IFR Course Notes

DOCS * *Henry Holistic Landing, Holding Pattern detail * * Garmin 530 w Aspen, *Craig Student

IFR Course Notes- Overview

[Overview]
There 3 elements to IFR flight are:

1) Being able to fly the plane without looking out the window
2) Understanding the 'academic' element (mostly what is in these pages)
3) Working your Avionics. This is a 'programming/understanding/utilization' job unto itself.

The 'life cycle' of an IFR flight is about "Clearances" as in
"Cleared To.." and
"Expect Further Clearance (EFC) at …"
"Direct" means from your last position, to the airport

Separation:
If under radar contact within 40nm

- As little as 3 nm
- Up to 6nm due to wake turbulence
- 3nm from tower/obstruction
- 1,000 ft vertical
- Above FL 290 has Reduced Vertical Separation Minimum, special equipment

Non-Radar environment

- w/o DME or RNAV 10 minutes laterally
- 10 minutes vertically

ATIS:
If Ceiling is absent, it is 5,000' or more
If Visibility is missing, it is 5 miles or more..

ALTITUDES:
West: Even # of thousands of feet(e.g., 2,000, 4,000, 6,000, etc.)
East Odd # of Thousand feed (e.g., 1,000, 3,000, 5,000, etc.)
Yes, even as low as 1,000 MSL. The IFR clearance guy told me that when he flew in Florida, he would routinely file/fly at 1,000 MSL (Field elevation is under 100' down there, as you recall). Subject to clearances and MERA etc., but that low!

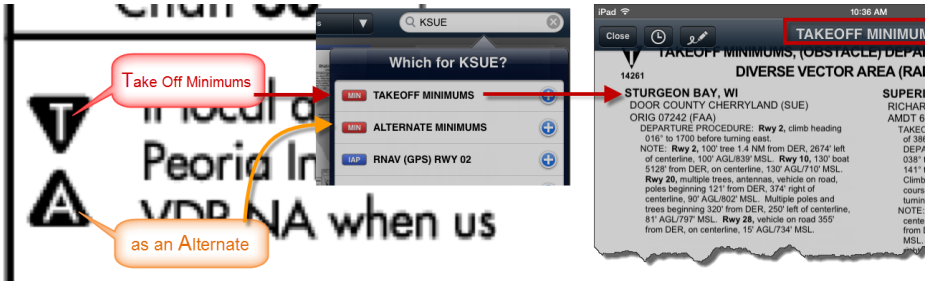
Common 'Parts':

1 Definitions	
23 Certified aircraft	91 PILOTS of small aircraft, in the US
43 Maintenance	135 Charters ← and corporate pilots???
61 Certification	121 Commercial air carriers (the Airlines)

IFR Course Notes Departures

(Operations, Procedures and Considerations)

Departure Operations: "T" and "A"



In **ForeFlight**, these are in: **Airports/Procedures**, and then either **Departure** (Takeoff) or **Arrival** (Alternates)

T Takeoff Considerations, including ODP (Obstacle Departure Procedures)

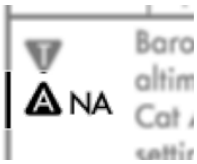
Us Part 91 guys can take off in 0/0. [T] only for commercial Part 135/121, though SOME parts ARE applicable to everyone like OBSTACLE DEPARTURE. These are called **ODP** (Obstacle Departure Procedures).

So CHECK THE TAKEOFF MINIUMS before you leave!!

ODPs are implicitly binding in any IFR clearance

These are stored alphabetically, all in one big doc ☹, so you have to scroll to find your airport by city name, not Airport Name (see below)

