ILS/LOC Approaches

Instrument Rating

Relevant FARs

CFR § 61.65(b) - Aeronautical Knowledge
Area
(1) Federal Aviation Regulations of this chapter that apply to flight operations under IFR;
(2) Appropriate information that applies to flight operations under IFR in the “Aeronautical Information Manual;”
(3) Air traffic control system and procedures for instrument flight operations;
(4) IFR navigation and approaches by use of navigation systems;
(5) Use of IFR en route and instrument approach procedure charts;
(6) Procurement and use of aviation weather reports and forecasts and the elements of forecasting weather trends based on that information and personal observation of weather conditions;
(7) Safe and efficient operation of aircraft under instrument flight rules and conditions;
(8) Recognition of critical weather situations and windshear avoidance;
(9) Aeronautical decision making and judgment; and
(10) Crew resource management, including crew communication and coordination.

Relevant ACS

Task	***B. Precision Approach***
References	14 CFR parts 61, 91; FAA-H-8083-15, FAA-H-8083-16; IFP; AIM
Objective	To determine the applicant exhibits satisfactory knowledge, risk management, and skills associated with performing precision approach procedures solely by reference to instruments. ***Note:*** *See Appendix 7: Aircraft, Equipment, and Operational Requirements & Limitations for related considerations.*
Knowledge	The applicant demonstrates understanding of:
IR.VI.B.K1	Procedures and limitations associated with a precision approach, including determining required descent rates and adjusting minimums in the case of inoperative equipment.
IR.VI.B.K2	Navigation system displays, annunciations, and modes of operation.
IR.VI.B.K3	Ground-based and satellite-based navigation (orientation, course determination, equipment, tests and regulations, interference, appropriate use of navigation data, signal integrity)
IR.VI.B.K4	A stabilized approach, to include energy management concepts
Risk Management	The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
IR.VI.B.R1	Failure to follow the correct approach procedure (e.g. descending below the glideslope, etc.).
IR.VI.B.R2	Selecting an incorrect navigation frequency.
IR.VI.B.R3	Failure to manage automated navigation and autoflight systems.
IR.VI.B.R4	Failure to ensure proper airplane configuration during an approach and missed approach.
IR.VI.B.R5	An unstable approach including excessive descent rates.
IR.VI.B.R6	Deteriorating weather conditions on approach.
IR.VI.B.R7	Continuing to descend below the Decision Altitude (DA)/Decision Height (DH) when the required visual references are not visible.
Skills	The applicant demonstrates the ability to:
IR.VI.B.S1	Accomplish the precision instrument approach(es) selected by the evaluator.
IR.VI.B.S2	Establish two-way communications with ATC appropriate for the phase of flight or approach segment, and use proper communication phraseology.
IR.VI.B.S3	Select, tune, identify, and confirm the operational status of navigation equipment to be used for the approach.
IR.VI.B.S4	Comply with all clearances issued by ATC or the evaluator.
IR.VI.B.S5	Recognize if any flight instrumentation is inaccurate or inoperative, and take appropriate action.
IR.VI.B.S6	Advise ATC or the evaluator if unable to comply with a clearance.
IR.VI.B.S7	Complete the appropriate checklist.
IR.VI.B.S8	Establish the appropriate airplane configuration and airspeed considering turbulence and windshear.
IR.VI.B.S9	Maintain altitude ±100 feet, selected heading ±10°, airspeed ±10 knots, and accurately track radials, courses, and bearings, prior to beginning the final approach segment.
IR.VI.B.S10	Adjust the published DA/DH and visibility criteria for the aircraft approach category, as appropriate, to account for NOTAMs, Inoperative airplane or navigation equipment, or inoperative visual aids associated with the landing environment.
IR.VI.B.S11	Establish a predetermined rate of descent at the point where vertical guidance begins, which approximates that required for the airplane to follow the vertical guidance.
IR.VI.B.S12	Maintain a stabilized final approach from the Final Approach Fix (FAF) to DA/DH allowing no more than ¾-scale deflection of either the vertical or lateral guidance indications and maintain the desired airspeed ±10 knots.
IR.VI.B.S13	Immediately initiate the missed approach procedure when at the DA/DH, and the required visual references for the runway are not unmistakably visible and identifiable.
IR.VI.B.S14	Transition to a normal landing approach (missed approach for seaplanes) only when the airplane is in a position from which a descent to a landing on the runway can be made at a normal rate of descent using normal maneuvering.

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ILS and LOC Approaches

- Instrument Landing System (ILS) and Localizer (LOC) approaches
- These are PRECISION approaches that rely on a localizer and glideslope to provide lateral and vertical guidance to the runway
- Because there is vertical guidance, the minimums are reported as Decision Altitude (DA)
- **Decision Altitude (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… Referenced to mean sea level." [**AIM Glossary**]

ILS and LOC Approaches

- ILS approaches require an CDI (Course Deviation Indicator) or HSI (HSI (Horizontal Situation Indicator) with vertical and lateral needles; minimums are typically 200’ AGL
- LOC approaches only require lateral guidance but have higher minimums
- Category I approaches have a Decision Height (DH) of 200’
- Category II and III approaches have different minimums but require more sophisticated equipment than is typically found in GA aircraft (91.189)
- If the glide slope fails, the ILS reverts to a non-precision localizer approach.

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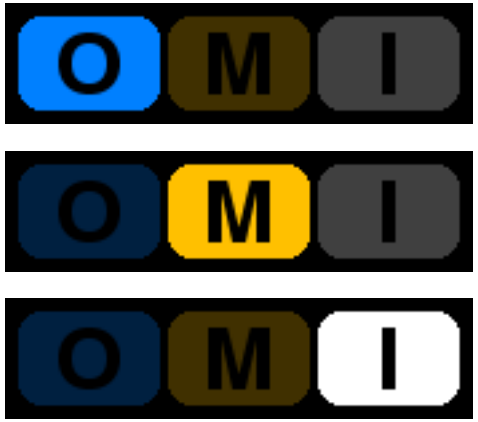
ILS Basics [AIM 1-1-9]

- These are angular approaches with the both needles becoming more sensitive the closer the aircraft is to the source
- They are associated with Marker Beacons that help pilots determine distance from the runway

TBL 1-1-3

Marker Passage Indications

Marker	Code	Light
OM	– – –	BLUE
MM	● – ● –	AMBER
IM	● ● ● ●	WHITE
BC	● ● ● ●	WHITE



- **Outer Marker (OM)** – Identifies the Final Approach Fix (FAF) for nonprecision approach (NPA) operations (for example, localizer only)
- **Middle Marker (MM)** – Indicates a position approximately 3,500 feet from the landing threshold, 200’ above the TDZE. A MM is no longer operationally required.
- **Inner Marker (IM)** – Indicates the point at which an aircraft is at decision height on the glide path during a Category II ILS approach. An IM is only required for CAT II operations that do not have a published radio altitude (RA) minimum.

ILS Criteria (Instrument Approaches Handbook)

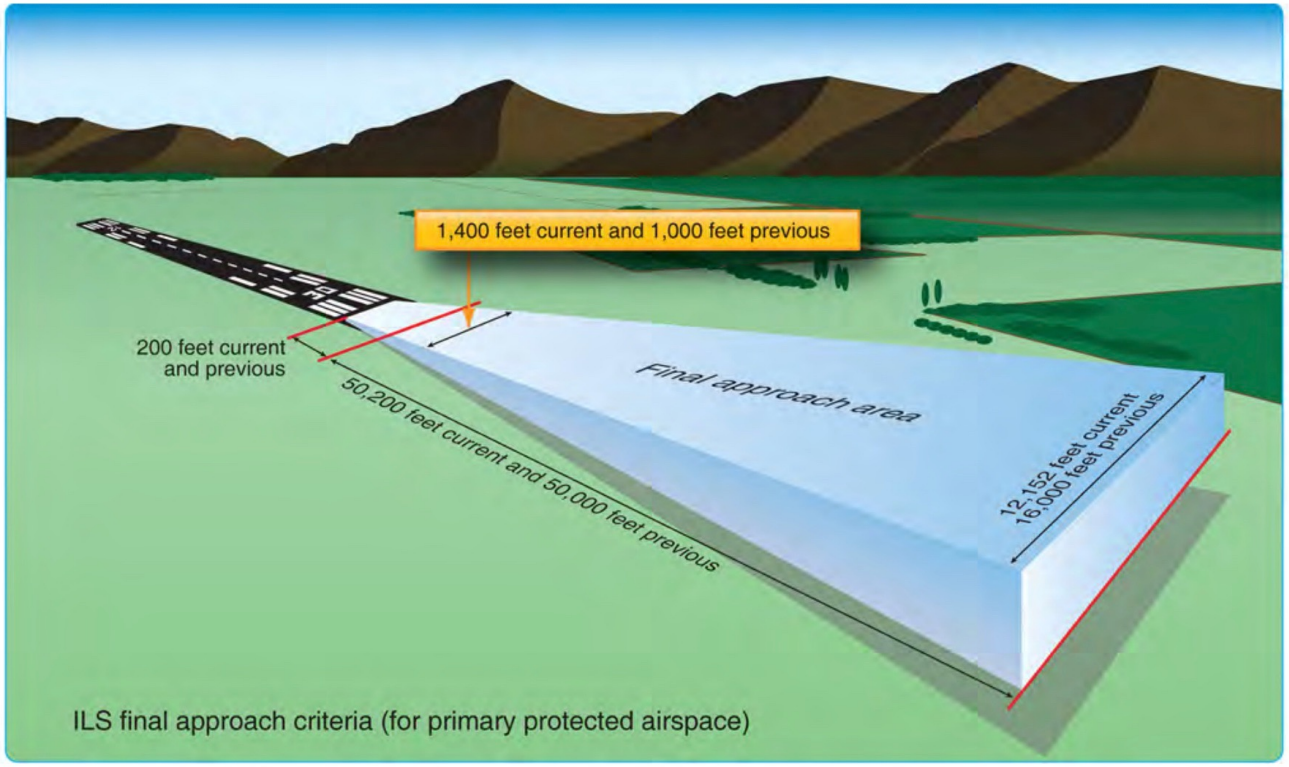


Figure 4-40. ILS final approach segment design criteria.

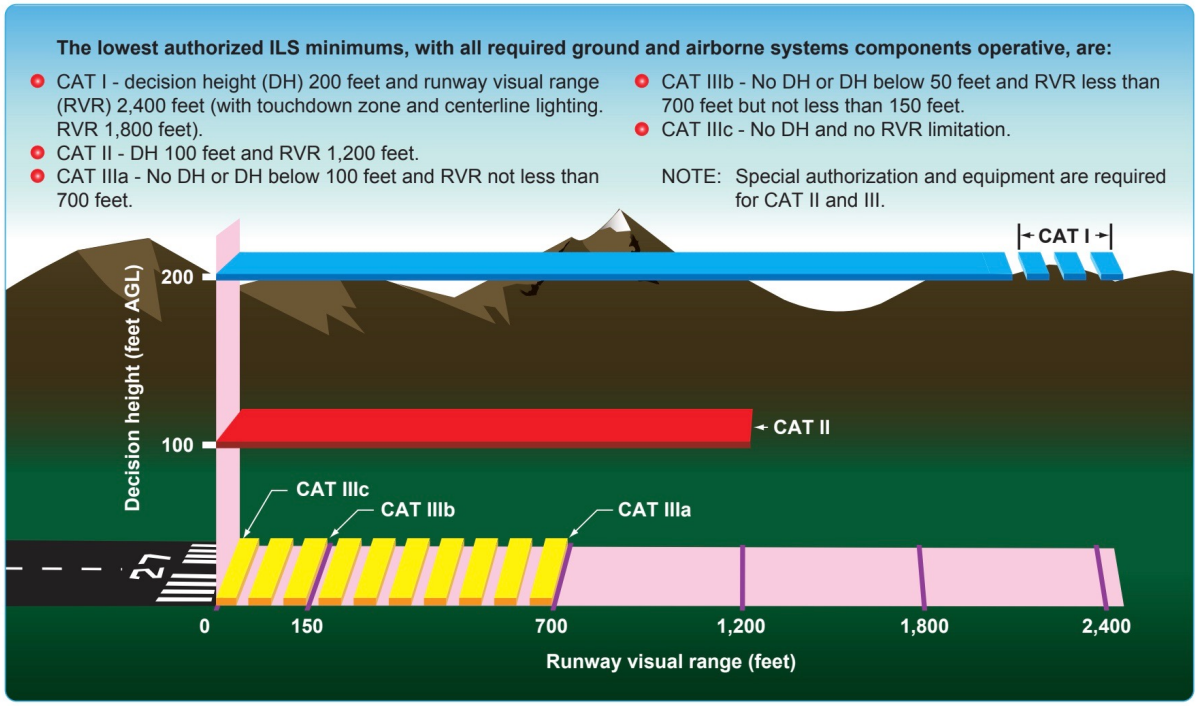


Figure 4-41. ILS approach categories.

