The Instrument Landing System and ILS Approaches

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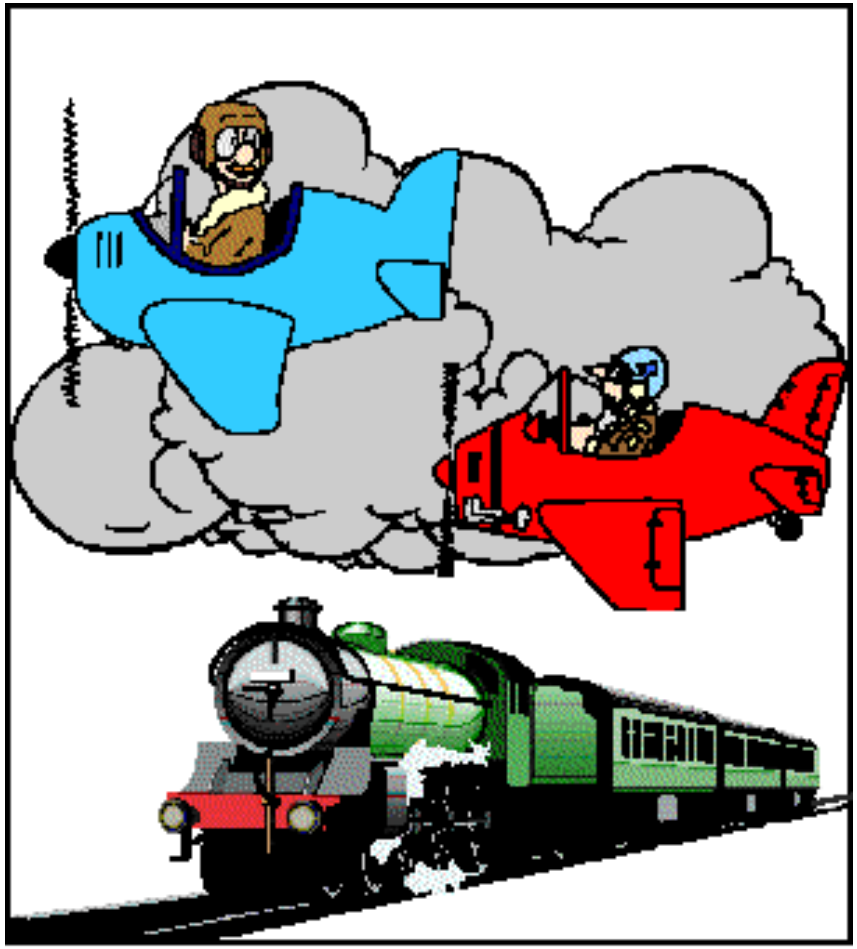
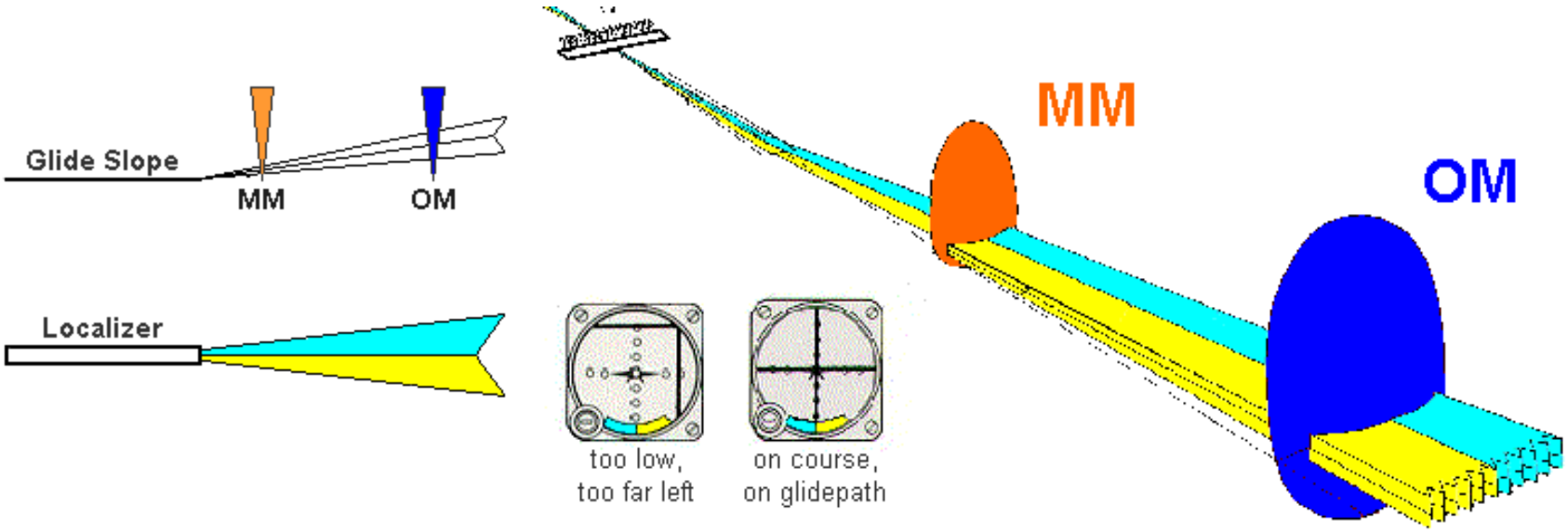
The definition of IFR