A Alternate Considerations

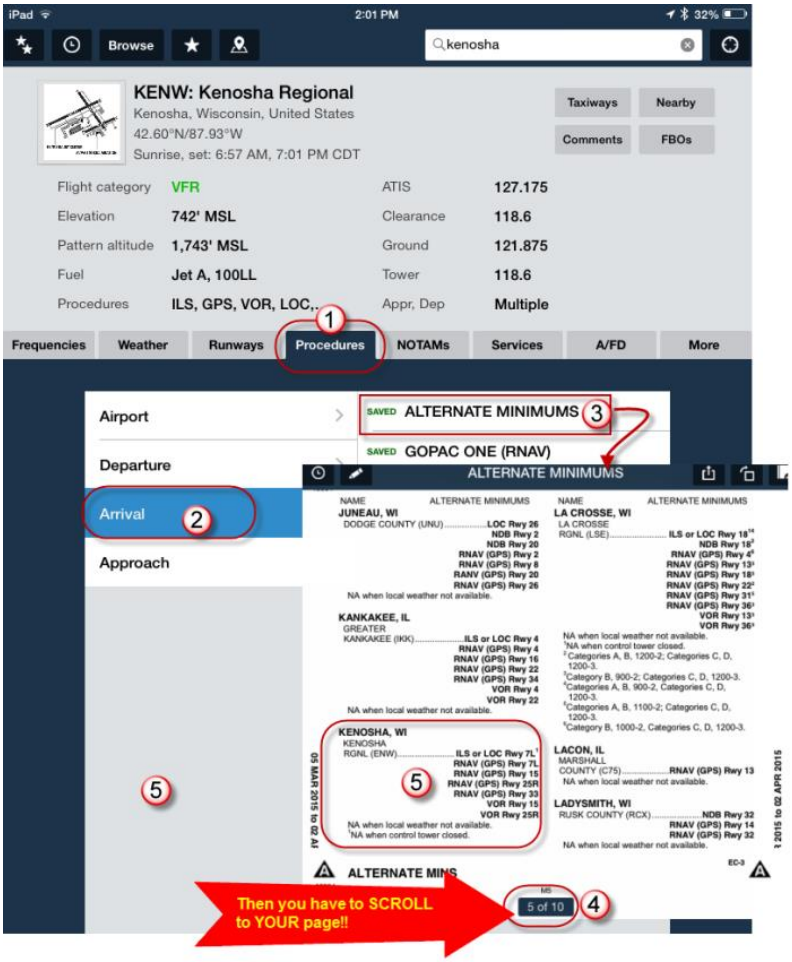


Not Acceptable as an Alternate. EVER.

These are stored alphabetically, all in one big doc ☹, so you have to scroll to find your airport (see below)

If you are required to have an Alternate airport, it must have a non-GPS approach that you can use, UNLESS you are WAAS-enabled (which I am)

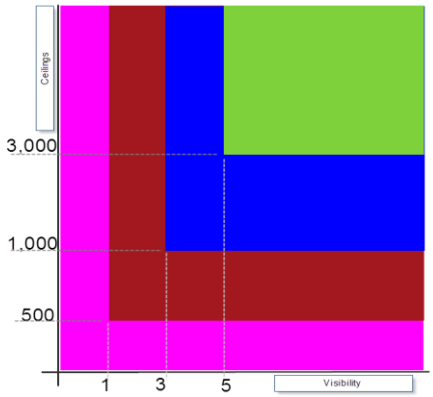
Note: Alternate will need MONITORED WEATHER AND INSTRUMENT REPORTING. E.g., if the ILS is out, or the weather is below minimums, you need to have some way of knowing that when you plan to arrive!



IFR Course Notes Departures

(Operations, Procedures and Considerations)

Rules for having an Alternate:



1 2 3

Look at your Destination Airport:

What is the TAF **1** hr. before and 1 hr. after your ETA.

If the CEILINGS are at least **2**,000'

and VISIBILITY is **3** nm,

then you don't need to list an Alternate

Alternate must meet the

- Ceiling & Visibility requirements in the table below, AND
- any notices for that Airport.

FAR 91.169(a)(2) plus (b).
When filing an IFR flight plan, an alternate is required except when the first intended destination has an instrument approach and...

You can file to an airport with out an IFR approach, but it has to be forecast for VFR +/- 1 Hr ETA, and you must list an airport with an IAP as an alternate

	Ceilings	**Visibility**	Comments
Destination	2,000	3	
Alternate Precision Appr	600	2	For this purpose, only ILS counts
Non-Precis Appr	800	2	

This only refers to filing. At the time of actual need, you can attempt to SHOOT the approach even if forecast is down to 0/0. To actually land of course, you need to meet the IAP minimums listed.

And if you are flying to an airport with NO Approaches, you can do so but must file an alternate, because the Except…. Can't apply..

Fuel = Destination + Alternate + 45 minutes

← Irrespective of Night or Day:

IFR Course Notes Departures

(Operations, Procedures and Considerations)

And in the T (T)akeoff section of the IAP, you may have to do some (for lack of a better term) "Rate of Climb" calculations, in Ft per NM. Here's the math for that

$$\text{FPNm} = \frac{\text{Feet}}{\text{Nm}} = \frac{(\text{Feet/Min})}{(\text{Nm/Hr})/60} = \frac{\text{FPM}}{\text{KTs}/60} = \frac{\text{FPM} \times 60}{\text{KTs}}$$

← *GROUND Speed, not IAS*

Note that GS will be LOWER than IAS if you take off into the wind.
E.g., 96 Kt IAS is 90 Kts with 6Kt headwind.
So you use 96 kts in your calculation for Ft/Nm, but reality at take off may be 90 which results in a smaller denominator and hence a larger Ft/Nm – a small, built-in safety factor ☺
Presumably you always take off at Vx (96Kts for me) until clear of all obstacles, then climb out a Vy

So, what is my best FPNm in N78HF? (Vx is 96)

FPNm = FPM x 60 / Kts = FPM x 60 / 96 = FPM x 0.63 ~ **FPM x 0.6** ~ 2/3rds of FPM

= 300 x 0.6 = 180'/Nm

= **500** x 0.6 = **300'**/Nm in N78HF, typically

= 750 x 0.6 = 450'/Nm

= 800 fpm x 0.6 = 480FtPNm (500 Ft/Nm using exact value)

