APPROACHES

FULFILLS IR.VI & CFII PTS VIII

Objective	
The student shall understand the designations, performance, and execution of various approach types. The student shall become familiar with the planning and operational requirements execute fly an approach.	
Instructor Actions	**Student Actions**
- Explain VOR, Localizer, ILS, and GPS approaches. - Discuss “dive and drive” method and possible risks - Show examples and explain symbols on approach plates - Explain VDP	- Take notes and participate in instructor’s discussion - Practice
Case Studies	**Equipment**
	- Computer - FAR/AIM - PHAK - White Board
Completion Standards	

ELEMENTS

RESOURCES

FAA-S-ACS-8C Instrument Rating Airplane ACS - Area VI
FAA-S-8081-9E CFII PTS - Area VIII

FAA-H-8083-15B Instrument Flying Handbook - Chapter 9: Navigation Systems
FAA-H-8083-15B Instrument Flying Handbook – Chapter 10: IFR Flight
FAA-H-8083-16B Instrument Procedures Handbook Chapter 4: Approaches

AIM 1-1 Navigation Aids
AIM 5-4 Arrival Procedures

ERAU Special VFR GPS Approaches Video
ERAU Special VFR ILS Approaches Video
ERAU Special VFR VOR Approaches Video

1. APPROACH BASICS

Now that we've mastered operating in the enroute environment, it's time to descend from our cruise altitude. We do this via a mechanism called an instrument approach. Instrument approaches utilize navigation sources that we've become familiar with, like VORs, and GPS, as well as new ones like localizers. How we fly an approach has less to do with the navigational source, and more about the capabilities offered by a particular approach.

Some approaches just offer lateral course guidance just like we've been using in the enroute phase, just more precise. We are responsible for descending to prescribe altitudes upon reaching certain fixes. These are called non-precision approaches.

Some approaches offer a glideslope, which tells us if we are above or below an imaginary line emanating from the runway. Here, we need to intercept both the lateral course guidance and vertical course guidance. These are called precision approaches.

We can track am instrument approach only so low until it becomes unsafe due to obstacles like trees, powerlines, and cell towers. Precision approaches, since they offer very precise lateral and vertical guidance, allow us to descend lower than non-precision approaches.

Approaches are named with respect to their navigation type. For example, VOR RWY 9L or ILS RWY 9R. When there is more than one approach of the same navigation type to the same runway, we add a letter, starting from Z – ILS Z RWY 13 and ILS Y RWY 13.

When straight in landing minimums do not apply, due to terrain or inadequately high minimums, the runway is replaced with a letter starting from A – VOR-A and RNAV-B.

InFO 15012 outlines when a pilot may log an instrument approach, which is necessary to demonstrate IFR currency.

This lesson plan should be read after II.A, Aircraft Flight Instruments and Navigation Equipment.

2. APPROACH CATEGORIES AND MINIMUMS

Minimums are dependent on an aircraft's approach speed. The higher the approach speed, the higher the minimums. If an aircraft falls under a certain category, but is operating at a higher airspeed, it should use the higher category.

See this InFO and AIM 5-4-7.

CATEGORY	A	B	C	D	E
Max Airspeed	< 91 KIAS	91-120 KIAS	121-140 KIAS	141-160 KIAS	>161 KIAS

Nomenclature referring to approach minimums differs for precision/APV approaches and non-precision approaches. When an approach has vertical guidance, the minimum altitude is called a Decision Altitude (DA) in MSL or Decision Height (DH) in AGL. When an aircraft is descending on the glideslope and reaches the DA/DH, that becomes the MAP and the aircraft must begin the missed approach procedure immediately if the requirements of 91.175(c) are not met.

When an approach does not have vertical guidance, the minimum altitude is called a Minimum Descent Altitude (MDA). When an aircraft reaches the MDA after "diving and driving" or "chopping and dropping", they are permitted to remain at the MDA until the MAP. The aircraft must immediately begin the missed approach procedure at the MAP if the requirements of 91.175(c) are not met.

Visibility requirements are in units of SM or ft. When in SM, it is depicted following a "-". When in feet, it is written as hundreds of feet.

CATEGORY	A	B	C	D
CIRCLING	1100-1¼	839 (900-1¼)	1420-3 1159 (1200-3)	1540-3 1279 (1300-3)

MDA (MSL) - VIS (SM) HAT (AGL)

CATEGORY	A	B	C	D
S-ILS 16R	1095/40	302 (300-¾)		

MDA (MSL)/RVR (FT) HAT (AGL)

3. VOR APPROACH

VOR approaches use the same VOR facilities we use for enroute navigation to provide approach capabilities for airports. These facilities may be on or off the airport and not necessarily aligned with the landing runway. VOR approaches can be straight segments or even arcs to the final approach course! Additionally, some VOR approaches do not have a FAF! What do we do then?

3.1. Straight-In VOR Approaches

Lets look at the VOR 27L into KMLB.

Explain approach procedure

- **start from enroute - how to join**
- **Where is the FAF?**

> FINAL APPROACH POINT- The point, applicable only to a nonprecision approach with no depicted FAF (such as an on airport VOR), where the aircraft is established inbound on the final approach course from the procedure turn and where the final approach descent may be commenced. The FAP serves as the FAF and identifies the beginning of the final approach segment. (Pilot controller glossary)

Remain within 10 NM of what? The PT fix, in this case the MLB VOR/DME.

Explain dive and drive

Explain varying sensitivity

3.2. VOR with Arc

Lets look at the VOR 12R into KVRB. Unlike the previous approach, this approach has a FAF indicated by the Maltese cross. If we are given the TRV VOR as our IAF, then there is no need to fly the arc. However, we may be given MLBSO or WUBUR depending on where we are coming from.

3.3. Minimum Descent Altitude (MDA)

Since VOR approaches have no capability for vertical guidance, once established inbound, we dive and drive to our respective minimum descent altitude, either the straight in for the designated runway or the circling approach minimum. These are both called MDAs, since we can level off at the MDA until the missed approach point (MAP). On non-precision only approach plates, this is depicted visually with the horizontal line at the end of the approach track in the profile view. This line terminates at the missed approach point.

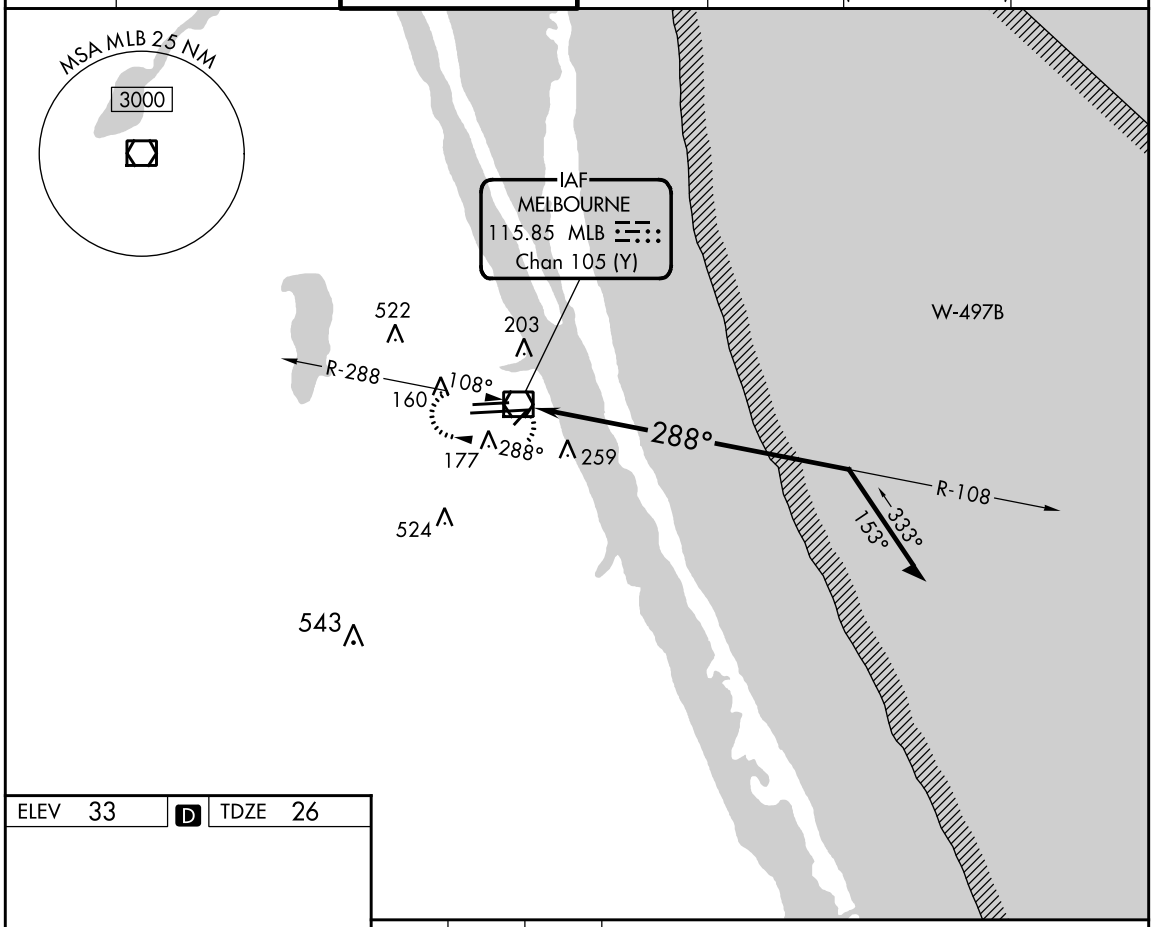
VOR RWY 27L

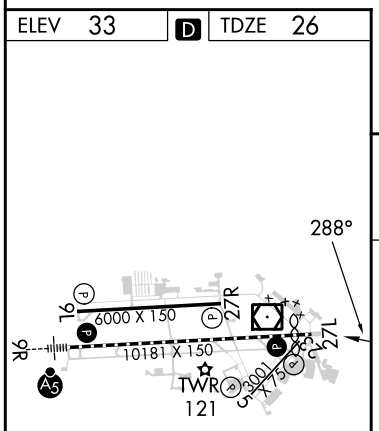
MELBOURNE ORLANDO INTL (MLB)

