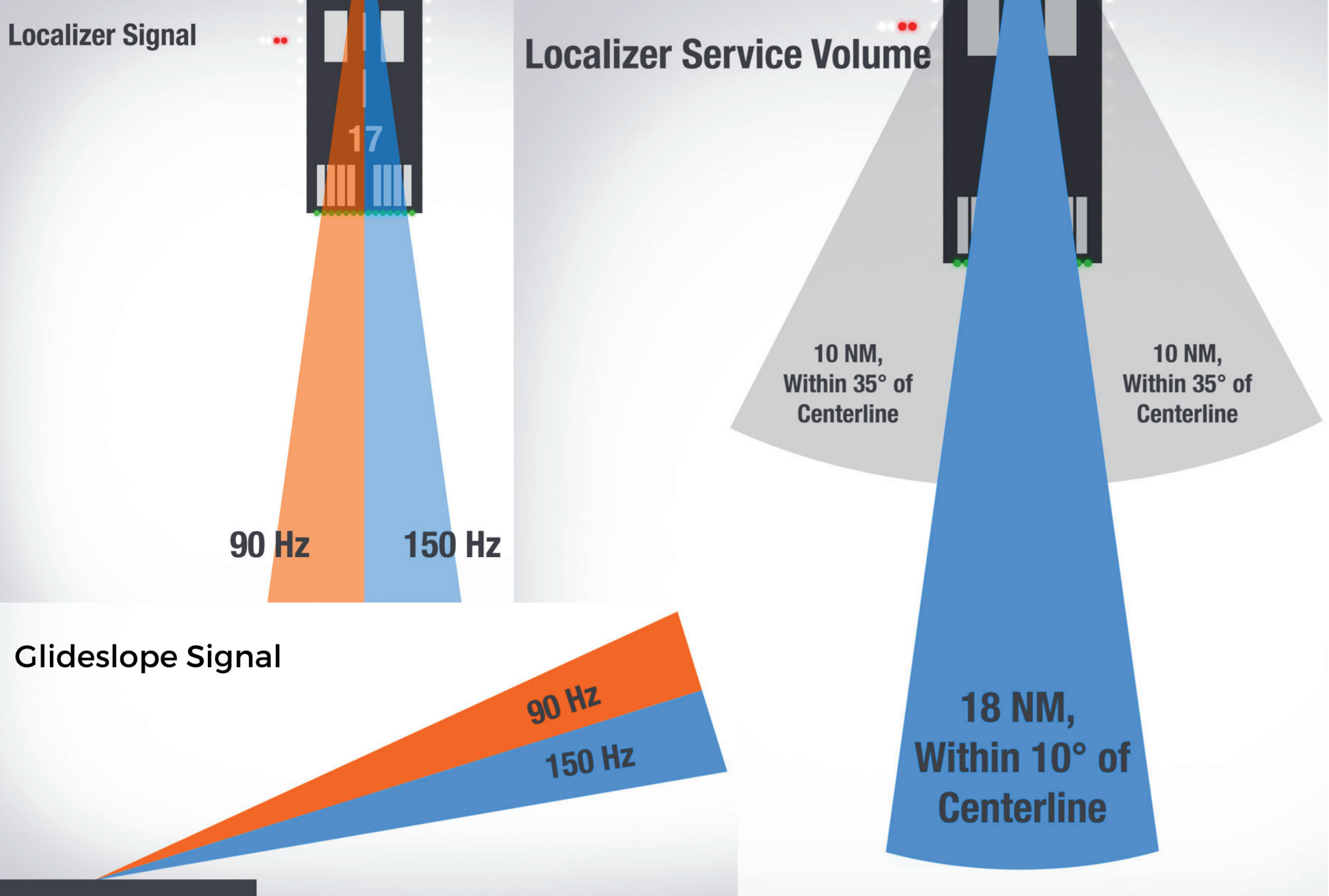
### The lowest authorized ILS minimums, with all required ground and airborne systems components operative, are:

- CAT I - decision height (DH) 200 feet and runway visual range (RVR) 2,400 feet (with touchdown zone and centerline lighting, RVR 1,800 feet).
- CAT II - DH 100 feet and RVR 1,200 feet.
- CAT IIIa - No DH or DH below 100 feet and RVR not less than 700 feet.

- CAT IIIb - No DH or DH below 50 feet and RVR less than 700 feet but not less than 150 feet.
- CAT IIIc - No DH and no RVR limitation.

