Area of Operation **VIII** - Task **B**

Precision Instrument Approach

westflying

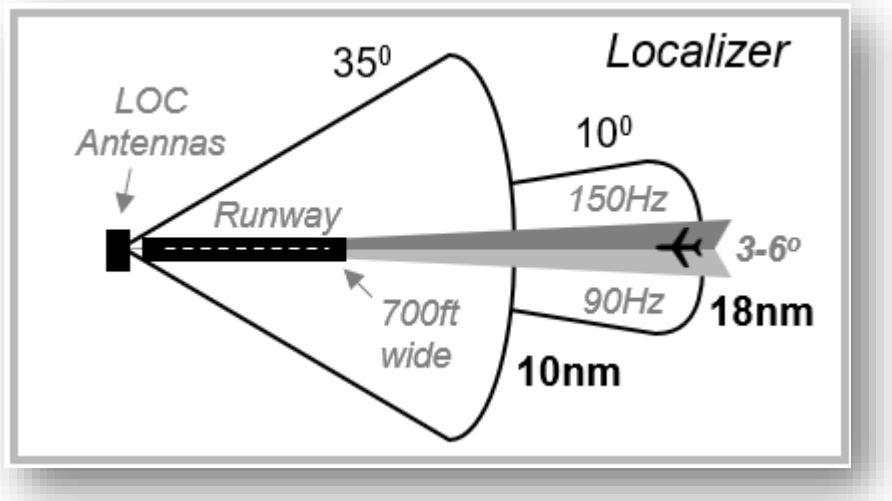
Key References:
- Instrument Flying Handbook
- Instrument Procedures Handbook
- AIM

Content

1. Introduction

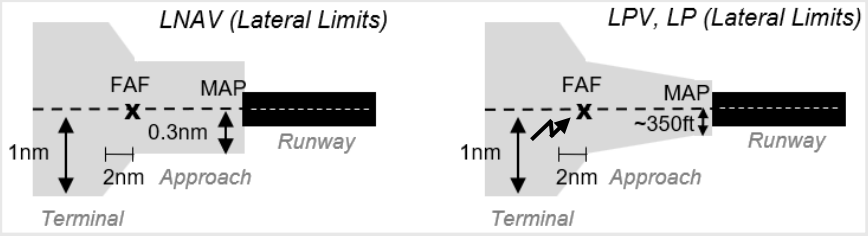
Precision

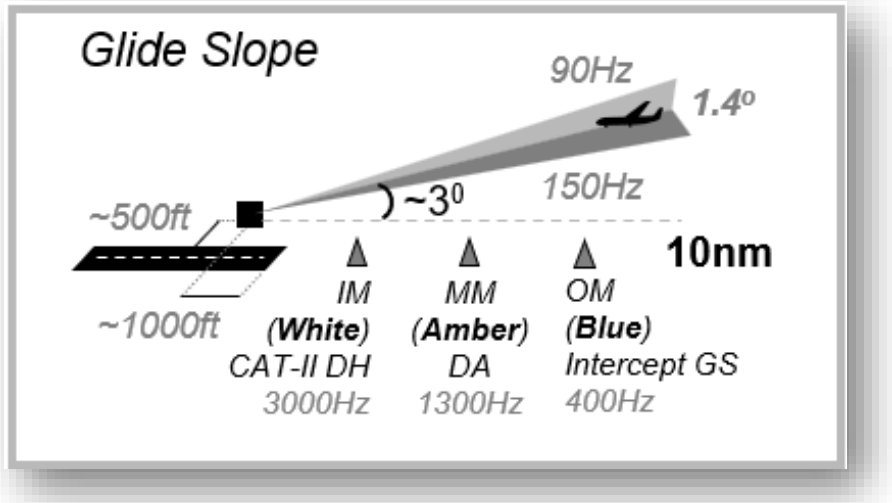
- **What**: Approach with Lateral and Vertical Guidance, lower minimums and more complex equipment.
- **Why**: Provides lower minimums and a more stable/guided descent
- **Precision Approaches (Types)**
  - They have DA instead of MDA
  - **ILS** ➔ Instrument Landing System (usually DA of 200ft AGL)
  - **GLS** ➔ GBAS Landing System
  - **PAR** ➔ Precision Radar Approach



- **Approach with Vertical Guidance (APV)** – *RNAV approaches*
  - Not a Precision Approach, but they have DA and offer similar minimums
  - LPV → Localizer Performance w/ Vertical Guidance (req. WAAS)
  - LNAV/VNAV → Lateral / Vertical Navigation (req. WAAS or Baro-VNAV)

Careful: LNAV+V or LP+V are not APV or Precision Approach





2. Definitions | Minimums

- **MDA (Minimum Descent Altitude)**
  - Lowest altitude the approach descents to
    (specific criteria needs to be met before descending further)
  - May level off at the MDA until the missed approach point
  - Used in Non-Precision Approaches

- **DA/DH (Decision Altitude/Height)**
  - Altitude where decision is made to land or execute missed appr.
  - DH is the same as DA, but measures height above threshold
  - Used in Precision Approaches and App w/ Vertical Guidance (APV)

Precision Approaches (PA)
- Provides course and glidepath guidance, Minimums given by DA.
- ILS → Instrument Landing System
- GLS → GBAS Landing System
- PAR → Precision Radar Approach

Approach with Vertical Guidance (APV)
- Provides course and glidepath guidance. Min given by DA, but considered NPA
- LPV → Localizer Performance w/ Vertical Guidance *(type of a RNAV approach)*
- LNAV/VNAV → Lateral Navigation / Vertical Navigation *(type of RNAV approach)*

Non-Precision Approached (NPA)
- Provides only course (lateral) guidance. Min given by MDA
- LOC → Localizer (3-6º course width). Full deflection = 2.5º)
- LDA → Localizer Directional Aid. Like LOC, but not aligned to the runway
- SDF → Simplified Directional Facility. Like LOC, but 6-12º course width
- VOR → Approach based on a VOR (full deflection = 10º)
- NDB → Approach based on a NDB
- LNAV → Lateral Navigation *(type of a RNAV approach)*
- LP → Localizer Performance *(type of a RNAV approach)*
- ASR → Approach Surveillance Radar. Similar to PAR, but lateral guidance only

NOTE: Rate of Descent (3º glide path) → Rule of thumb: **VS (fpm) = GS x 5**

- **Approach Categories** [97.3]
  - Group aircraft in similar speed range
  - Mean to determine the appropriate minimums (MDA/DA) to be used
  - Based on aircraft's Vref (or 1.3*Vso if not published)
  - If aircraft is operating at a higher airspeed than the category's range, the minimum for the higher category is used [AIM 5-4-7(b)]

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

CATEGORY	A	B	C	D
S-ILS 32L	453-1¼ 431 (500-1¼)			
S-LOC 32L	700-1 678 (700-1)		700-1⅞ 678 (700-1⅞)	

2. Definitions | Minimums

- **When to descent below MDA/DA** [91.175]
  1. Aircraft is in position where landing can be made with normal maneuvers, **and…**
  2. Flight visibility at/above the minimum for the selected approach, **and…**
  3. At least one of the following is distinctly visible:
     - ✓ Threshold, or threshold markings, or threshold lights
     - ✓ Touchdown zone, or touchdown zone markings, or touchdown zone lights
     - ✓ Runway, or runway markings, or runway lights
     - ✓ REIL, or PAPI/VASI, or Red terminating bars, or Red side row bars

