



Marker beacon system

● OUTER MARKER
400Hz Tone - - -

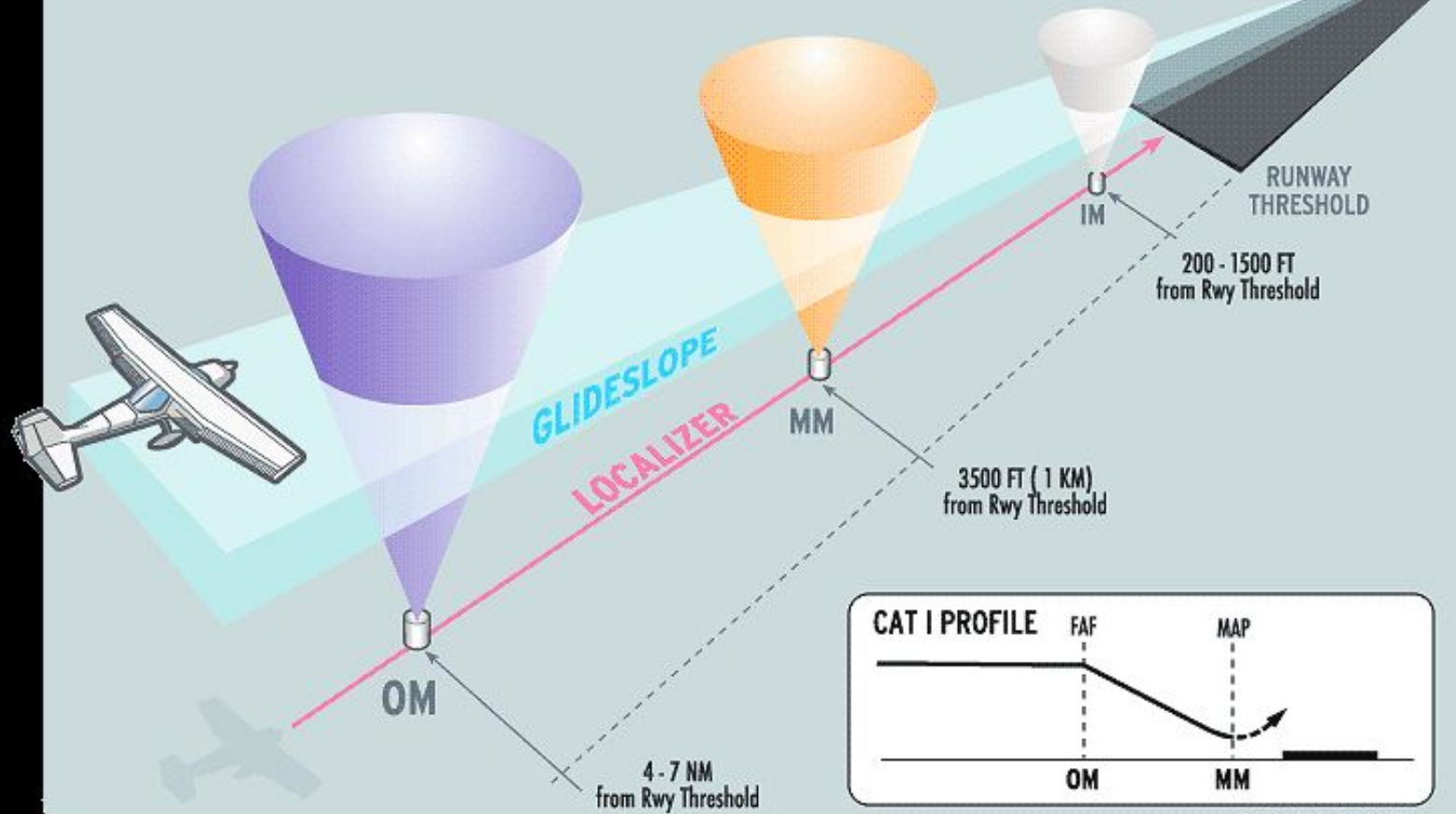
● MIDDLE MARKER
1300 Hz Tone • - - • - -