NOTE: Special authorization and equipment are required for CAT II and III.

# INSTRUMENT LANDING SYSTEM (ILS)



**OUTER MARKER**  
400Hz Tone ---

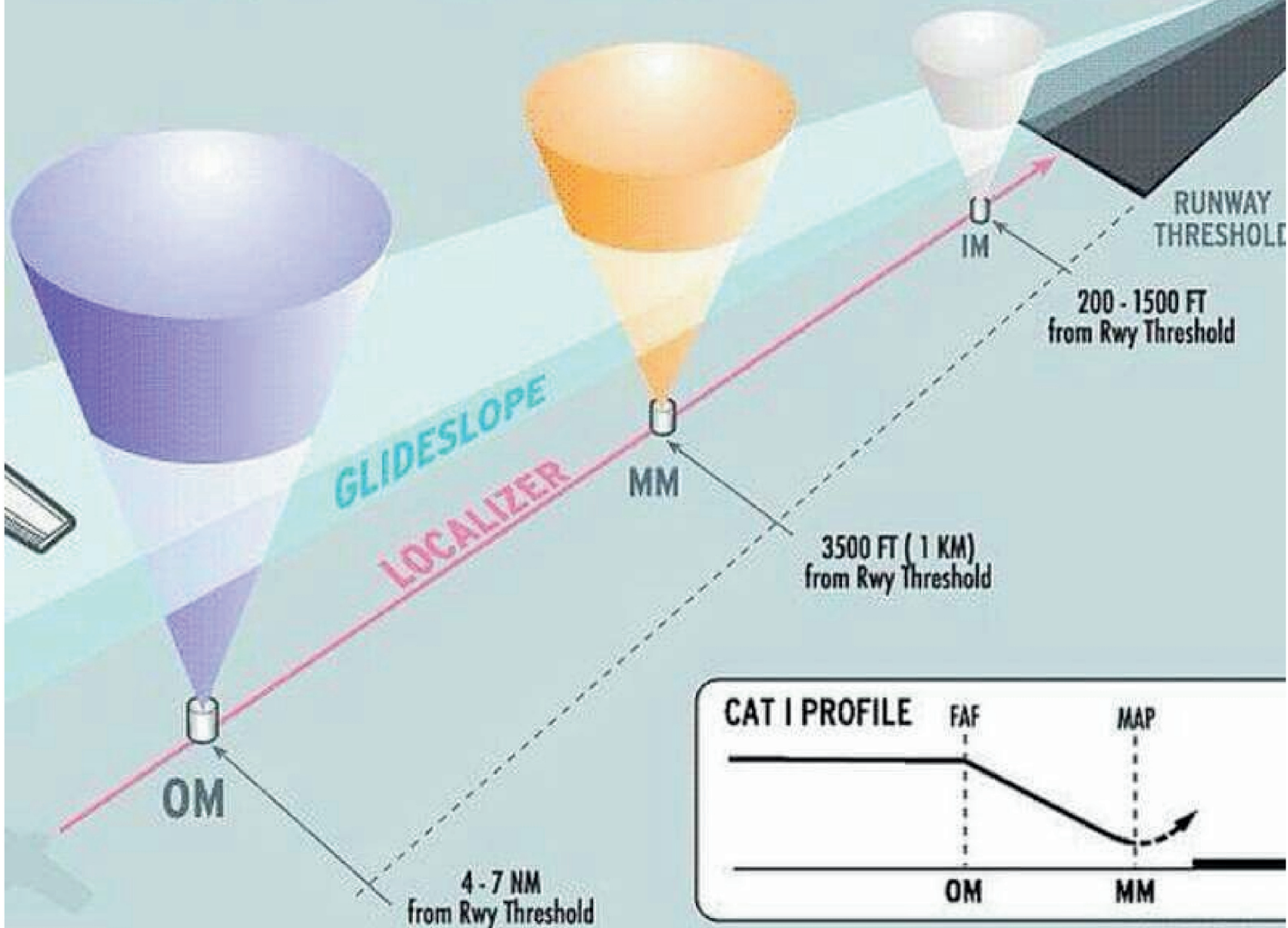