NOTE: if only see the ALS (not the above), can descend to 100ft above TDZ

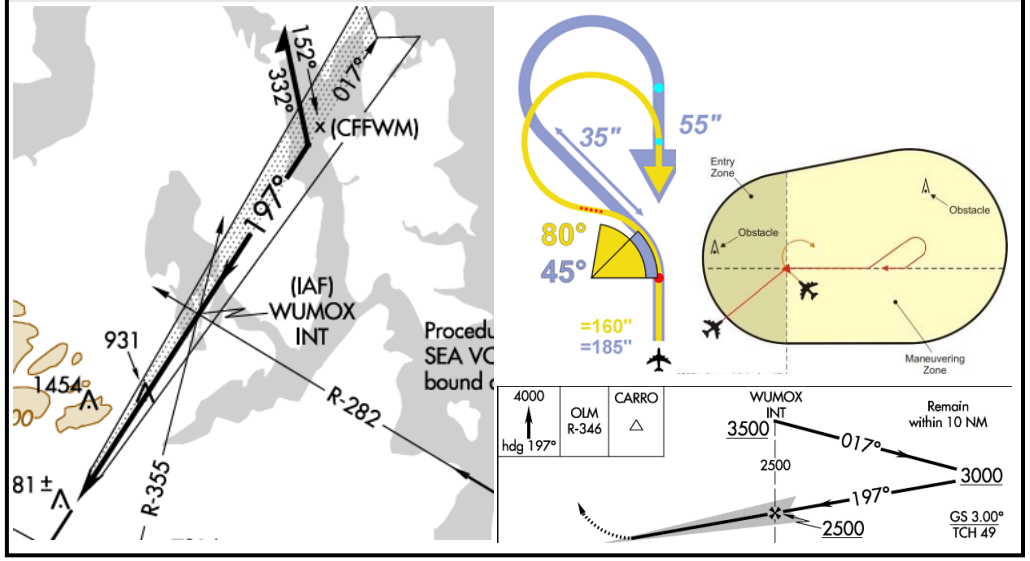
2. Definitions | Course Reversal

AIM 5-4-9

A maneuver used when need to reverse direction to establish the aircraft inbound on an approach course

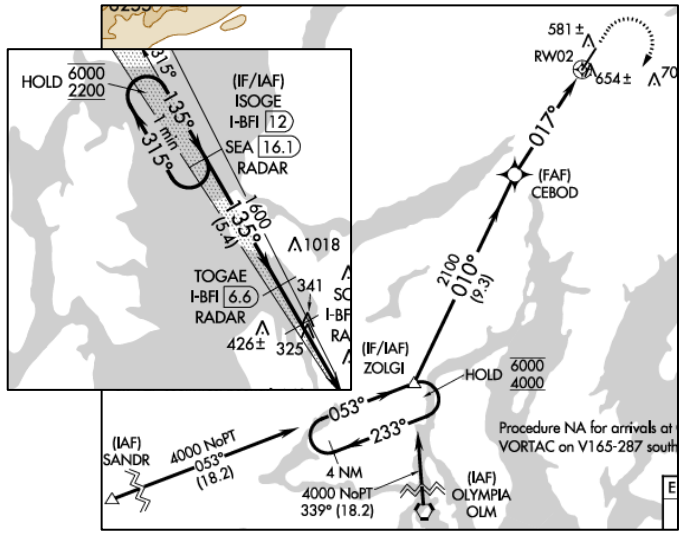
Procedure Turn (Arrow)

- Direction Arrow points where to turn *(max speed 200kts)*
- Pilot stays within the charted distance (e.g. 10nm)



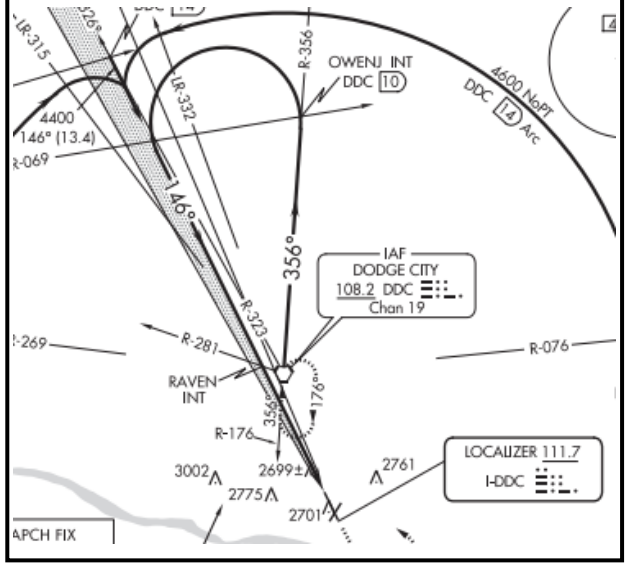
Hold-in-Lieu-of-PT

- Execute as charted
- Only stay holding if instructed by ATC



Tear Drop

- If depicted and a course reversal is needed, it must be flown



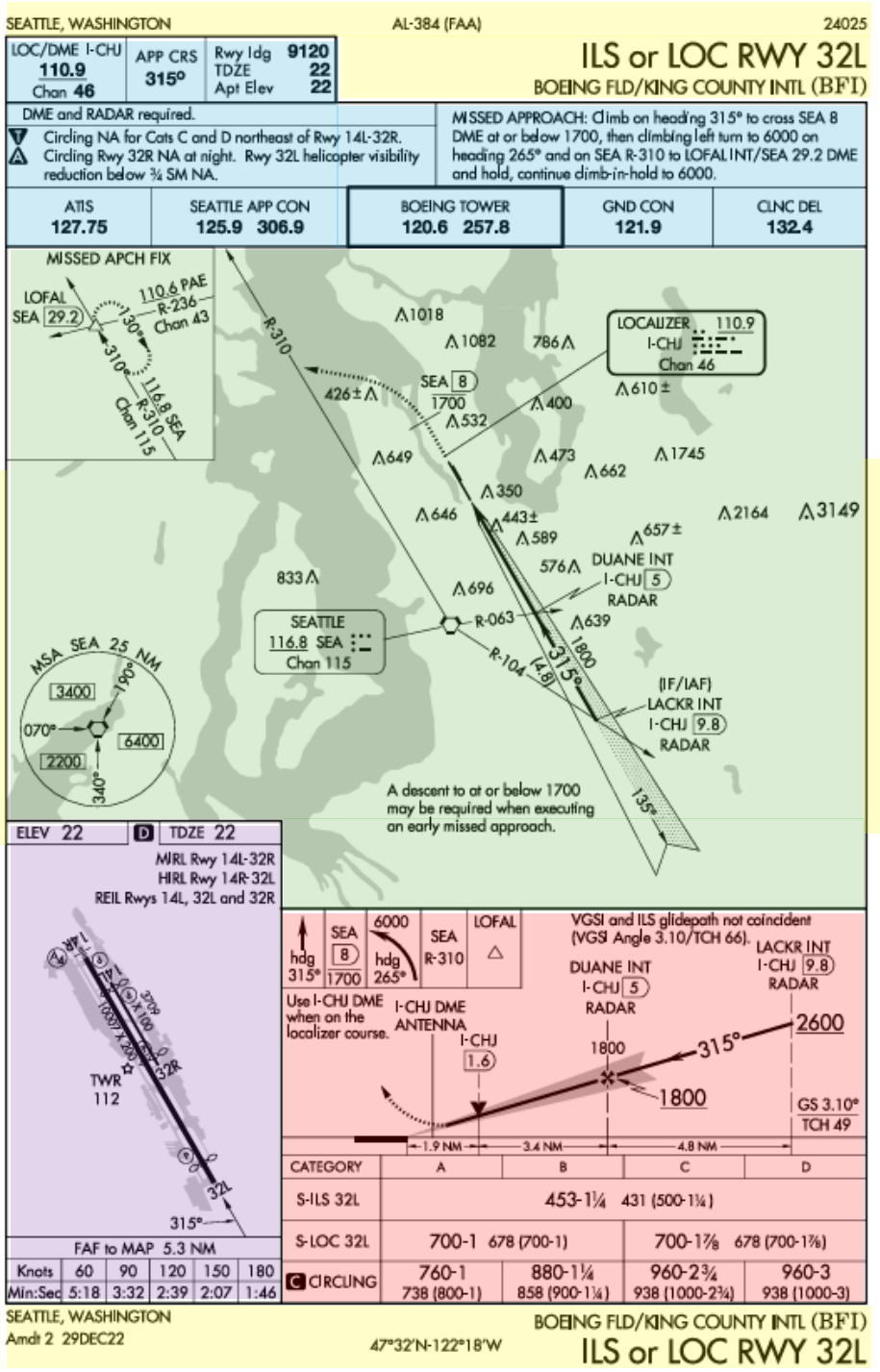
- **NOT to fly a procedure turn when**
  - [91.175(j)] ➔ Radar vectors to final, Chart has "NoPT", ATC clears for "straight-in" or Timed approach from a holding fix [AIM 5-4-10]
  - The absence of the procedure turn barb in the plan view indicates that a procedure turn is not authorized for that procedure [AIM 5-4-9]
- **Descent below PT altitude ➔** when established on the inbound course

