**Attention**

Air Traffic control says “N123AB you are cleared for the KPUJ ILS 31 approach.”

**Objective**

To gain knowledge of all the elements of approaches.

**Schedule**

Ground instruction – 60 minutes

**Reference Material**

Instrument Procedure Handbook FAA-H-8083-16 (2015)
nashvillecfi.com
ivao.aero

**What**

An instrument approach, or instrument approach procedure (IAP), is a series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. These approaches are approved in the United States by the FAA or the United States Department of Defense for the military. The ICAO defines an instrument approach as a series of predetermined maneuvers by reference to flight instruments with specific protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if landing is not completed, to a position at which holding or enroute obstacle clearance criteria apply.

**Why**

If you are in the clouds or in an area of near complete darkness, you need to be able to find the runway as well as not hit anything. An instrument approach is basically a 3 dimensional map. Secondary, an approach will make sure as you get set up to land, you will be lined up for the runway, not too high, and not too low.

It would be smart to have available the IAPs for any airport you are not familiar with. Not only will it guide you to the runway safely, it also gives you most of the important information. You have all the frequencies, the elevation, the mini airport diagram, and where to go if you can’t see the runway when you get there (missed approach).

**Material**

Types of IAPs

There are three types of IAPs: precision approach (PA), approach with vertical guidance (APV), and non-precision approach (NPA).

A precision approach (PA) uses a navigation system on the ground that provides course and glidepath deviation. The only system you will typically use that the FAA considers a precision approach is an instrument landing system (ILS).

An approach with vertical guidance (APV) also uses a navigation system for course and glidepath deviation, just not to the same standards as a PA. Examples include baro-VNAV, localizer type directional aid (LDA) with glidepath, LNAV/VNAV, and LPV.

A non-precision approach (NPA) uses a navigation system for course deviation but does not provide glidepath information. These approaches include VOR, NDB and LNAV. NPAs are flown to a minimum descent altitude (MDA).

Each procedure chart uses a specific type of electronic navigation system such as an NDB, VOR, ILS, LOC, and RNAV/GPS. The chart name reflects the primary navigational aid (NAVAID), if there is more than one straight-in procedure or if it is just a circling-only procedure.

History

Tests of the ILS system began in 1929 in the United States (CAA) authorized installation of the system in 1941 at six locations. The first landing of a scheduled U.S. passenger airliner using ILS was on January 26, 1938, when a Pennsylvania Central Airlines Boeing 247D flew from Washington, D.C., to Pittsburgh, Pennsylvania, and landed in a snowstorm using only the Instrument Landing System. The first fully automatic landing using ILS occurred in March 1964 at Bedford Airport in UK.

Sections

See FAA-H-8083-16 Figure 4-3.

Top Margin Identification:
The margin identification section is the header at top and bottom of the chart. It depicts the airport location and procedure identification, among other information.

The number at the top center over the margin is the FAA chart reference number.

In the top right contains the approach type and runway number (if any). A runway number is listed when the approach course is aligned within 30° of the runway centerline to straight-in landing. If it is more than 30° from the centerline, a letter is assigned instead: "VOR-A"

Pilot Briefing:

The top row of the boxes contains the ILS/localizer/VOR frequency, the final approach course, the runway landing length, touchdown zone elevation, and the airport elevation.

The middle row has two boxes: a notes box, and a box for information on the missed approach. You'll note a bolded "T" and "A" in the notes section.

The "T" signifies that the airport has non-standard IFR takeoff minimums. This applies to 121 and 135 operators, as there are no regulatory IFR takeoff minimums for Part 91 operations.

The bolded "A" signifies that non-standard alternate minimums exist for the airport (the usual alternate minimums being 600-1 and 800-1. If "NA" is specified it indicates that alternate minimums are not authorized due to it being an unmonitored facility or lack of a weather reporting service. This means you cannot use that approach to determine, during preflight planning, if you can choose this airport as an alternate. If all the approaches at that airport specify "NA", you may not use the airport as an alternate.

The missed approach section will give you a textual description of the missed approach procedure and should be reviewed carefully each time you brief the approach.

