Mead

120 SHEETS
WIDE RULED
10½ x 8in / 26.6 x 20.3cm
3 SUBJECT NOTEBOOK

Spiral®

www.meadweb.com

Global Positioning System.

Operated by the Dept of Def (DOD)
PPS - Precise positioning service (military)
SPS: Standard positioning service.
100 meter.

Vertical error greater than vertical.

GPS cannot replace your barometric altimeter.

No GPS approach unless Receiver autonomous integrity monitoring (RAIM).
indicated by an annunciator light.

Baro aiding is a method of augmenting the GPS integrity selection by using info from Mode C Altimeter.

Many IFR GPS require to enter an altimeter setting when you turn them on.

Basic GPS Navigation.
- latitude, longitude, altitude, ground speed
- Ground track course, course deviation, time to fix.

Use on GPS

Distance

KAPA To DBL 96.00 DTK 262°

Dep Arrive Desired track (DTK)
262

BRG 265° DIST 31.1NM

Magnetic Bearing 265 Distance

When on course BRG agrees with DTK

TRK 292° GS 154 KTS

Current Magnetic track over ground
292°. (30° intercept for 262°
Ground speed

ETE 13:59 ETA 19:182 Fuel 3,1

D→ : Direct to

enter a destination waypoint.
Then it gives navigation indications
easiest way for simple routes.

F P L : Flight Plans or sometimes
RTE.

IFR detailed route, not simple
like DIRECT TO,
the function allows you to enter a list of
waypoint that make a route.

WPT,

Use this function to access information
about waypoint in the data base, such
as frequencies for Towers or VOR,

NAV: NAVIGATION

Once you have programmed a route
or selected Direct TO, this function gives
up information that help you navigate the Route

NRST. Nearest.
To quickly locate the nearest airport for emergency.

Data Entry keys.
You can select waypoint from the database as well as created other options.
Escape enters keys move between page or field data and the small keys change the data highlighted by the cursor.

ENT: Enter key
When you have selected the data you want using the data entry keys press this key to complete the operation.

CLR.
CLR Clear key. This key typically blanks out a data entry field or backs out of an operation.

CRSR cursor SEL
cursor Select
Use cursor keys to move the cursor

MSG = Message
The GPS will indicate if it has a message for you, e.g. to set a course on HSI, warn of loss of RAIM.
Press the button to read periodically.

Programming and Flying Routes

Using GPS simple use => DIRECT TO. enter destination, follow GPS course deviation indication, distance & time. But you will not see where you are and for IFR navigation.
IFR approved GPS receiver can be programmed with routes containing dozens of waypoints.

You can enter route based on existing VOR, or you can choose more direct route based on your own waypoint.

On direct routes below FL 390 you define your route with one route description waypoint for each ARTCC you will through (Air Route Traffic Control).
These waypoint must be located within 200 nautical miles of the preceding center boundary.

GPS Course Deviation Indicator

In an installation approved for IFR approach, the GPS unit is usually connected to one of your communication VOR receivers. Normally, a switch selects whether the indications are from the VOR or GPS.

Unlike a VOR, which indicate your angle of course, RNAV (area navigation) systems like GPS tell your absolute distance from course in nautical miles.

The GPS scale changes as you move from Enroute, to terminal to the approach phase of flight.
When you are at least 30 nautical miles away from your destination the GPS sensitivity is 5 nautical miles when the CDI is fully deflected to one side (1 nautical mile per dot.) just like a VOR at 3 cdi dots. When the receiver is armed for the approach and you are with 30 nautical miles of the destination, the sensitivity increases to 1 NM, full scale. As you reach the Final approach waypoint (FAWP) the

The same like increase to 0.3 nautical mile full scale

Automatic and Manual course selection
Unlike VOR, GPS select your course for you based on which waypoint you are flying sometime you need to manually select a course. ATC may clear you to a different course than what is published and contained in the GPS database
When switching to manual, you can select the course using the OBS on the VOR head you are using with the GPS.

DME Arc
The GPS may give you CDI indication fully the manual. check POH/AFM

Auto Sequencing
When a departure, arrival, approach or other route is programmed into your GPS, the GPS senses when you are near your next waypoint and automatically sequences to the next waypoint. No more touching the OBS.