**MIDDLE MARKER**  
1300 Hz Tone •---•

**INNER MARKER**  
3000 Hz Tone •••

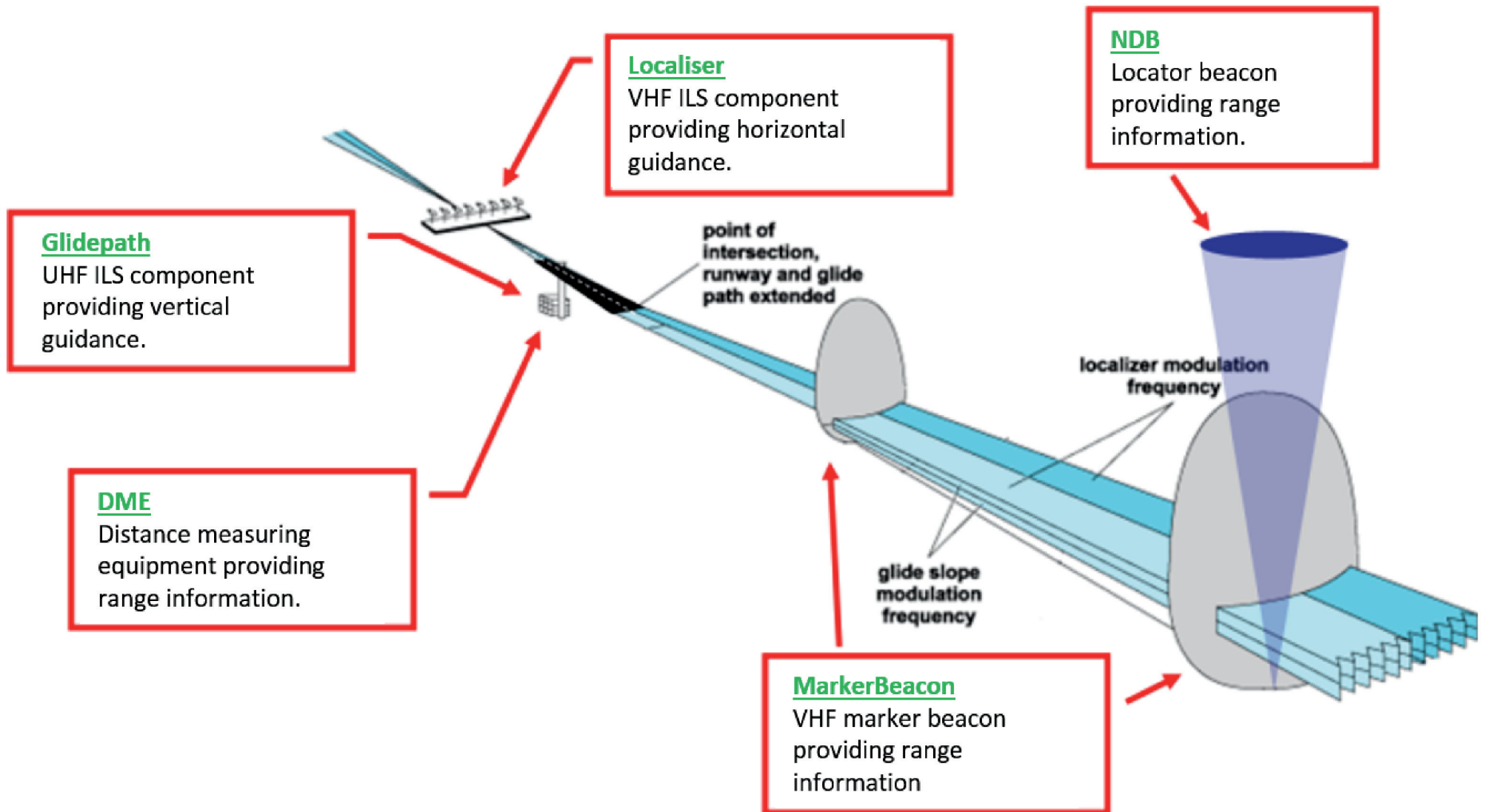
Final Approach Fix  
for Non-Precision Approach