The bottom row in the margin identification section has the important frequencies for the airport. These include the weather, approach/departure, unicom, tower, ground, etc frequencies.

Plan View:

The Plan View provides a graphical, overhead view of the approach procedure. The majority of NACO charts contain a reference or distance circle with a 10nm radius. Only the data within this reference circle is drawn to scale. When a route segment outside the circle is drawn to scale, the symbol is two jagged lines and it interrupts the segment. Dashed circles or concentric rings around the distance circle are used when information necessary to the procedure will not fit to scale within the limits of the plan view area.

The final approach course is the thick, solid line. You'll note it agrees with the course specified in the margin box at the top. A feeder route is medium thickness line and indicates a transition from the enroute structure to an initial approach fix. Radials are represented as thin lines.

The MSA (minimum safe altitude) circle appears in the plan view except in approaches for which the navaid is unavailable. The MSA circle guarantees 1000 ft clearance over obstacles and terrain.

The circle contains the facility ID of the navaid used to determine the MSA. For RNAV approaches, the MSA is based on the runway waypoint for straight-in approaches or the airport waypoint for circling approaches. For GPS approaches, the MSA center will be the missed approach waypoint. The altitudes appear in boxes within the circle.

The terminal arrival area is another transition method for aircraft with GPS/RNAV equipment. They divide a terminal area into multiple segments with differing altitudes and initial approach fixes for aircraft approaching from the different segments. TAAs will also eliminate or reduce the need for feeder routes, departure extensions, and procedure turns or course reversals.

Airport Diagram:

You'll see the airport elevation. In the middle is, obviously, the runway environment, lighting facilities, runway lengths, etc.

Profile View:

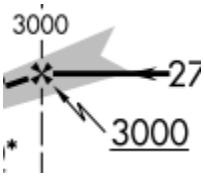
The profile view is a drawing of the side view of a procedure that illustrates the vertical approach path altitudes, headings, distances, and fixes. It includes the minimum altitudes and maximum distance for a procedure turn, altitudes over prescribed fixes, distances between fixes, and the missed approach procedure.

In non-precision approaches, the final descent is initiated at the final approach fix (FAF), which is represented by a maltese cross on the chart. Step-down fixes in non-precision procedures are provided between the FAF and the airport for authorizing a lower MDA after passing an obstruction. They are represented by vertical dashed line.

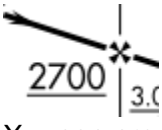
Glide-slope intercept altitude is represented by lightning symbol.

When a fix is incorporated in a non-precision final segment, two sets of minimums may be published, depending upon whether or not fix can be identified.

Precision approaches use a decision altitude (DA) charted in MSL followed by decision height (DH) referenced in height above threshold elevation (HAT). Non-precision approaches use a minimum descent altitude (MDA). The primary difference being that when a pilot reaches a DA, the missed approach must immediately be executed if the runway environment is not yet in sight. With an MDA, the pilot levels off at or above that altitude and continues until either the missed approach point, or the runway environment comes into view.



Lighting bolt = ILS FAF



X = non precision FAF

Minimums and categories

The altitude minimums for the approach are located at the bottom of the profile section. The minimums are separated by approach "category", which is determined by the speed of the aircraft flying the approach. Aircraft approach category means a grouping of aircraft based on a reference landing speed (VREF), if specified, or if VREF is not specified, 1.3 VSO at the maximum certified landing weight. VREF, VSO, and the maximum certified landing weight are those values as established for the aircraft by the certification authority of the country of registry. A pilot must use the minima corresponding to the category determined during certification or higher. Helicopters may use Category A minima. If it is necessary to operate at a speed in excess of the upper limit of the speed range for an aircraft's category, the minimums for the higher category must be used. For example, an airplane that fits into Category B, but is circling to land at a speed of 145 knots, must use the approach Category D minimums.

| Category | Speed |
|---|---|
| A | 0-90 |
| B | 91-120 |
| C | 121-140 |
| D | 141-165 |
| E | 166+ |

Minimum Descent Altitude (MDA), Decision Altitude (DA), And Decision Height (DH):

MDA—the lowest altitude, expressed in feet MSL, to which descent is authorized on final approach or during circle-to land maneuvering in execution of a standard instrument approach procedure (SIAP) where no electronic glideslope is provided.