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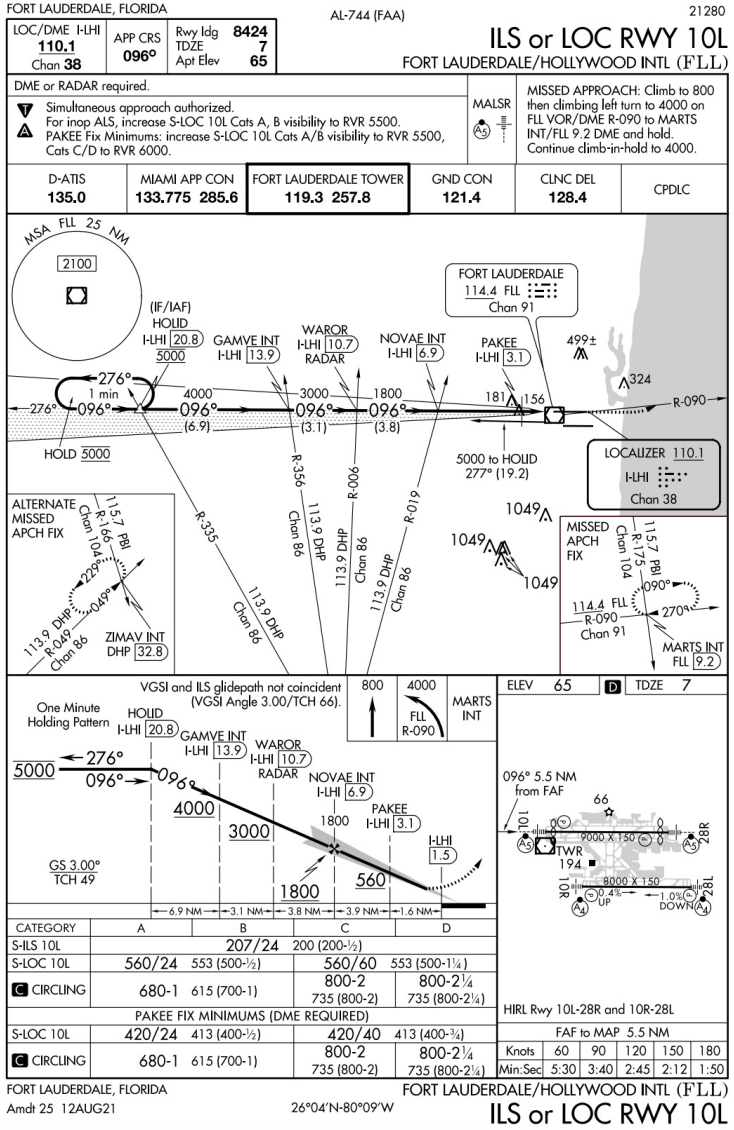
Approach Plate Example

Let's Brief It

Relevant material from the digital Terminal Procedures Publication Supplement will also be included



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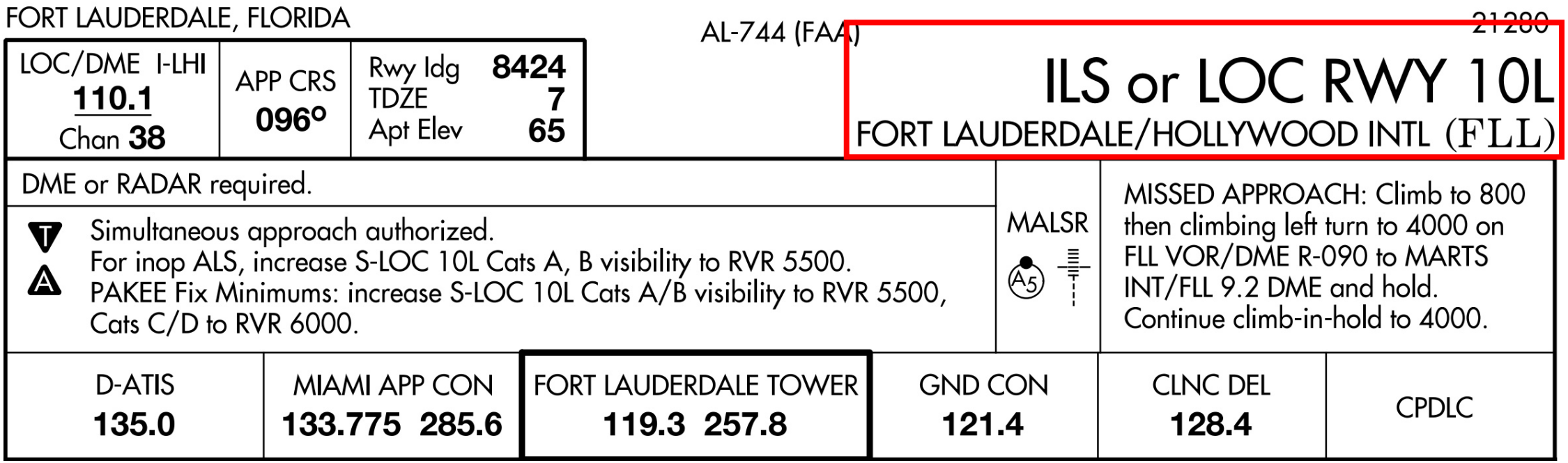
Approach Plate Example



FORT LAUDERDALE, FLORIDA

AL-744 (FAA)

21280

ILS or LOC RWY 10L

FORT LAUDERDALE/HOLLYWOOD INTL (FLL)

LOC/DME I-LHI	APP CRS	Rwy Idg	8424
110.1	096°	TDZE	7
Chan 38		Apt Elev	65

DME or RADAR required.

T A Simultaneous approach authorized.
For inop ALS, increase S-LOC 10L Cats A, B visibility to RVR 5500.
PAKEE Fix Minimums: increase S-LOC 10L Cats A/B visibility to RVR 5500, Cats C/D to RVR 6000.

MALSR

A5

MISSED APPROACH: Climb to 800 then climbing left turn to 4000 on FLL VOR/DME R-090 to MARTS INT/FLL 9.2 DME and hold. Continue climb-in-hold to 4000.

D-ATIS	MIAMI APP CON	FORT LAUDERDALE TOWER	GND CON	CLNC DEL	CPDLC
135.0	133.775 285.6	119.3 257.8	121.4	128.4	

This is the ILS Runway 10L into Fort Lauderdale/Hollywood International

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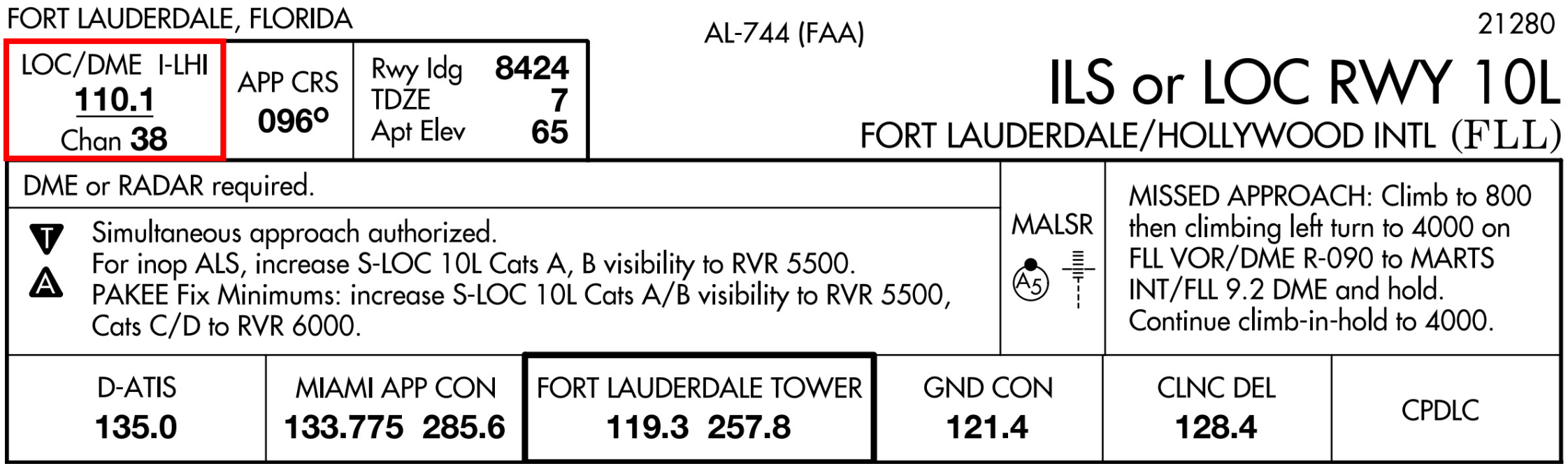
Approach Plate Example



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AL-744 (FAA)

21280

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FORT LAUDERDALE/HOLLYWOOD INTL (FLL)

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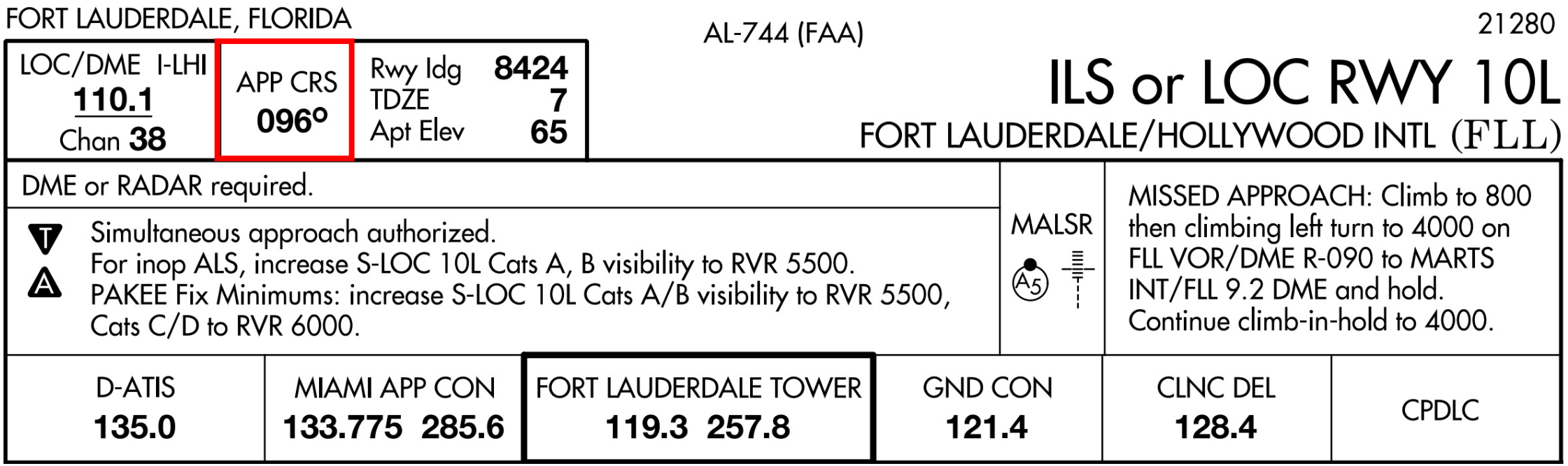
D-ATIS	MIAMI APP CON	FORT LAUDERDALE TOWER	GND CON	CLNC DEL	CPDLC
135.0	133.775 285.6	119.3 257.8	121.4	128.4	

The localizer frequency is 110.1 and we'll IDENT it

Approach Plate Example



The final approach course is 096

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Approach Plate Example

FORT LAUDERDALE, FLORIDA

AL-744 (FAA)

21280

ILS or LOC RWY 10L

FORT LAUDERDALE/HOLLYWOOD INTL (FLL)

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135.0	133.775 285.6	119.3 257.8	121.4	128.4	

Runway length is 8,424’; touchdown zone elevation is 7’ and airport elevation is 65’

We need to know TDZE because recall from 91.175 we can descend to TDZE 100’ if we have the approach lights in sight

Approach Plate Example

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AL-744 (FAA)

21280

ILS or LOC RWY 10L

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D-ATIS	MIAMI APP CON	FORT LAUDERDALE TOWER	GND CON	CLNC DEL	CPDLC
135.0	133.775 285.6	119.3 257.8	121.4	128.4	

DME or RADAR is required

IAP PBN/Equipment Requirements Notes Box

PBN Requirements Box →	From WINRZ, LIBGE: RNAV-1 GPS, RNAV-1GPS from MAP to YARKU.
Equipment Requirements Box →	DME required for LOC only.
Standard Procedure Notes Box →	T Circling to Rwy 25 NA at night. #For inop MALSR increase S-ILS 16R all cats visibility to 2½ SM.