But you must disable Autosequencing when conducting maneuver.
(you fly over the same beam more than once)

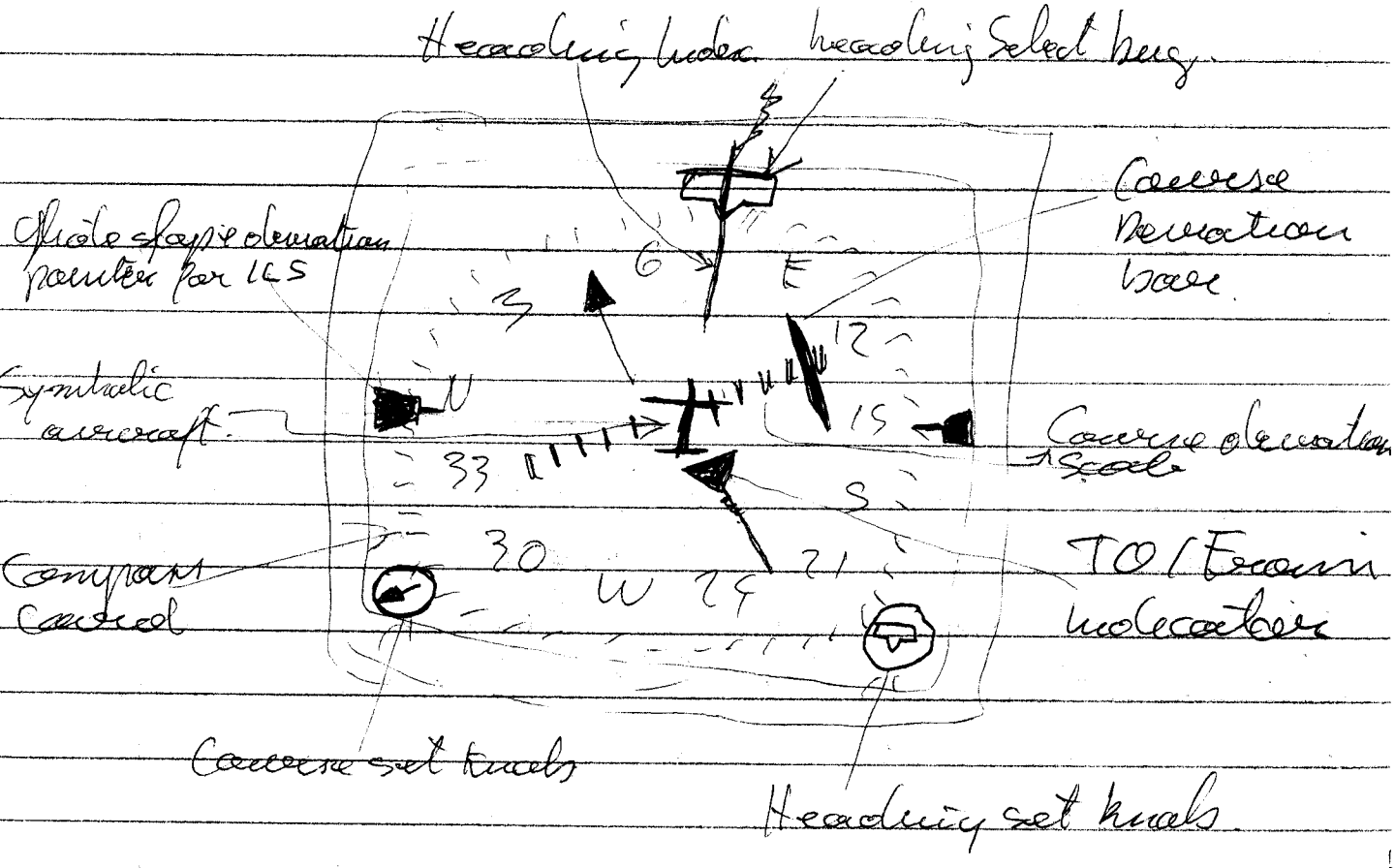
Differential GPS (meter)

Instrument Navigation

Horizontal situation Indicator HSI combine the VOR navigation indicator with a heading indicator.

When an HSI is tuned to a VOR station left means left, and right mean right.

the TO / FROM is replaced with a symbol



Each dot on HSI course deviation scale is a 2° deviation from course selected manually with a VOR.
Each dot from center indicates a deviation of 200ft per nautical mile

Intercepting a Radial

The CDI needle will show a full scale deflection until you are within 10° of your course

Tracking

Your preflight planning & experience helps to eliminate initial heading.

If you do not know the wind direction simply try your intended course as your heading and watch the CDI needle if it moves off course. Turn 20° toward the needle and hold the heading correction until the needle centers. Reduce the drift correction to 10°, note whether the drift correction and keep the CDI centered and make subsequent small corrections as needed.