● 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



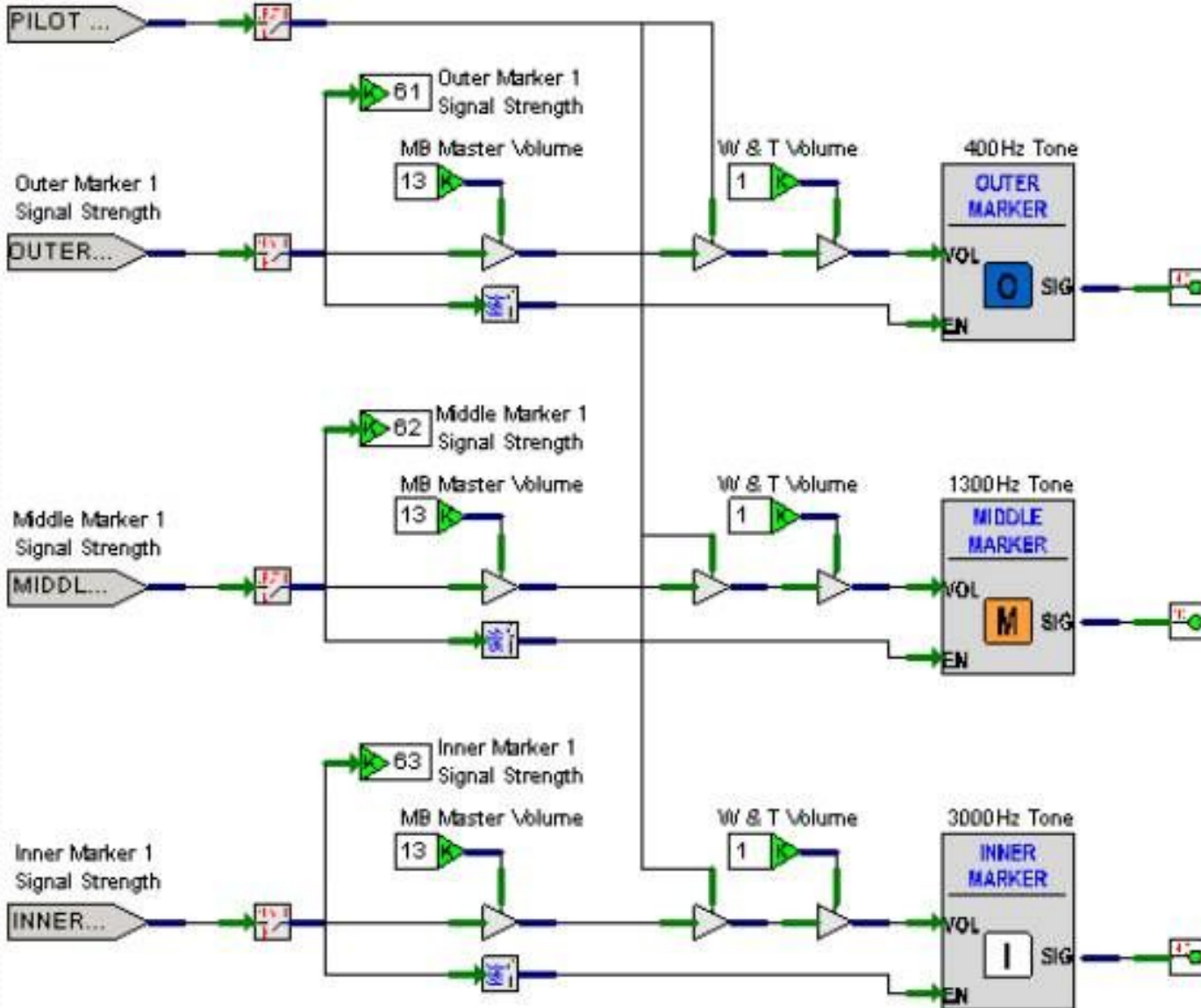
MARKER BEACON 1


Marker Beacon Master Volume



PILOT AUDIO

Pilot Audio Mkr Bon 1





A marker beacon is a particular type of VHF radio beacon used in aviation, usually in conjunction with an instrument landing system (ILS), to give pilots a means to determine position along an established route to a destination such as a runway.

According to Article 1.107 of the International Telecommunication Union's (ITU) ITU Radio Regulations (RR)[1] a marker beacon is defined as A transmitter in the aeronautical radionavigation service which radiates vertically a distinctive pattern for providing position information to aircraft.