Johnson, IFR does not mean
"I Follow Railroads!"

ILS Components

- Localizer for lateral guidance (VHF)
- Glideslope for vertical guidance (UHF)
- Marker Beacons – in use but many replaced by GPS waypoints with IFR certified GPS



ILS Components

- **The FAA categorizes ILS components as:**

- **Guidance information**: the localizer and glide slope.
- **Range information**: the outer marker (OM) and the middle marker (MM) beacons.
- **Visual information**: approach lights, REILs, touchdown and centerline lights, runway lights.

Localizer

- The localizer signal provides azimuth, or lateral, information to guide the aircraft to the centerline of the runway. It is similar to a VOR signal except that it provides radial information for only a single course; the runway heading.

- Localizer information is displayed on the same indicator as your VOR information

Localizer

- The localizer indicator reacts differently from a VOR in several ways.
- The localizer consists of only a single course.
- The localizer course needle is four times as sensitive as a VOR needle. Heading adjustments must be much smaller because of the increased sensitivity of the indicator.
  - For VOR work, each dot under the needle represents 2° deviation from course while for the localizer each dot under the needle represents 0.5° deviation from course.
- Because the localizer provides information for only one radial, the runway heading, the navigation receiver automatically cuts out the OBS, the Omni Bearing Selector knob. Rotating the OBS still rotates the course ring on the instrument, but has no affect on the needle.

Specifics of the Localizer

- The localizer antenna is located at the far end of the runway.
- The approach course of the localizer is called the front course.
- The course line in the opposite direction to the front course is called the back course.
- The localizer signal is normally usable 18 NM from the field.
- The Morse code Identification of the localizer consists of a three-letter identifier preceded by the letter I. For example, the localizer identifier for Providence's Runway 5 **I-PVD**

Example

- Familiar looking gauge, isn't it? Tracking inbound on the Localizer to Runway 5, Green Airport, in Providence, R.I.

- From left to right, 1.) the aircraft is 1° Right of course, two dots (turn left to return); 2.) On course; 3.) and Left of course 1° (turn right to return).

Tips for setting LOC

- Smart pilots rotate the OBS to the desired localizer or reference runway heading as a reminder of where they are going.

- How sensitive is the Localizer?
  - Near the Outer Marker, a one-dot deviation puts you about 500 ft. from the centerline.
  - Near the Middle Marker, one dot means you are off course by 150 ft.