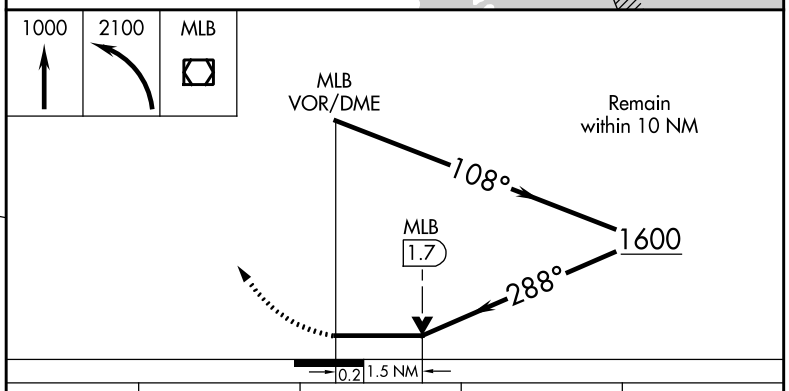
VOR/DME MLB	APP CRS	Rwy Idg	9482
115.85	288°	TDZE	26
Chan 105 (Y)		Apt Elev	33

MISSED APPROACH: Climb to 1000 then climbing left turn to 2100 direct MLB VOR/DME and hold.

ATIS	ORLANDO APP CON	MELBOURNE TOWER ★	GND CON	CLNC DEL	CLNC DEL	UNICOM
132.55	132.65 281.425	118.2 (CTAF) L 257.8	121.9	121.9	132.65 (When twr closed)	122.95







CATEGORY	A	B	C	D
S-27L	560-1	534 (600-1)	560-1½	534 (600-1½)
C CIRCLING	560-1	527 (600-1)	680-1¾ 647 (700-1¾)	880-2¾ 847 (900-2¾)

REIL Rwy 27L L
HIRL Rwy 9R-27L L
MIRL Rwys 5-23 and 9L-27R L
TDZ/CL Rwy 9R

MELBOURNE, FLORIDA
Orig 08NOV18

28°06'N-80°39'W

MELBOURNE ORLANDO INTL (MLB)

VOR RWY 27L

SE-3, 03 OCT 2024 to 31 OCT 2024

SE-3, 03 OCT 2024 to 31 OCT 2024

VOR RWY 12R

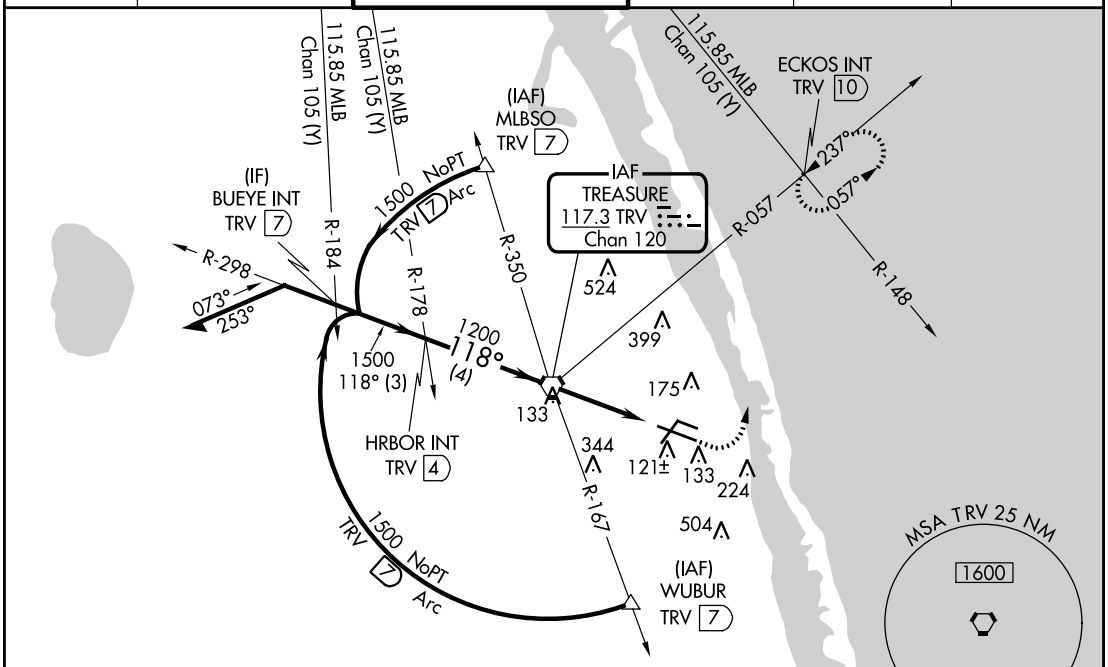
VERO BEACH RGNL (VRB)

VORTAC TRV	APP CRS	Rwy Idg	7314
117.3	118°	TDZE	23
Chan 120		Apt Elev	24

Circling to Rwy 30R NA at night. When local altimeter setting not received, use Fort Pierce altimeter setting and increase all MDAs 40 feet and Circling Cat C/D visibility ¼ SM.

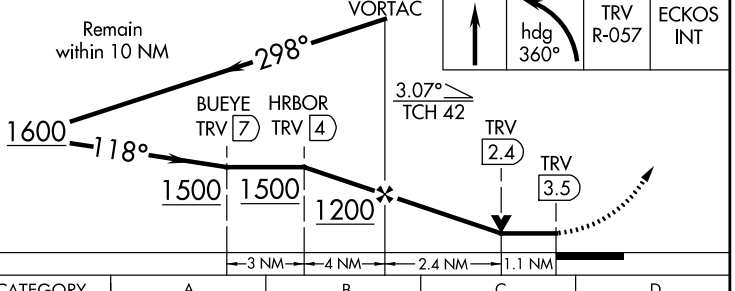
MISSED APPROACH: Climb to 500 then climbing left turn to 2000 heading 360° and on TRV VORTAC R-057 to ECKOS INT/TRV 10 DME and hold.

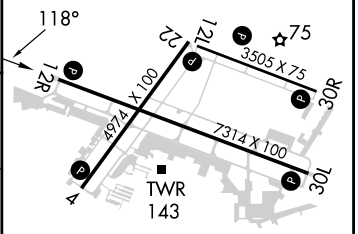
ATIS	PALM BEACH APP CON	VERO BEACH TOWER ★	GND CON	CLNC DEL	UNICOM
120.575	123.625 225.4 (N)	126.3 (CTAF) L	127.45	134.975	122.95



ELEV 24 D TDZE 23

536





MIRL Rwys 4-22, 12R-30L, and 12L-30R L
REIL Rwys 4, 12R, 22 and 30L L

CATEGORY	A	B	C	D
S-12R	400-1 377 (400-1)			
CIRCLING	560-1 536 (600-1)		660-1¾ 636 (700-1¾)	820-2½ 796 (800-2½)

FAF to MAP 3.5 NM

Knots	60	90	120	150	180
Min:Sec	3:30	2:20	1:45	1:24	1:10

VERO BEACH, FLORIDA
Amdt 14E 30DEC21

27°39'N-80°25'W

VERO BEACH RGNL (VRB)
VOR RWY 12R

SE-3, 03 OCT 2024 to 31 OCT 2024

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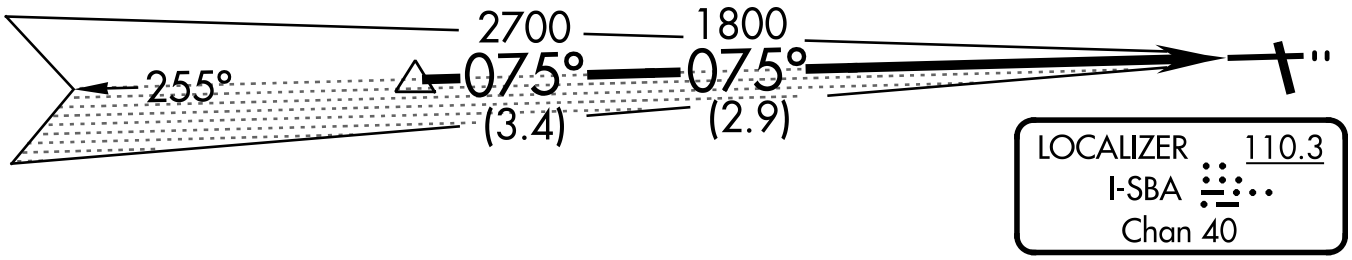
4. LOCALIZER APPROACH

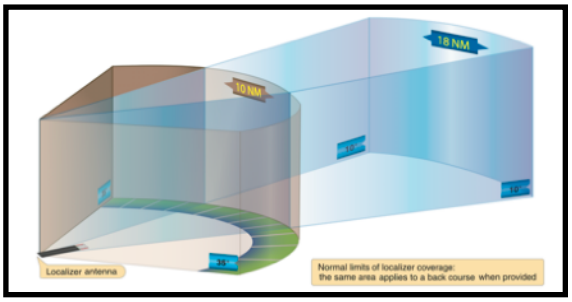
Unlike a VOR, the localizer only broadcasts lateral guidance relative to the approach course. The OBS setting does not affect the CDI. However, it is usually good practice to set the final approach course as the OBS setting for better situational awareness. Localizer NAVAIDs are prefixed with "I", as seen here at KSBA.