3. Choosing an Approach

- **ATIS:** Specifies runway(s) and approach(es) in use
- **Aircraft Capabilities:** Dictate which approaches are an option
- **Weather:** Reported ceiling & visibility vs. approach minimums
- **NOTAMs:** Anything that prevent or changes the desired approach
- **Feeder Routes**: What's most convenient/efficient
- **Straight-In vs Circling Approach**
  - Straight-In: Lower minimums, simpler, safer & more efficient
  - Circling: Landing on a runway not suitable for a straight-in approach
- **Preference:** Comfort, Safety and Proficiency
- **Once approach is selected:**
  - Let ATC know your intentions (and how it will terminate)
  - Load approach (and activate when proper) if needed
  - Verify the correct and current approach chart
  - Brief the approach and missed approach

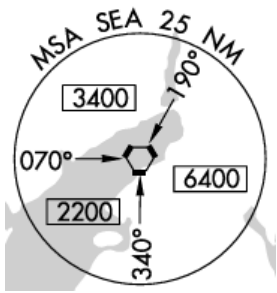
4. Approach Charts | Components

- **Top Bar (Chart Info) and Sides**
  - City, State, Issue #, Approach / Runway, Airport
  - Valid dates
- **Briefing Information**
  - Frequencies, Course, Runway distances, Notes, Missed approach, Approach lighting (not depicted on this specific plate)
- **Plan View**
  - Overhead view depicting initial fix to MAP
  - Minimum Safe Altitude (MSA) diagram
- **Profile View & Minimums**
  - Side view depicting waypoints, course, altitude, distances, missed approach point, etc.
  - Minimum altitudes (MDAs/DAs)
- **Minimums & Airport Diagram**
  - Airport Diagram, Elevation, Lights
  - Time to MAP, as necessary

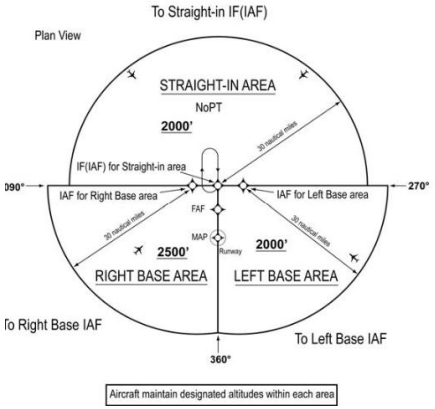


4. Approach Charts | MSA vs TAA

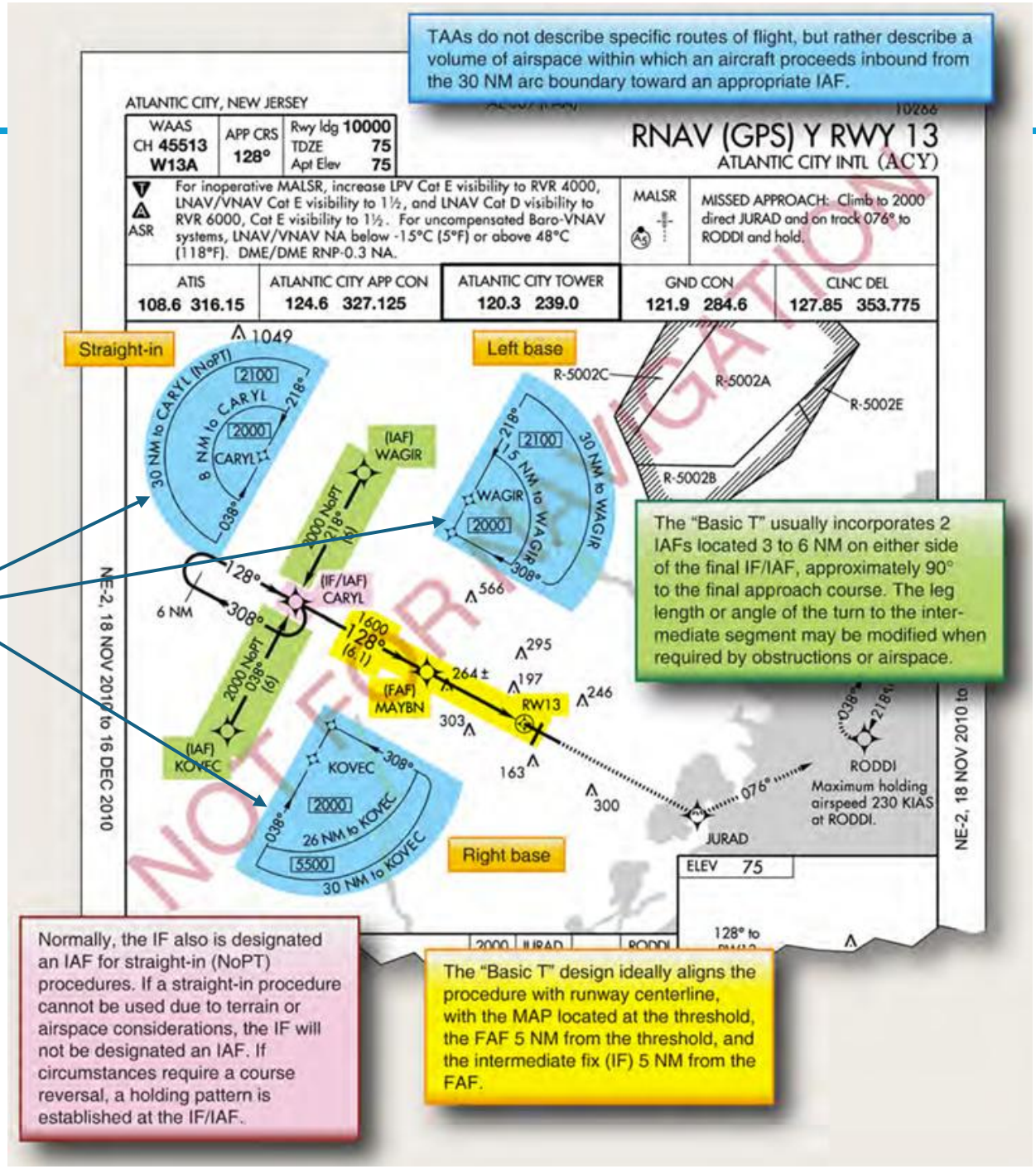
- **MSA (Minimum Safe Altitude)**
  - Used for emergencies
  - At least 1000’ clearance from obstacles
  - Usually 25nm from a navaid



- **TAA (Terminal Arrival Area)**
  - Transition from enroute to the terminal environment
  - Usually used in RNAV approaches
  - Once cleared for the approach, the pilot can descend to the TAA minimums unless instructed otherwise