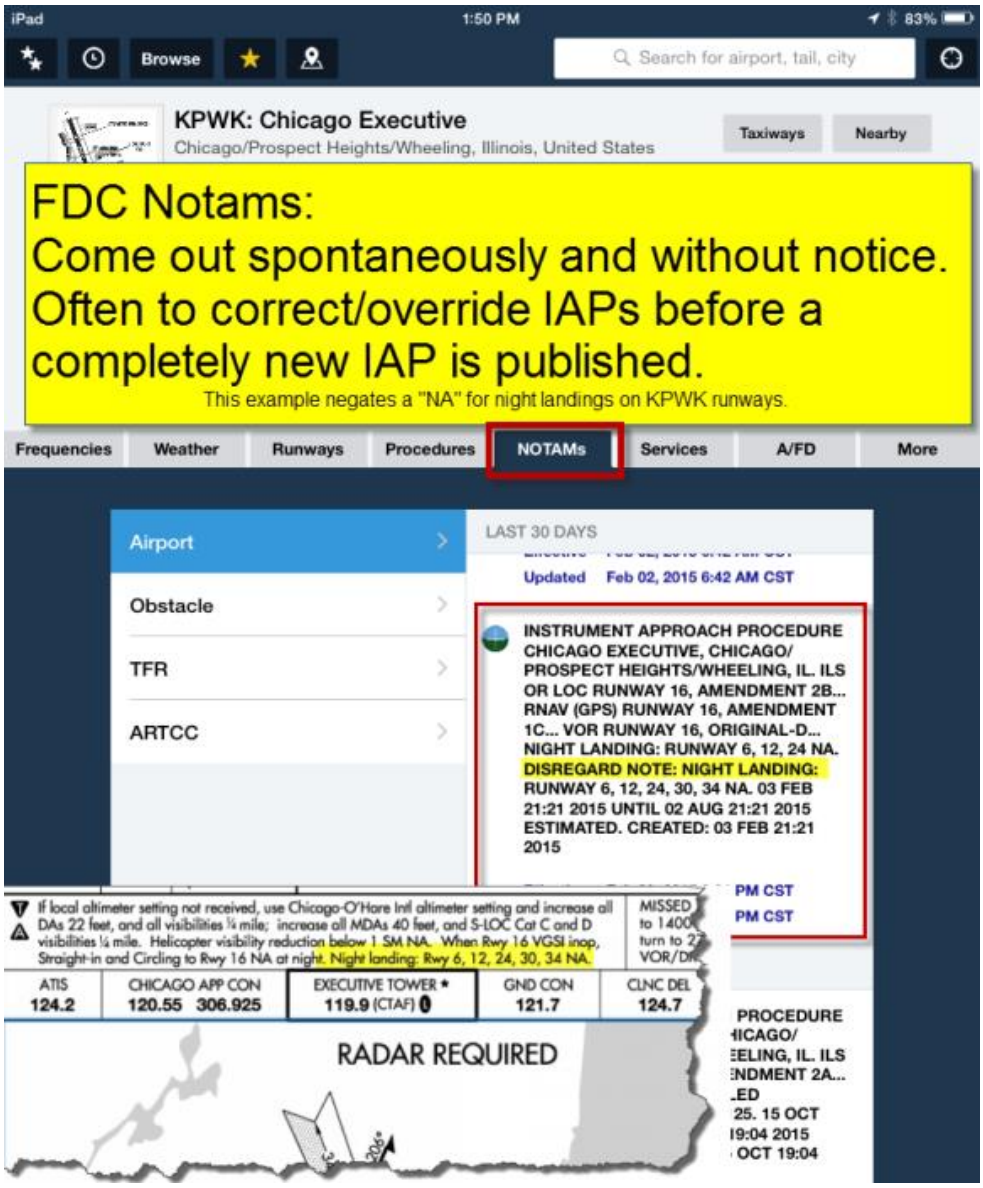
If you are given the FPNm and you want to determine what your FPM would have to be, the equation is:

FPM = FPNm x Kts / 60 = FPNm x 96/60 = FPNm x 1.6 ~ **1 ½ x FPNm**

Altitude Increase = FPM x Min
Minutes required to gain altitude = Altitude Increase/FPM

Ft/NM		
	Ground Speed	
	96 Kts	115 Kts
500 fpm	310	260
800 fpm	500	415

FDC Notams:


iPad
1:50 PM
83%
Browse
Search for airport, tail, city
KPWK: Chicago Executive
Chicago/Prospect Heights/Wheeling, Illinois, United States
Taxiways
Nearby
FDC Notams:
Come out spontaneously and without notice.
Often to correct/override IAPs before a completely new IAP is published.
This example negates a "NA" for night landings on KPWK runways.
Frequencies
Weather
Runways
Procedures
NOTAMs
Services
A/FD
More
Airport
Obstacle
TFR
ARTCC
LAST 30 DAYS
Updated Feb 02, 2015 6:42 AM CST
INSTRUMENT APPROACH PROCEDURE CHICAGO EXECUTIVE, CHICAGO/ PROSPECT HEIGHTS/WHEELING, IL. ILS OR LOC RUNWAY 16, AMENDMENT 2B... RNAV (GPS) RUNWAY 16, AMENDMENT 1C... VOR RUNWAY 16, ORIGINAL-D... NIGHT LANDING: RUNWAY 6, 12, 24 NA. DISREGARD NOTE: NIGHT LANDING: RUNWAY 6, 12, 24, 30, 34 NA. 03 FEB 21:21 2015 UNTIL 02 AUG 21:21 2015 ESTIMATED. CREATED: 03 FEB 21:21 2015
If local altimeter setting not received, use Chicago-O'Hare Intl altimeter setting and increase all DAs 22 feet, and all visibilities ¼ mile; increase all MDAs 40 feet, and S-LOC Cat C and D visibilities ½ mile. Helicopter visibility reduction below 1 SM NA. When Rwy 16 VGSI inop, Straight-in and Circling to Rwy 16 NA at night. Night landing: Rwy 6, 12, 24, 30, 34 NA.
ATIS 124.2
CHICAGO APP CON 120.55 306.925
EXECUTIVE TOWER * 119.9 (CTAF)
GND CON 121.7
CLNC DEL 124.7
RADAR REQUIRED