CAT I Decision Heights  
Normal ILS Miss Approach Point

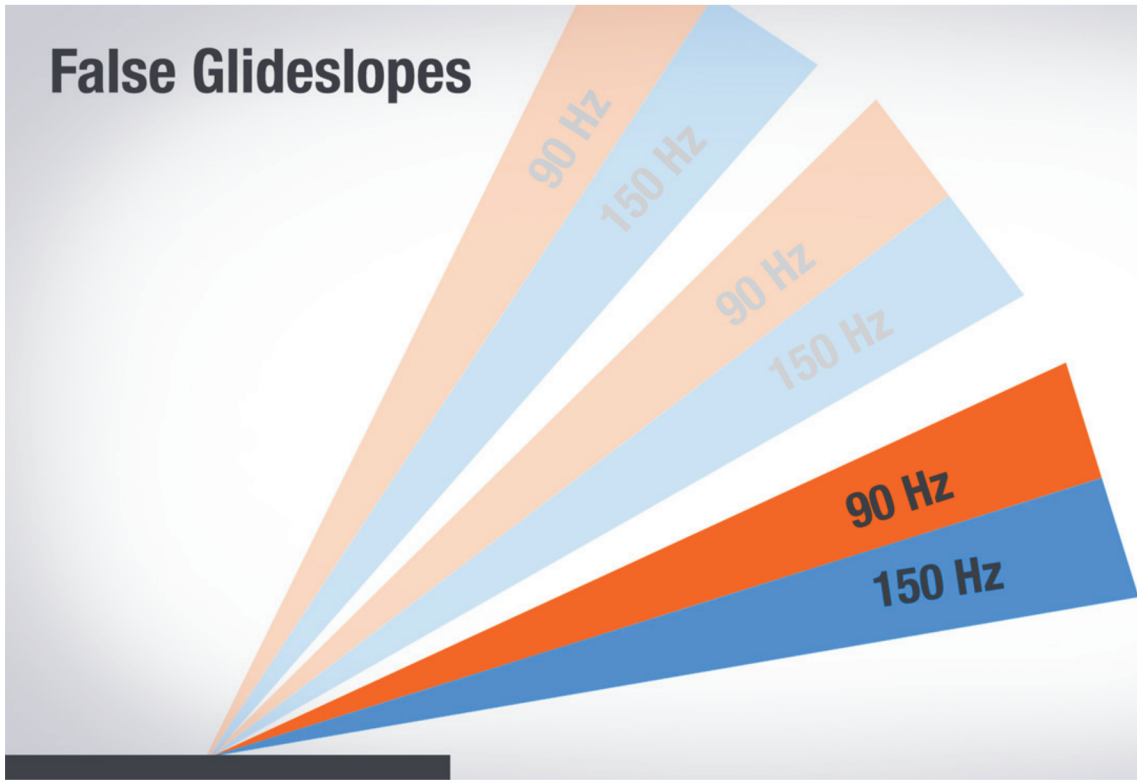
CAT II & CAT III  
Decision Heights



# INSTRUMENT LANDING SYSTEM (ILS)

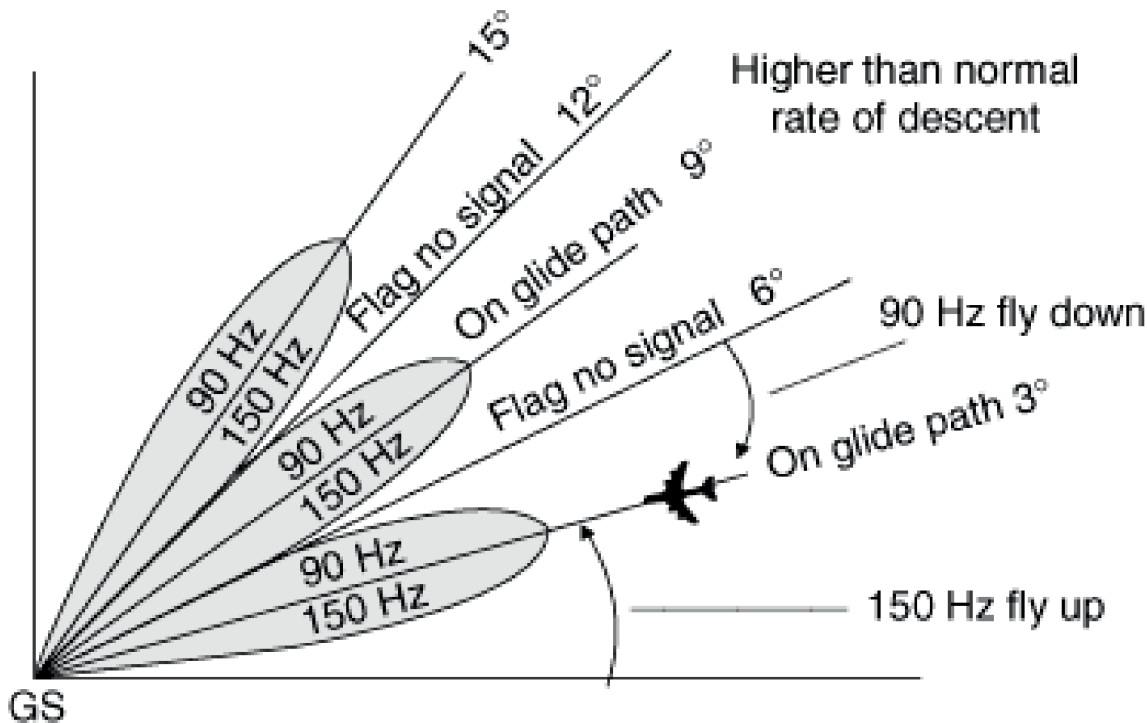


# False Glideslopes



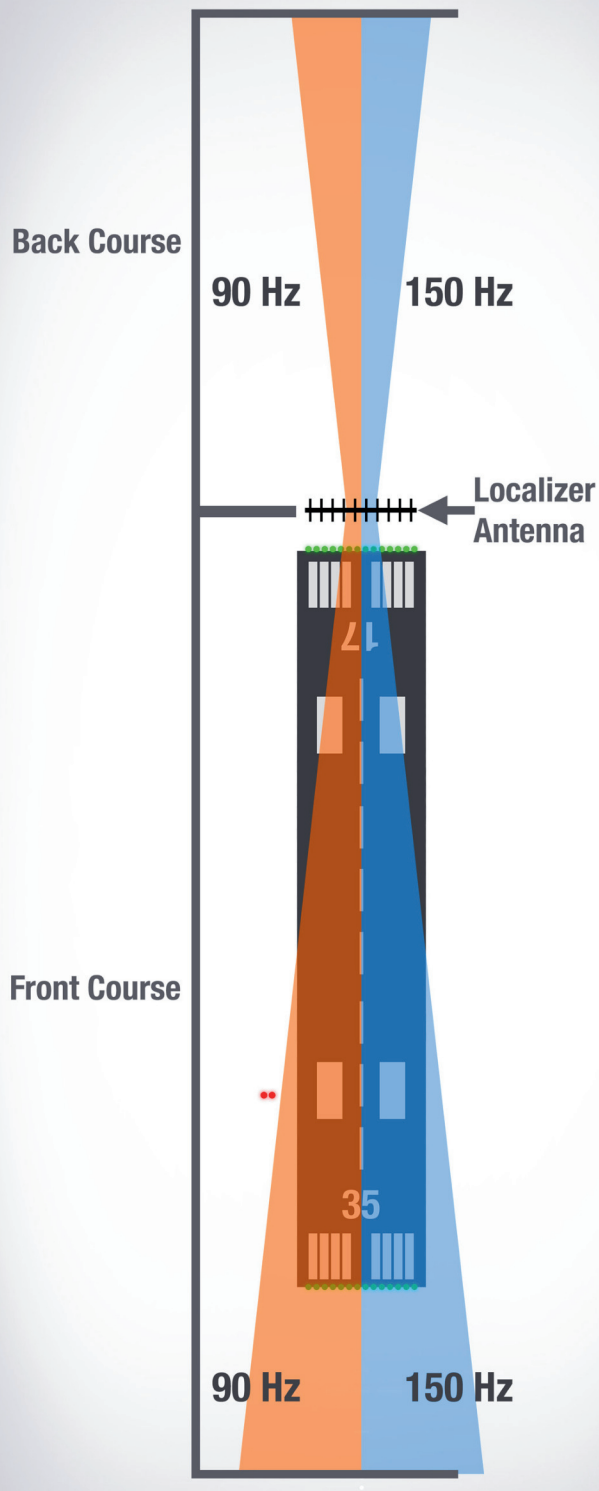
The glideslope is subject to false signal errors. False glide slopes may be present above the desired path. These false signals are at a higher angle than it and may cause the pilot to fly a steeper approach than expected.

To prevent following the wrong slope, always intercept the glideslope from the published altitudes on the approach fixes.