Example of a common T-Shape RNAV (GPS) approach

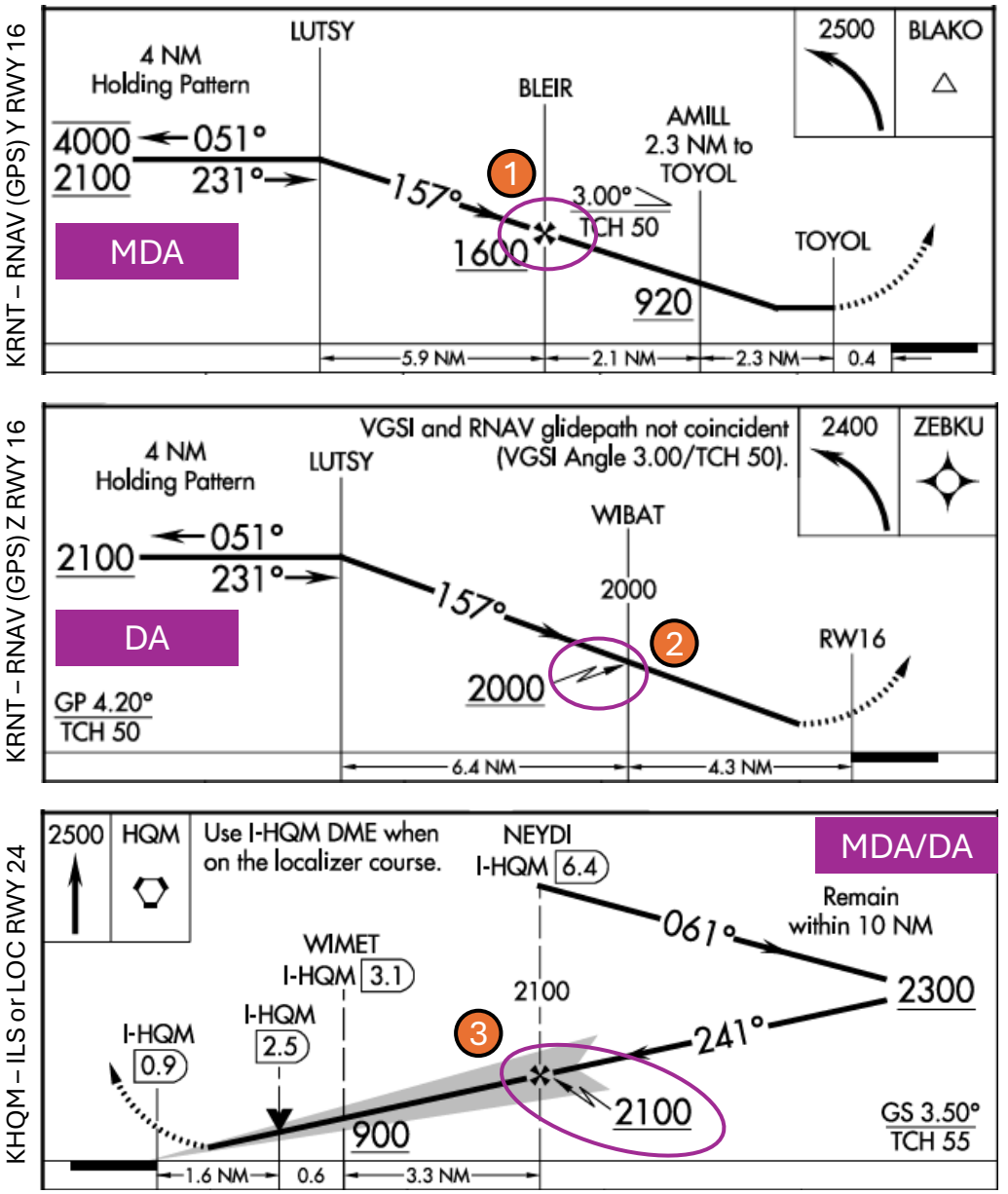


4. Approach Charts | FAF

- **FAF (Final Approach Fix)**
  - Identifies the beginning of the final approach segment
  - Non-Precision (MDA) ➔ Maltese Cross ①
  - Precision & AVP (DA) ➔ Lightning bolt ②

    (not a point, but the altitude to intercept the GS)

  ✓ Often you will see both, but they are not necessarily in the same location ③



4. Approach Charts | Briefing

Basics

1 Verify Airport/City Name, 2 Approach name and 3 Dates

11 Read applicable notes and 12 available approach light system

4 Check Navaid frequencies and 17 comms frequencies

Navigation

4 Analyze the plan view, entry points, holds and proc. turns

5 Check final approach course and 6 stepdown altitudes/FAF

7 Note and bug minimum altitudes; Verify minimum visibility

Airport

8 Verify airport elevation and the overall 18 airport diagram

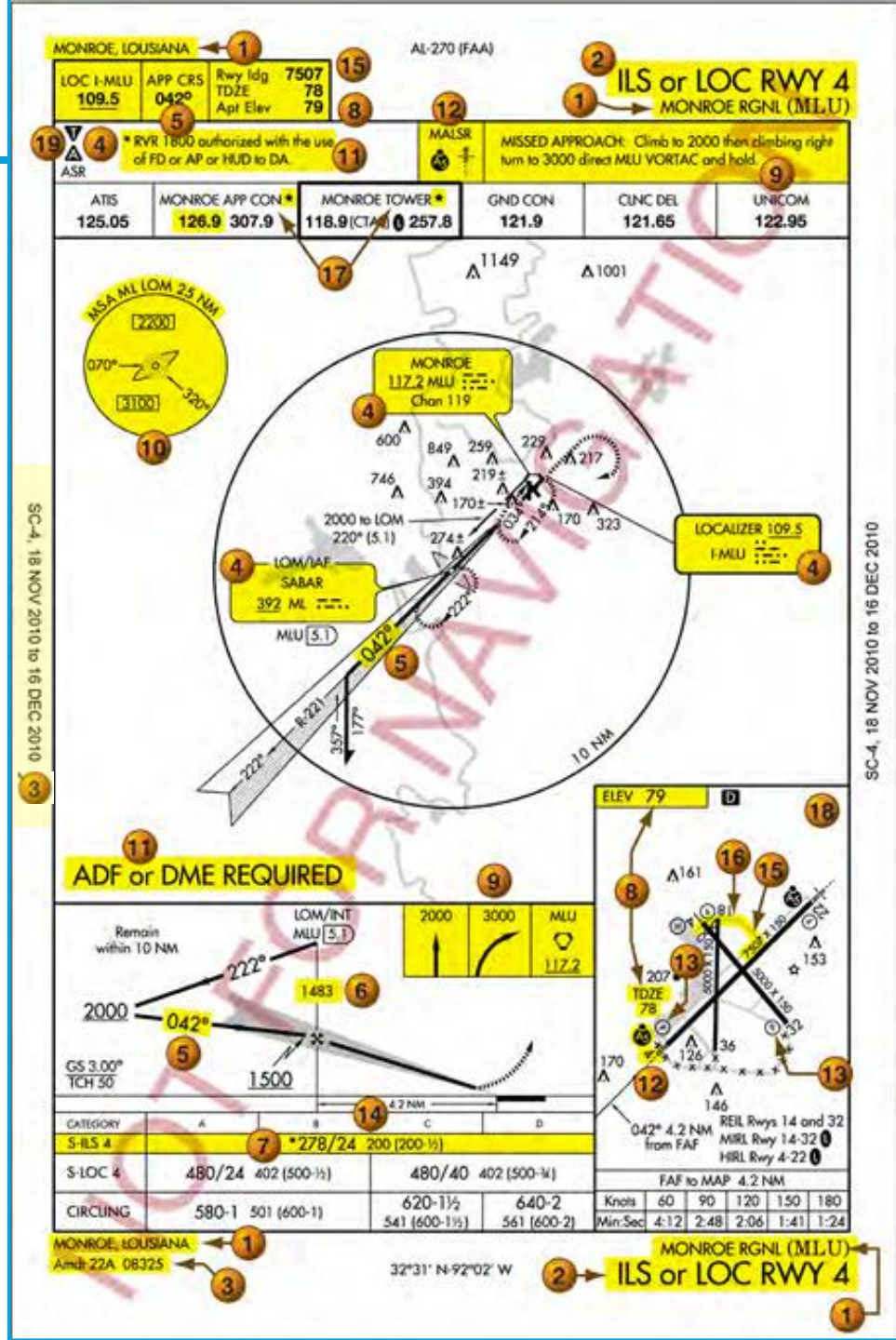
15 Verify runway length and 13 VASI/PAPI available