Determining Your Progress by using VOR

If you have 2 VOR receiver you can determine your position simply by tuning your 2 second VOR receiver to a station located to the side of your route. This can be especially helpful as you approach navigation fixes which are identified by off-route VORs.

If you only on VOR receiver, then carefully track the heading that track your course from the first VOR while you tune to the second station whose radial intersect of course.

A D F navigation from UFR Book

Automatic Direction Finders

Nondirectional Radio Beacons (NDBs) transmit low / medium frequency (LF/MF) signals in the range of 190 to 535 kHz.

Since NDB are not limited to line of sight the ADF system provide reliable range portion at lower altitudes than VOR equipment.

In addition to NDB your aircraft ADF equipment also can receive AM commercial broadcast stations. some appear in your chart

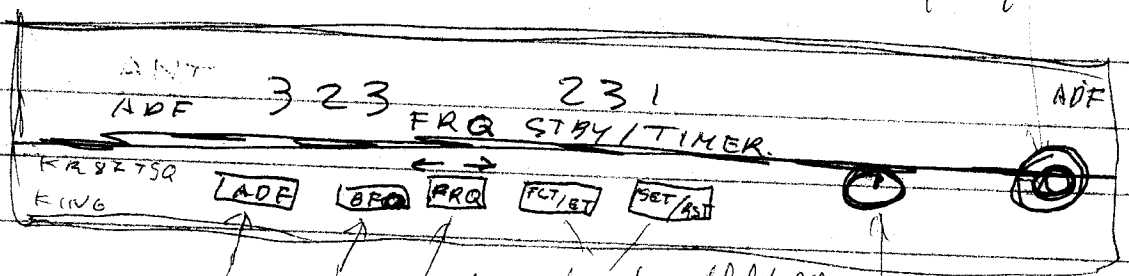
ADF antennas

The directional antenna is flat & loop about the size of the hand, usually mounted on the bottom of the aircraft

The nondirectional sense antenna receive signal out the equal efficiency in all direction

ADF Receiver

to select the LIHF frequency.



to operate the stop watch fct of this ADF mode

Volume for Morse Code On/Off volume control

exchanges the Standby frequency for the in-use frequency

Select the Beat frequency Oscillator BFO mode to tune and identify Continuous Wave (CW) signal

To access the ANT mode to identify a station or the ADF mode to the station.

ADF Bearing Indicator.

Fixed card bearing indicator.

Card always on the top (nose of aeroplane).

Needle point to the station.

Angle between 0 and Needle = Relative Bearing

Magnetic Heading (not shown in Fixed card) + Relative Bearing (needle to Zero) = Magnetic Bearing.

Homing. to keep the nose of the aircraft directly to the station.
Turn the aircraft to the station by homing the needle along with the zero on a fixed card indicator.

Adjust for crab and drift

Tracking.
When you are on course and tracking to the station, the card correction angle (CCA) should equal the number of degrees the ADF needle point left or right of the aircraft nose,

intercepting a Course

To track 90° when on 060 MH from until the needle is on 030 on ADF then Hdg to 090 Heading to have the needle on 0

MH + RB = M Bearing

ADF orientation:
To locate your position on a chart using the ADF you need to add 180° to or subtract

from the magnetic bearing to determine the reciprocal bearing, which is the bearing from the station. If MB 090 the reciprocal bearing is 270 (090 + 180 = 270)

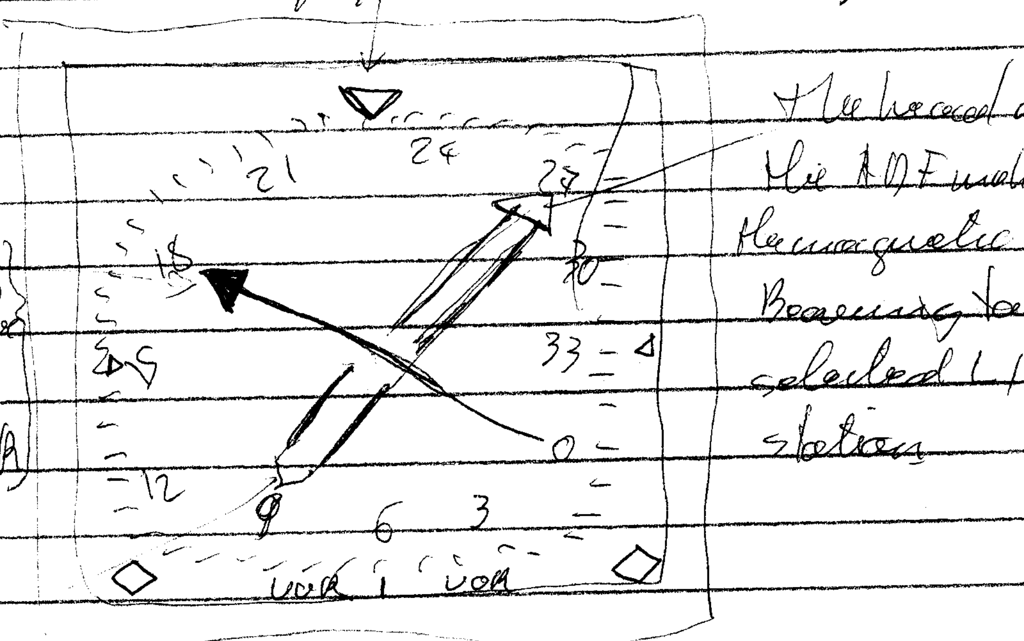
Movable Card Indicators.