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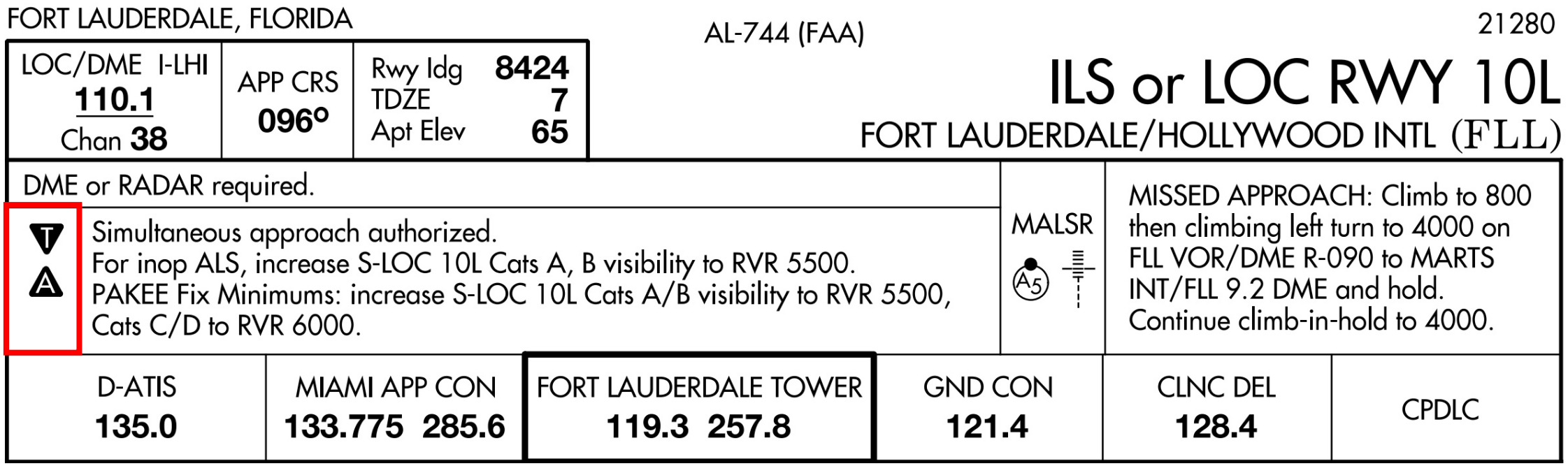
Approach Plate Example



FORT LAUDERDALE, FLORIDA

AL-744 (FAA)

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MALSR

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D-ATIS	MIAMI APP CON	FORT LAUDERDALE TOWER	GND CON	CLNC DEL	CPDLC
135.0	133.775 285.6	119.3 257.8	121.4	128.4	

Takeoff and alternate minimums are published for this approach

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

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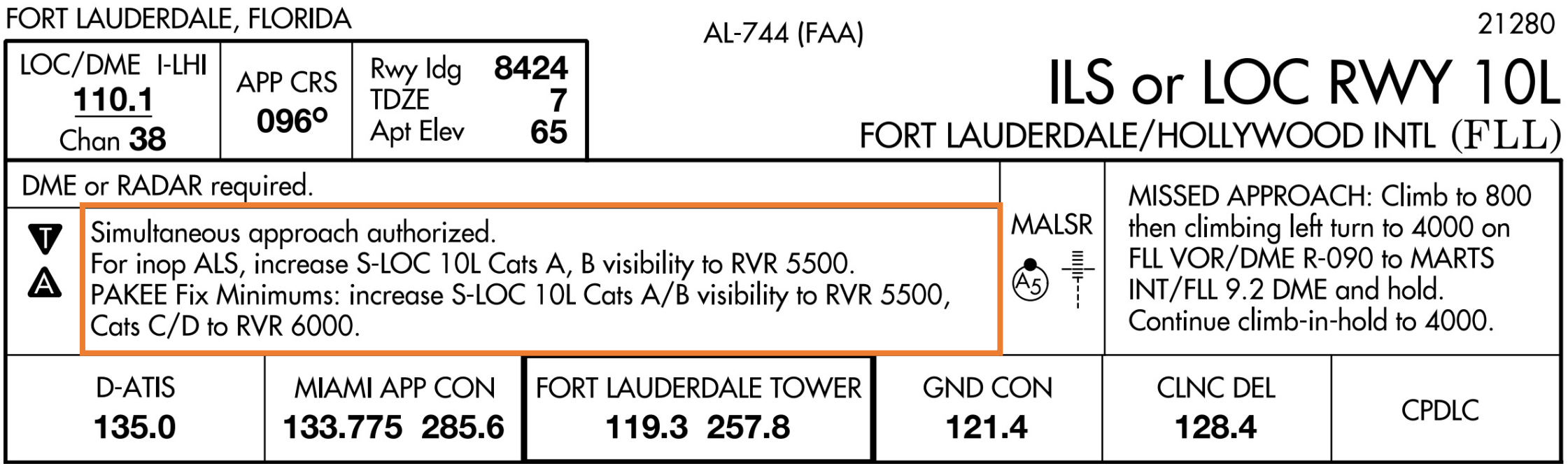
Approach Plate Example



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MALSR

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D-ATIS	MIAMI APP CON	FORT LAUDERDALE TOWER	GND CON	CLNC DEL	CPDLC
135.0	133.775 285.6	119.3 257.8	121.4	128.4	

These are requirements we would have reviewed before hand

Approach Plate Example

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AL-744 (FAA)

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ILS or LOC RWY 10L

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Chan 38		Apt Elev	65

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MALSR

(A5)

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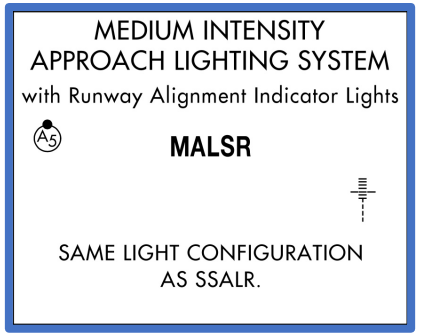
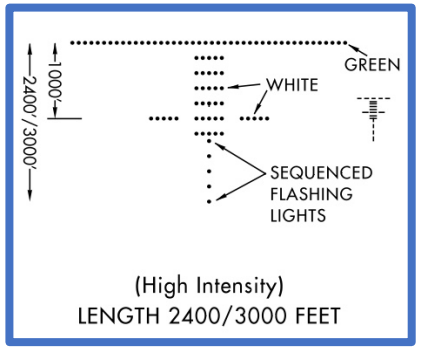
135.0	133.775 285.6	119.3 257.8	121.4	128.4	

We'll be looking for a MALSR





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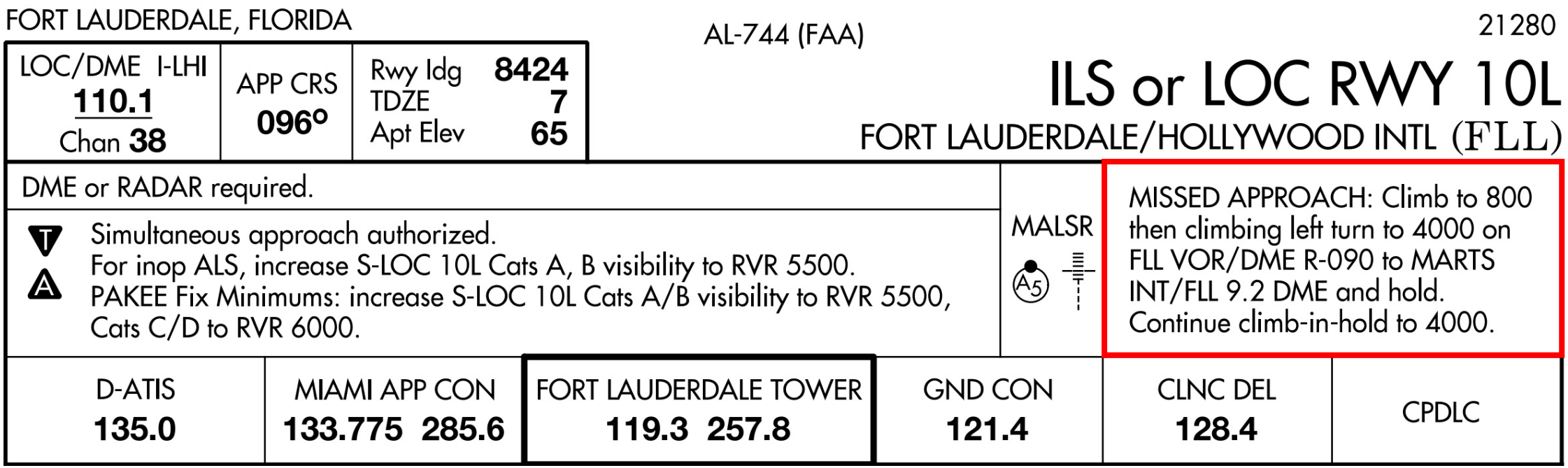
Approach Plate Example



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135.0	133.775 285.6	119.3 257.8	121.4	128.4	

For a missed approach we'll climb to 800' MSL then climbing left turn to 4,000' on the FLL VOR/DME on R-090 to MARTS 9.2 DME and hold and continue the climb in the hold to 4,000'

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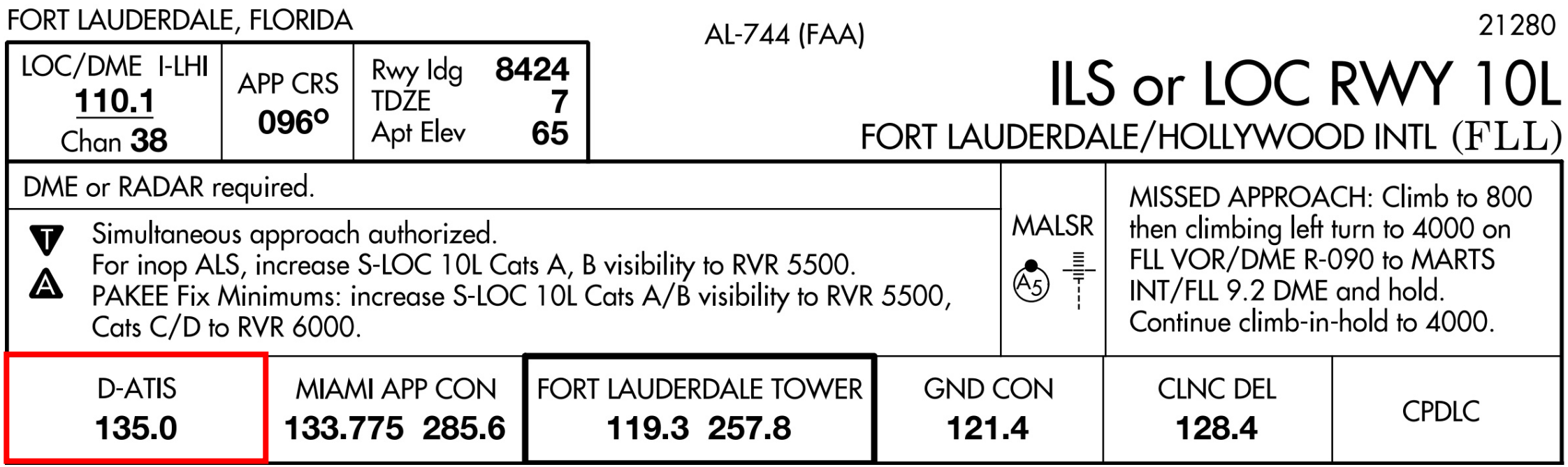
Approach Plate Example



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AL-744 (FAA)

21280

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135.0	133.775 285.6	119.3 257.8	121.4	128.4	

The ATIS is 135.0

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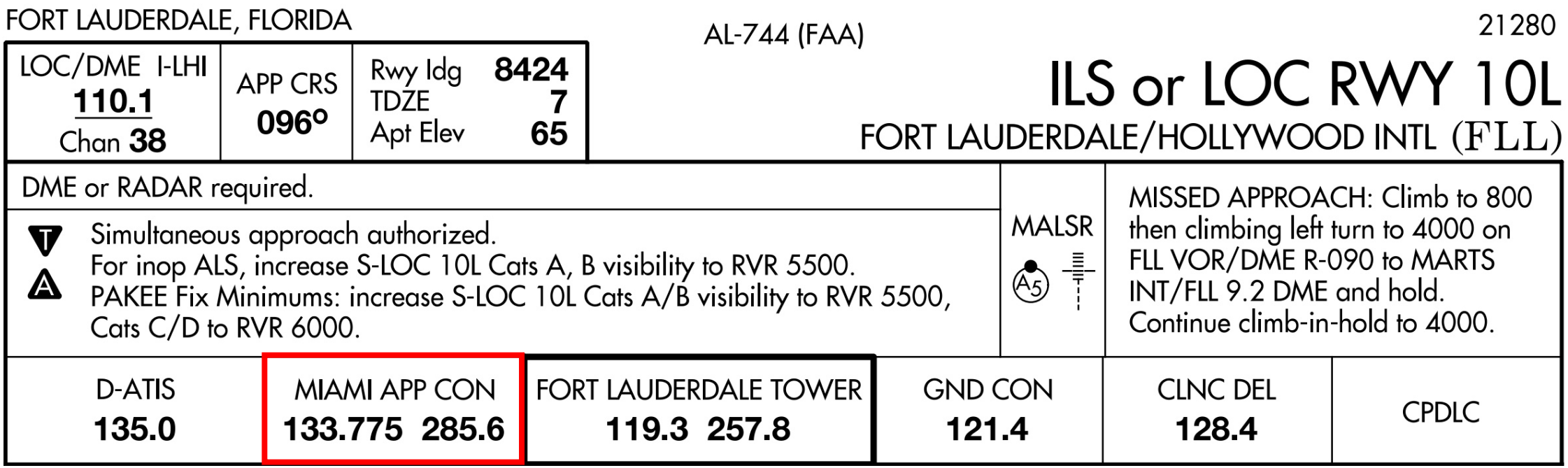
Approach Plate Example