13 Verify lights available on the specific runway

Missed

9 Understand the Missed Approach procedure

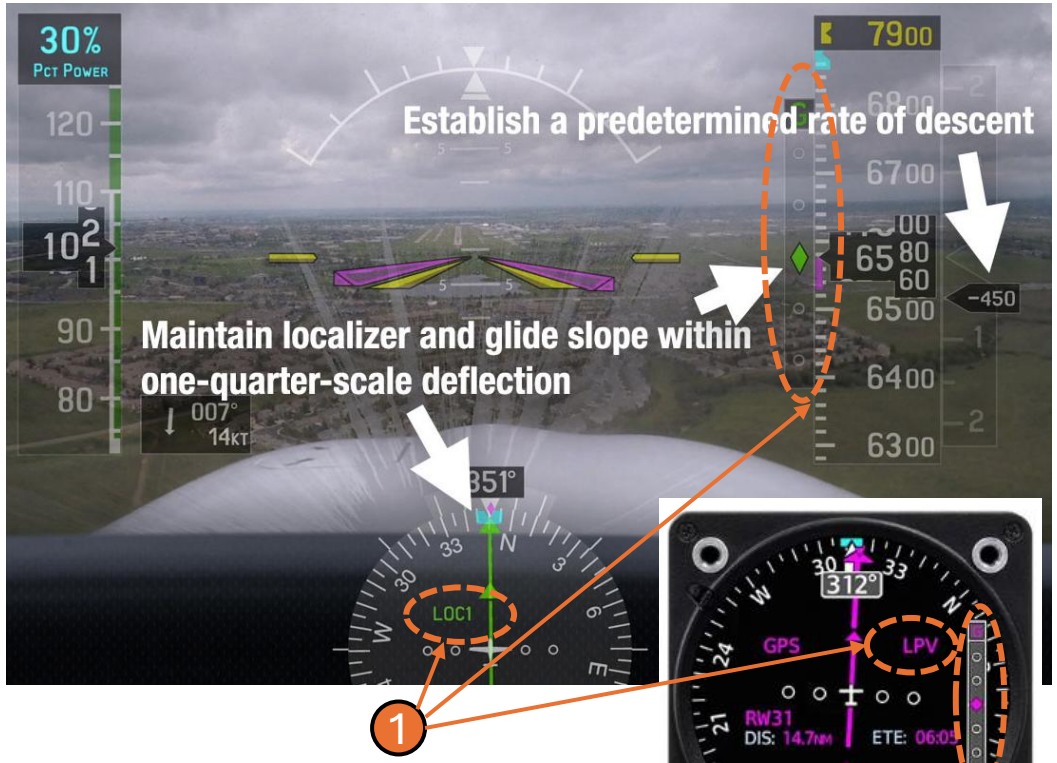
- Calculate the VDP and monitor the MAP

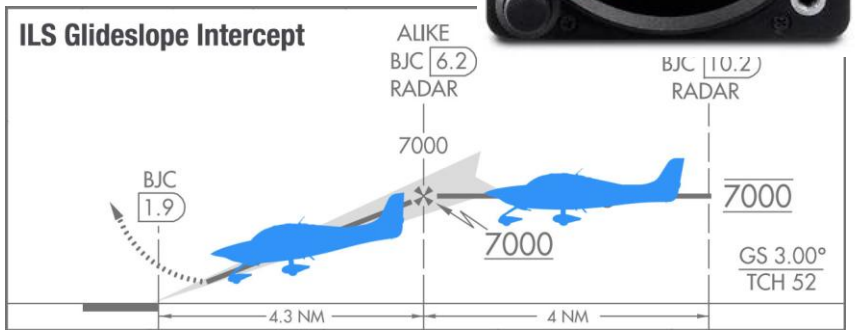


5. Flying the Approach

Precision

1. **Brief the approach and Setup Avionics**
   - Load/Activate in the Navigator (if needed) and verify
   - Tune frequencies & identify, and change the CDI (green / magenta for APV)
   - Set Minimums
2. **Expect clearance (ATC will state your location)**
3. **Once cleared**
   - Establish ➔ Trim ➔ Crosscheck ➔ Adjust
   - Keep the localizer needle centered (adjust for the wind)
   - Small adjustments: maintain course, altitude, airspeed
   - Attention to altitudes/fixes: *5Ts: Turn, Time, Twist, Throttle, Talk*
4. **Stay ahead of the airplane:** Situational Awareness
5. **Before reaching FAF** (~½ dot before Glideslope intercept)
   - Checklist: Power, airspeed, flaps, gear, lights, Check GS alive and the proper HSI flag (1)
   - Intercept the Glideslope at the intercept altitude to avoid false glideslopes
6. **During the Final Approach:**
   - Maintain stable rate of descent ➔ *FPM = GS (kts) x 5 (for a 3° approach)*
   - Keep both needles centered
7. **Watch for minimums and either go land or go missed at DA**





6. Adjustments to Altitudes

- **Cold temperature airports** [AIM 7-3-4/5]
  - Needs published altitude corrected if below certain temp.
  - What to correct
    - ✓ *Individual segments (Airports List)*
    - ✓ *All Segments from IAF to MDA/DA if no access to the list*
  - What NOT to correct
    - ✓ *SIDs, ODPs, STAR altitudes, or ATC assigned altitudes*
  - How to correct
    - ✓ *Look at the TPP Supplement, enter Height Above Airport vs Reported Temp.*
  - Advise ATC if correction are applied and which segments were applied

- **Equipment not operative (e.g. lights)**
  - If an approach component is inop, MDA/DA corrections need to be made
  - If more than 1 component, use the highest value of a single component
  - Table found in the TPP Supplement
    - ✓ *E.g. MALSR inop ➔ Increase visibility by ½ mile*