When you set your magnetic heading under the top index of a movable card indicator, the head of the needle will directly indicate magnetic bearing to a station. The number under the tail of the needle indicates magnetic bearing from the station.

Radio Magnetic Indicator RMI combines a heading indicator with two bearing needle.
The RMI has a single hair and a double hair needle superimposed over a rotating compass card which is referenced to magnetic north.
The single hair needle normally point to a VOR and the double hair needle point to a (/ MF station, on many

~~mean~~ RMI each needle can be set to either a VOR or an L/MF facility

The airplane magnetic heading is displayed under the heading index



The tail of the ADF needle indicate the magnetic bearing from the Selected L/MF station.

ADF Limitation

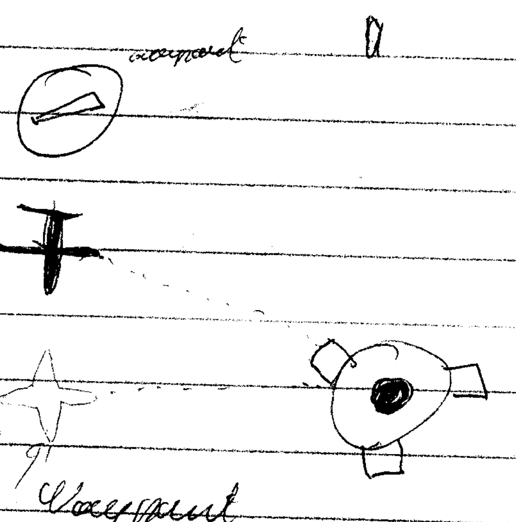
Listen to the signal.
Night fluctuation of the needle. Night Effect
just before & after sunrise → fly heading, average fluctuation, use station below 350 kHz

Area Thunderstorm effect → needle turn to source
Precipitation, static → need card
Terrain effect: erroneous bearing indication
Shoreline effect.

Advanced Navigation:

Area navigation (RNAV) → refers to advanced VORTAC navigation.
VORTAC, Long Range Nav Sys, GPS, Inertial Nav Sy.

VORTAC.



The RNAV (Area Navigation) computer compare the angle and distance between your aircraft and the VORTAC to the angle and distance between the VORTAC and the waypoint.

RNAV need deflection indicate course displacement because the horizontal scale represent a given value such 0.25, 0.5, 1 nautical mile.

Long Range Navigation LORAN

new LORAN ~~C~~ C

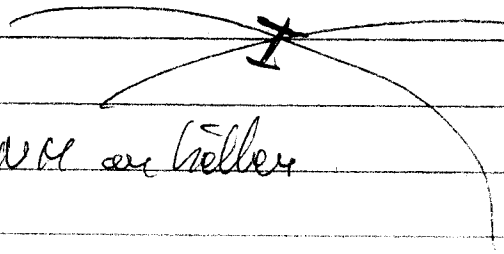
low frequency 90 - 110 kHz

Stations called chain → Master Station

→ Secondary

By measuring the Time difference TD between the reception of a master station signal and that of a secondary station the LORAN computer determines your location along a series of possibilities called a line of Position (LOP). By using a second LOP, ~~LORAN~~ LORAN can match your position

cont.



within 0,3 NM or better

interference from AM radio, Ect Thunder

Inertial Navigation (INS) is a totally self contained system which supplies aircraft position and navigation information based on inertial forces measured by gyroscopic instrument called accelerometers. Use in Aerobic, Gulf

ILS. Instrument Landing System
is a precision approach navigational aid which provides highly accurate course, glide slope and distance to RW

ICS category I. CAT I ILS
= 1,550 M or 2400 ft RVR
or RVR 1800 when centerline and touchdown zone lights are provided. Decision Height (DH) is 200 ft above touchdown zone elevation.