History

From the 1930s until the 1950s, markers were used extensively along airways to provide an indication of an aircraft's specific position along the route, but from the 1960s they have become increasingly limited to ILS approach installations. They are now very gradually being phased out of service, especially in more developed parts of the world, as GPS and other technologies have made marker beacons increasingly obsolete.

- The Outer Marker, which normally identifies the final approach fix (FAF), is situated on the same course/track as the localizer and the runway center-line, four to seven nautical miles[2] before the runway threshold. It is typically located about 1 NM (1.85 km) inside the point where the glideslope intercepts the intermediate altitude and transmits a 400 Hz tone signal on a low-powered (3 watts), 75 MHz carrier signal. Its antenna is highly directional, and is pointed straight up. The valid signal area is a 2,400 ft (730 m) × 4,200 ft (1,280 m) ellipse (as measured 1,000 ft (300 m) above the antenna.) When the aircraft passes over the outer marker antenna, its marker beacon receiver detects the signal. The system gives the pilot a visual (blinking blue outer marker light) and aural (continuous series of audio tone morse code-like 'dashes') indication.

- **Inner marker**

Similar to the outer and middle markers; located at the beginning (threshold) of the runway on some ILS approach systems (usually Category II and III) having decision heights of less than 200 feet (60 m) AGL. Triggers a flashing white light on the same marker beacon receiver used for the outer and middle markers; also a series of audio tone 'dots' at a frequency of 3,000 Hz in the headset.

On some older marker beacon receivers, instead of the "O", "M" and "I" indicators (outer, middle, inner), the indicators are labeled "A" (or FM/Z), "O" and "M" (airway or Fan and Z marker, outer, middle). The airway marker was used to indicate reporting points along the centerline of now obsolete "Red" airways; this was sometimes a "fan" marker, whose radiated pattern was elongated at right angles across the airway course so an aircraft slightly off course would still receive it. A "Z" marker was sometimes located at low/medium frequency range sites to accurately denote station passage. As airway beacons used the same 3,000 Hz audio frequency as the inner marker, the "A" indicator on older receivers can be used to detect the inner marker.

- Back course marker
- A back course marker (BC) normally indicates the ILS back course final approach fix where approach descent is commenced. Its cockpit audio and visual indications are the same as for an inner marker (IM), but its location on the approach course is very different (final approach fix for BC vs. runway threshold for IM).[4]
- Fan marker
- The term fan marker refers to the older type of beacons used mostly for en-route navigation.[5][6] Fan-type marker beacons were sometimes part of a non-precision approach and are identified by a flashing white light and a repeating dot-dash-dot signal.[7] Recent editions of the FAA's AIM publication no longer mention fan markers.[4][8]