IFR Course Notes Departures

(Operations, Procedures and Considerations)

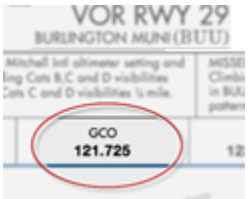
FILING:

You may file up to 24 hours in advance or as little as 20 minutes before departure (> 30 recommended) .
Your flight plan will be held for up to two hours after your estimated departure time.
At that point if not activated it will be canceled.
To cancel on the ground you can call 800-WX BRIEF or 888-766-8267 or use the RCO or GCO if available

ACTIVATING

From a Towered airport, Ground Control or Clearance Delivery will do that ☺
From a non-towered airport:

a) Telephone (800-WX Brief or National Clearance Delivery 888/766-8267) and you will be given a VOID time (see below)
b) RCO - Remote Control Outlet. See FSS in "Ground School Notes"
c) GCO – Ground Control Outlet like a telephone link, see Plate inset →
It's like a 'telephone connection', that will hang up on you if there is no noise at least every 60 seconds, so sing if you are 'on hold' ☹
d) Pick up in the air (departing VFR) very, very bad idea for lots of reasons.
Climb to 400' AGL before beginning any turns, even to your initial heading, if not told "Fly RW heading until…."



VOID TIMES:

Will give you a VOID clearance good for about 20 minutes (not to exceed 30 minutes).
E.g., the FAA will reserve/dedicate a time/block of airspace with your name on it.

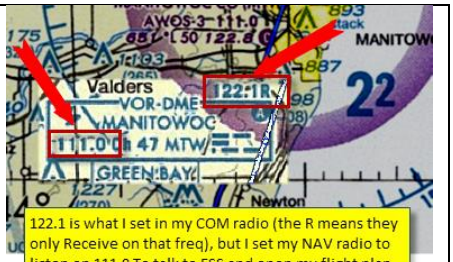
And you **must** contact them if you do NOT depart, or they will initiate search/rescue, just as if you didn't close a VFR flight plan AIM 5-2-6 : "Failure of an aircraft to contact ATC within 30 minutes after the clearance void time will result in the aircraft being considered overdue, and search and rescue procedures initiated.
Do they give a START and an END time???
Example: "Clearance void if not off by (clearance void time) and, if required, if not off by (clearance void time) advise (facility) not later than (time) of intentions."

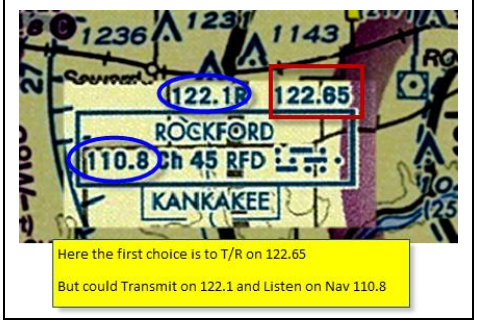
VORs and FSS

FSS is the 'physical' frequency for Flight Service. Flight Service includes:

- Flight Plan (file/close)
- Preflight weather briefing
- NOTAMS
- IFR Clearances

Some VORs allow you to talk to a FSS on frequencies transmitted through the same antennas. .The words "Green Bay" under the box is who you are talking to. So you say "Green Bay Radio, N78HF would like to open our Flight Plan"When you have to use the VOR to listen, don't forget to turn the nav volume up. We always have the comm volume up but many forget that the nav has its own vol. knob.





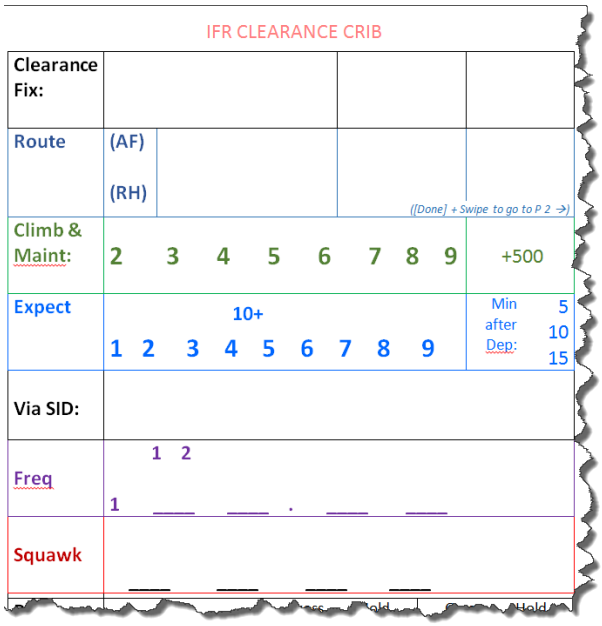
IFR Course Notes Departures

(Operations, Procedures and Considerations)