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AL-744 (FAA)

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135.0	133.775 285.6	119.3 257.8	121.4	128.4	

Miami approach is 133.775

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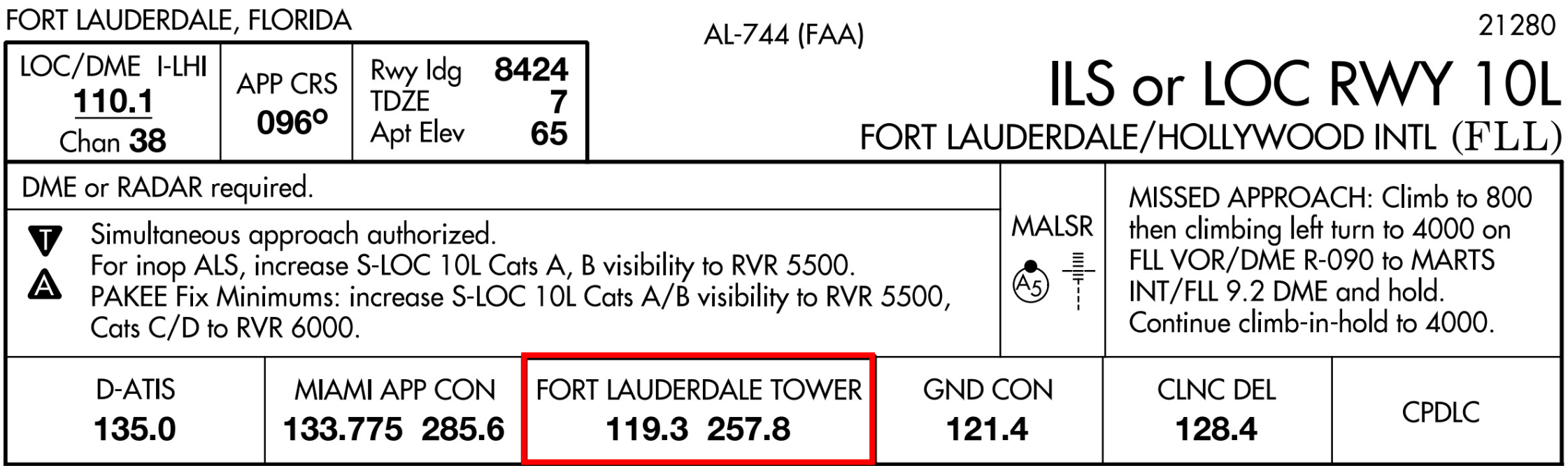
Approach Plate Example



And tower is 119.3

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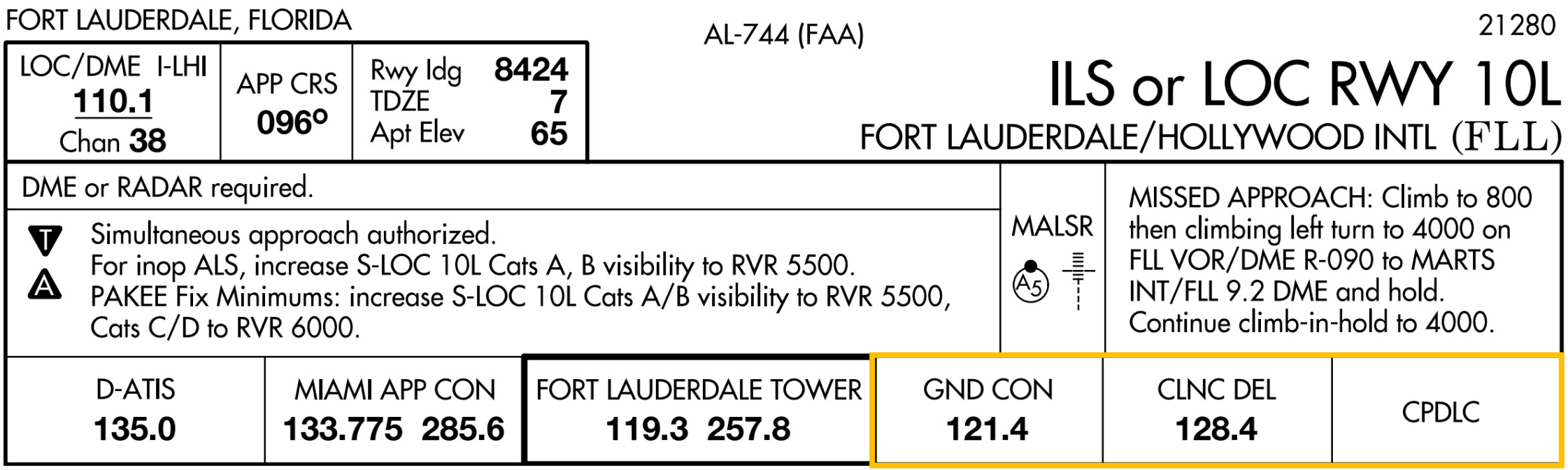
Approach Plate Example



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135.0	133.775 285.6	119.3 257.8	121.4	128.4	

These are less immediately relevant

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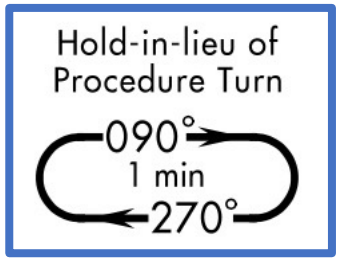
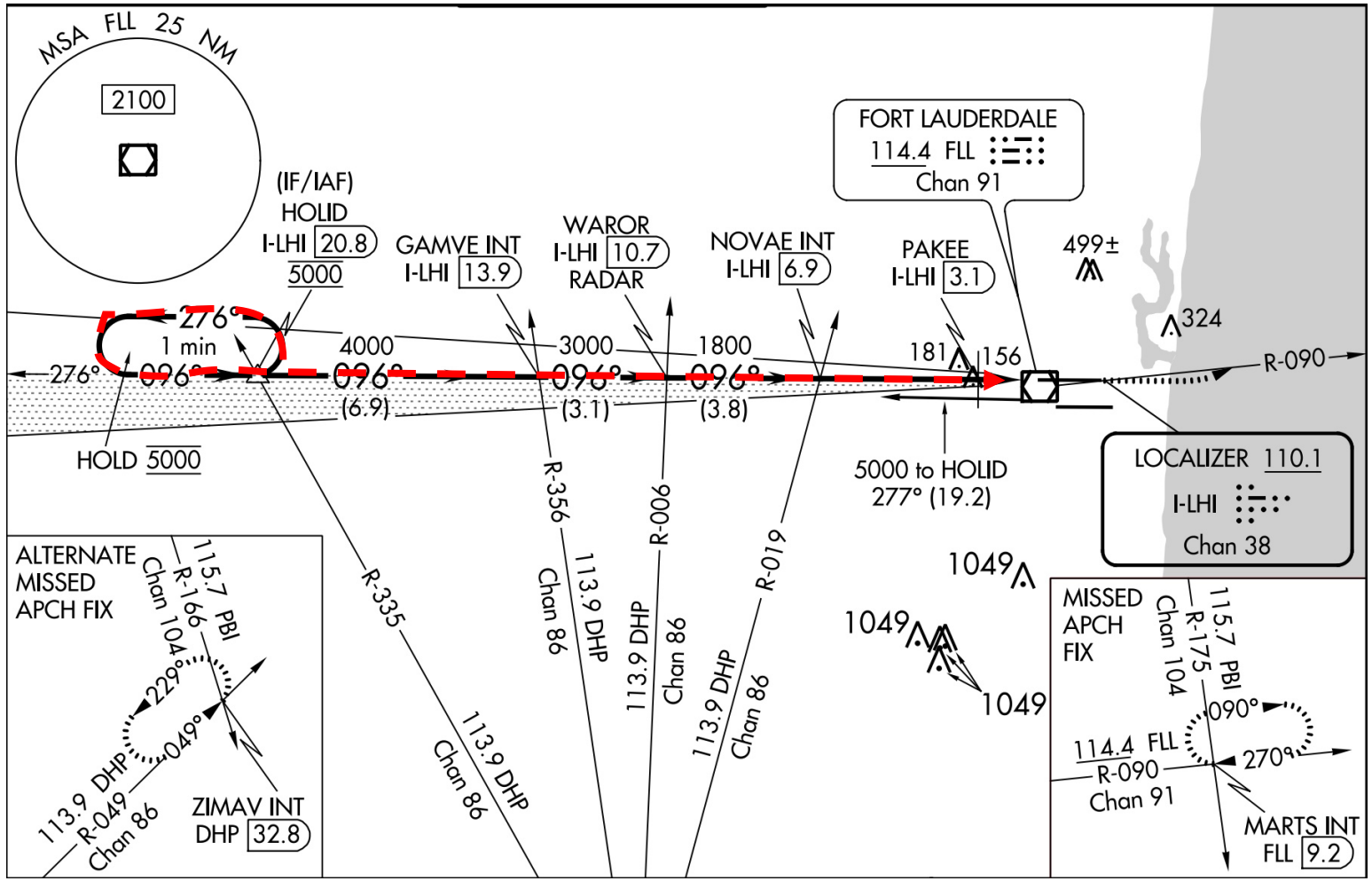
Approach Plate Example

From our IAF (initial approach fix) of HOLID we will complete the hold and then proceed inbound on 096

It is most common to vectored to intercept the localizer by ATC



The inbound leg will be timed for 1 minute



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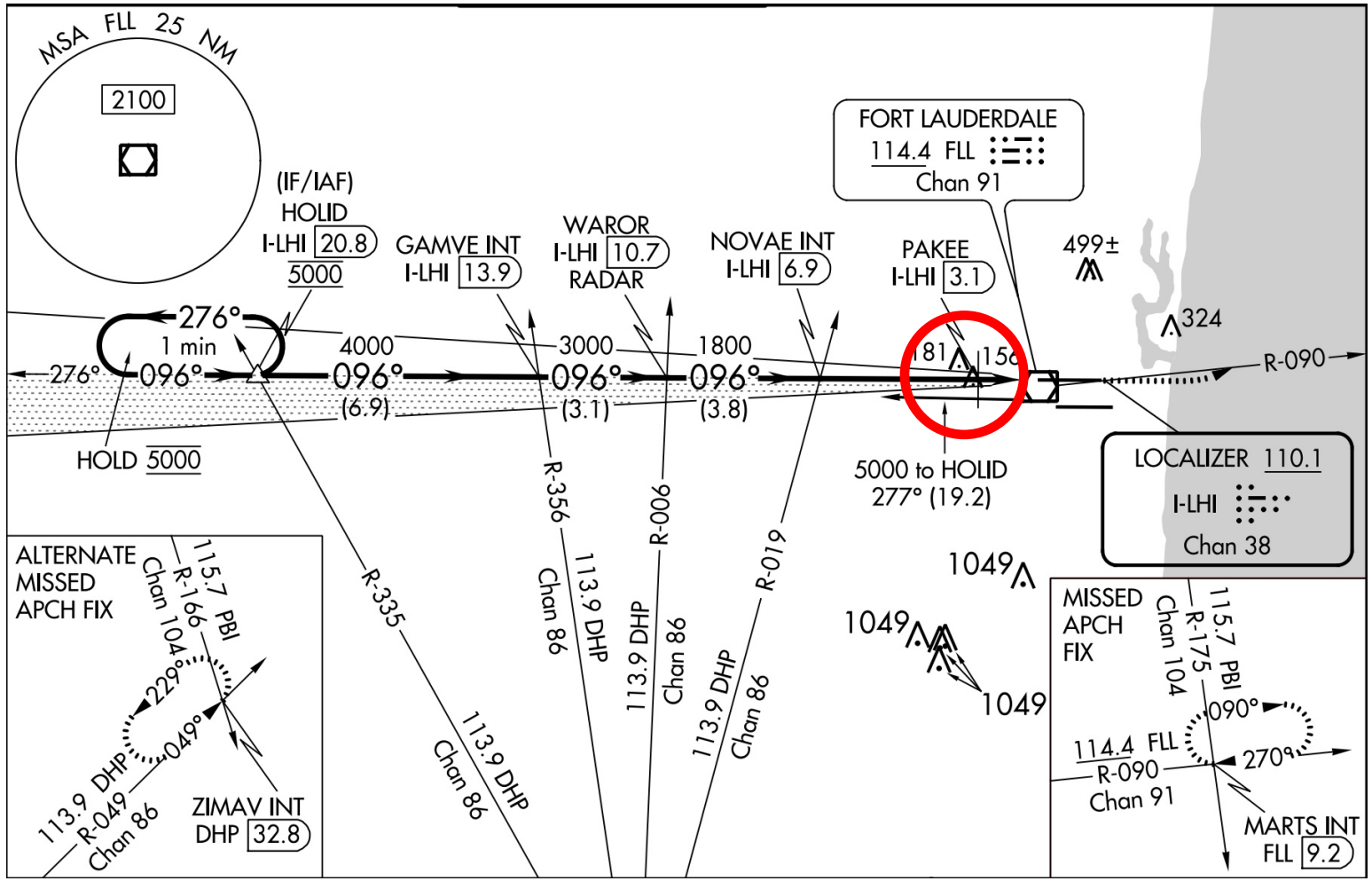
Approach Plate Example