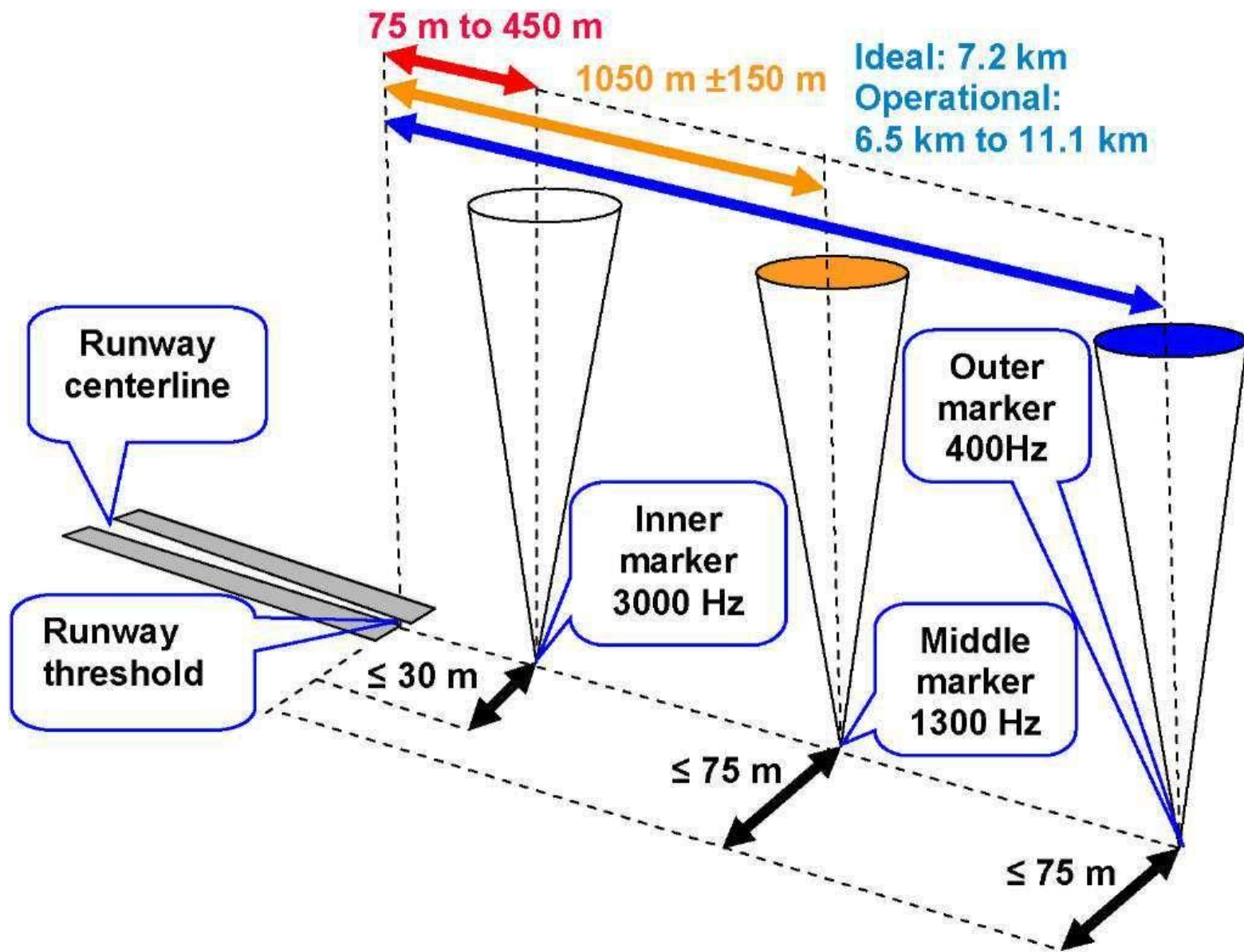
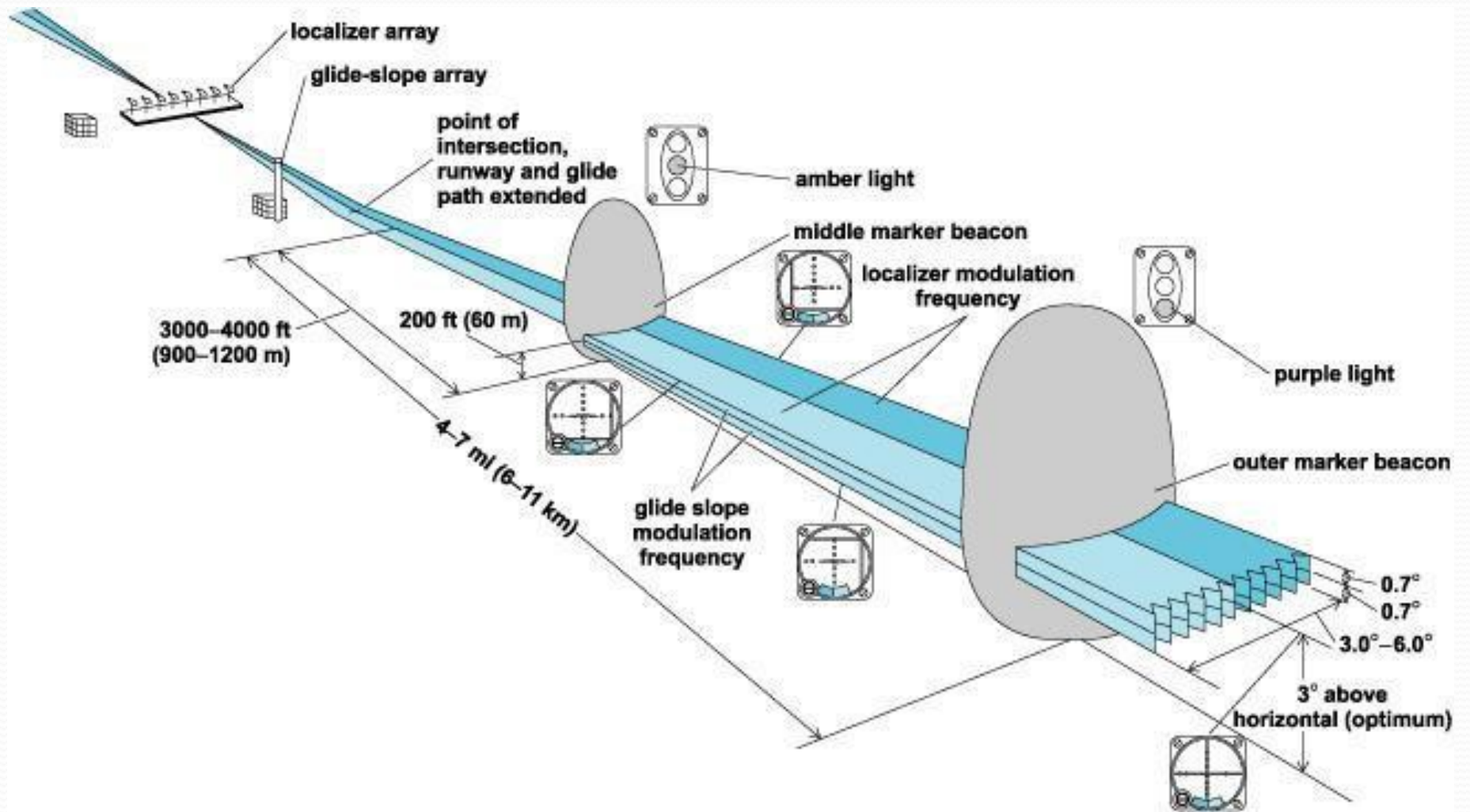