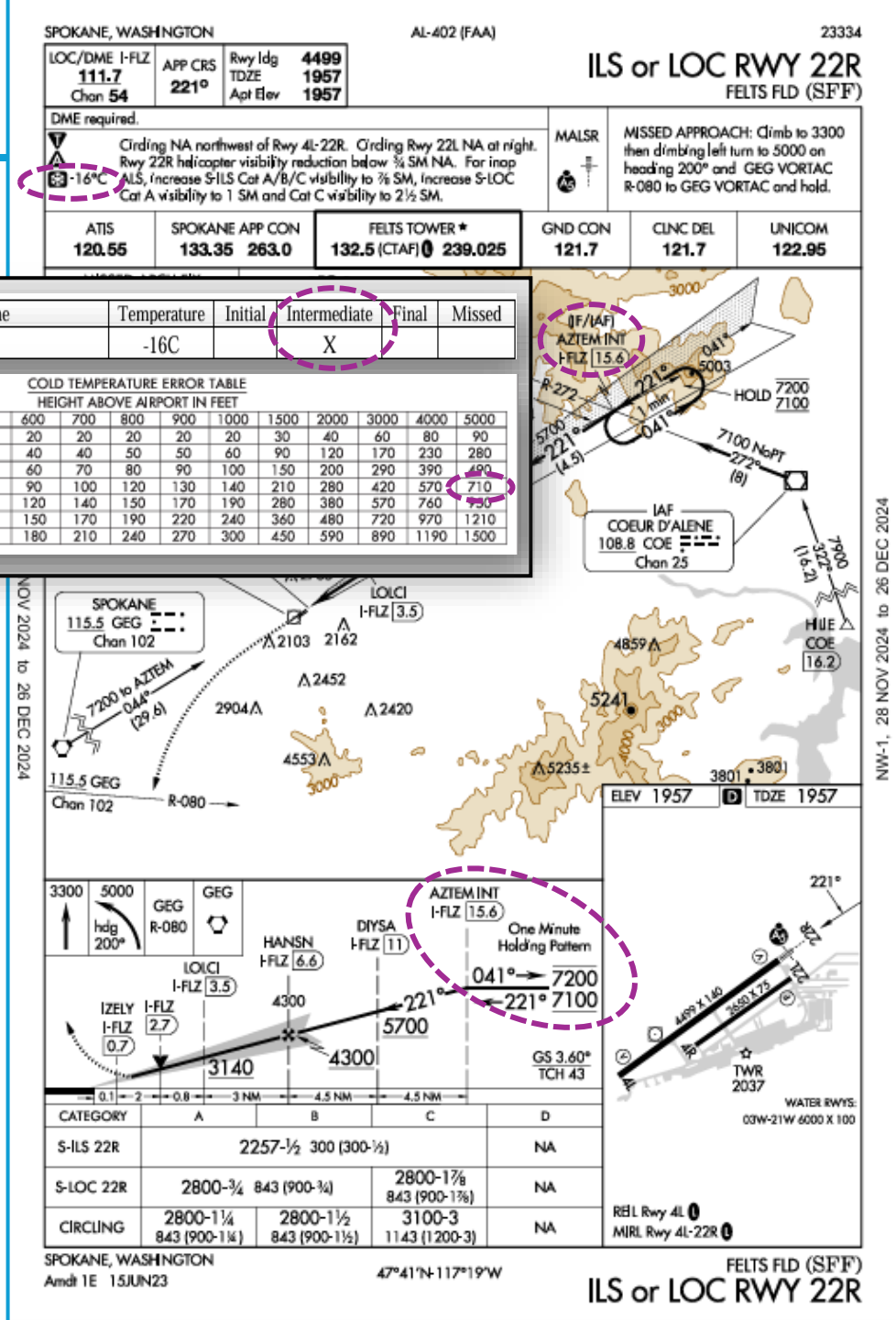
CTA List

Identifier	Airport Name	Temperature	Initial	Intermediate	Final	Missed
KSFF	Felts Field	-16C		X		

TPP Suppl.

COLD TEMPERATURE ERROR TABLE
HEIGHT ABOVE AIRPORT IN FEET

REPORTED TEMP °C	200	300	400	500	600	700	800	900	1000	1500	2000	3000	4000	5000
+10	10	10	10	10	20	20	20	20	20	30	40	60	80	90
0	20	20	30	30	40	40	50	50	60	90	120	170	230	280
-10	20	30	40	50	60	70	80	90	100	150	200	290	390	490
-20	30	50	60	70	90	100	120	130	140	210	280	420	570	710
-30	40	60	80	100	120	140	150	170	190	280	380	570	760	950
-40	50	80	100	120	150	170	190	220	240	360	480	720	970	1210
-50	60	90	120	150	180	210	240	270	300	450	590	890	1190	1500



6. Adjustments to DA | Terminal Procedures Publication (TPP) Supplement

A1

INOP COMPONENTS 19339

INOPERATIVE COMPONENTS OR VISUAL AIDS TABLE
(For Civil Use Only)

Straight-in and Sidestep landing minimums published on instrument approach procedure charts are based on full operation of all components and visual aids (see exception below for ALSF 1 & 2) associated with the particular approach chart being used. Higher minimums are required with inoperative components or visual aids as indicated below. If more than one component is inoperative, each minimum is raised to the highest minimum required by any single component that is inoperative. ILS glideslope inoperative minimums are published on the instrument approach charts as localizer minimums. This table applies to approach categories A thru D and is to be used unless amended by notes on the approach chart. Such notes apply only to the particular approach category(ies) as stated. Category E inoperative notes will be specified when published on civil charts. The inoperative table does not apply to Circling minimums. See legend page for description of components indicated below.

Full Operation Exception: For ALSF 1 & 2 operated as SSALR, or when the sequenced flashing lights are inoperative, there is no effect on visibility for ILS lines of minima.

(1) ILS, PAR, LPV, GLS minima

Inoperative Component or Visual Aid	Increase Visibility
All ALS types (except ODALS)	¼ mile

(2) ILS, LPV, GLS with visibility minima of RVR 1800†/2000*/2200*

Inoperative Component or Visual Aid	Increase Visibility
ALSF 1 & 2, MALSR, SSALR	To RVR 4000† To RVR 4500*
TDZL or RCLS	To RVR 2400#
RVR	To ½ mile

#For ILS, LPV, GLS procedures with a 200 foot HAT, RVR 1800 authorized with use of FD or AP or HUD to DA.

(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

(4) Sidestep minima (CAT C-D)

Inoperative Component or Visual Aid to Sidestep Runway	Increase Visibility
ALSF 1 & 2, MALSR, SSALR	½ mile

(5) All Approach Types, All lines of minima

Inoperative Component or Visual Aid	Increase Visibility
ODALS (CAT A-B)	¼ mile
ODALS (CAT C-D)	⅛ mile

NW-1, 31 OCT 2024 to 26 DEC 2024

INOP COMPONENTS 19339

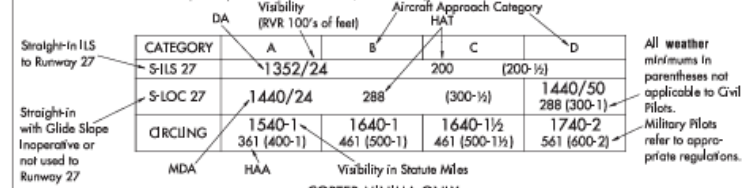
TERMS/LANDING MINIMA DATA 20142

IFR LANDING MINIMA

The United States Standard for Terminal Instrument Procedures (TERPS) is the approved criteria for formulating instrument approach procedures. Landing minima are established for six aircraft approach categories (ABCDE and COPTER). In the absence of COPTER MINIMA, helicopters may use the CAT A minimums of other procedures.

LANDING MINIMA FORMAT

In this example airport elevation is 1179, and runway touchdown zone elevation is 1152.



COPTER MINIMA ONLY

CATEGORY	COPTER		
H-176°	680-½	363	(400-½)

Copter Approach Direction — Height of MDA/DA Above Landing Area (HAL) — No circling minimums are provided

NOTE: The W symbol indicates outages of the WAAS vertical guidance may occur daily at this location due to initial system limitations. WAAS NOTAMS for vertical outages are not provided for this approach. Use LNAV minima for flight planning at these locations, whether as a destination or alternate. For flight operations at these locations, when the WAAS avionics indicate that LNAV/VNAV or LPV service is available, then vertical guidance may be used to complete the approach using the displayed level of service. Should an outage occur during the procedure, reversion to LNAV minima may be required. As the WAAS coverage is expanded, the W will be removed.

RNAV minimums are dependent on navigation equipment capability, as stated in the applicable AFM, AFMS, or other FAA approved document. See AIM paragraph 5-4-5, AC 90-105 and AC 90-107 for detailed requirements for each line of minima.

COLD TEMPERATURE AIRPORTS

NOTE: A -12°C symbol indicates a cold temperature altitude correction is required at this airport when reported temperature is at or below the published temperature. See the following Cold Temperature Error Table to make manual corrections. Advise ATC with altitude correction. Advising ATC with altitude corrections is not required in the final segment. See Aeronautical Information Manual (AIM), Chapter 7, for guidance and additional information. For a complete list, see the "Cold Temperature Airports" link under the Additional Resources heading at the bottom of the following page: http://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dtpp/search/

COLD TEMPERATURE ERROR TABLE

HEIGHT ABOVE AIRPORT IN FEET

REPORTED TEMP °C	200	300	400	500	600	700	800	900	1000	1500	2000	3000	4000	5000
+10	10	10	10	10	20	20	20	20	30	40	60	80	90	
0	20	20	30	30	40	40	50	50	60	90	120	170	230	280
-10	20	30	40	50	60	70	80	90	100	150	200	290	390	490
-20	30	50	60	70	90	100	120	130	140	210	280	420	570	710
-30	40	60	80	100	120	140	150	170	190	280	380	570	760	950
-40	50	80	100	120	150	170	190	220	240	360	480	720	970	1210
-50	60	90	120	150	180	210	240	270	300	450	590	890	1190	1500

AIRCRAFT APPROACH CATEGORIES

Aircraft approach category indicates a grouping of aircraft based on a speed of VREF, if specified, or if VREF not specified, 1.3 VSO at the maximum certificated landing weight. VREF, VSO, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry. Helicopters are Category A aircraft. An aircraft shall fit in only one category. When necessary to operate the aircraft at an airspeed in excess of the maximum airspeed of its certified aircraft approach category, pilots should use the applicable higher category minima. For additional options and to ensure the aircraft remains within protected airspace, consult the AIM. See following category limits:

MANEUVERING TABLE

Approach Category	A	B	C	D	E
Speed (Knots)	0-90	91-120	121-140	141-165	Abv 165

NW-1, 31 OCT 2024 to 26 DEC 2024

TERMS/LANDING MINIMA DATA 20142

TERMS/LANDING MINIMA DATA 19339

CIRCLING APPROACH OBSTACLE PROTECTED AIRSPACE

The circling MDA provides vertical obstacle clearance during a circle-to-land maneuver. The circling MDA protected area extends from the threshold of each runway authorized for landing following a circle-to-land maneuver for a distance as shown in the tables below. The resultant arcs are then connected tangentially to define the protected area.