The approach course of the localizer is depicted with the half-shaded arrow. At KSBA, the I-SBA localizer is oriented for an approach course of 075°.The localizer antenna is typically installed on the extended runway centerline on the far side of the landing runway.



As discussed in Aircraft Flight Instruments and Navigation Equipment, the localizer broadcasts two signals, 90 Hz and 150 Hz, and compares the strength too determine the aircraft position relative to the approach course.

The localizer signal is only valid within its designated service volume, as shown in the figure to the right. However, the actual width of the course is only 3°-6° (tuned to be 700ft wide at runway threshold). This means that a full scale deflection is 1.5°-3°. However, these readings are reliable anywhere within the limits of the service volume.



Localizer approaches require some indication of position along the approach course. This requires DME (remember GPS is an acceptable replacement under AC 90-108), RADAR coverage, or RNAV monitoring.

Unfortunately, localizer approaches require pilots to manage their own descent by publishing step down altitudes. Rather than following a glideslope, we can either calculate a suitable descent rate to follow a ~3° glide path or employ the "dive and drive"/"chop and drop" method. When we arrive at the minimums specified on the approach plate, we fly all the way to the missed approach point (MAP). Usually, the MAP is denoted with a DME distance, but in this example, the only way the identity the MAP is by starting a timer at the FAF.

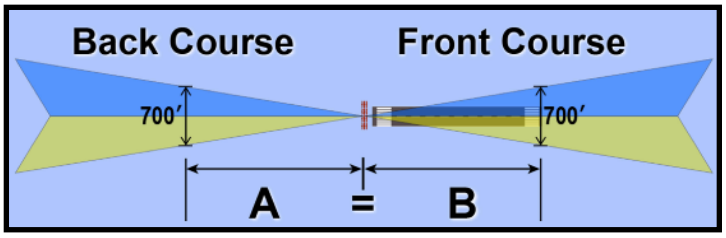
Take a look at the LOC 17 into KVCV.

Explain approach procedure

- **start from enroute - how to join**
- **Where is the IAF (we don't have one since we must be vectored onto final)**
- **How do we identify any other fix (ATC will tell us!)**
- **Explain varying sensitivity**
- **Explain MAP**

4.1. Localizer Back Course

A feature of the localizer is that is broadcasts in the primary directional, the **front course**, and in the opposite direction, the **back course**. If there is sufficient accuracy and terrain permits, the back course signal may be designated as another approach for the opposite runway. Remember that the CDI will reverse sense and it will be necessary to "pull" the needle (unless using an HSI)! Also remember that since the antennas are located on the approach side of the back course approach, CDI sensitivity will be significantly greater at the same outbound distance. A back course approach will never have an associated glidelsope, but be cognizant of a false glideslope appearing if the front course includes a GS.



4.2. Simplified Direction Facility (SDF)

The SDF provides course guidance **similar** to a localizer, but may be wider than a localizer (6° or 12°) and may not be aligned with the runway. There are no SDFs current in operation in the United States.

4.3. Localizer-Type Directional Aid (LDA)

The Instrument Flying Handbook says clearly on 9-43:

> The localizer type directional aid (LDA) is of comparable utility and accuracy to a localizer but is not part of a complete ILS. The LDA course width is between 3° and 6° and thus provides a more precise approach course than an SDF installation. Some LDAs are equipped with a GS. The LDA course is not aligned with the runway, but straight-in minimums may be published where the angle between the runway centerline and the LDA course does not exceed 30°. If this angle exceeds 30°, only circling minimums are published. The identifier is three letters preceded by "I" transmitted in code on the LDA frequency. For example, the identifier for Van Nuys, California, LDA is I-BUR.

The minimum offset angle of the LDA to the runway is 3°. The only functional difference between an LDA and LOC is the offset angle.

LDA with GS example: LDA Y RWY 6 / LDA Z RWY 6 at KROA. Without GS: LDA-C. Remember that approach procedures that do not include a runway do not contain straight in minimums.

4.4. Minimum Descent Altitude (MDA)

Similar to VOR approaches, localizer, SDF, and LDA (without GS) approaches are flown to an MDA.

LOC RWY 17

SOUTHERN CALIFORNIA LOGISTICS (VCV)

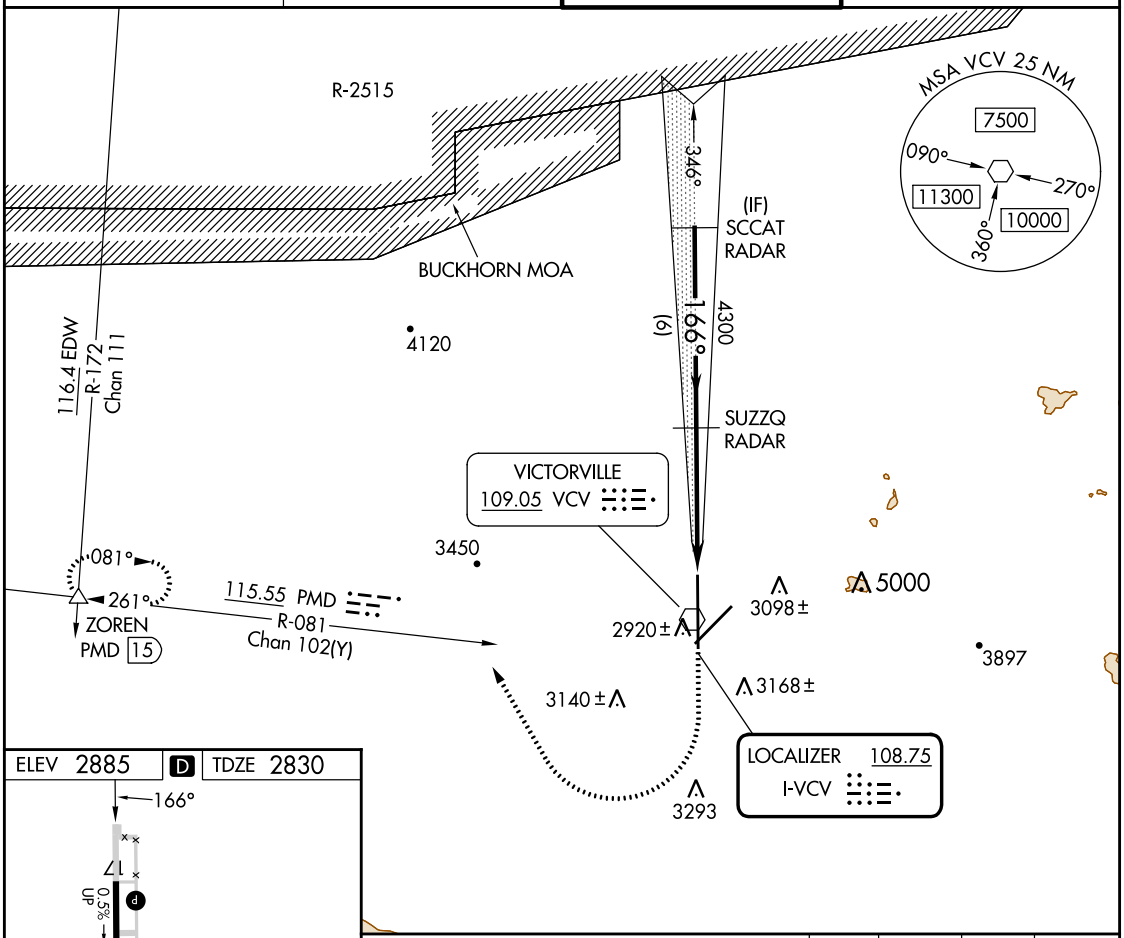
LOC I-VCV	APP CRS	Rwy Idg	13052
108.75	166°	TDZE	2830
		Apt Elev	2885

RADAR required.

Circling NA for Cats C and D southeast of Rwys 35 and 21. When local altimeter setting not received use Edwards AFB altimeter setting and increase all MDAs 160 feet, and Circling visibilty Cat C ½ SM.

MISSED APPROACH: Climb to 3500 then climbing right turn to 6000 on heading 316° and on PMD VORTAC R-081 to ZOREN INT/PMD 15 DME and hold.

ATIS ★	JOSHUA APP CON	VICTORVILLE TOWER ★	GND CON
135.475	124.55 363.0	118.35(CTAF) L 282.225	124.45



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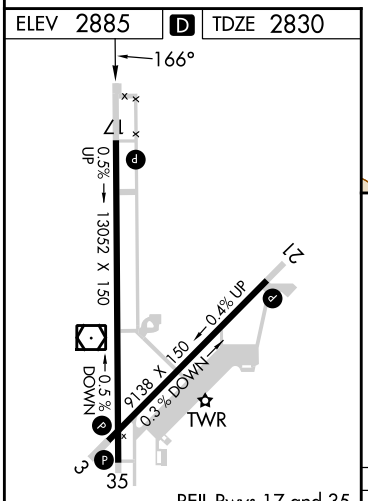
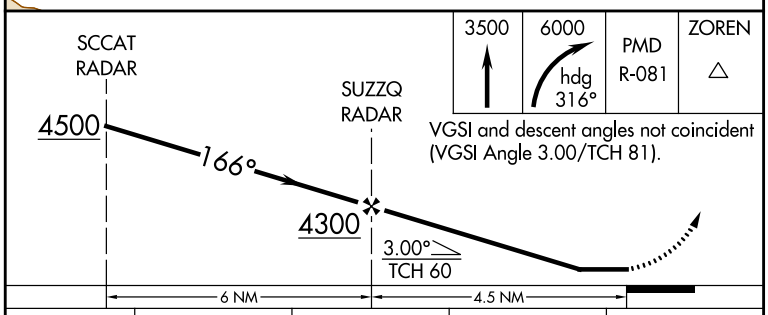


REIL Rwys 17 and 35

HIRL Rwys 3-21 and 17-35 L

FAF to MAP 4.5 NM					
Knots	60	90	120	150	180
Min:Sec	4:30	3:00	2:15	1:48	1:30



VGSI and descent angles not coincident (VGSI Angle 3.00/TCH 81).