CRAFT

"Direct" means from your last position, to the airport

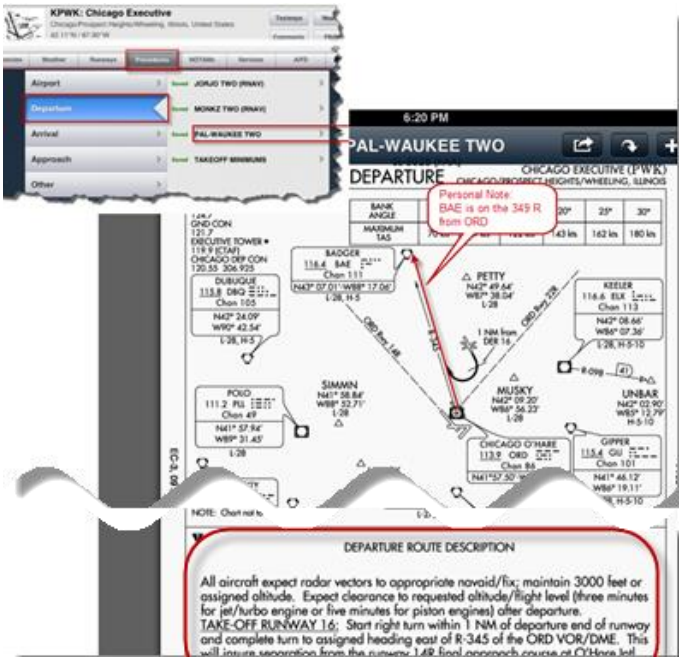
> *Cessna 12345 cleared to Nashville as filed, fly runway heading, climb and maintain three thousand, expect seven thousand one zero minutes after departure, departure frequency one two four point six five, squawk two seven one three."*



Flight Watch is 122.0

Some aiprorts have standard departure routes (STARS, formerly called SIDs I think)

Dashed line was used for lost communication.



IFR Course Notes – Enroute Charts

[EnrouteCharts]
ATS Routes Air Traffic Services Route

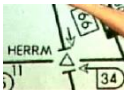
- Victor airways (VOR Federal airways)
    - 1200 – 18,000 AGL
    - 4nm on either side of centerline, so 8nm wide
- Jet routes (High altitude)
    - 18,000 to LF 450
- Q/T Routes (RNAV?) equipment suffixes /E, /F, /G
    - Q is high altitude RNAV
    - T is low altitude RNAV
- Colored Airways
    - Used in some coastal areas (NDBs), not a factor for me.
- Arrival/Departure Routes

VOR Navaids

- Low VOR
    - Above 1,000 AGL, have a 40nm range (ie, 80nm between VORs)
- High VOR have 100 nm range (ie, 200nm between VORs)
- Terminal
    - Used for instrument approaches
    - 1,000-12,000 AGL range of 25nm

DIRECT is between 2 VORs, without an established, verified Victor airway between them.

Victor Airways Per se:

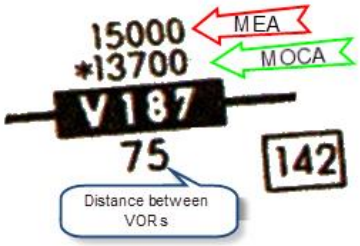
Symbols: 

	Symbol Descrip	Meaning
	Triangle – Solid	Compulsory reporting point And even then, only if NOT under radar contact
	Triangle – Hollow	Optional reporting point, whether in radar contact or not
	Arrow – Solid	DME reading is not allowable
	Arrow - Hollow	DME distance
	'end cap'	Altitude change ('dinner plates') Can START to climb at end cap, unless marked as MCA

Change Over points for VOR Frequency

A. Bend in the airway (d'uh)
B. "Z" (swastika)
C. Half way distance

IFR Course Notes – Enroute Charts



MEA Minimum Enroute Altitude

- Won't hit anything ← The only element of MOCA
- Still getting VOR contact ← The only element of MRA

*** MOCA** Minimum Obstruction Clearance Altitude (asterisk on Charts)

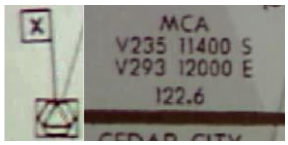
- Won't hit anything.
- Nav signal only within 22nm of VOR
- 1,000 clearance. 2,000 over mountains

OROCA Off Route Obstacle Clearance Altitude

- "Won't hit anything" means that you will pass at least 1,000' above anything +/- 4 nm of the airway centerline. 2,000' in 'mountainous terrain'

MEF VFR equivalent of OROCA, but does not include the 1,000' (2,000') safety margin

	Obst Clr	Nav Radio
MEA	√	√
MOCA	√	
MRA		√



[X] MCA Minimum Crossing Altitude

- Normally you change altitude after you cross the checkpoint.
  - Unless: (see inset at right)

[R] MRA Minimum Reception Altitude

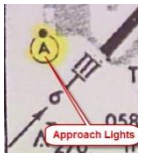
- As the name implies, how low to still get VOR signals from a "intersecting" VOR.
- E.g., where the Fix/Intersection itself is a radial from a 3rd (off course) VOR.

MAA Maximum Authorized Altitude

- See T-Route example below. As name implies, stay below because either
  - You will get conflicting NavAid signals
  - They want to keep you below Class Bravo/Charlie airspace

MVA Minimum Vectoring Altitude – presumably how high you must be for radar to see you..