Objects below 5,000 feet AGL have a tendency to reflect glideslope signals. This can create false glideslopes, which are often at 9-degree and 12-degree angles to the runway. Pilots are taught to intercept the glideslope from below to ensure they don't capture a "false" glideslope

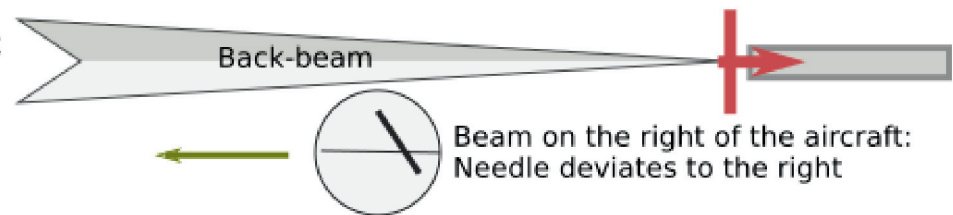
## Localizer Front Course And Back Course



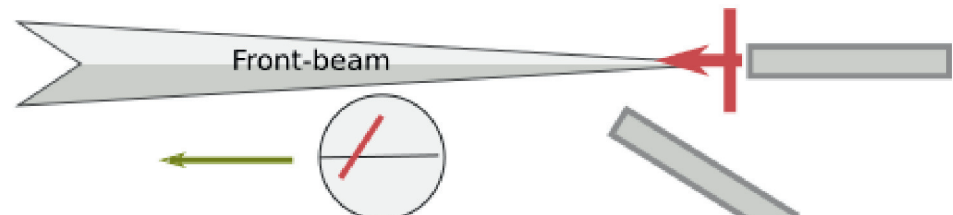
# ILS BACK COURSES

The back course localizer approach provides the lateral guidance of an ILS approach without the glide slope information. Instrument landing system (ILS): An electronic system that provides both horizontal and vertical guidance to a specific runway, used to execute a precision instrument approach procedure.

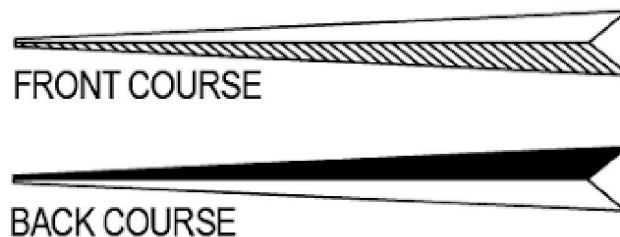
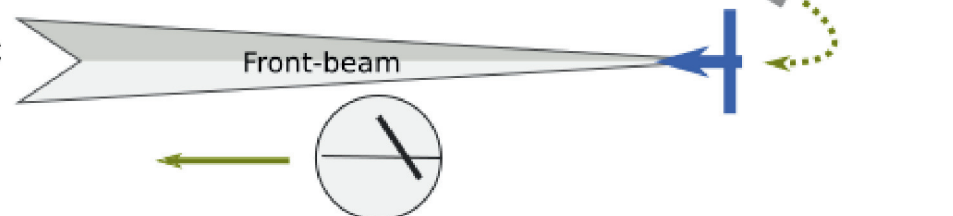
Conventional back-course transmitted from the back lobes: Regular indications when flying outbound



Back-course transmitted from the front lobes: Reversed indications when flying outbound



Reversed back-course transmitted from the front lobes: Regular indications when flying outbound



Marker	Code	Light
OM	- - -	BLUE
MM	• - • -	AMBER
IM	• • • •	WHITE
BC	• • • •	WHITE

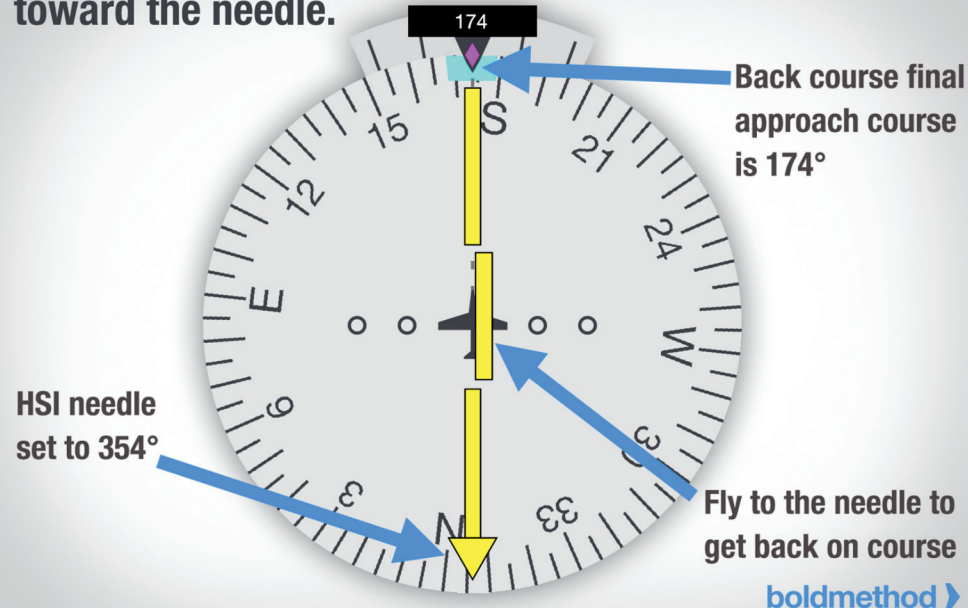
## How To Set Up A "LOC BC" (With HSI)