CATEGORY	A	B	C	D
S-LOC 17	3180/55 350 (300-1)			
CIRCLING	3380-1 495 (500-1)	3420-1 535 (600-1)	3460-1½ 575 (600-1½)	3780-3 895 (900-3)

VICTORVILLE, CALIFORNIA

Amdt 3A 05SEP24

34°36'N-117°23'W

SOUTHERN CALIFORNIA LOGISTICS (VCV)

LOC RWY 17

LOC BC RWY 2L

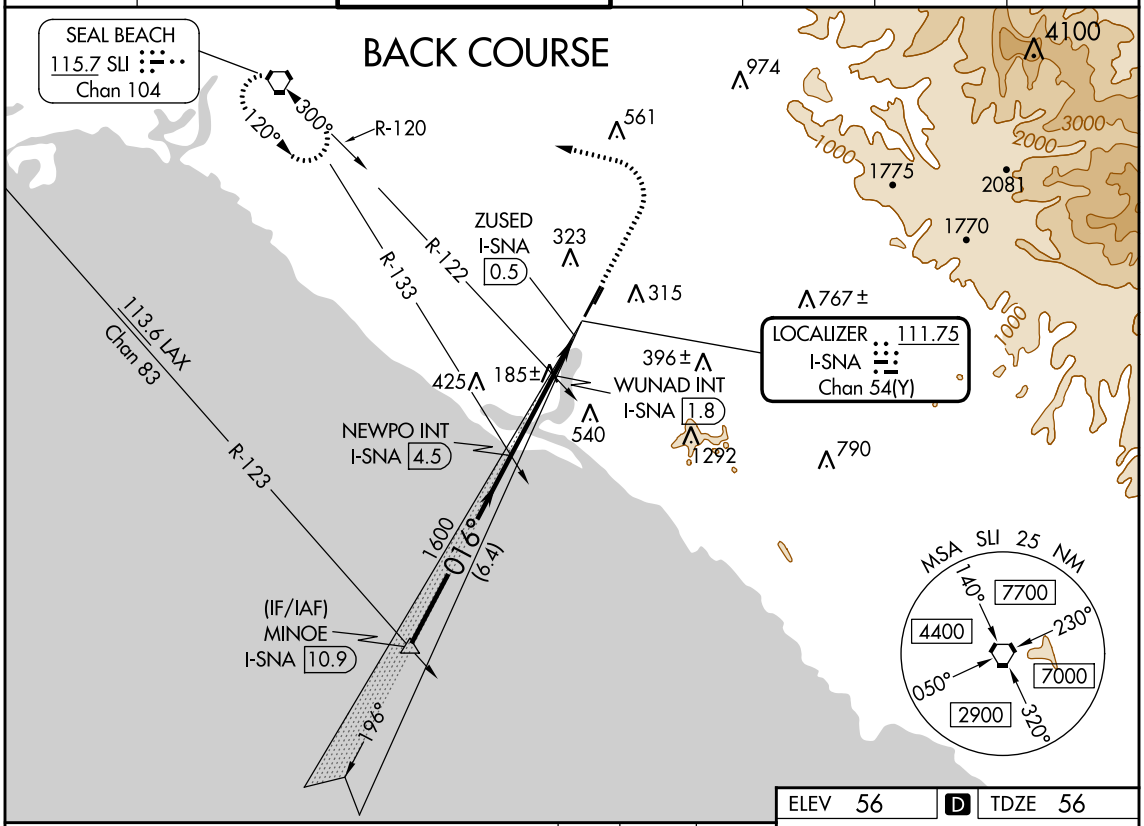
JOHN WAYNE/ORANGE COUNTY (SNA)

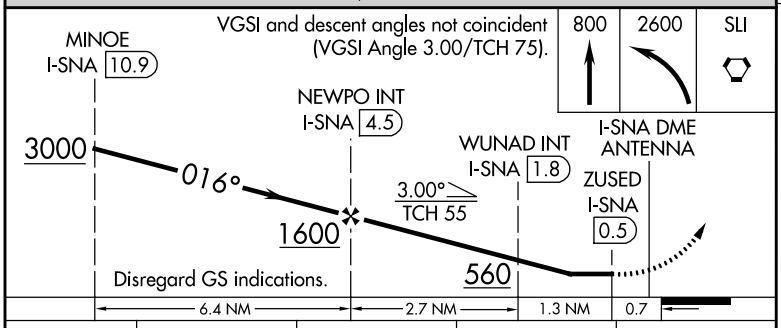
LOC/DME I-SNA	APP CRS	Rwy Idg	5700
111.75	016°	TDZE	56
Chan 54 (Y)		Apt Elev	56

Circling Rwy 20L NA at night.

MISSED APPROACH: Climb to 800 then climbing left turn to 2600 direct SLI VORTAC and hold.

D-ATIS	SOCAL APP CON	JOHN WAYNE TOWER ★	GND CON	CLNC DEL	CPDLC	UNICOM
126.0	121.3 263.1	126.8 (CTAF) L 343.625	120.8	118.0		122.95

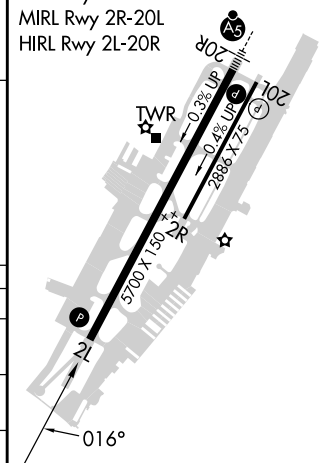




CATEGORY	A	B	C	D
S-LOC 2L	560-1 504 (600-1)		560-1⅜ 504 (600-1⅜)	
C CIRCLING	640-1 584 (600-1)		840-2¼ 784 (800-2¼)	1160-3 1104 (1200-3)
WUNAD FIX MINIMUMS (DUAL VOR RECEIVERS OR DME REQUIRED)				
S-LOC 2L	480-1 424 (500-1)		480-1¼ 424 (500-1¼)	
C CIRCLING	640-1 584 (600-1)		840-2¼ 784 (800-2¼)	1160-3 1104 (1200-3)

ELEV 56 D TDZE 56

REIL Rwy 20L
MIRL Rwy 2R-20L
HIRL Rwy 2L-20R



FAF to MAP 4 NM					
Knots	60	90	120	150	180
Min:Sec	4:00	2:40	2:00	1:36	1:20

SANTA ANA, CALIFORNIA
Amdt 13A 03NOV22

33°41′N-117°52′W

JOHN WAYNE/ORANGE COUNTY (SNA)

LOC BC RWY 2L

SW-3, 28 NOV 2024 to 26 DEC 2024

SW-3, 28 NOV 2024 to 26 DEC 2024

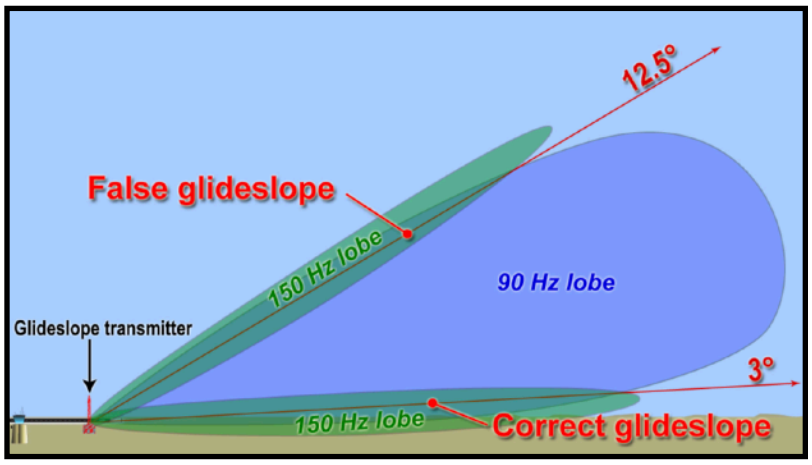
5. ILS APPROACHES

See AIM 1-1-9

ILS approaches build upon the localizer with the addition of a glideslope, allowing pilots to reach minimums as low as 200 ft AGL (CAT I). Because this approach includes vertical guidance and meets the ICAO requirements, it is known as a precision approach.

When you tune a localizer with an accompanying glideslope, the NAV radio automatically adds the GS to the indicator. The GS antenna is located 250-600 ft from the runway centerline. For a normal installation of a 3° glideslope, a crude approximation is 3° translates to ~300 ft descent per NM, and GS*5 = descent rate in FPM.

The GS system operates similarly to the localizer system. The strengths of two "lobed" signals are compared to determine the aircraft's vertical deviation. However, since one signal is pointed near the ground, it may reflect generating a false glideslope much higher than the actual glideslope. It is best practice to intercept a glideslope from below.