The Glide Slope

- The Glide Slope is the signal that provides vertical guidance to the aircraft during the ILS approach.
  - The standard glide-slope path is 3° downward to the approach-end of the runway. Follow it faithfully and your altitude will be precisely correct when you reach the touchdown zone of the runway.
- Tracking the glide slope is identical to tracking a localizer. If the glide-slope needle swings away from center—up or down—maneuver the aircraft towards the needle by adjusting the engine's power.

The Glideslope

- Inbound to Runway 5, Green Airport, Providence, R.I.

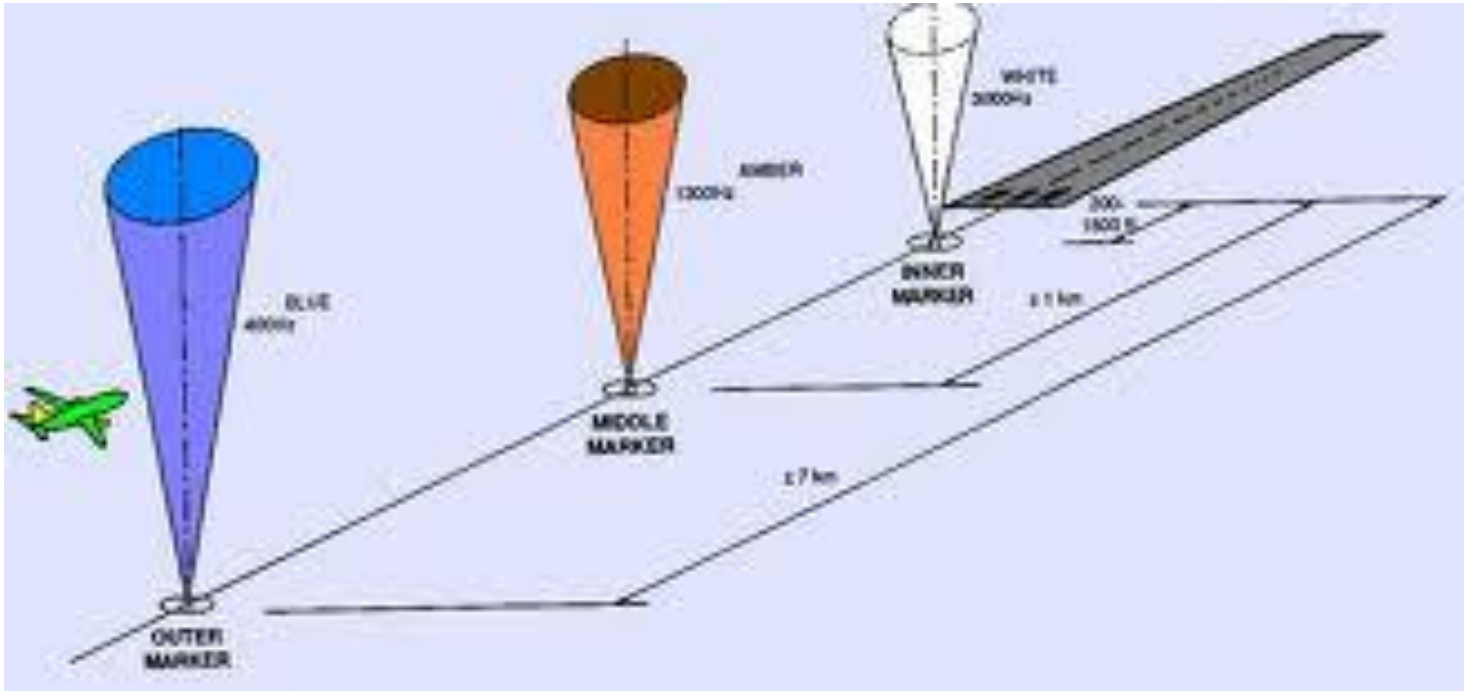
- From left to right, the aircraft is **Above** the glide path, **On** the glide path, and **Below** the glide path.