Category 2. CAT II ILS. = DH not less 100 ft above touchdown and RVR not 1200 ft

Category 3: CAT III ILS. 3 groups.
CAT IIIa approach 700 ft RVR
CAT IIIb " 150 ft RVR
CAT IIIc " without RVR

Localizer
The ILS uses a localizer transmitter to provide info regarding proper alignment with the runway centerline.
The localizer transmitter emits a narrow beam of energy from the far end of the RW.
When there signal are the approach is said to be a front course. This transmitter

can also provide a signal in the direction opposite of the front course; however you should not use these back course signals for navigation unless a back course approach is established and ATC has authorized you to execute.

The signal from the localizer transmitter represent only one magnetic course to the runway. However you may find it helpful to set the published course of the ILS on the navigation indicator as a reminder of the inbound course during tracking and heading corrections.

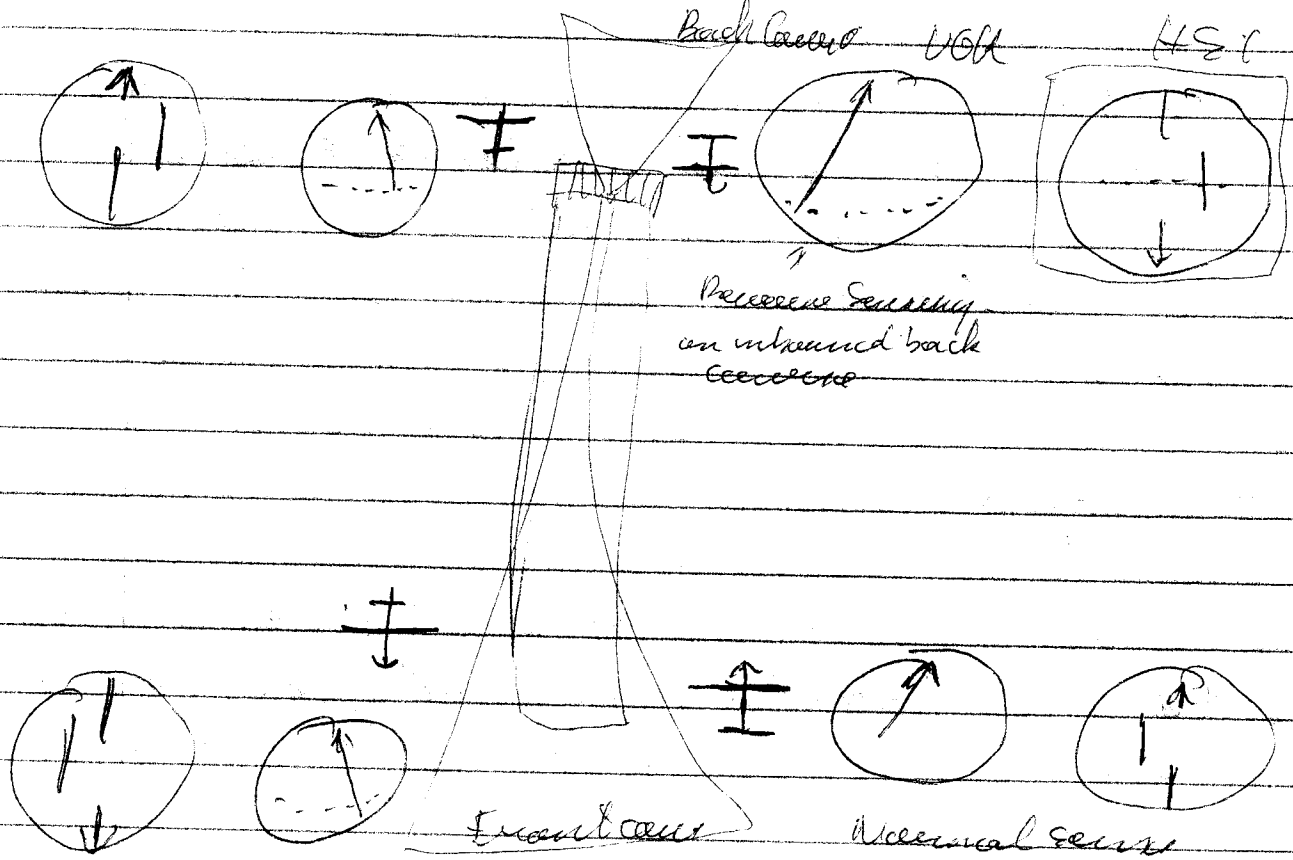
Regardless of what course you select, the CDI senses off-course position only with respect of the localizer.