Some ILS approaches are just to ILS minimums (i.e. not "ILS or LOC"). Don't be confused at the lack of Maltese cross (ILS at VNY) - since that is just for non-precision approaches. For precision approaches, the FAF is indicated by glideslope intercept at the zig-zag line. Remember, you cannot perform a circling approach from an ILS or any precision/APV approach without listed non-precision minimums (TERPS 3-15)!

The ILS' localizer and glideslope comprise the **guidance** portion of an instrument landing system. However, the ILS also includes a **range** portion, consisting of a marker beacon (usually an OM to identify the FAF) or DME, and a **visual** portion, which include the approach lights, touchdown and centerline lights, and runway lights. This is important because inoperative ILS components will increase the approach minimums!

Explain approach procedure

- **What is the grey shaded area (ILS glideslope)**
- **Show symbols (zig zag lightning bolt,)**
- **Explain sensitivity**

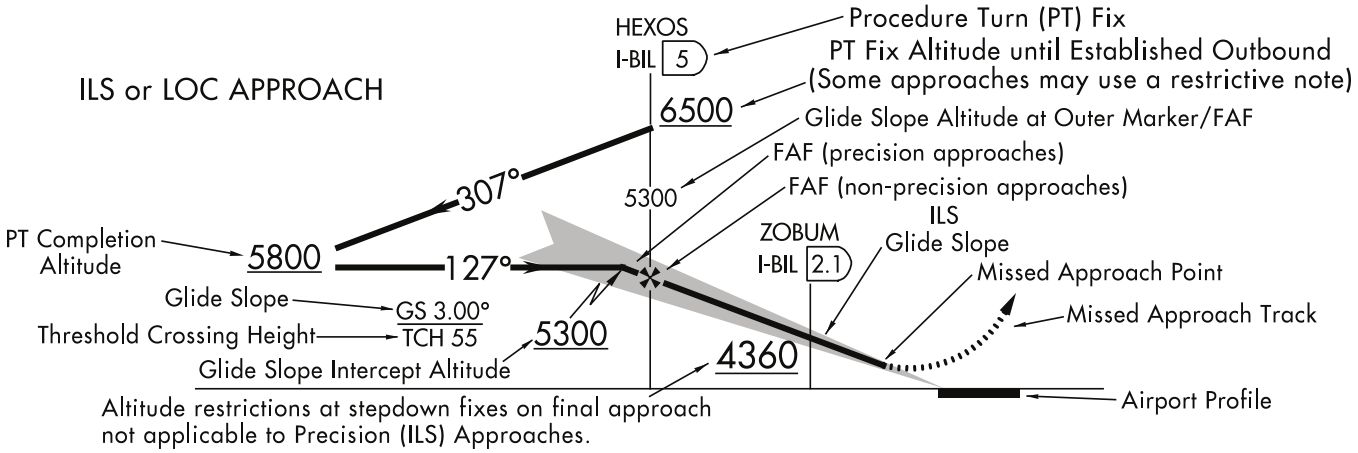
5.1. Decision Altitude (DA)

As soon as we reach the approach's minimums, we MUST execute the missed approach procedure. There is no leveling off at the DA, we MUST go missed immediately.

5.2. Loss of Glideslope

Pilots should, but are not legally required, to go missed if GS fails on an ILS approach. They can then resequence following the localizer step down fixes.

Other information on ILS approach plates:



(3) All Approach Types and all lines of minima other than (1) & (2) above

Inoperative Component or Visual Aid	Increase Visibility
ALSF 1 & 2, MALSR, SSALR	½ mile
MALSF, MALS, SSALF, SSALS, SALSF, SALS	¼ mile

ILS Z RWY 16R
VAN NUYS (VNY)

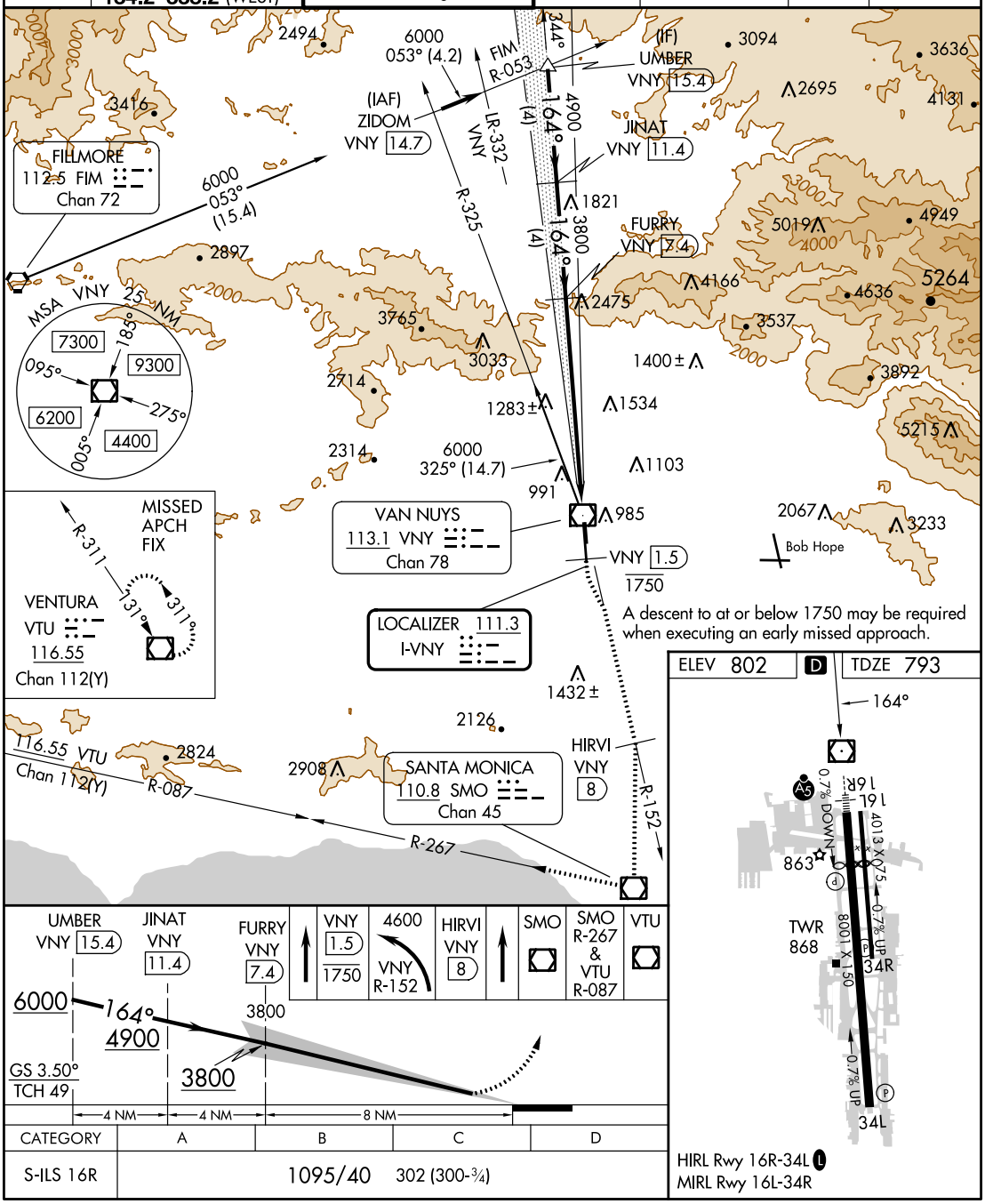
LOC I-VNY	APP CRS	Rwy Idg	6569
111.3	164°	TDZE	793
		Apt Elev	802

T DME required. RADAR required for monitoring of missed approach. When local altimeter setting not received, use Burbank altimeter setting and increase DA to 1114. Rwy 16R helicopter visibility reduction below RVR 4000 NA. For inop ALS, increase S-ILS 16R all Cats visibility to RVR 5000.

MALSR

MISSED APPROACH: Climb to cross VNY 1.5 DME south of VNY VOR/DME at or below 1750 then climbing left turn to 4600 on VNY VOR/DME R-152 to HIRVI/VNY VOR/DME 8 DME, direct SMO VOR/DME then on SMO VOR/DME R-267 then on VTU VOR/DME R-087 to VTU VOR/DME and hold.

ATIS	SOCAL APP CON	VAN NUYS TOWER ★	GND CON	CLNC DEL	CPDLC	UNICOM
127.55	120.4 360.6 (NORTH) 134.2 338.2 (WEST)	119.3 (CTAF) L 239.0	121.7	126.6 239.0		122.95



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SW-3, 28 NOV 2024 to 26 DEC 2024

VAN NUYS, CALIFORNIA
Amdt 1 15SEP16

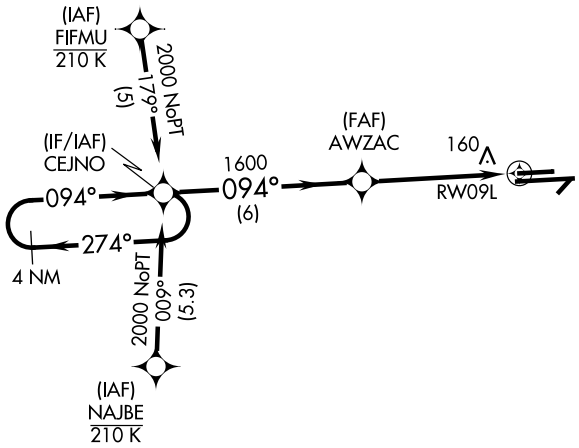
34°13′N-118°29′W

VAN NUYS (VNY)
ILS Z RWY 16R

6. GPS APPROACHES

There are two types of GPS approaches: RNAV (GPS) and RNAV (RNP). RNP in this context is short for RNP AR, or RNP authorization required. We cannot fly these approaches without special equipment and training.