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

Comparable Values of RVR and Visibility

The following table shall be used for converting RVR to ground or flight visibility. For converting RVR values that fall between listed values, use the next higher RVR value; do not interpolate. For example, when converting 4800 RVR, use 5000 RVR with the resultant visibility of 1 mile.

RVR (feet)	Visibility (SM)	RVR (feet)	Visibility (SM)	RVR (feet)	Visibility (SM)	RVR (feet)	Visibility (SM)
1600	¼	2400	½	3500	⅝	5500	1
1800	½	2600	½	4000	¾	6000	1¼
2000	½	3000	⅝	4500	⅞		
2200	½	3200	⅝	5000	1		

RADAR MINIMA

	RWY	GP/TCH/RPI	CAT	DA/ MDA-VIS	HAT HAA	CEIL-VIS	CAT	DA/ MDA-VIS	HAT HAA	CEIL-VIS
PAR	10	2.5°/42/1000	ABCDE	**195**/16	100	(100-¼)				Visibility (RVR 100's of feet)
	28	2.5°/48/1068	ABCDE	**187**/16	100	(100-¼)				
ASR	10		ABC	**560**/40	463	(500-¾)	DE	**560**/50	463	(500-1)
	28		AB	**600**/50	513	(600-1)	CDE	**600**/60	513	(600-1¼)
CIR	10		AB	**560**-1¼	463	(500-1¼)	CDE	**560**-1½	463	(500-1½)
	28		AB	**600**-1¼	503	(600-1¼)	CDE	**600**-1½	503	(600-1½)

Visibility in Statute Miles — All minimums in parentheses not applicable to Civil Pilots. Military Pilots refer to appropriate regulations.

Radar Minima:
1. Minima shown are the lowest permitted by established criteria. Pilots should consult applicable directives for their category of aircraft.
2. The circling MDA and weather minima to be used are those for the runway to which the final approach is flown- not the landing runway. In the above RADAR MINIMA example, a category C aircraft flying a radar approach to runway 10, circling to land on runway 28, must use an MDA of 560 feet with weather minima of 500-1½.

NOTE: Military RADAR MINIMA may be shown with communications symbology that indicates emergency frequency monitoring capability by the radar facility as follows: (E) VHF and UHF emergency frequencies monitored
(V) VHF emergency frequency (121.5) monitored
(U) UHF emergency frequency (243.0) monitored

Additionally, unmonitored frequencies which are available on request from the controlling agency may be annotated with an "x".

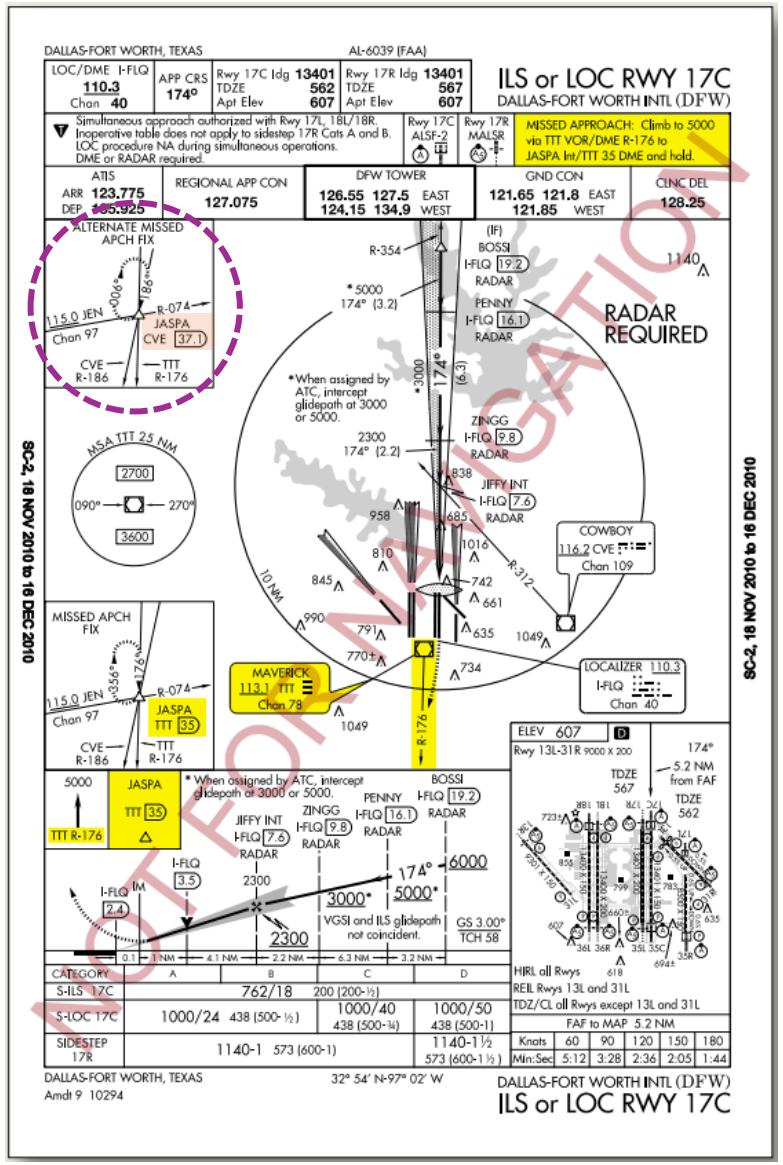
A Alternate Minimums not standard. Civil users refer to tabulation. USA/USN/USAF pilots refer to appropriate regulations.
NA Alternate minimums are Not Authorized due to unmonitored facility or absence of weather reporting service.
V Airport is published in the Takeoff Minimums, (Obstacle) Departure Procedures, and Diverse Vector Area (Radar Vectors) tabulation.

NW-1, 31 OCT 2024 to 26 DEC 2024

TERMS/LANDING MINIMA DATA 19339

Designated Extreme Cold Weather Airports

7. Missed Approach



- **Common Reasons for Executing a Missed Approach**
  - Don't have required visibility and/or visual references
  - Unstable or descent can't be made at a normal rate/normal maneuvers
  - Aircraft, equipment, animals on the runway
  - Pilot determines that a safe approach/landing is not possible
  - Instructed to do so by ATC

FAF to MAP 6.3 NM					
Knots	60	90	120	150	180
Min:Sec	6:18	4:12	3:09	2:31	2:06

- **Identifying the Missed Approach Point**
  - If MDA *(Non-Precision)* ➔ Time from the FAF to MAP or specific fix
  - If DA *(Precision or APV)* ➔ Upon reaching the DA

- **Reaching the MAP, fly the published procedure**
  - Perform a go-around and fly the procedure (or ATC instructions)
  - Announce you are on the missed approach
  - Climb rate of 200ft per NM, unless published higher
  - Technique: Have the first 2-3 steps memorized
  - Alternate missed approach might be available (e.g. alternate DME)

✓ *Note: You can initiate the vertical portion (climb) before the MAP, but can only execute the lateral/course once reached the MAP*

