INSTRUMENT LANDING SYSTEM

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Instrument Landing System
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- History of IFR landing procedures before development of ILS
- What’s it used for?
- How it works
- Why it’s so important
- Future plans for ILS system
History of IFR Landing Procedures

- Until the mid-1950’s, only visual landing procedures were possible
- 1958-First IFR landing system developed
- 1966-First ILS system developed and tested at Edwards AFB in Mojave, CA
History of IFR Landing Procedures

• 1968-First ILS applications installed at major airports
• 1974-ILS systems mandated by FAA for at least two major runways at all Regional, and International Airports.
What It’s Used For
What It’s Used For

- Aid aircraft to a runway touchdown point in IFR conditions
- Aid larger aircraft (ex. Boeing 747, 777) to land on a designated runway touchdown point (VFR, IFR)
- Allow for use of new Autoland systems!
How does it work?

- VHF Frequency transmits radar signal and intensity data to ILS Signal Deciphering and Display Computer.
- Localizer signal transmitted in direction opposite of runway to horizontally guide aircraft to touchdown point.

On-board ILS gauge from a Boeing 747-400 aircraft.
How does it work?

- Glide-Slope signal transmitted at an angle of 7.5-10 degrees into sky to define vertical descent path to runway touchdown point.
- On-board antenna system located in aircraft radome receives radar and VHF signals and sends it to on-board ILS computer.

On-board ILS gauge from a Boeing 747-400 aircraft.
How does it work?

- Signal data is then displayed on instrument panel gauge which maps the directional, and descent path to the runway

On-board ILS gauge from a Boeing 747-400 aircraft
IALS

- Instrument Landing Systems (ILS) are designed to guide an aircraft in its final approach and landing.
- Three distinct subsystems are used:
  - Localiser
  - Glide Slope
  - Markers.
ILS Components

- Localizer – indicates alignment w/ runway
- Glide slope – indicates correct descent path
- Outer Marker – Final Approach Fix
- Middle Marker – Missed Approach Point
Localizer

- Aids the pilot in lining his/her aircraft in the up proper azimuth approach to the runway.
- Consists of a group of transmitters and antennas positioned at the far end of the runway.
Localizer

- The antenna radiation pattern has a 5° beamwidth, centered along the runway.
- The VHF frequencies used for the localizer are in the range 108.1 to 111.9 MHz. The useful range of the system is about 40 km.
Localizer Plan

- 5°
- 90 Hz
- 150 Hz

Runway

Localiser Tx

(top view)

(108.1 - 111.9 MHz)

DIRECTION OF APPROACH

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Needle indicates direction of runway.

Centered Needle = Correct Alignment
Glide Slope

- Aids the pilot in making his/her approach at the proper elevation angle to the runway.
- Consists of a group of transmitters and antennas positioned beside the runway.
Glide Slope

• The antenna radiation pattern has a 1° beamwidth, and elevated about 2.5° to 2.75° in the direction of approach.
• The VHF frequencies used for the glide slope are in the range 329.3 to 335.0 MHz.
• The useful range of the system is about 40 km.
Glide Slope
VHF Glide Slope Antenna's
Frequency Arrangement
Glide Slope

Needle indicates above/below glidepath.

Centered Needle = Correct Glidepath
Glide Slope

- **Descent Cone**
- **Correct Glidepath**
- **Runway**
Marker Beacon

- Markers are transmitters that radiate continuous narrow vertical radio beams.
- The carrier frequency is 75 MHz modulated by special tones.
## Marker Beacon Characteristics

<table>
<thead>
<tr>
<th>Marker Beacon</th>
<th>Pilot Alert</th>
<th>Distance to Threshold</th>
<th>Modulated Frequency</th>
<th>Audio Keying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer</td>
<td>Glide Path Intercept</td>
<td>4 to 7 nm</td>
<td>400 Hz</td>
<td>- - - -</td>
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<tr>
<td>Middle</td>
<td>Category I Decision Height</td>
<td>3500 feet</td>
<td>1300 Hz</td>
<td>. - . -</td>
</tr>
<tr>
<td>Inner</td>
<td>Category II Decision Height</td>
<td>1000 feet</td>
<td>3000 Hz</td>
<td>. . . .</td>
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</tbody>
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END OF PRESENTATION