Most GPS approaches follow a similar layout: the "Basic T." At either end of the T is an IAF, with an IAF/IF in the middle. Typically, the IAF/IF also serves as the holding fix for a HILPT.



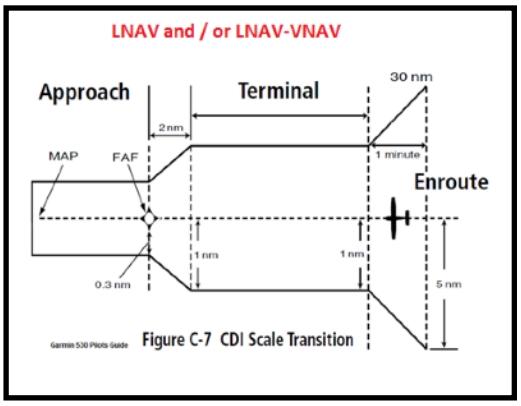
The two sides of the "T" allow aircraft to reverse course without needing to fly outbound on the inbound course. However, it also affords the flexibility to utilize the hold as a course reversal if necessary.

GPS approach minimums are dependent on the current performance of GPS and obstacles along the glide path. RNAV (GPS) approach charts normally have four lines of approach minimums: LPV, LNAV/VNAV, LNAV, and Circling. This enables as many GPS equipped aircraft to use the procedure as possible and provides operational flexibility if WAAS becomes unavailable. The GPS will use the best method available or the best method supported by that GPS. The GPS 175 supports all these types, however, a non-WAAS Garmin 430 only supports the LNAV and circling minimums.

CATEGORY	A	B	C	D
LPV DA	831-1¾ 619 (700-1¾)			
LNAV/ VNAV DA	835-1¾ 623 (700-1¾)			
LNAV MDA	1000-1 788 (800-1)	1000-1¼ 788 (800-1¼)	1000-2½ 788 (800-2½)	
C CIRCLING	1000-1 788 (800-1)	1220-1½ 1008 (1100-1½)	1460-3 1248 (1300-3)	1560-3 1348 (1400-3)

The GPS will indicate the approach method it is using. We cannot manually override this method unless we disable WAAS functionality. In the image above, the GPS automatically chose LPV guidance. However, it may show LNAV for a number of reasons on the same approach.

6.1. LNAV Minimums



LNAV does not provide vertical guidance. Additionally, when we fly under LNAV minimums, we are actually flying a fixed course width. In other words, sensitivity is constant all the way to the missed approach point. A GPS approach utilizing LNAV is considered a non-precision approach and is flown to a MDA.

LNAV+V is a feature of some WAAS GPS units that augment lateral guidance with an advisory glideslope. This is not an approved glideslope and only serves to provide the pilot with added situational awareness for managing their descent.

6.2. LNAV/VNAV Minimums

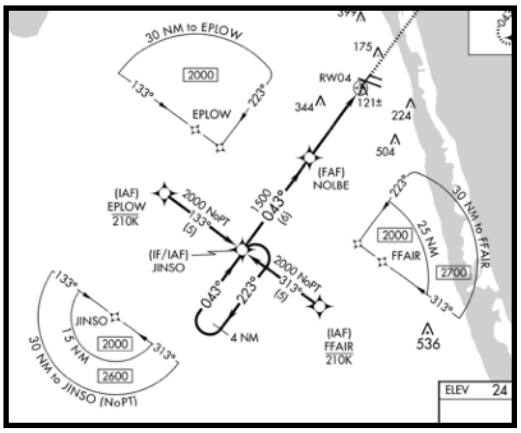
Only aircraft equipped with GPS and FMS (with approach-certified barometric vertical navigation, or Baro-VNAV) can fly to the LNAV/VNAV DA.

6.3. LP/LPV Minimums

LPV (localizer performance with vertical guidance) provides the performance of a localizer with a glideslope. Some approaches do not have vertical guidance, due to terrain limitations or obstructions, and are comparable to localizer only systems (hence localizer performance, LP). Even though LPV approaches provide vertical guidance, they do not meet ICAO requirements and are thus not considered precision approaches. Rather, they fall into their own category, approaches with vertical guidance (APV approaches). LPV/LP approaches will say “WAAS” in the top left corner. Approaches where WAAS vertical guidance may be unreliable (but can be attempted) have a small w in a black square.

Flying an LPV approach requires an aircraft with WAAS avionics. If for some reason the WAAS service becomes unavailable, all GPS or WAAS equipped aircraft can revert to the LNAV MDA and land safely using GPS only, which is available nearly 100 percent of the time.

6.4. Terminal Arrival Area

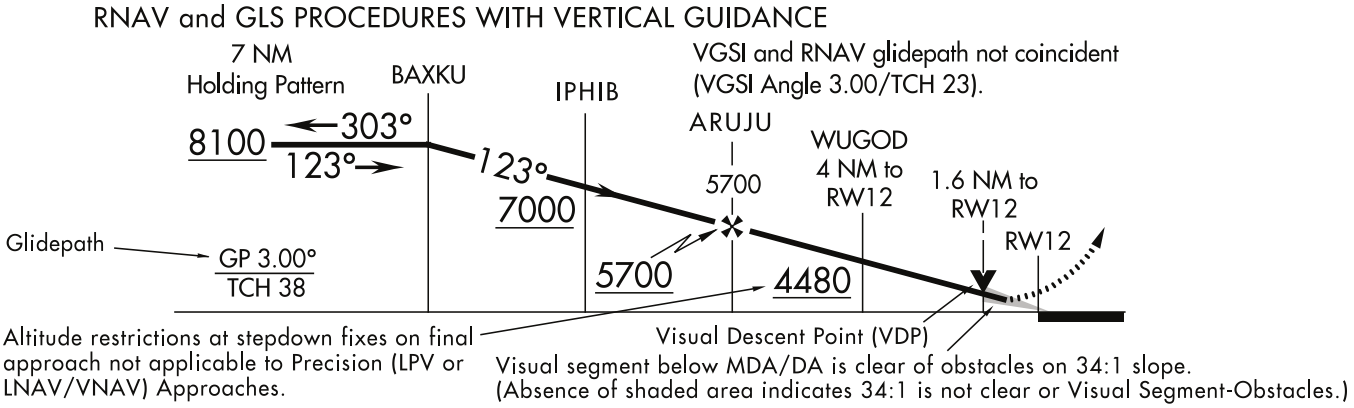


The TAA provides a transition from the en route structure to the terminal environment with little required pilot/air traffic control interface for aircraft equipped with Area Navigation (RNAV) systems. A TAA provides minimum altitudes with standard obstacle clearance when operating within the TAA boundaries. TAAs are primarily used on RNAV approaches but may be used on an ILS approach when RNAV is the sole means for navigation to the IF; however, they are not normally used in areas of heavy concentration of air traffic.

An ATC clearance direct to an IAF or to the IF/IAF without an approach clearance does not authorize a pilot to descend to a lower TAA altitude. Once cleared for the approach, pilots may descend in the TAA sector to the minimum altitude depicted within the defined area/subdivision, unless instructed otherwise by air traffic control. Pilots should plan their descent within the TAA to permit a normal descent from the IF/IAF to the FAF. - AIM 5-4-5d

7. OTHER APPROACH SYMBOLS

Other information on RNAV approach plates:



GPS – Obstacle Indicator in the 34:1 glideslope

For RNAV approaches only, the presence of a grey shaded triangle from the MDA to the runway symbol in the profile view is an indication that the visual segment below the MDA is clear of obstructions on the 34:1 slope. Absence of the gray shaded area indicates the 34:1 OCS is not free of obstructions. The OCS, (Obstacle Clearance Surface) can be any slope designated for obstacle flagging (IFR mag).

Non-Precision – Visual Descent Point

A defined point on the final approach course of a nonprecision straight-in approach procedure from which a stabilized visual descent from the MDA to the runway touchdown point may be commenced. The pilot should not descend below the MDA prior to reaching the VDP (AIM 5-4-5h).

The VDP is calculated via the descent angle from the visual glide slope indicator (AIM 5-4-5h). The VDP indicates the 20:1 surface is clear, but not necessity the 34:1 surface.

Rule of thumb: Take the AGL value of the MDA and divide it by 300.