DA—a specified altitude in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

DH—with respect to the operation of aircraft, means the height at which a decision must be made during an ILS to either continue the approach or to execute a missed approach.

| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| S-ILS 31 | 1483-¾ 200 (200-¾) | | | |
| S-LOC 31 | 1680-1 397 (400-1) | | | 1680-1¼ 397 (400-1¼) |
| CIRCLING | 1880-1 591 (600-1) | | 1880-1½ 591 (600-1½) | 1940-2 651 (700-2) |

Figure 1 Minimums for KPUJ ILS 31

Assuming a category A plane…
S-ILS 31 - If the ILS is working then 1483 ft MSL/200 ft AGL is your minimum. If you do not see the runway environment follow the Missed Approached Procedure (MAP). Also notice you must be able to see for ¾ of a mile.

S-LOC 31 – If the glide slope is not working but the localizer is working then 1680 ft MSL/400 ft AGL is your minimum. Also notice you must be able to see for a mile.

Circling – If the winds favor runway 13, then 1880 ft MSL/600 ft AGL above is your minimum. If the glide slope and localizer are not working you should use GPS 31 instead.

| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| LPV DA | 1483-¾ 200 (200-¾) | | | |
| LNAV/ VNAV DA | 1635-1¼ 352 (400-1¼) | | | |
| LNAV MDA | 1720-1 437 (500-1) | | 1720-1¼ 437 (500-1¼) | 1720-1½ 437 (500-1½) |
| CIRCLING | 1880-1 591 (600-1) | | 1880-1½ 591 (600-1½) | 1940-2 651 (700-2) |

Figure 2 Minimums for KPUJ GPS 31

Assuming a category A plane…
LPV DA – If you have vertical and lateral guidance 1483 ft MSL/200 ft AGL is your minimum. This is the same as when you use the ILS. Not bad considering no equipment to maintain on the ground.

Localizer Performance with Vertical Guidance (LPV) approaches take advantage of the refined accuracy of WAAS lateral and vertical guidance to provide an approach very similar to a Category I ILS. Like an ILS, an LPV has vertical guidance and is flown to a Decision Altitude (DA). The design of an LPV approach incorporates angular guidance with increasing sensitivity as an aircraft gets closer to the runway (or point in space (PinS) type approaches for helicopters). Sensitivities are nearly identical to those of the ILS at similar distances. This is intentional to aid pilots in transferring their ILS flying skills to LPV approaches.

LNAV/VNAV DA – 1635 ft MSL/400 ft AGL

Lateral Navigation/Vertical Navigation (LNAV/VNAV) approaches provide both horizontal and approved vertical approach guidance. Vertical Navigation (VNAV) utilizes an internally generated glideslope based on WAAS or baro-VNAV systems.

LNAV MDA – 1720 ft MSL/500 ft AGL

Localizer Performance without Vertical Guidance (LP) and Lateral Navigation (LNAV).
LPs are non-precision approaches with WAAS lateral guidance. They are added in locations where terrain or obstructions do not allow publication of vertically guided LPV procedures. Lateral sensitivity increases as an aircraft gets closer to the runway (or PinS type approaches for helicopters). LP is not a fail-down mode for an LPV. LP and LPV are independent. LP minimums will not be published with lines of minima that contain approved vertical guidance (LNAV/VNAV or LPV).

Circling – 1880 ft MSL/600 ft AGL same as the ILS approach.

Step Down Minimums

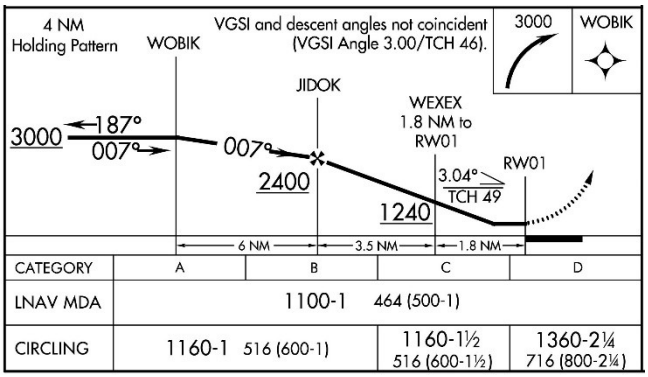



Figure 3 Plan view for KRMG GPS 1

If you are more than 11.3 NM from the runway, anything up to WOBIK you must stay above 3000 ft MSL.