There is an obstacle to the left of the final approach course



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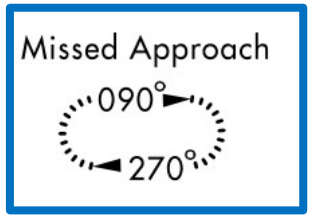
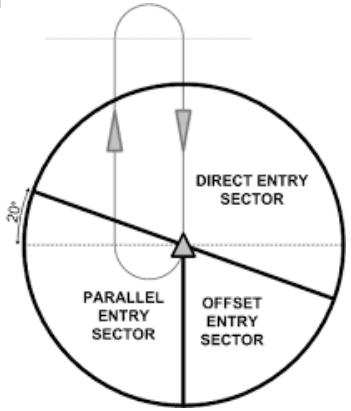
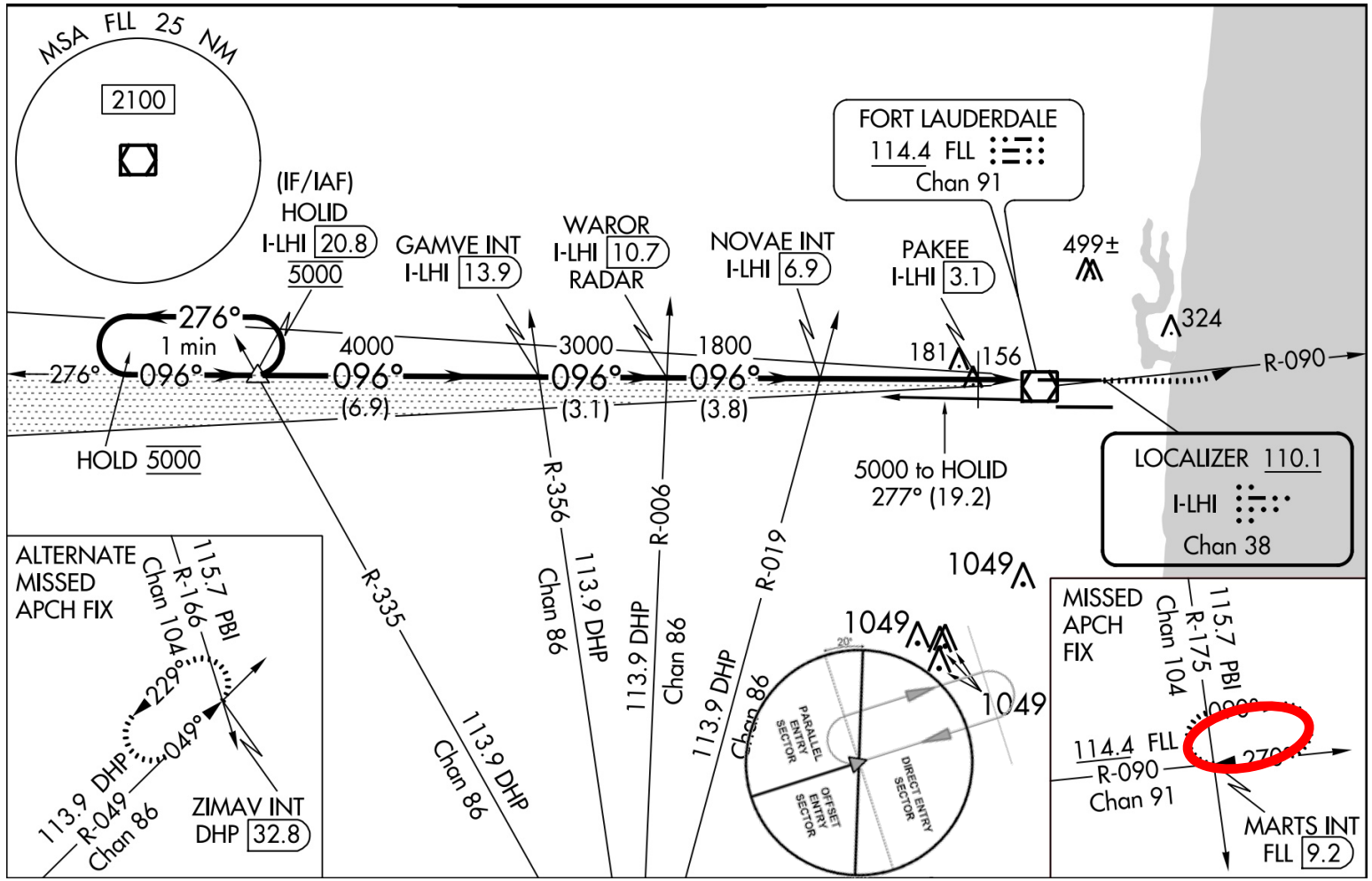
Approach Plate Example

We'll enter the hold via parallel or teardrop entry







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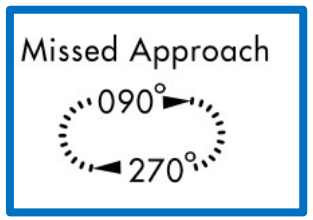
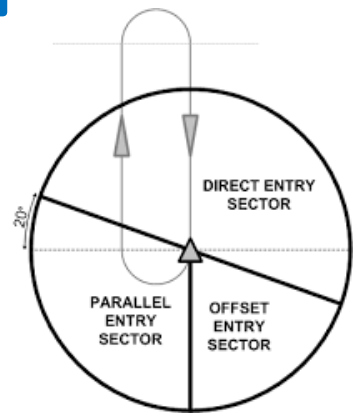
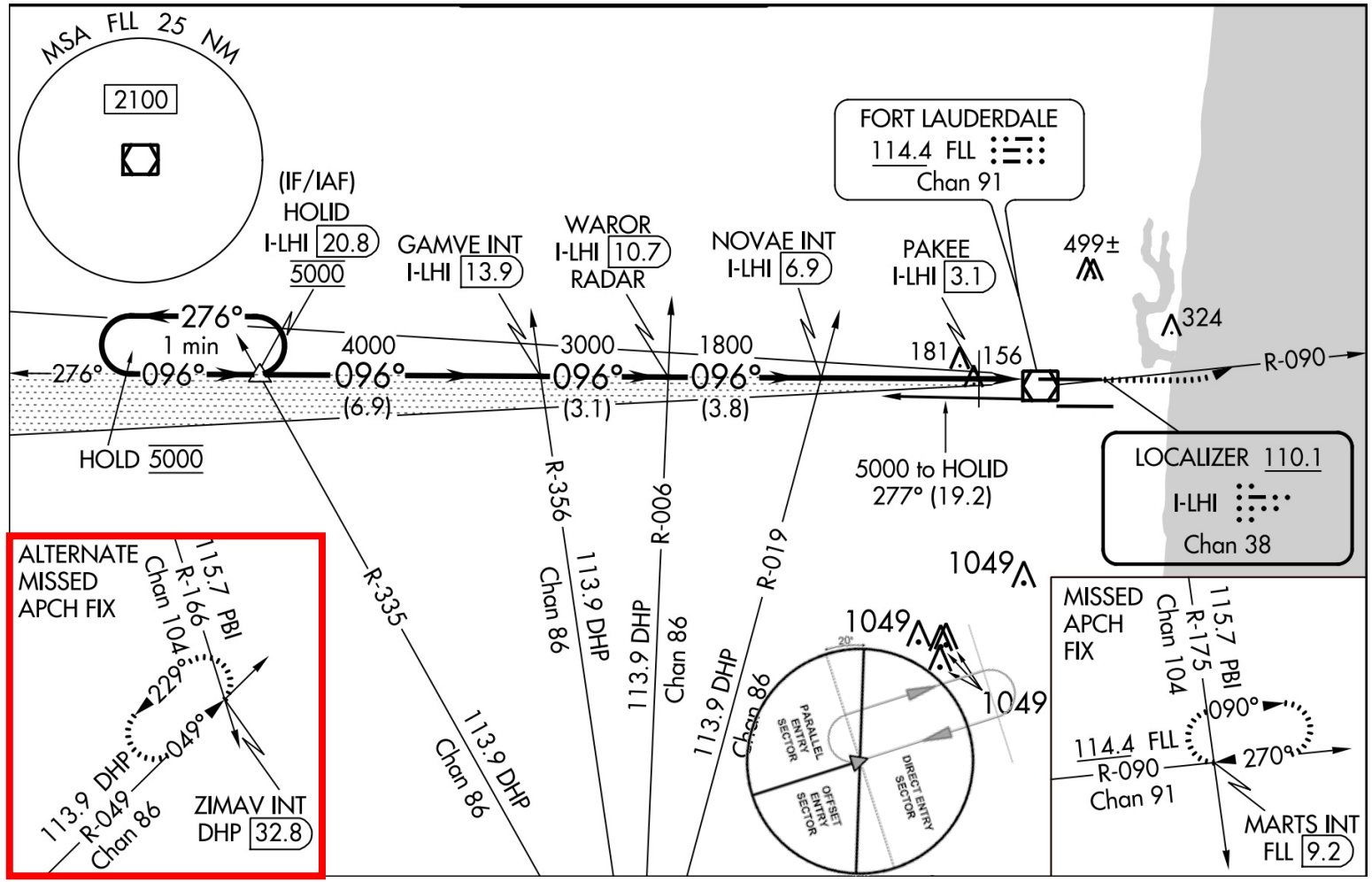
Approach Plate Example