Lighting: L = 24 hrs. (L) = PCL



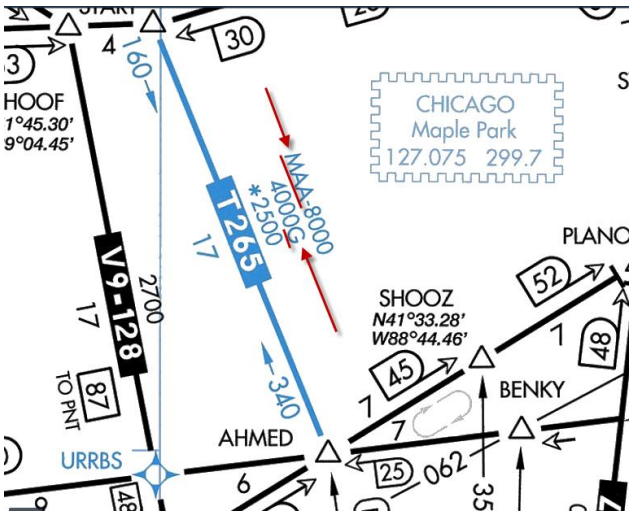
VORs

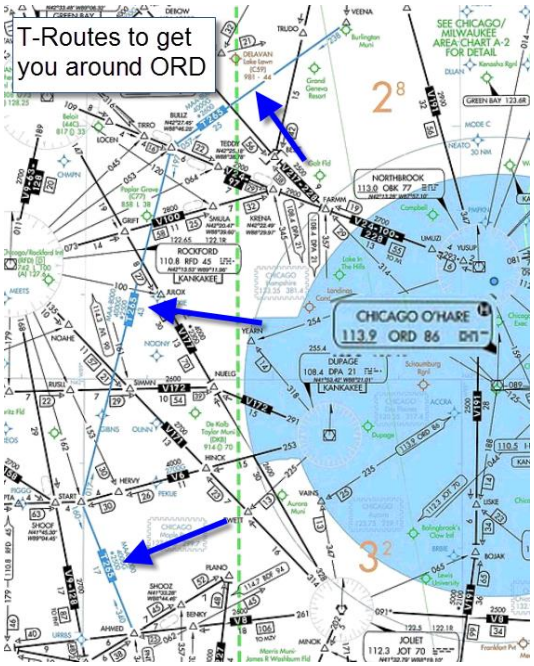
- HIGH 100/200nm maximum distance
- Low 40 / 80 nm max distance
- Terminal

The standard service volume (SSV) defines the reception limits of NAVAIDs used for navigation off established airways. Below 18,000 feet the SSV for "L" class VORs is 40 NM, therefore for IFR operations off established airways below 18,000 feet MSL use navigational aids not more than 80 NM apart (40 NM for each NAVAID). Note: The service volume for "H" class VORs increases to 100 NM between 14,500 feet and 17,999 feet, so the maximum off airway distance between two class "H" VORs within those altitudes is 200 NM

IFR Course Notes – Enroute Charts

T-Routes are RNAV IFR Termainal Transition Routes that help pilots avoid detours in busy areas





Cold Weather Altimeter anomaly

(see fuller notes in my Ground School Doc) An icon will be incrementally added to airport approach plates, beginning Mar 5, 2015. The icon indicates a cold temperature altitude correction will be required on an approach when the reported temperature is, "at or below" the temperature specified for that airport. The one exception to this procedure is Chicago Midway Intl (KMDW). Only operations to 22L and 22R will be affected. Altitude corrections will not be required on any approach to any other landing runway at KMDW.

ASR = Airport Surveillance Radar

PAR is Precision Approach Radar

Henry, as a follow up to our discussion today about errors in the altimeter, here is the official ICAO Cold Temperature Error Table. Keep in mind that the error decreases to zero when you land at the airport that provided the altimeter setting. This error is for pilot consideration and possible correction if temp is way below standard. This correction is never made while at cruise, but only a possible correction while on an approach.

Height Above Airport in Feet **Reference: AIM 7-2-3**

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

EXAMPLE-

Temperature-10 degrees Celsius, and the aircraft altitude is 1,000 feet above the airport elevation. The chart shows that the reported current altimeter setting may place the aircraft as much as 100 feet below the altitude indicated by the altimeter.

This is another reason you need an extra 1,000' when flying over mountains (e.g., 2,000 v 1,000): As you ascend from your last accurate Hg reading, you may be 10% lower than your altimeter is telling you. *E. Allan Englehardt* Cell: 847-732-1785

Required Obstacle Clearance (ROC) used on procedure segment altitudes.

As a result of the analysis, Cold Temperature Restricted Airports have been designated in the NAS. The list of airports, the segment(s) of the approach requiring cold temperature altitude correction and associated operating procedures may be found at www.faa.gov/air_traffic/publications/notices NTAP, Part 4. Graphic Notices, Section 1. General - Cold Temperature Restricted Airports.

The list of affected airports is also available as a PDF on the bottom of the FAA Digital Products, **"Terminal Procedures Search Results" page**.