(Horizontal Situation Indicator)

If you are using an HSI for the approach you normally must set it to the ILS front course for guidance.

When you are tracking the front course of an ILS toward the RW using a basic (more) VOR indicator, CDI sensing is

reversed, that is right bearing corrections are applied for right deflection of the CDI. Reverse CDI sensing occurs whenever the aircraft travels on the reciprocal heading of the localizer course.



When using a basic VOR indicator, normal sensing occurs inbound on the localizer front course and outbound on the back course. Reverse sensing occurs inbound on the back course and outbound on the front course.

With an HSI you can proceed

reverse sensing by setting the published course under the course index.
This applies regardless of your direction of travel, whether inbound or outbound or whether the front or back course

Each dot of displacement on CDI / HSI equates to a specific distance from the localizer centerline depending on your distance from the runway. (SEE in NEXT 2 Page continued)

Glide Slope

The horizontal needle of a VOR indicator or HSI provides the vertical guidance you need to maintain the glide slope

The glide slope transmitter is offset and normally elevated to maintain the glide slope from the ILS centerline and normally only relevant signal to the front course approach

The glide slope signal provides vertical navigation information for descent to the lowest authorized decision height

for the associated approach procedure

If you receive glide slope guidance below decision height you should consider it unreliable

You may also receive other erroneous navigation info, such as false signal and receiver warning at high angle above the normal 3° glide slope position

To avoid navigation error you should only rely on glide slope indications from the time you approach the glide slope intercept altitude shown on the approach chart until you reach decision height

Since full scale deviation of the glide slope needle is 0.7 above or below the center of the glide slope beam, a pilot only slightly off the glide slope centerline will produce large needle deflections on the navigation indicator

To fly a smooth approach you must respond immediately to any needle movement with heading, pitch and power changes.

(CONTINUOUS)

As you fly on a localizer course you will notice that CDI is more sensitive than during VOR navigation.

When navigating using a VOR, full scale deflection of the CDI represents a 20° radial span on either side of course.

However, when using localizer signal the total span of the CDI is 5° or 2.5 each side of the course.

The advantage of the localizer to greater CDI sensitivity is that you can track a localizer course with 4 times accuracy of a VOR.

But because of this, CDI movement is more rapid during localizer tracking necessitating corrections for off course indications, they should be small to avoid overshooting.

Marker Beacons Chapt 8

ILS marker beacons provide range info with respect to the RCL during the approach

The Outer Marker (OM) and the Middle Marker (MM)

The placement of the OM varies from 4 to 7 seven miles from RCL
It usually is placed inside the point where an aircraft flying the ILS intercept the glide slope.

The MM is usually located 3400 feet from the landing threshold with the signal range intercepting a 3° glide slope at approximately 200 ft above the touchdown zone.

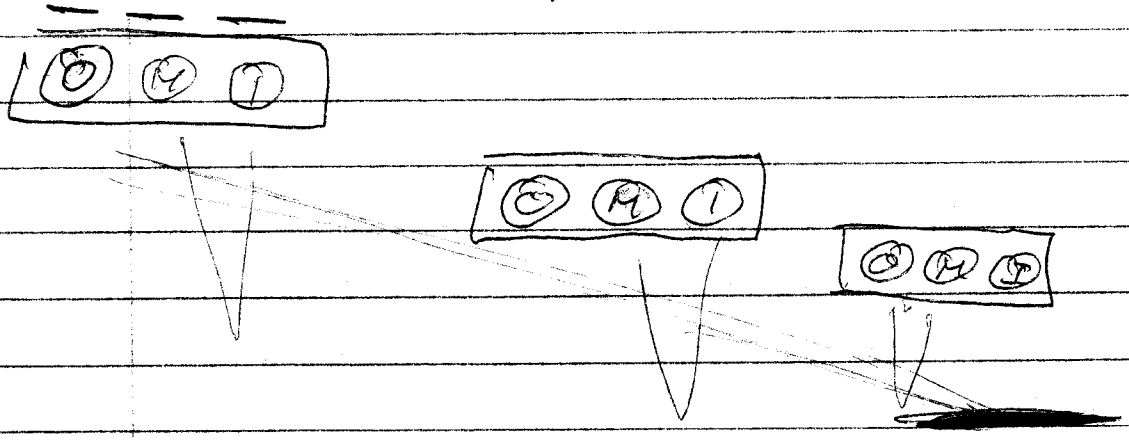
At some location where Category II and III ILS operations have been certified, an INNER Marker (IM) is installed.
The Inner Marker indicates the closer inspection the CAT II glide slope and

and moderate progress on a CAT III approach

Occasionally marker beacons may also used on the localizer back course to indicate the final approach fix.