And there's an alternate hold







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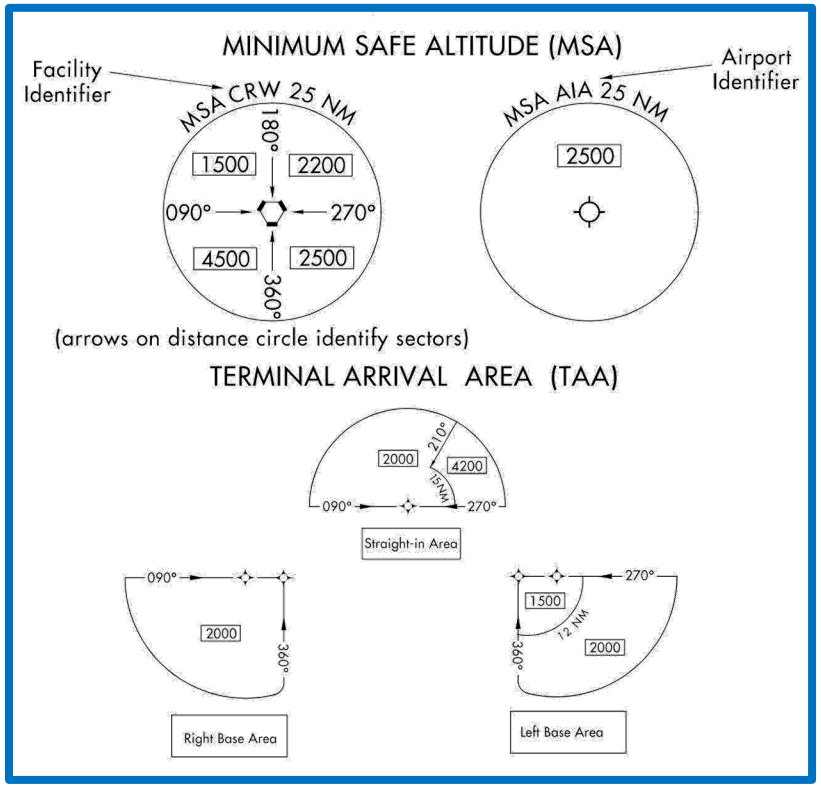
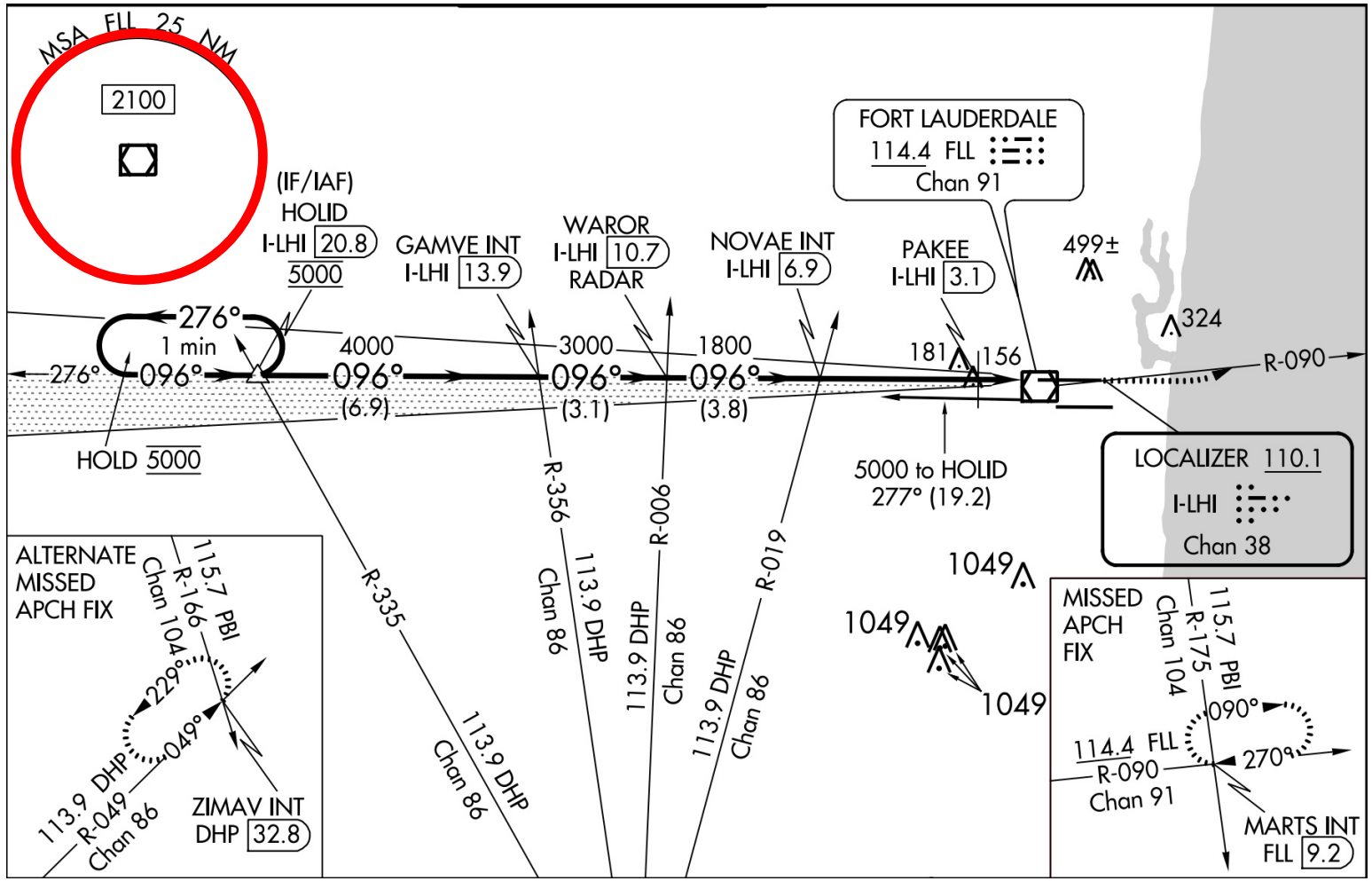
Approach Plate Example

MSA in the vicinity of the VOR is 2,100’





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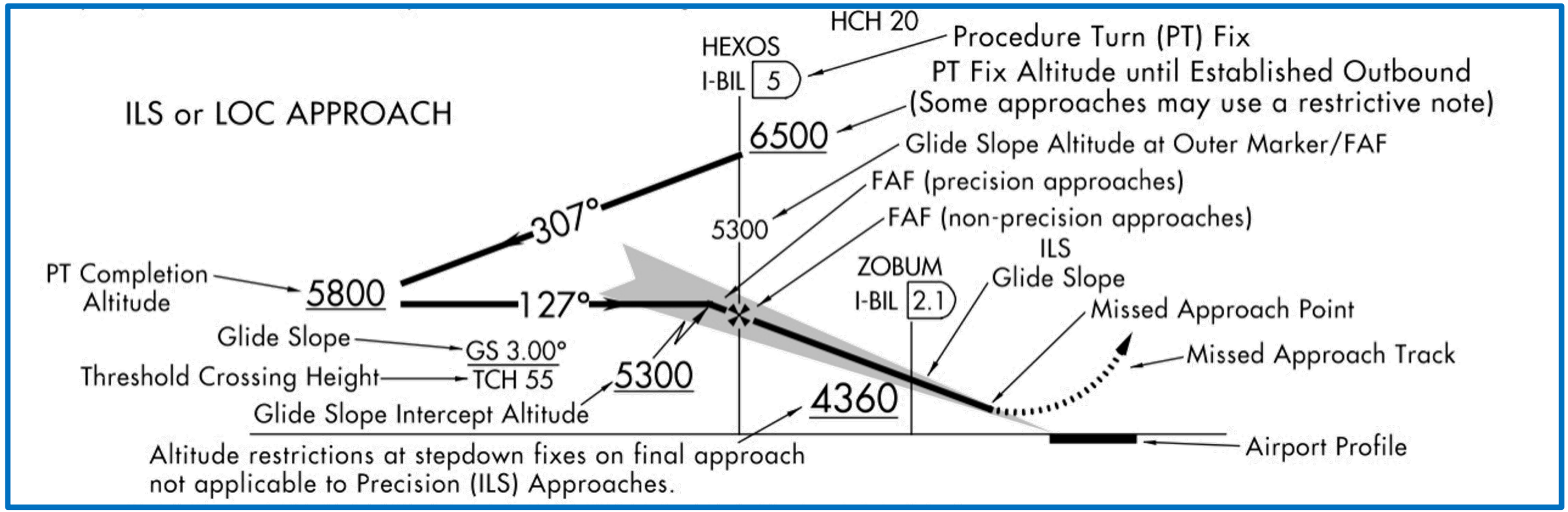
From the Terminal Procedures Supplement



5500	Mandatory Altitude	3000	Recommended Altitude
2500	Minimum Altitude	5000 / 3000	Mandatory Block Altitude
4300	Maximum Altitude		

2400	Glide Slope/Glidepath Intercept Altitude and final approach fix for vertically guided approach procedures.
▼	Visual Descent Point (VDP)

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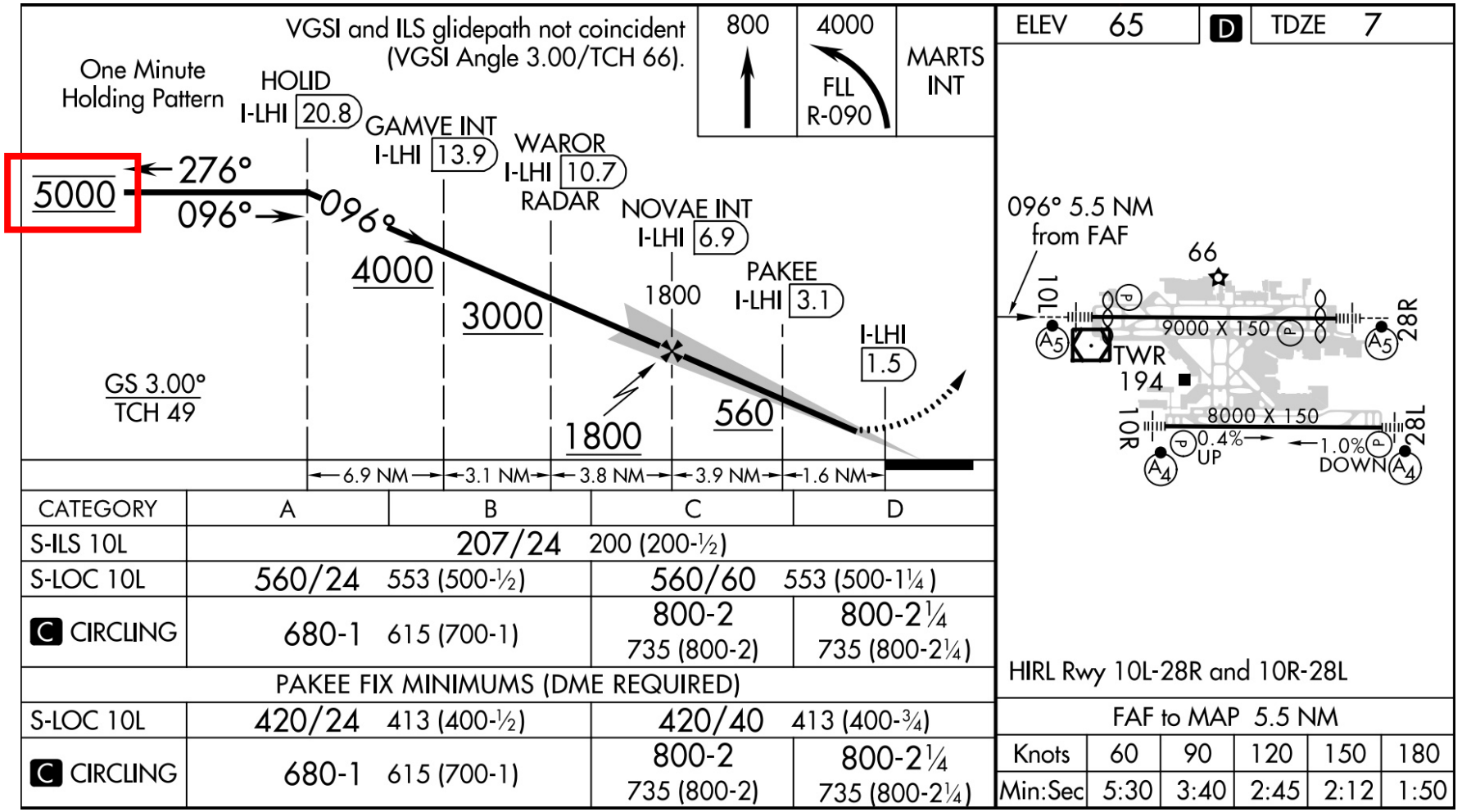
Approach Plate Example



CATEGORY	A	B	C	D
S-ILS 10L	207/24 200 (200-½)			
S-LOC 10L	560/24 553 (500-½)		560/60 553 (500-1¼)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)
PAKEE FIX MINIMUMS (DME REQUIRED)				
S-LOC 10L	420/24 413 (400-½)		420/40 413 (400-¾)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)

Knots	60	90	120	150	180
Min:Sec	5:30	3:40	2:45	2:12	1:50

We'll expect to stay at 5,000' until inbound from HOLID

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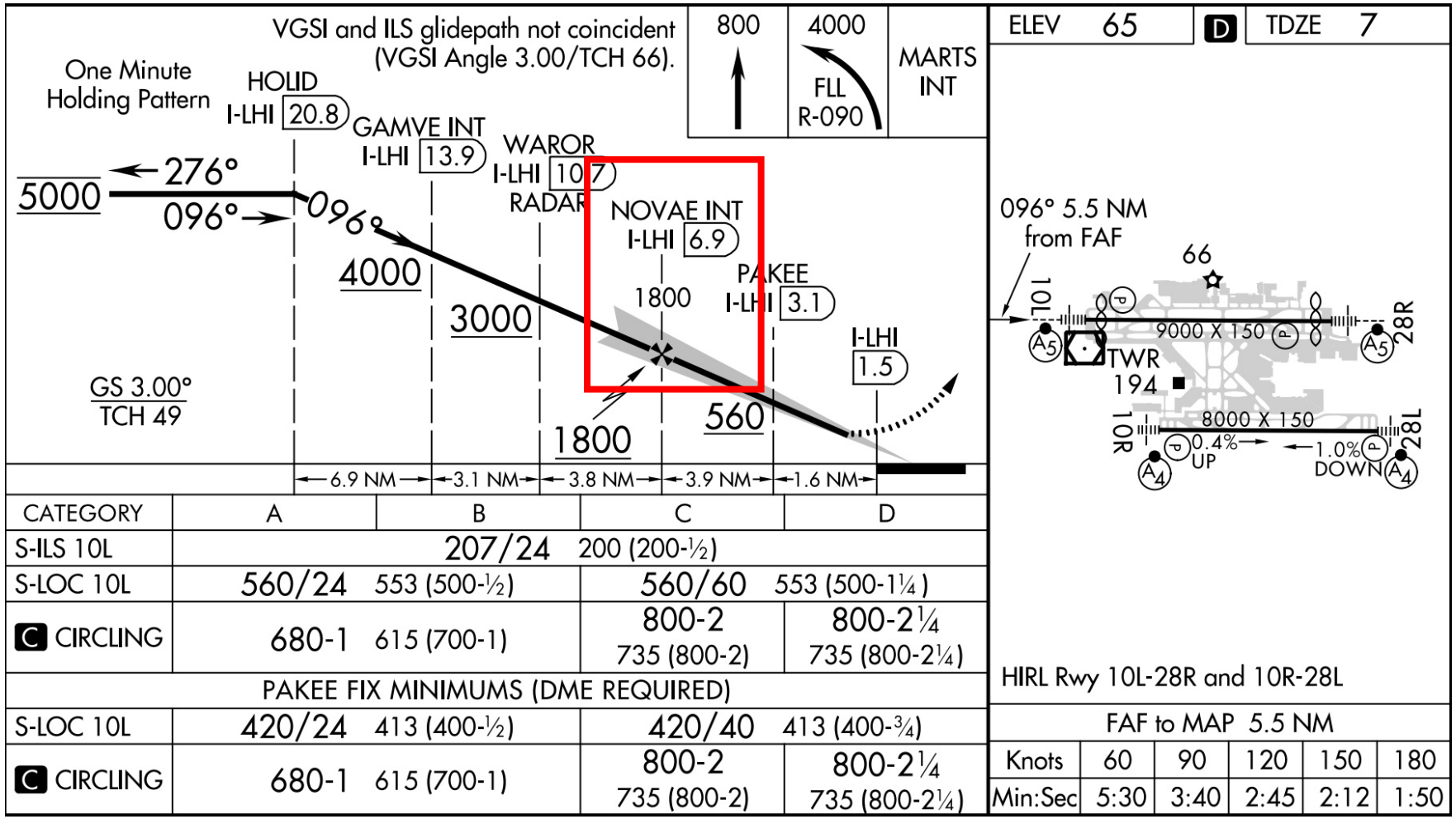
Approach Plate Example



CATEGORY	A	B	C	D
S-ILS 10L	207/24 200 (200-½)			
S-LOC 10L	560/24 553 (500-½)		560/60 553 (500-1¼)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)
PAKEE FIX MINIMUMS (DME REQUIRED)				
S-LOC 10L	420/24 413 (400-½)		420/40 413 (400-¾)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)

We'll expect to cross the FAF of NOVAE at 1,800'

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From the Terminal Procedures Supplement

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.