IFR Course Notes – Enroute Charts

Flight Service / Flight Service Station, and Flight Watch

FSS is the 'physical' frequency for Flight Service. Flight Service includes:

- Flight Plan (file/close)
- Preflight weather briefing
- NOTAMS
- IFR Clearances

Flight watch (officially ' Enroute Flight Advisory Service' or EFAS)

- En route weather updates
- PiReps

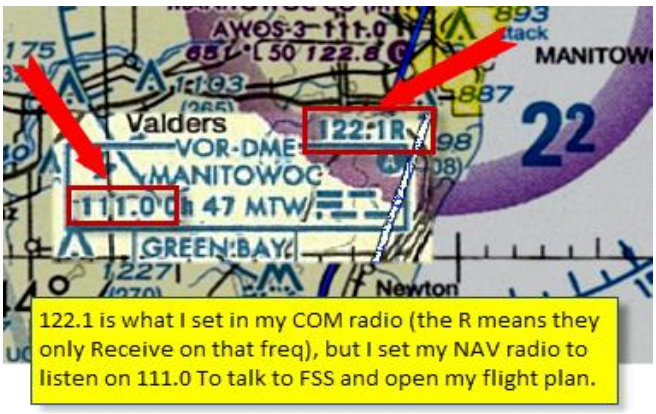
Flight Watch is available on a single common frequency, **122.0 MHz.** Flight Watch may be unavailable below 5,000 feet AGL, depending on terrain and the distance from the nearest station FW is available from 6am-10pm and above 5000 ft. If you can't hear them, see if you need to climb a bit.

Flight FOLLOWING is completely different. It is you getting put on the ATC screen, almost as if you were IFR (but only for traffic advisories)

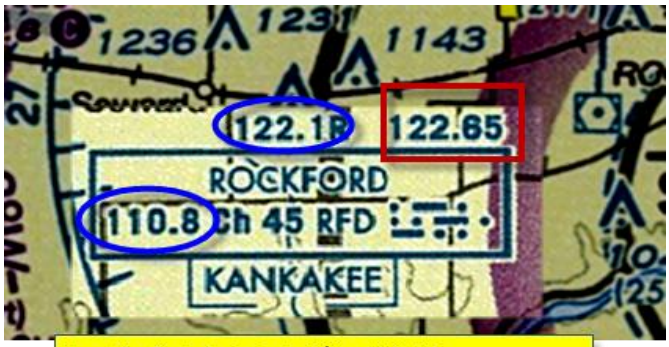
Think of flight watch as a dept. w/i the flight service station. You can contact FW for in flight wx updates and to give them pilot reports. Look at the back inside cover of the a/fd for the frequency and you'll also see how the sectors are configured. When calling them, you address them according to the hub/station that is nearest to you. FW is available from 6am-10pm and above 5000 ft. If you can't hear them, see if you need to climb a bit.

VORs and FSS

Some VORs allow you to talk to a FSS on frequencies transmitted through the same antennas. This is how you open your



122.1 is what I set in my COM radio (the R means they only Receive on that freq), but I set my NAV radio to listen on 111.0 To talk to FSS and open my flight plan.



Here the first choice is to T/R on 122.65

But could Transmit on 122.1 and Listen on Nav 110.8

Flight Plan when in the air.

See the words "Green Bay" under the box? That's who you are talking to. So you might say "**Green Bay Radio, N78HF would like to open our Flight Plan**"

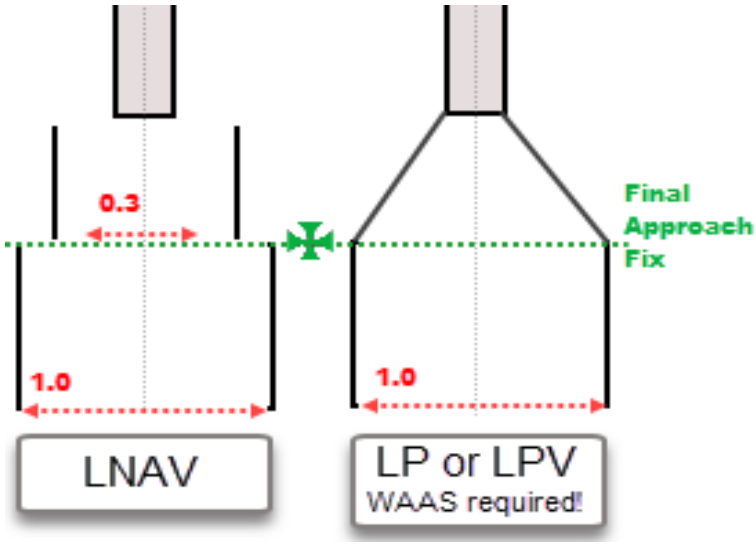
When you have to use the vor to listen, don't forget to turn the nav volume up. We always have the comm volume up but many forget that the nav has it's own vol. knob.

IFR Course Notes – Approaches/Overview

Overview of Approaches…

	V/Loc (Ground Based)	GPS (Satellite Based)
Non-Precision MDA ~400-500' AGL No official Vertical Guidance	**VOR**	
	Localizer only	**LP** (+v) *Localizer Precision*
	BackCourse	**LNAV** (+v)
	LDA *(ILS but at angle)*	(**+v** is *advisory* GS offered by the GPS)
	SDF *(wider, offset)*	So LP is a higher resolution version of LNAV
Precision DH ~200-300' AGL	**ILS** *(Localizer + GS)*	**LPV*** *Localizer Peform w/ Vert*
		LNAV/VNAV * *Lateral Navigation*
Minimums:	**Ceiling** minima are a function of **Vertical** guidance; **Visibility** minima are a function of runway **lighting**.	
	Localizer is approx. 5 deg wide	
	LPV approaches are only available on **WAAS**-enabled GPSs	
	Vertical Navigation (**VNAV**) uses a glideslope based on **WAAS**, or a barometric pressure interface (Baro-VNAV). Minimums are published as a DA.	
	(*****) For minimums at an ALTERNATE airport on an IFR Flight Plan, all GPS approaches are considered NON-Precision; only an ILS is considered a Precision Approach for this purpose. (i.e., 800' ceilings instead of 600; 2 sm visibility in either case)	
	+V : Some units like the Garmin 530/W will offer a linear descent GS 'as a courtesy'. Use at your own risk, as it is still a NON-Precision approach.	