Marker Beacons

- Marker beacons are used to alert the pilot that an action (e.g., altitude check) is needed. This information is presented to the pilot by audio and visual cues. The ILS may contain three marker beacons: inner, middle and outer.
- The inner marker is used only for Category II operations.
- Marker beacons <u>are</u> being replaced by GPS waypoints

Audio Frequency	Audio Keying	Lamp Actuated
400 Hz	▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬	Blue (Outer)
1300 Hz	• ▬ • ▬ • ▬ • ▬	Amber (Middle)
3000 Hz	• • • • • • • •	White (Airway/Inner)

Marker Beacons



Compass Locators

- LOM: It is common to collocate a compass Locator transmitter with the Outer Marker beacon. Hence – LOM
- Compass locators transmit two-letter identification groups. The outer locator transmits the first two letters of the localizer ident Morse code (ILS: I-BED LOM: BE)
- LOM are primarily for situational awareness on the ILS

DME

- Distance Measuring Equipment can be a crucial part of an ILS installation. Not only does it assist with the approach, but it can be a necessary component to guide you to the FAF to begin the approach.

- Functions of the DME in an approach:
  - When installed with the ILS and specified in the approach procedure, DME may be used:
    - In lieu of the OM,
    - As a back course (BC) final approach fix (FAF), and
    - To establish other fixes on the localizer course.

Decision Height (DH) or Altitude (DA)

- The ILS brings in a term called, Decision Height, or DH
- Thus far, the altitude published in the minimums section of the approach plates that you have used has been the MDA, or Minimum Descent Altitude.
- When flying a non-precision approach, you are not authorized to descend below the MDA unless you can see the runway or the approach lights and make a normal landing.
- Decision Altitude or DA has a similar meaning. The DA for an ILS approach is a point on the glide slope *determined by the altimeter* where a decision must be made to either continue the landing or execute a missed approach.

Decision Altitude and MDA

Approach minimums, Runway 5, Green Airport, Providence, R.I. (Elevation 53 feet)				
CATEGORY	A	B	C	D
S-ILS 5	253/18			
S-LOC 5	460/24		460/40	
CIRCLING	560 - 1		620 - 1½	620 - 2

ILS Categories

Categories of ILS Approaches			
Category	**Minimum DH**	**Minimum RVR**	**Remarks**
I	200 feet	2400 feet	
I	200 feet	1800 feet	With touchdown zone and runway centerline lighting
II	100 feet	1200 feet	Half the minimums of a standard Cat I approach
IIIa	100 feet	700 feet	
IIIb	50 feet	150 to 700 feet	
IIIc	No DH	No RVR limitation	Hope that your electronics and autopilot are accurate and reliable.

ILS vs Other Approaches

Straight-in approach minimums for Runway 5, Green Airport, Providence, R.I. Runway 5 elevation is 53 ft.			
Type Approach	**DA/MDA ft. *****	**AGL, ft.**	**RVR ft.**
NDB **	740	687	4000
VOR	720	667	2400
LOC	460	407	2400
ILS	253	200	1800*
ILS Cat. II	153	100	1200

* Touchdown zone identification lights and runway centerline lights are available.
** An NDB approach is no longer available at Providence but was left in this table to illustrate the numbers.
*** MDA values are shown on approach plates in increments of 20 ft since that is the way altimeters are marked. (and the MDA is always rounded up)