DA
Visibility (RVR 100's of feet)
Aircraft Approach Category
HAT

CATEGORY	A	B	C	D
S-ILS 27	1352/24		200	(200-½)
S-LOC 27	1440/24	288	(300-½)	1440/50 288 (300-1)
CIRCLING	1540-1 361 (400-1)	1640-1 461 (500-1)	1640-1½ 461 (500-1½)	1740-2 561 (600-2)

Straight-in ILS to Runway 27

Straight-in with Glide Slope Inoperative or not used to Runway 27

All **weather** minimums in parentheses not applicable to Civil Pilots.

Military Pilots refer to appropriate regulations.

MDA
HAA
Visibility in Statute Miles

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

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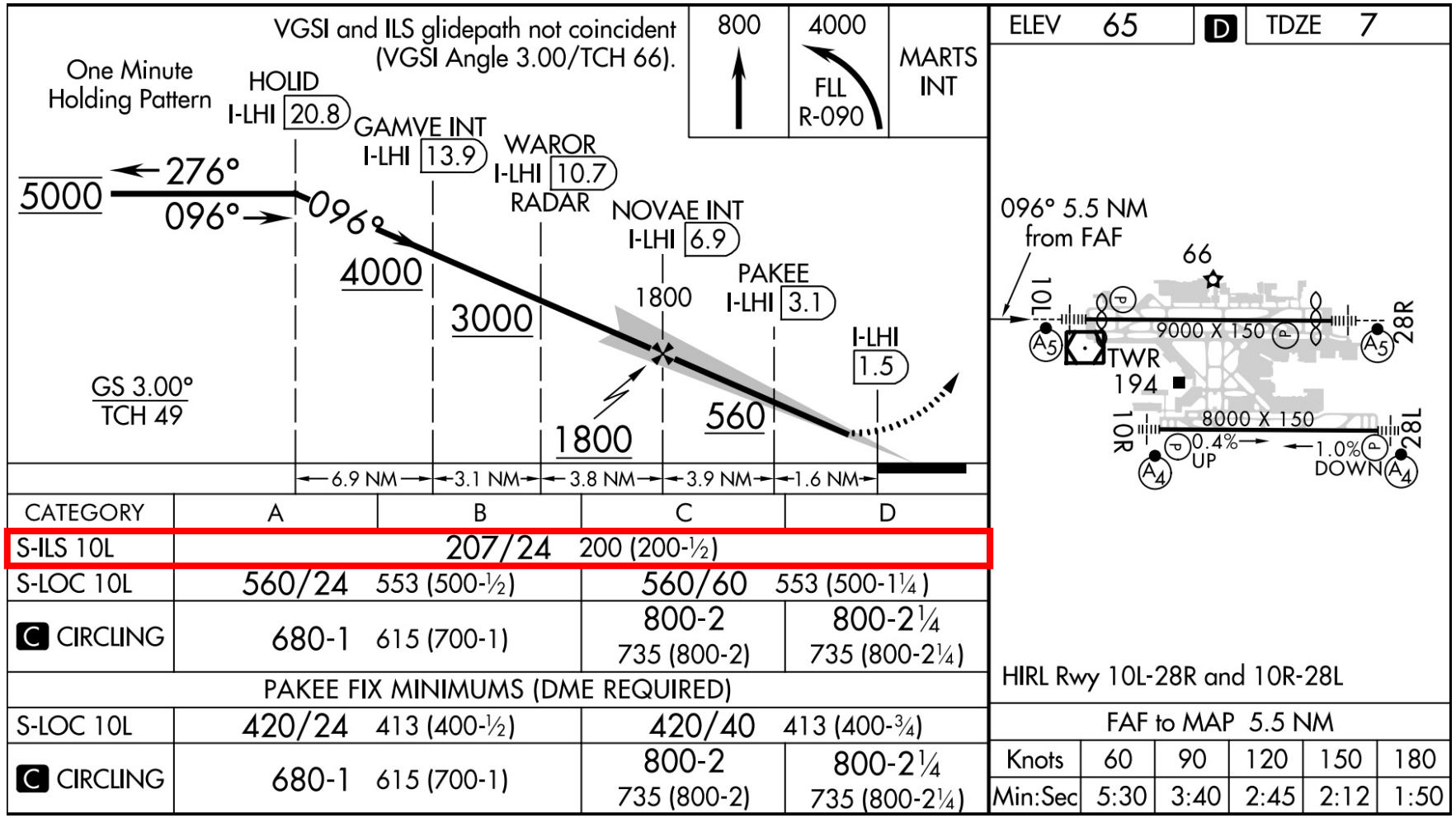
Approach Plate Example



CATEGORY	A	B	C	D
S-ILS 10L	207/24 200 (200-½)			
S-LOC 10L	560/24 553 (500-½)		560/60 553 (500-1¼)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)
PAKEE FIX MINIMUMS (DME REQUIRED)				
S-LOC 10L	420/24 413 (400-½)		420/40 413 (400-¾)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)

Our minimums will be 207’

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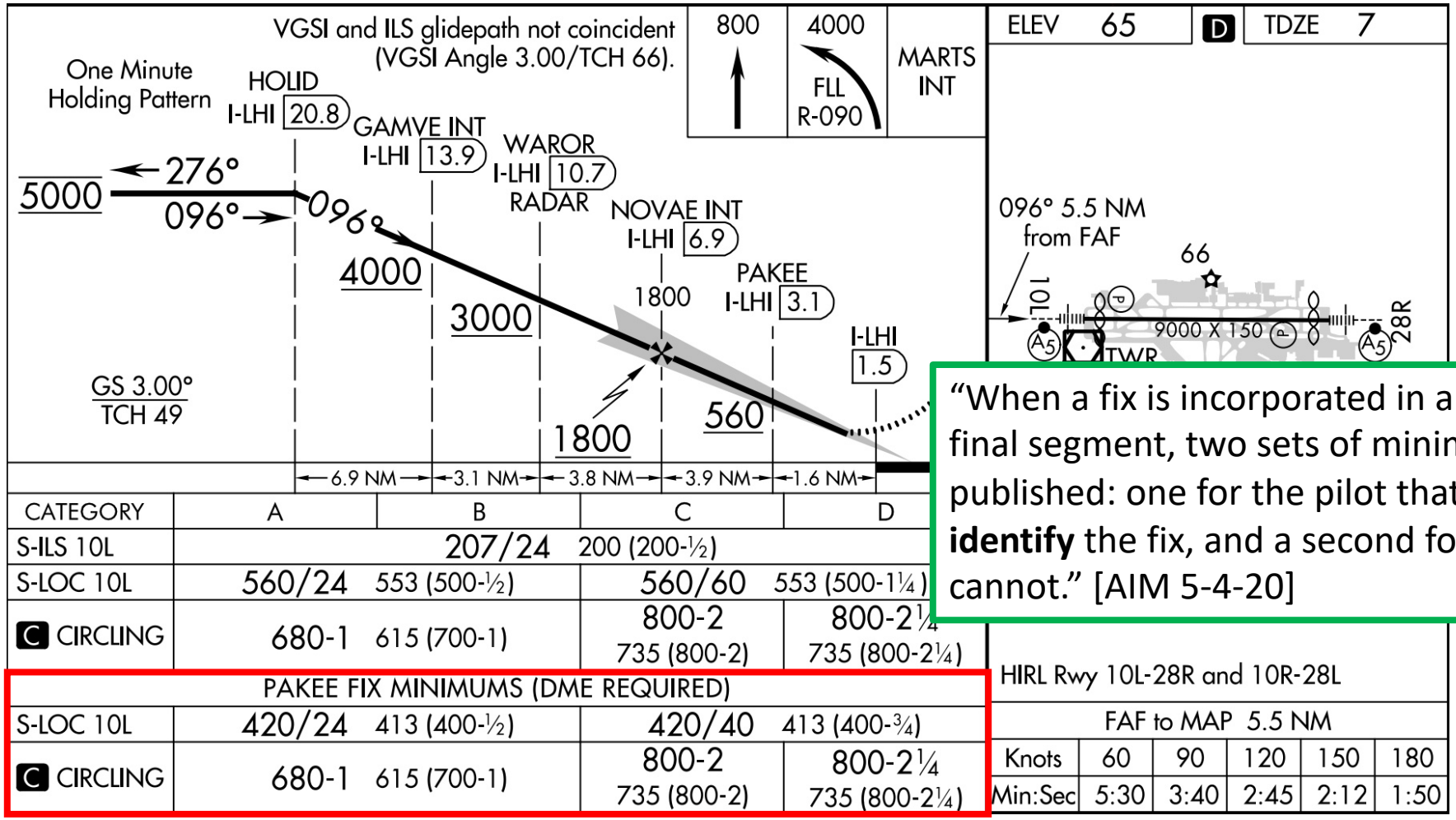
Side Note



"When a fix is incorporated in a nonprecision final segment, two sets of minimums may be published: one for the pilot that is **able to identify** the fix, and a second for the pilot that cannot." [AIM 5-4-20]

If we didn't have glideslope capabilities, we could descent lower than the S-LOC minimums if we had a way to identify the PAKEE fix

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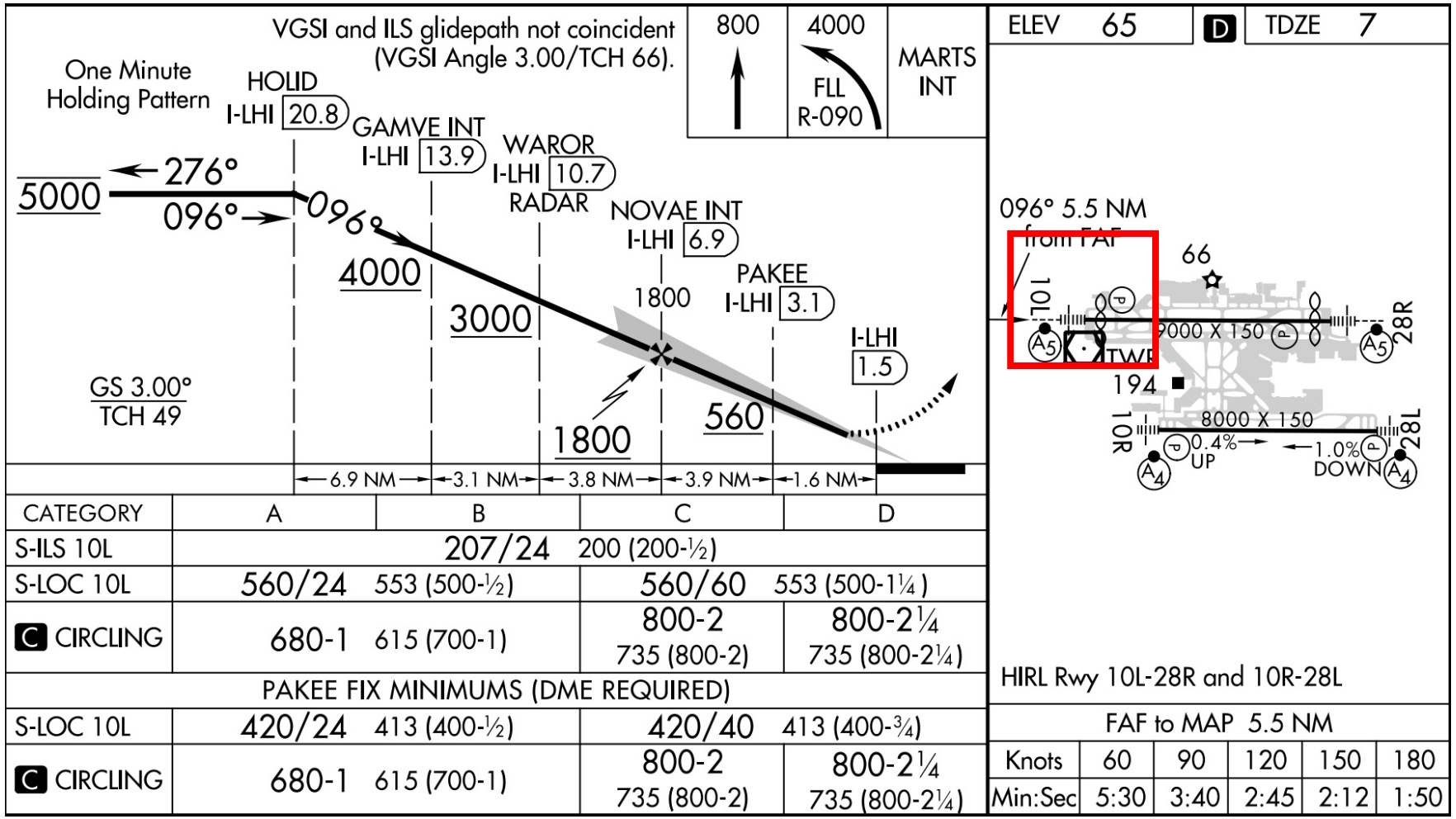
Approach Plate Example