If you're lucky enough to fly with a horizontal situation indicator (HSI), flying LOC BC approaches gets significantly easier. The HSI combines a heading indicator with CDI needles. As long as you tune the front course for the localizer, you won't get reverse sensing.

When configured properly, you can fly the LOC BC approach with normal sensing, and fly "to the needle" like you do in all other navigation.

For example, if you were flying the LOC BC to runway 17R in Grand Forks, instead of dialing the back course of 174 degrees, you'd dial the front course of 354 degrees, and fly to the needle to navigate the approach

With an HSI, dial the front course, and fly toward the needle.



## How To Set Up A "LOC BC" (Without HSI)

For pilots flying a LOC BC approach using a course deviation indicator (CDI) with an omni bearing selector (OBS), you must pay close attention to "reverse sensing" associated with the back course. According to the AIM, "when flying inbound on the back course it is necessary to steer the aircraft in the direction opposite the needle deflection when making corrections from off-course to on-course. This 'flying away from the needle' is also required when flying outbound on the front course of the localizer."

It doesn't matter whether you select the front course or the back course with the OBS knob (in the image below, 174 degrees or 354 degrees, or any OBS setting for that matter), the needle will work the same. However, it's easier for many pilots to dial the final approach course with the OBS to remember which general direction they're flying the approach.

When you're established on the LOC BC approach, you will always "reverse sense" using a CDI with OBS. If you're in this situation, try saying out loud "fly away from the needle."

In the this image, and CDI is set up for the Localizer Back Course approach to runway 17R in KGFK (174 degree final approach course). The CDI needle is deflected to the left. You need to turn right (fly away from the needle) to get back on course for this localizer back course approach.