In most general aviation aircraft, the marker beacon receiver is incorporated into the audio control console for the avionics. Marker beacon have 3 separate light to correspond to the types of marker beacons

The audio identification of each marker beacon can be heard over the speaker during station passage.



Compass locators

Many ILS systems use a low power, low or medium frequency (LF/MF) radio beacon called a compass locator collocated with the outer or middle marker

Outer compass locator (LOM).

Middle compass locator (LMM).

25 watt - 15 mile.

The frequency range for compass locators is 190 to 535 kHz

Compass locators transmit a two letter Morse code identifier taken from the last three letters of the localizer identifier group. For ex if the localizer identifier is IXYZ the LOM would transmit the first two letters of the localizer identifier groups (XY). If our LMM is installed, it would transmit the second 2 letters of the localizer identifier groups (YZ)

DME

When DME is unavailable through the localizer frequency, Jeppesen charts publish the notations, "LOC/DME" on the top of the facility box.

Procedure Approach Legibility and Minimum

Visibility	Height above Touchdown	Visibility	RVR
No light	2000 ft	3 sm	4000 ft
MALSR, SSALR or ACSF-1	200 ft	1/2 sm	2400 ft
MALSR, SSALR or ACSF-1 and TDZ/CL			

Flying the ILS:

Before intercepting the ILS glide slope

- → stabilize airspeed
- → " altitude
- – " magnetic heading on the localizer

Maintain glide slope with power adjustment and pitching

Decision height is at approximately the middle middle marker. But the clearance of MAP (missed approach point) for an ILS panels is the point where the glide slope intercept the decision height.

During actual IFR ~~condition~~ ILS approach limited occasional.
Visual contact 200 to 600

Since your aircraft is usually below the glide slope during the intermediate approach the glide slope indicator a full-up needle deflection, you should decrease the initial downward movement and lead the descent to intercept the glide ~~slope~~ centerline

77 1321

If the glide slope and localizer are centered but your airspeed is too fast, your initial adjustment should be to reduce power.

If your groundspeed decreases, the rate of descent required to stay on glide slope must also decrease a little bit.

Localizer and glide slope indications become more sensitive as you get closer to the runway. After the correction.

The DH on the glide slope is the Missed Approach Point (MAP) on the precision approach.
If you have not established the required visual reference at DH on the ILS approach you must execute the missed approach.

M 4-2

STRAIGHT-IN (NoPT)

NoPT = No procedure Turn

Preparing for the approach

- Reset altimeter
- Tune your navaid freq
- Set the ADF to the NDB
- Tune the 2nd radio to Tower freq
- [illegible] received to the ~~[illegible]~~ [illegible] DME
- Verify all navaids, including DME by listening to the identification feature
- Turn on the marker beacon receiver, test it for proper operation

Clearance from ATC (of course)

Descent prior to the final approach course → good time to complete landing checklist

Inbound to the outer marker

Once you are on the localizer begin to descend

Monitor VOR (HSI) indicator for initial corrections

77B23

Monitor your progress using DME and air scanning for the outer marker

Final approach segment

- Marker beacon flash ~~under~~ blue - a dash tone.
- Monitor altimeter for Decision Height
- Correct glide slope

Missed Approach
If you reach decision height and don't see field you must execute a missed approach, add power, increase pitch attitude and raise gear flaps.

ILS Approach with a course reversal

often use in airport without radar coverage

ILS / DME Approach.
Study each approach carefully
same as ILS but to identify approach and a missed approach fix using DME

M 1324

Radar Vector to ILS final.
Vector issue by ATC

ILS Approach to Parallel Runway

- Parallel Dependent ILS approach
=> Simultaneous Independent parallel ILS approach
- Simultaneous close ll ILS approach use => Precision Runway Monitor (PRM)

- Simultaneous converging instrument approach

Localizer approach - same as ILS but ~~except~~ with ~~precision~~ removal

LDA Approach

A localizer type directional aid LDA is comparable to a localizer but it is not aligned with the runway.
LDA course width is between 3 & 6°.
Some LDA approaches have an electronic glide slope

If the final approach course is aligned to within 30° of the runway centerline straight in landing minimums also may be available.