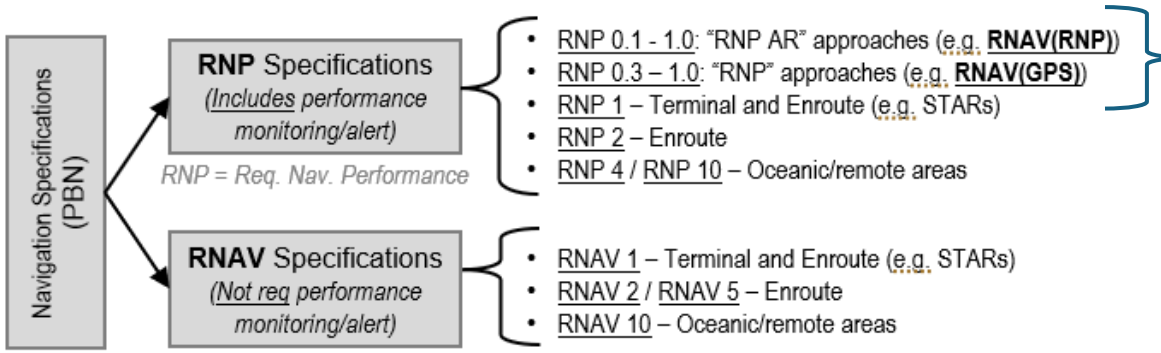
Appendix: Details on RNP Approaches

GPS Equipment [AIM 1-1-18(c), AIM 1-1-17(b2a2), AIM 1-1-3(f3b2)]

- TSO 129/196: Can fly RNAV(GPS) approaches to LNAV minima (LNAV/VNAV with baro-aided systems). Needs to confirm RAIM availability as part of pre-flight. Under IFR, must be equipped with an alternate means of navigation (if lose RAIM, must revert to VOR navigation)
- TSO 145/146 (**WAAS**): Can fly the approaches above, plus LPV, LP, and LNAV/VNAV minima without temperature restrictions or baro-aided system. RAIM is not required (unless if lose WAAS signal). WAAS users flying under Part 91 are not required to carry VOR avionics for IFR/GPS operations

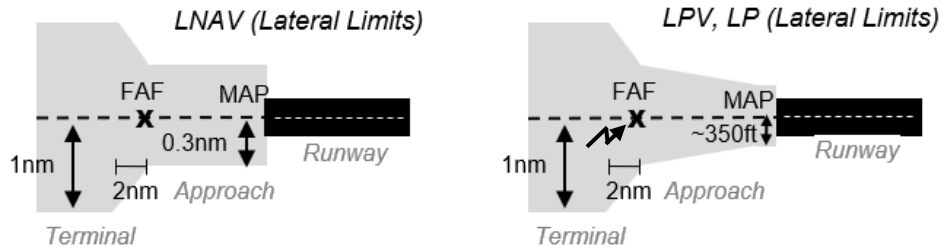
PBN (Performance Based Navigation) [AIM 1-2-1(a)]

- PBN is a framework for defining performance requirements. In other words, it sets the basis for navigations equipment standards.
- 2 types of standards: RNAV and RNP (which is RNAV w/ monitoring & alerting)
- Numerical designation → lateral nav accuracy (nm) met 95% of time (e.g. RNP 2)



RNP Approaches (Required Navigation Performance) [AIM 1-2-2(b1a)]

- RNAV (GPS) → RNP Approach. Can be LPV, LP, LNAV, LNAV/VNAV
- RNAV (RNP) → RNP AR Approach. Addtl authorization/training/equip is required
- *NOTE: LP/LPV lateral guidance narrows to 700ft (usually) then remains constant*

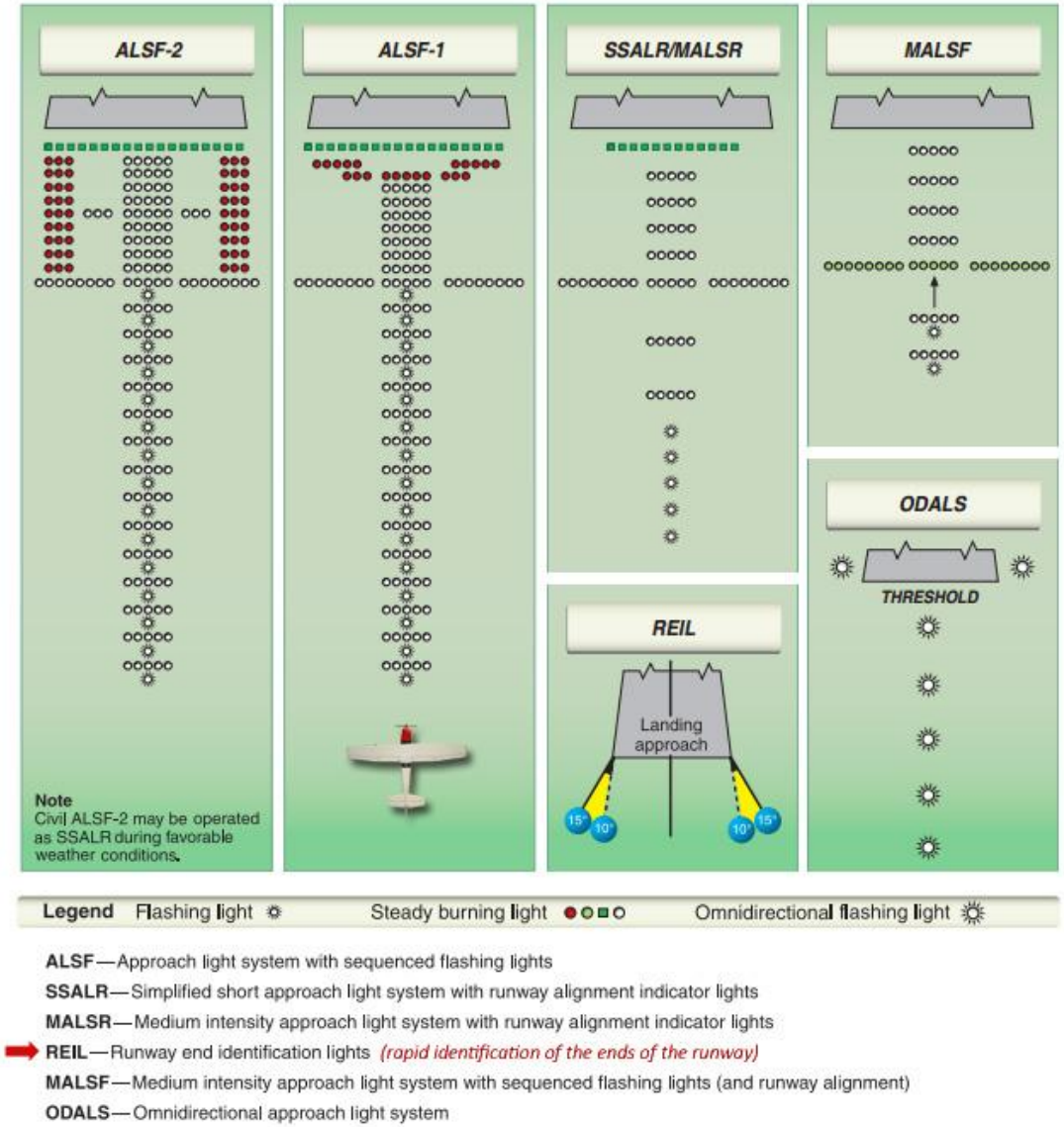


Appendix: Approach Light System (ALS) AIM 2-1

ALS: Transition from instrument to visual conditions

- **ALSF**: ALS with sequenced flashing lights (can be -2 or -1 configuration)
- **MALSF**: medium-intensity ALS with sequencing flashing lights
- **MALSR**: same as above, but with rwy alignment lights instead of flashing
- **SSALR**: short simplified ALS with runway alignment lights
- **ODALS**: omnidirectional approach light system (extended centerline)
- **REIL**: runway-end identifier lights *(the 2 flashing lights in the corners of the rwy)*

Lights 2400-3000ft



Questions?