RNAV (GPS) RWY 9L
MELBOURNE ORLANDO INTL (MLB)

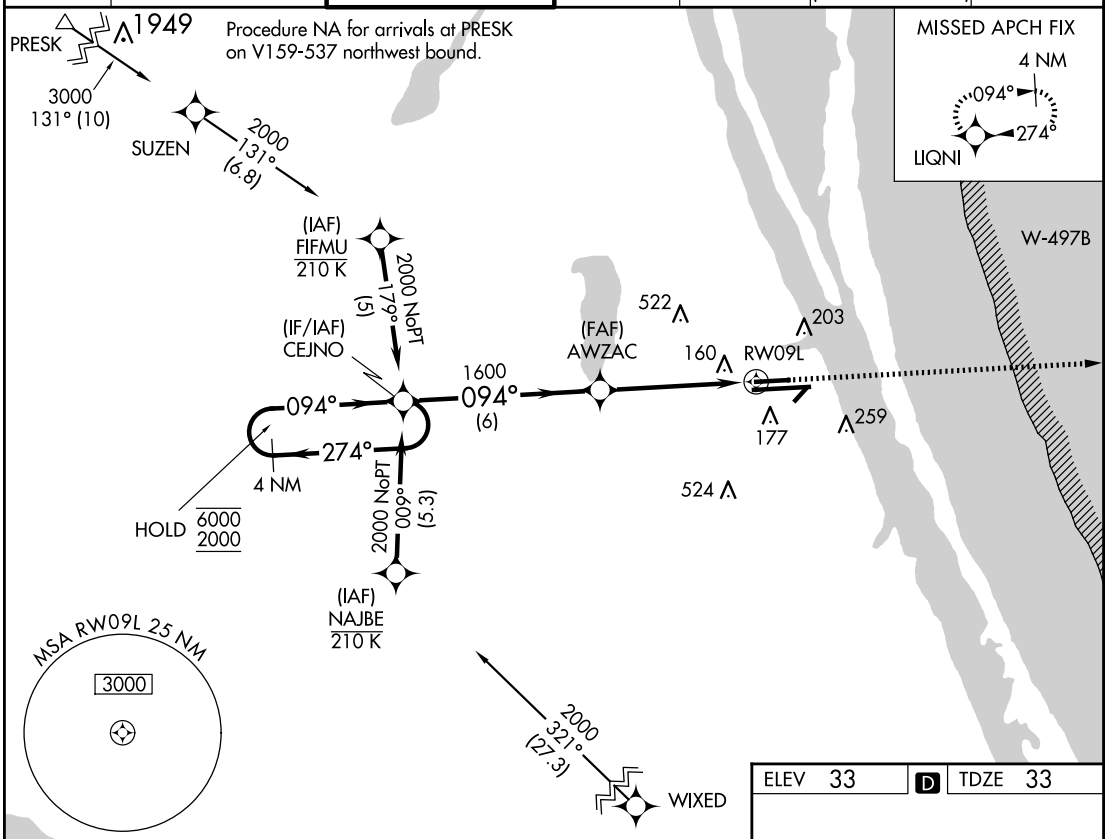
WAAS	APP CRS	Rwy Idg	6000
CH 65601	094°	TDZE	33
W09A		Apt Elev	33

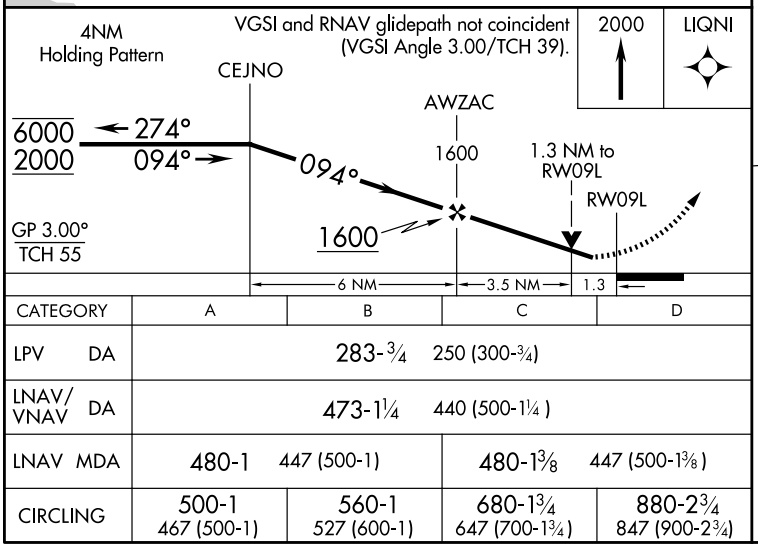
RNP APCH - GPS.

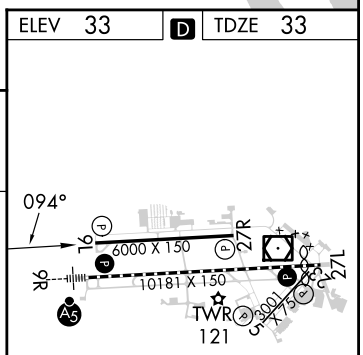
For uncompensated Baro-VNAV systems, LNAV/VNAV NA below 2°C or above 54°C. Rwy 9L helicopter visibility reduction below ¾ SM NA.

MISSED APPROACH: Climb to 2000 direct LIQNI and hold.

ATIS	ORLANDO APP CON	MELBOURNE TOWER ★	GND CON	CLNC DEL	CLNC DEL	UNICOM
132.55	132.65 281.425	118.2 (CTAF) L 257.8	121.9	121.9	132.65 (When twr closed)	122.95







CATEGORY	A	B	C	D
LPV DA	283-¾ 250 (300-¾)			
LNAV/VNAV DA	473-1¼ 440 (500-1¼)			
LNAV MDA	480-1 447 (500-1)		480-1⅜ 447 (500-1⅜)	
CIRCLING	500-1 467 (500-1)	560-1 527 (600-1)	680-1¾ 647 (700-1¾)	880-2¾ 847 (900-2¾)

REIL Rwy 27L L
HIRL Rwy 9R-27L L
MIRL Rwys 5-23 and 9L-27R L
TDZ/CL Rwy 9R

MELBOURNE, FLORIDA
Amdt 2 20FEB25

28°06'N-80°39'W

MELBOURNE ORLANDO INTL (MLB)
RNAV (GPS) RWY 9L

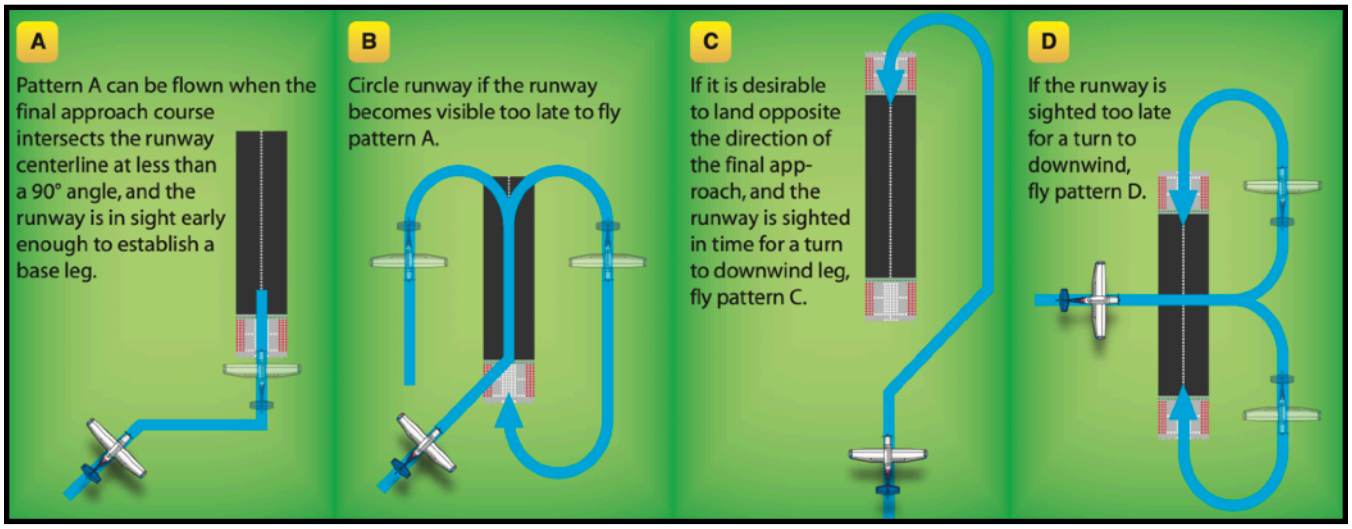
SE-3, 17 APR 2025 to 15 MAY 2025

SE-3, 17 APR 2025 to 15 MAY 2025

8. CIRCLING APPROACHES

What if there are no approaches to our desired runway? The circling approach allows us to fly a pseudo-traffic pattern after following an approach to the airport's vicinity. Circling minimums are typically higher than straight-in approach minimums, since the required obstacle clearance area is usually larger to accommodate maneuvering aircraft.

C CIRCLING	500-1 467 (500-1)	560-1 527 (600-1)	680-1¾ 647 (700-1¾)	880-2¾ 847 (900-2¾)



Aircraft must comply with the circling weather requirements outlined on the approach being followed. **Circling minimums were originally devised by considering obstacle and terrain obstructions within a set distance from the airport, dependent on the aircraft's approach category**. However, the FAA has redefined the obstacle clearance radius which is now dependent on bank angle and TAS for the category. Revised circling minimums are noted by the C symbol on the approach plate. The specific equations and parameters are outlined to the right:

Circling minimums absent of the C symbol follow the old circling radius procedures, shown in the table.

CAT	V_{KIAS}	$Bank_{angle}$	Straight Segment Length (S)
A	90	25	0.4
B	120	25	0.4
C	140	20	0.5
D	165	20	0.6
E	200	22	0.7

A minimum of 300 ft obstacle clearance is guaranteed at or above the circling MDA (TERPS 2-59).

$$CAR = 2 \times \frac{(V_{KTAS} + 25)^2}{\tan(bank_{angle}) \times 68625.4} + S$$

STANDARD CIRCLING APPROACH MANEUVERING RADIUS

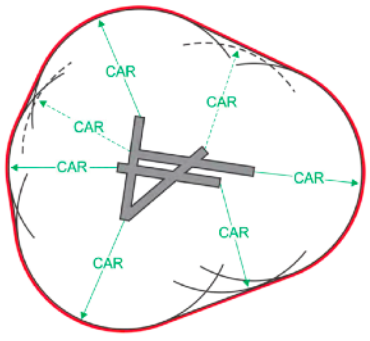
Circling approach protected areas developed prior to late 2012 used the radius distances shown in the following table, expressed in nautical miles (NM), dependent on aircraft approach category. The approaches using standard circling approach areas can be identified by the absence of the C symbol on the circling line of minima.