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S-LOC 10L	560/24 553 (500-½)		560/60 553 (500-1¼)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)
PAKEE FIX MINIMUMS (DME REQUIRED)				
S-LOC 10L	420/24 413 (400-½)		420/40 413 (400-¾)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)

We'll expect a displaced threshold for 10L with a PAPI on the left

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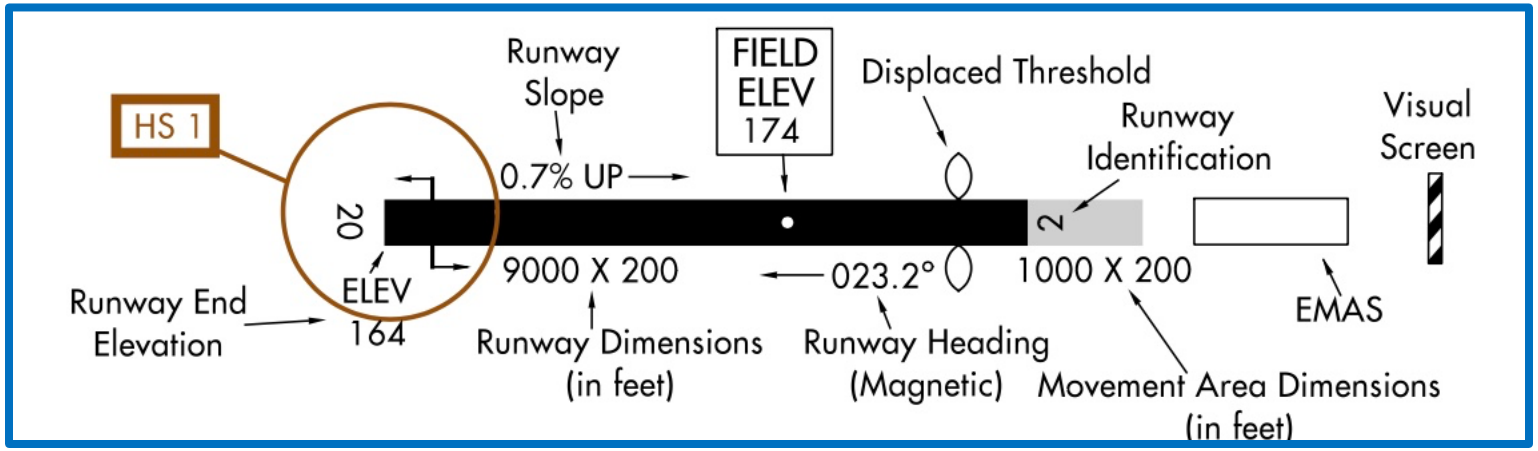
From the Terminal Procedures Supplement



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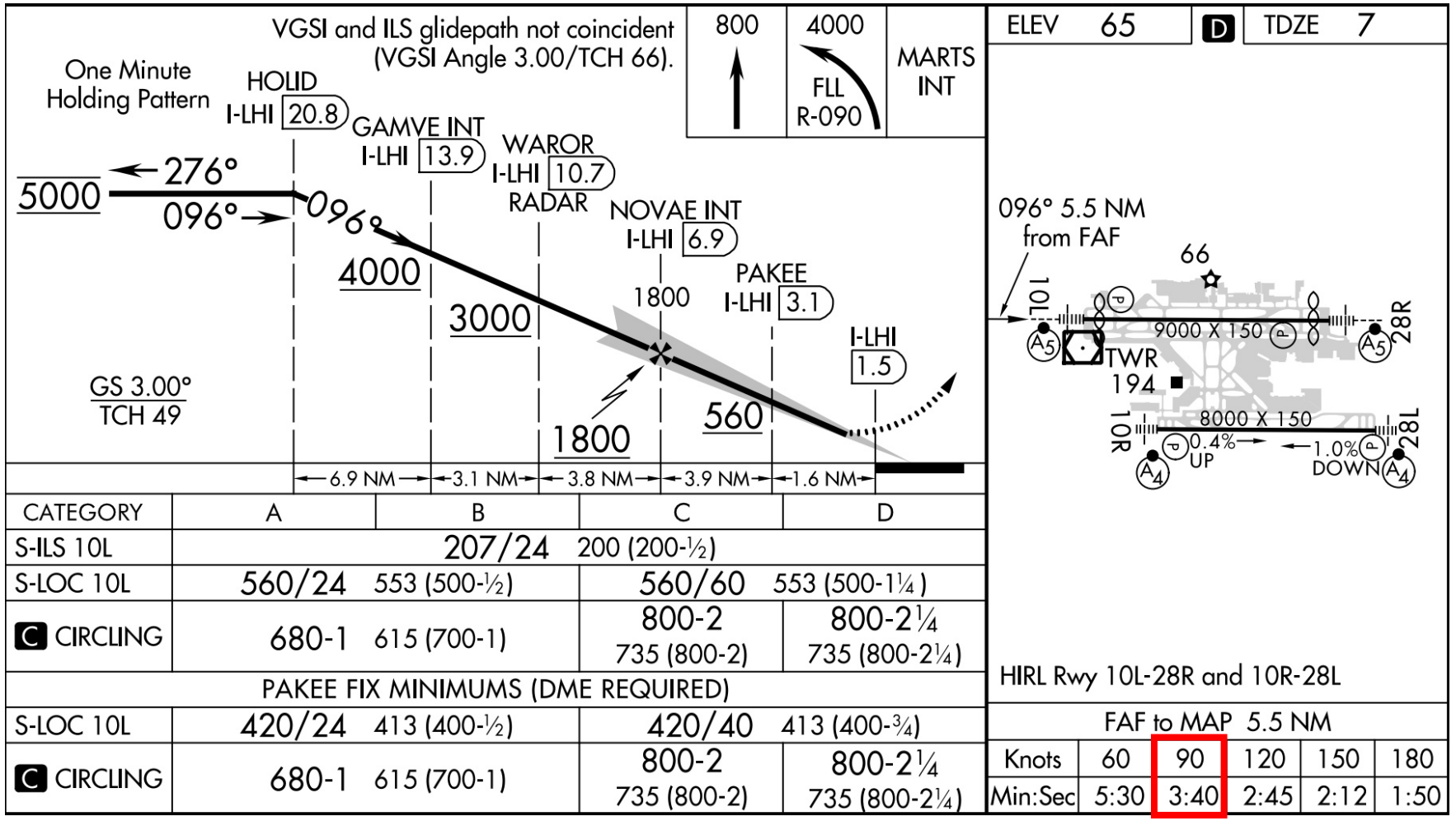
Approach Plate Example



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S-ILS 10L	207/24 200 (200-½)			
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S-LOC 10L	420/24 413 (400-½)		420/40 413 (400-¾)	
C CIRCLING	680-1 615 (700-1)		800-2 735 (800-2)	800-2¼ 735 (800-2¼)

FAF to MAP 5.5 NM

Knots	60	90	120	150	180
Min:Sec	5:30	3:40	2:45	2:12	1:50

And we'll time 3:40 from the FAF inbound. This allows us to continue descending to localizer minimums if the glideslope becomes INOP and there is no DME

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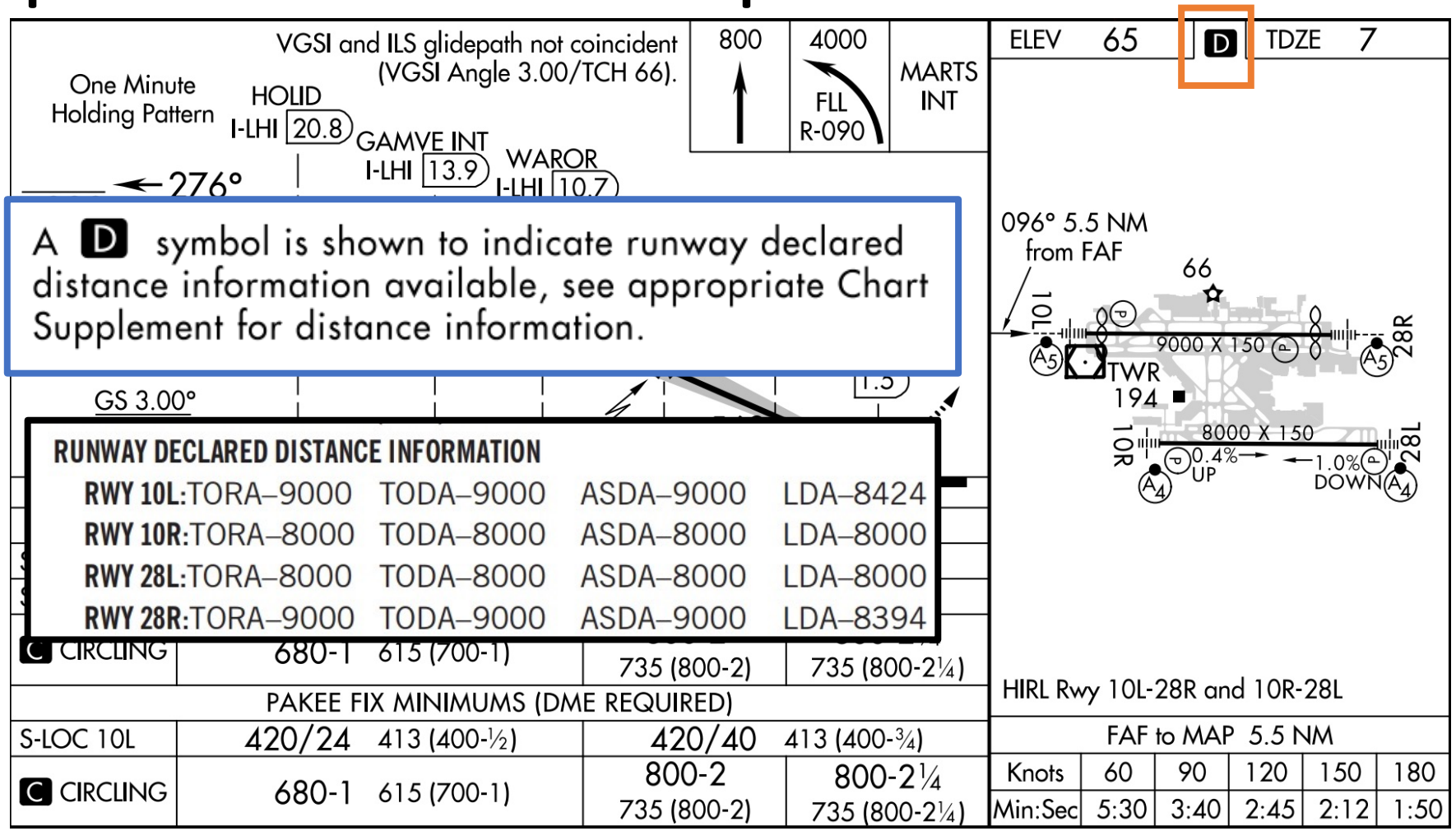
Approach Plate Example



We can also be aware that the runway has declared distance information on the chart supplement

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Considerations

- Recall from [**§ 91.175(c)(3)**], seeing the the approach lights – allows descent to TDZE + 100’ AGL which in this case is 107’ MSL
- We need to know this and keep it as part of the briefing

Questions?