Figure 14: Marker beacon placement with respect to runway



3. What do Marker Beacons do?

They aid in indicating the distance of the aircraft from the runway.

1. **Outer Marker (OM)**

The outer marker is normally located 7.2 to 10 km (4.5 to 6 mi) from the runway threshold. The cockpit indicator is a blue lamp that flashes in unison with the received audio code. The purpose of this beacon is to provide height, distance, and equipment functioning checks to aircraft on intermediate and final approach. On the aircraft, the signal is received by a 75 MHz marker receiver. The pilot hears a tone from the loudspeaker or headphones and a blue indicative bulb lights up.

2. **Middle Marker(MM)**

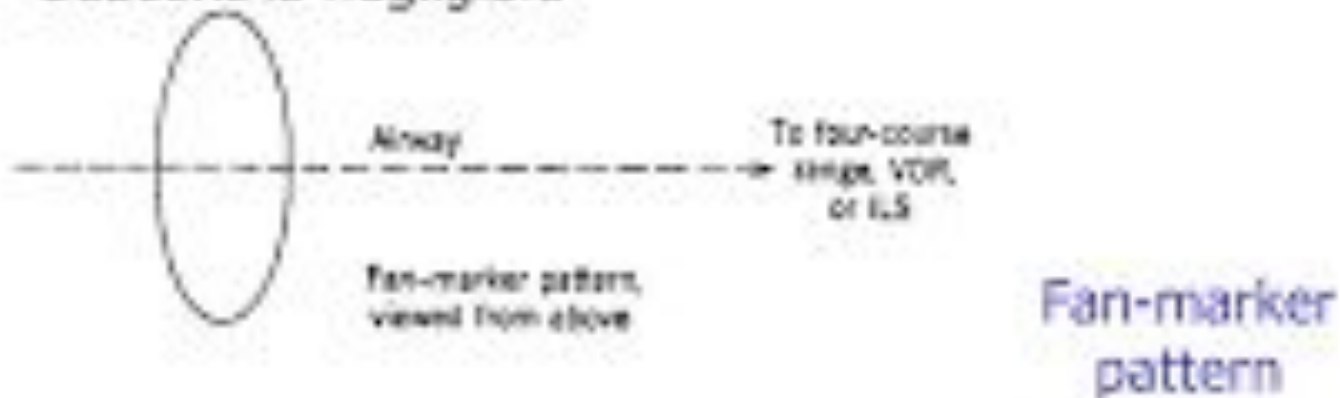
The middle marker should be located so as to indicate, in low visibility conditions, the missed approach point, and the point that visual contact with the runway is imminent, ideally at a distance of approximately 3,500 ft (1,100 m) from the threshold. The cockpit indicator is an amber lamp that flashes in unison with the received audio code.