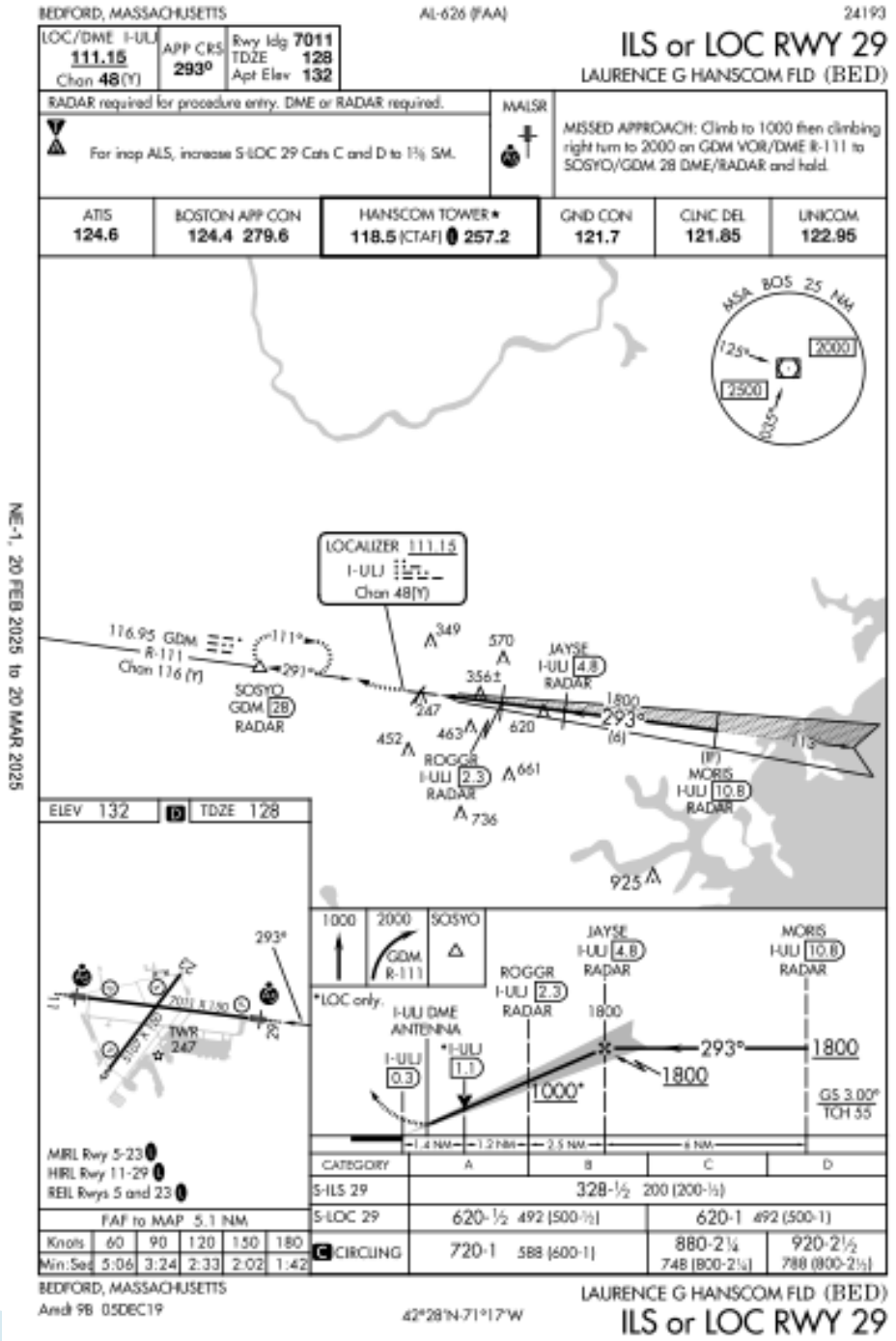
ILS 29 at KBED

Where is the FAF?

Is DME required?

When can the be VDP used?

What is the DH of this approach?



ILS Approach Video Tutorials

ILS Approach Videos and Tutorials

http://www.youtube.com/watch?v=QzZY6q5TChQ

http://www.youtube.com/watch?v=WxiX0ryjHnE

https://www.youtube.com/watch?v=LsNLs_Rcibc

https://www.youtube.com/watch?v=Ob-in4RF77g