SDF Approach

Simplified Directional Facility (SDF) approach system does not incorporate an electronic glideslope and may offer less accuracy than the LDA.
6° to 12° wide (may be offset or ACU)
Lateral limit of SDF course guidance are 35° either side (after degraded)

CDI has reduce sensitivity

Microwave Landing System (MLS
is a precision approach which provides azimuth, elevation and distance information
Can have multiple final approach paths curved path and multiple glide slope

Must have special Equipment. MLS is identified by morse M followed by 3 letter identifier for the facility.

MLS less susceptible to interference; ~~the~~ M stations
until GPS came

MB27

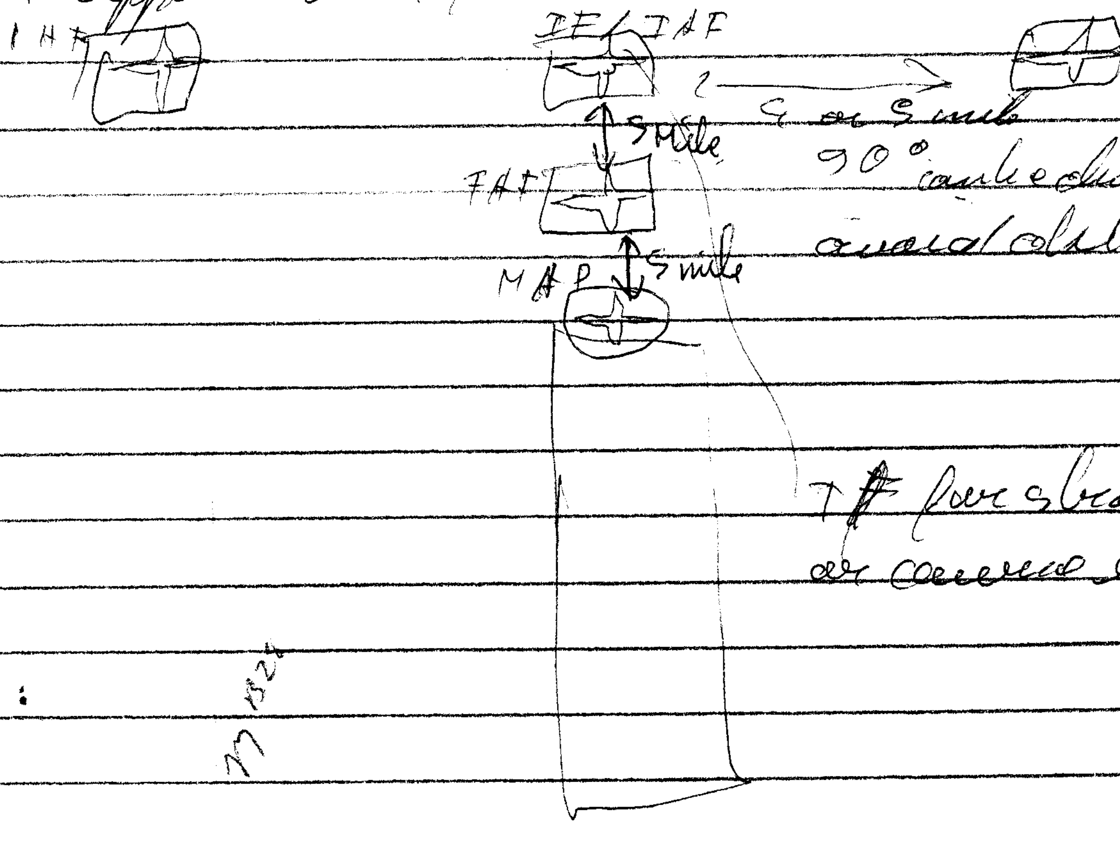
GPS   Overlay
Stand alone

Certified GPS for non precision approach based on conventional navaid except the one using localizer (LOC) localizer type directional aid (LDA) and simplified directional facilities (SDF).

Chart with additional info for GPS can be identified by the word VOR DME or GPS

In Jeppesen check in listing.

T approach (for stand alone)



90° can be change to avoid obstacle

TF for straight in or course reversal.

A GPS receiver continuously monitors the reliability of the GPS signal using a system => Receiver autonomous integrity monitoring (RAIM).

IFR certified GPS can preselect the RAIM availability at the intended location. see GPS codes, ATSS are DUATS.

Exclude satellite from the RAIM.

Best to request GPS RAIM availability when first file and have GPS departure & RAIM preselection for the departure airport.

RUSSIAN - GLONASS