# INSTRUMENT LANDING SYSTEM (ILS)

Fly down

Glideslope needle indicates "fly down" to intercept glideslope



Fly up

Glideslope needle indicates "fly up" to intercept glideslope

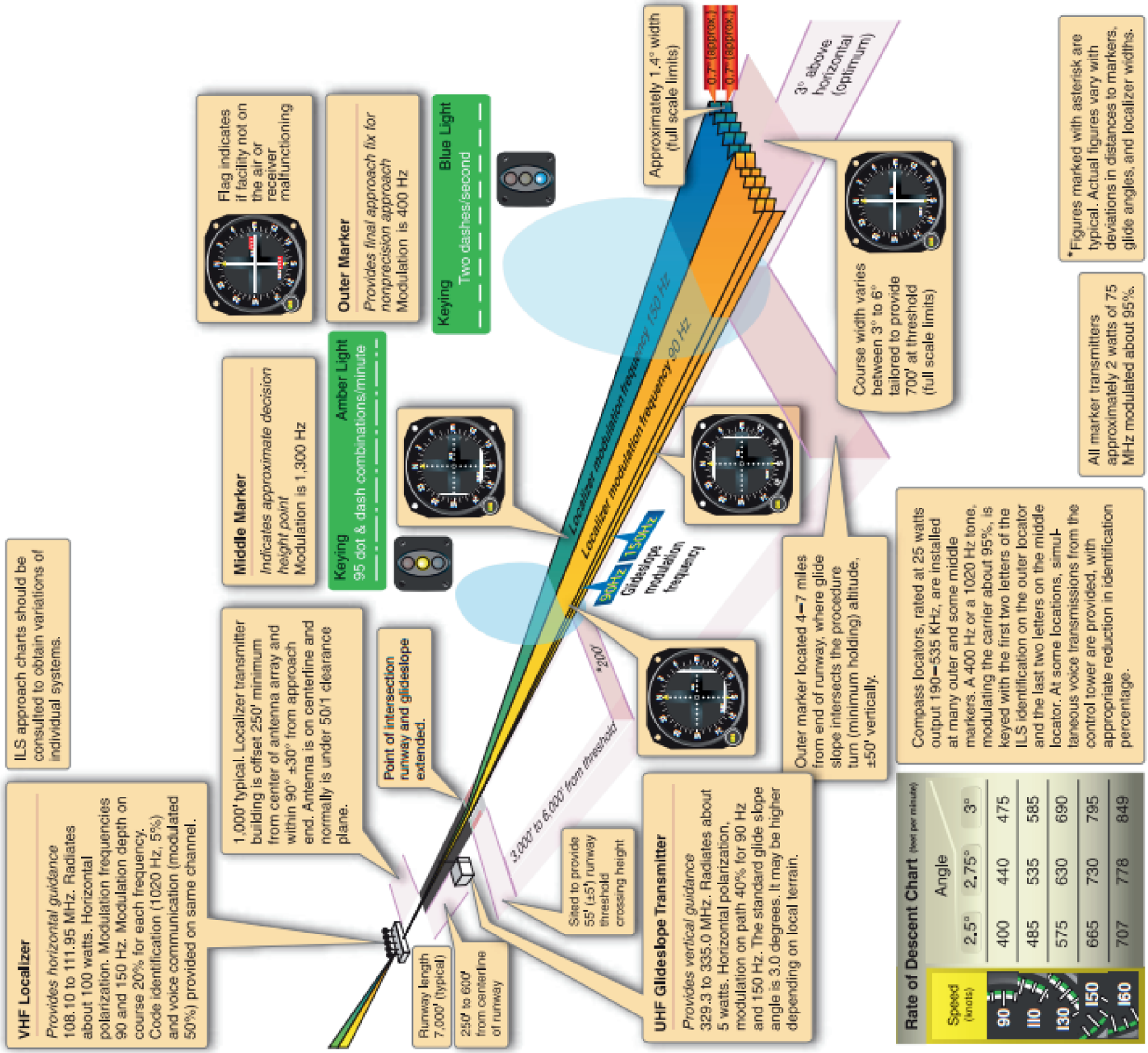


Glideslope





# INSTRUMENT LANDING SYSTEM (ILS)



ILS approach charts should be consulted to obtain variations of individual systems.

Flag indicates if facility not on the air or receiver malfunctioning

Outer Marker Provides final approach fix for nonprecision approach Modulation is 400 Hz

Keying Two dashes/second Blue Light

Middle Marker Indicates approximate decision height point Modulation is 1,300 Hz

Keying 95 dot & dash combinations/minute Amber Light

1,000' typical. Localizer transmitter building is offset 250' minimum from center of antenna array and within 90° ±30° from approach end. Antenna is on centerline and normally is under 50/1 clearance plane.

Point of intersection runway and glideslope extended.

Runway length 7,000' (typical)  
250' to 600' from centerline of runway

Sited to provide 55' (±5') runway threshold crossing height  
3,000 to 6,000' from threshold  
±200'

UHF Glideslope Transmitter Provides vertical guidance 329.3 to 335.0 MHz. Radiates about 5 watts. Horizontal polarization, modulation on path 40% for 90 Hz and 150 Hz. The standard glide slope angle is 3.0 degrees. It may be higher depending on local terrain.

Outer marker located 4-7 miles from end of runway, where glide slope intersects the procedure turn (minimum holding) altitude, ±50' vertically.

Compass locators, rated at 25 watts output 190-535 KHz, are installed at many outer and some middle markers. A 400 Hz or a 1020 Hz tone, modulating the carrier about 95%, is keyed with the first two letters of the ILS identification on the outer locator and the last two letters on the middle locator. At some locations, simultaneous voice transmissions from the control tower are provided, with appropriate reduction in identification percentage.

Approximately 1.4" width (full scale limits)

0.7" (approx.)  
0.7" (approx.)

3° above horizontal (optimum)

Course width varies between 3° to 6° tailored to provide 700' at threshold (full scale limits)

All marker transmitters approximately 2 watts of 75 MHz modulated about 95%.

\*Figures marked with asterisk are typical. Actual figures vary with deviations in distances to markers, glide angles, and localizer widths.

# ILS DECISION HEIGHTS & CATEGORIES

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