Between WOBIK and JIDOK you must stay above 2400. The moment you pass WOBIK you can immediately drop if you wish but there is no need to. You might do so if you think the clouds are at 2700 so you can get to a visual environment.

Between JIDOK and WEXEX you must stay above 1240. After WEXEX you must stay above LNAV MSA/CIRCLING minimums until you can see the runway.

VDP

The Visual Descent Point (VDP) is a defined point on a straight-in, non-precision approach from which you can descend below the MDA, as long as you have the required visual reference. If a VDP is available, it will be indicated by a "v" on the profile view portion of the instrument approach procedure chart. Do not descend below MDA before reaching the VDP.

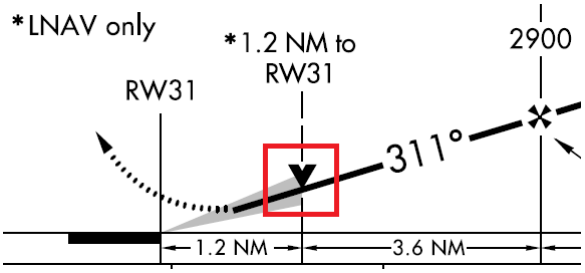



Figure 5

Segments

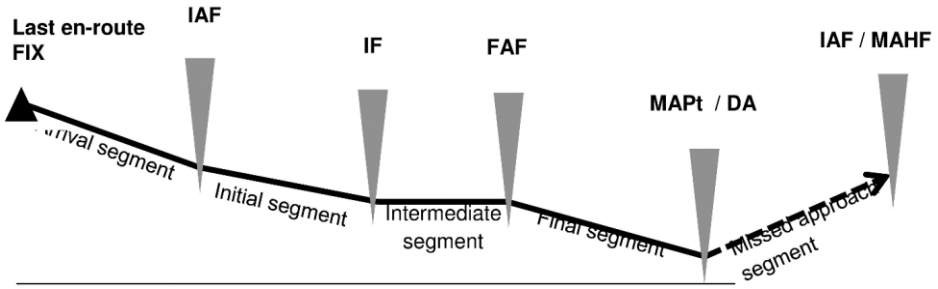



Figure 5

IAF = initial approach fix is a fix that marks the beginning of the initial segment and the end of the arrival segment, if applicable. In RNAV application, this fix is normally defined by a fly-by waypoint.

IF = intermediate fix is a fix that marks the end of an initial segment and the beginning of the intermediate segment. In RNAV application, this fix is normally defined by a fly-by waypoint.

FAF = final approach fix is a fix that marks the end of an intermediate segment and the beginning of the final approach segment for non-precision approach.

FAP = final approach point is a fix that marks the end of an intermediate segment and the beginning of the final approach segment for precision approach

MAPt = Missed approach point is a point in an instrument approach procedure at or before which the prescribed missed approach procedure must be initiated in order to ensure that the minimum obstacle clearance is not infringed.

MAHF = Missed approach holding fix is a fix used in RNAV application that marks the end of the missed approach segment and the center point for the missed approach holding.

MSA

Minimum Sector Altitude named MSA is the lowest altitude which may be used which will provide a minimum clearance of 300 m (= 1000ft) above all objects located in the area contained within a sector of a circle of 46 km (=25 NM) radius centered on a radio navigation aid. This does not guarantee acceptable navigational aid reception.

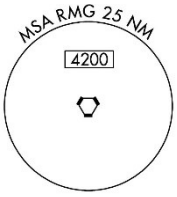



Figure 5

Figure 5 shows an MSA of 4200 within 25 NM of VOR RMG