Circling MDA in feet MSL	Approach Category and Circling Radius (NM)				
	CAT A	CAT B	CAT C	CAT D	CAT E
All Altitudes	1.3	1.5	1.7	2.3	4.5

C EXPANDED CIRCLING APPROACH MANEUVERING AIRSPACE RADIUS

Circling approach protected areas developed after late 2012 use the radius distance shown in the following table, expressed in nautical miles (NM), dependent on aircraft approach category, and the altitude of the circling MDA, which accounts for true airspeed increase with altitude. The approaches using expanded circling approach areas can be identified by the presence of the C symbol on the circling line of minima.

Circling MDA in feet MSL	Approach Category and Circling Radius (NM)				
	CAT A	CAT B	CAT C	CAT D	CAT E
1000 or less	1.3	1.7	2.7	3.6	4.5
1001-3000	1.3	1.8	2.8	3.7	4.6
3001-5000	1.3	1.8	2.9	3.8	4.8
5001-7000	1.3	1.9	3.0	4.0	5.0
7001-9000	1.4	2.0	3.2	4.2	5.3
9001 and above	1.4	2.1	3.3	4.4	5.5



8.1. Executing the Circling Approach

AIM 5-4-20(f) outlines the circling procedure. As long as aircraft remain within the protected area, the AIM recommends to "maneuver the shortest path to the base or downwind leg, as appropriate, considering existing weather conditions. There is no restriction from passing over the airport or other runways".

8.2. Going Missed from the Circle

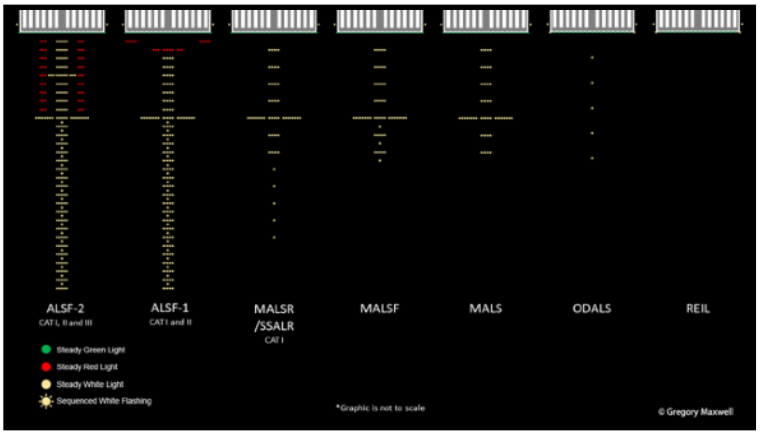
AIM 5-4-21(c)

> If visual reference is lost while circling-to-land from an instrument approach, the missed approach specified for that particular procedure must be followed (unless an alternate missed approach procedure is specified by ATC). To become established on the prescribed missed approach course, the pilot should make an initial climbing turn toward the landing runway and continue the turn until established on the missed approach course. Inasmuch as the circling maneuver may be accomplished in more than one direction, different patterns will be required to become established on the prescribed missed approach course, depending on the aircraft position at the time visual reference is lost. Adherence to the procedure will help assure that an aircraft will remain laterally within the circling and missed approach obstruction clearance areas. Refer to paragraph h concerning vertical obstruction clearance when starting a missed approach at other than the MAP. (See FIG 5-4-30.)

9. MISSED APPROACH AND 91.175

1. If at any point we descent below the MDA before the MAP
2. If upon arriving at the DA/DH or MAP do not meet the following (listed in 14 CFR 91.175):
   - **i. Must have flight visibility greater than or equal to visibility listed**
   - **ii. Must have runway environment in sight**
     - The threshold
     - The threshold markings
     - The threshold lights
     - The runway end identifier lights
     - The visual glideslope indicator
     - The touchdown zone or touchdown zone markings
     - The touchdown zone lights
     - The runway or runway markings
     - The runway lights
     - Approach lights*
   - **iii. Must be able to make a smooth descent to landing using normal maneuvers**

*If we see the approach lights AND red lights, this counts as the runway environment. If we only see the approach lights and NO red lights, then we can proceed to 100 ft above TDZE. (ALSF-Approach lighting system with flashing lights)



10. GPS DATABASES REQUIREMENTS

Although AIM 1-1-17 TBL 1-1-6 Note 3 says you can fly with an expired database for an approach as long as the procedure has not been amended. There is conflicting information on many FAA sources. Also check your GPS supplement.

AC 90-100A pg 12

Thread

> **2.5 Navigation Database**
> GPS/SBAS based IFR operations are prohibited unless the flight crew verifies and uses a valid, compatible, and current navigation database or verifies each waypoint for accuracy by reference to current approved data.

11. BRIEFING AND FLYING THE APPROACH

AABBCC

Source, Course, Freq, Ident

1/2 mile before the FAF - configure

11.1. When to Perform Procedure Turn and When to Proceed Straight-In

See AIM 5–4–9

12. FREQUENTLY ASKED QUESTIONS

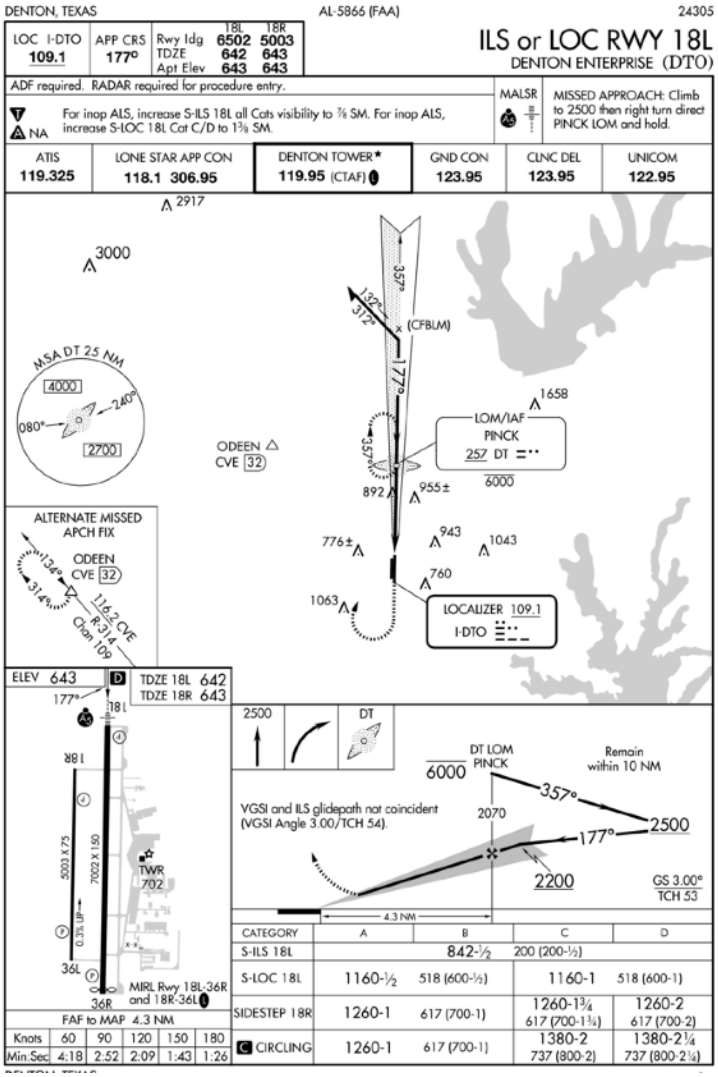
At what point in the flight will you have your student execute pre-arrival activities?

When ~30 minutes away from landing when time permits

What will those activities include? Do you have a memory aid or trick to help them remember all of these activities?

AABBCC and Source, Course, Frequency, Ident

Using the ILS to KDTO's 18L, teach me how to brief this approach. And what is that shaded diamond shaped symbol surrounding PINCK represent?



This is the ILS or LOC RWY 18L approach into Denton. Localizer frequency 109.1 is tuned and identified. Approach course 177° loaded under CDI. Runway length is suitable.

Notes in the briefing strip noted, no inop equipment reported. ADF will be substituted with GPS.

Will maintain 2200 for glide slope intercept, then down to straight in ILS mins of 842. Missed approach procedure is a straight out climb to 2500.

Shaded diamond symbol is an outer marker co-located with a NDB.

When are straight in minimums published?

When either the normal rate of descent or the runway alignment factor of 30 degrees is exceeded, a straight-in minimum is not published and a circling minimum applies

Is approved WAAS GPS a valid source of navigation to fly the final segment of a VOR approach? Says who?

See AIM 1-2-3(c). The NAVAID must be monitored (on #2) and operational, but the GPS can provide course guidance that you follow on #1. Also see AC 90-108.

4. Pilots may not substitute for the NAVAID (for example, a VOR or NDB) providing lateral guidance for the final approach segment. This restriction does not refer to instrument approach procedures with "or GPS" in the title when using GPS or WAAS. These allowances do not apply to procedures that are identified as not authorized (NA) without exception by a NOTAM, as other conditions may still exist and result in a procedure not being available. For example, these allowances do not apply to a procedure associated with an expired or unsatisfactory flight inspection, or is based upon a recently decommissioned NAVAID.

5. Use of a suitable RNAV system as a means to navigate on the final approach segment of an instrument approach procedure based on a VOR, TACAN or NDB signal, is allowable. The underlying NAVAID must be operational and the NAVAID monitored for final segment course alignment.

Where do you find the expanded circling radii?

TERPS or TPP

What are the requirements for a visual approach?

Pilot reports airport in sight, and airport must be VFR (≥3 sm, ≥1000 ft)