Marker Beacons

- Marker beacons operating at a carrier frequency of 75 MHz are provided.
- When the transmission from a marker beacon is received it activates an indicator on the pilot's instrument panel.
- The correct height the aircraft should be at when the signal is received in an aircraft.

Marker Beacons (1)

- Each beacon generates a fan-shaped pattern, the axis of the fan being at right angles to the airway
- Operate at 75 MHz & radiate a narrow pattern upward from the ground, with little horizontal strength, so that interference between marker beacons is negligible



Localizer Course

Marker Beacons

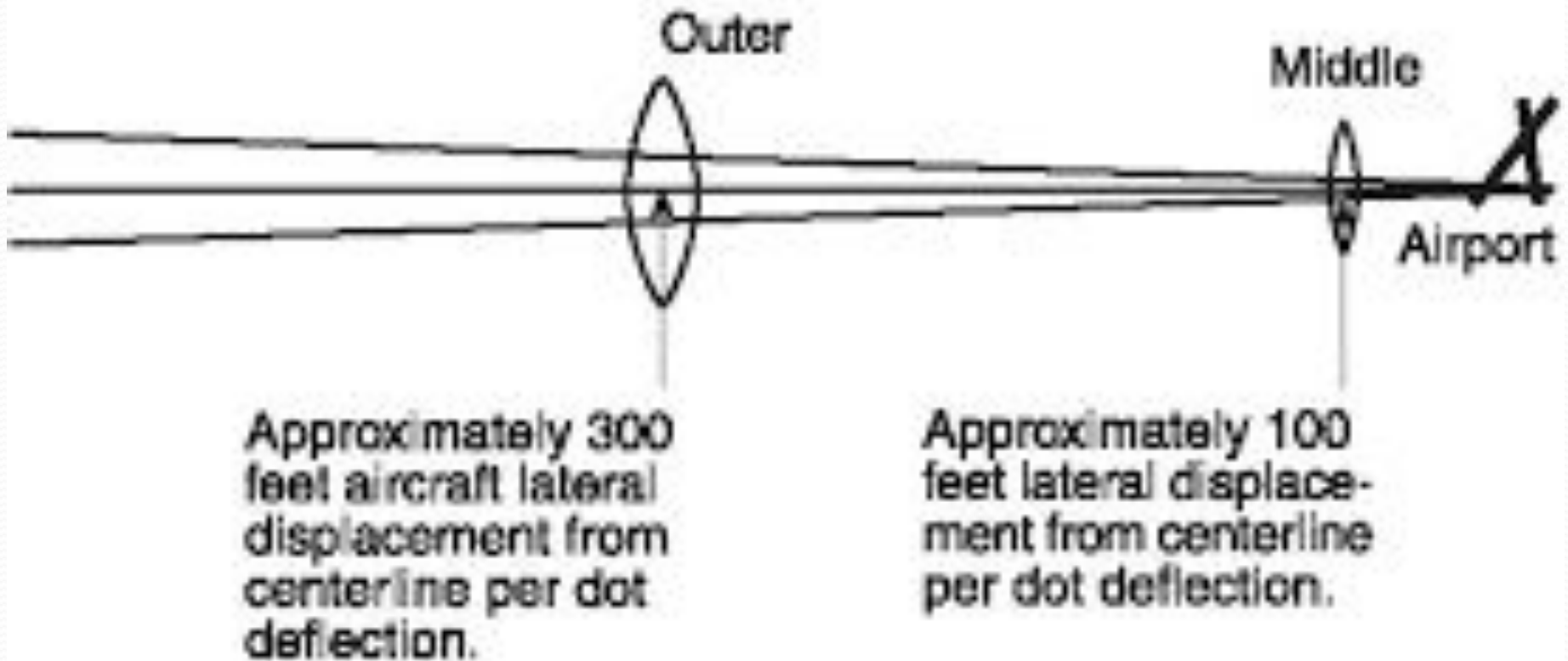


Figure 7-25. *Localizer receiver indications and aircraft displacement.*