LP & LPV approaches take advantage of the extra WAAS accuracy to provide an approach very similar to a **Category I ILS**. The design of an LPV approach incorporates angular guidance with increasing sensitivity as an aircraft gets closer to the runway. Sensitivities are nearly identical to an ILS at similar distances.
When using a non-WAAS GPS as the primary means of IFR navigation you are required to also have a non-GPS navigation system appropriate to the route flown.



Garmin displays "LNAV/VNAV" as "L/NAV" on the screen.

As of July 2011, there were twice as many WAAS approaches as ILS approaches. As of 2016, there are over 3000 LP and LPV approaches

Sometimes, the same Fix will be the IAF and the FAF. Due to naming convention, the FAF might not be labeled as such on the Plan view, though the IAFs and IFs are usually labeled as such.

IFR Course Notes – Approaches/Overview

The GNS 530W will select one of these 5 approach modes (+ Low Alt) to display in the lower left where just "APPR" appears on a non-WAAS unit:

1. LP
2. LP + V *(Vertical is Advisory)*
3. LNAV
4. LNAV**+V** *(Vertical is Advisory)*
5. LPV
6. L/VNAV ← FAA 'full name' is LNAV/VNAV but that doesn't fit in the GNS window ☺

- Low Alt

Table from the Garmin PDF Users manual→
Does not include the ~2012 LP, though such *is* part of my GNS530W

Annunciation	Description
ENR	En route, CDI full-scale deflection is 2.0 NM or current CDI scale selection, whichever is smaller.
TERM	Terminal, CDI full-scale deflection is 1.0 NM or current CDI scale selection, whichever is smaller.
(APPR)	APPRoach mode is for Non-WAAS units. For /W, you will switch to one of the 5 specific Approaches at right
LPV	Lateral Precision with Vertical guidance (LPV) approach. Fly to LPV minimums. A yellow background indicates that the approach is safe to continue but a downgrade to LNAV may occur.
L/VNAV	Lateral Navigation and Vertical Navigation (LNAV/VNAV) approach. Fly to LNAV/VNAV minimums.
LNAV+V	Lateral Navigation (LNAV) approach with Advisory Vertical guidance. Fly to LNAV minimums.
LNAV	Lateral Navigation approach. Fly to LNAV minimums.
LOW ALT (lower window)	For LNAV+V, LNAV/VNAV, or LPV approaches, the LOW ALT annunciation indicates the aircraft's estimated height is lower than the Final Approach Waypoint height by more than the current VPL plus 50 meters. This annunciation will not be active when TAWS is operating on units equipped with TAWS.
DPRT	Departure, indicates the system is using non-precision approach integrity. HAL = 0.3 and CDI full-scale deflection is 0.3 NM
MAPR	Missed Approach, indicates the system is providing missed approach integrity and CDI full-scale deflection ±0.3 NM. This also shows that the pilot has initiated a Missed Approach by pressing the **OBS** key after crossing the MAP.

12/2015 Tech Support: The GNS 530W with main software version 3.30 and higher has included LP approaches. The GNS 530W with main software version 5.10 and higher has included LP + V approaches. Your GNS main software can be seen during power on at the bottom of the page or in the AUX page group under the UTILITY page and SOFTWARE VERSIONS.

The AIM uses the exact same text to describe the meaning of B in the ICAO Equipment field as does the App. The following is from the Pilot Controller Glossary:

LPV− A type of approach with vertical guidance (APV) based on WAAS, published on RNAV (GPS) approach charts. This procedure takes advantage of the precise lateral guidance available from WAAS. The minima is published as a decision altitude (DA).

APPROACH WITH VERTICAL GUIDANCE (APV)– A term used to describe RNAV approach procedures that provide lateral and vertical guidance but do not meet the requirements to be considered a precision approach.

SBAS is also found in the AIM, but you have to look harder. It is described in 1-1-18 Wide Area Augmentation System (WAAS)

a. General.

2. The International Civil Aviation Organization (ICAO) has defined Standards and Recommended Practices (SARPs) for satellite−based augmentation systems (SBAS) such as WAAS.

SBAS is the general term for any Space Based Augmentation system, WAAS is an example of one used in the US.

IFR Course Notes – Approaches/Overview

Fixes: ---------- ----------

Note: 3° is about 20:1; 1Nm=6,000'; 1Nm@3° = 300' AGL (Precision)
2 Nm@3° = 600' AGL (Non-Prec)
5 Nm@3° = 1,500' AGL (FAF)

IAF **Initial Approach Fix** **is** **~5 nm before FAF (10Nm from Rwy)**
So you have 2-3 minutes until you reach the FAF, at 120Kts

IAA **Initial Approach Altitude** only **~100-500' above FAF**
So ~2nm before the FAF the GS w/b ~200+ above your IAA
So fly at IAA and look to intercept the GS ~1-2 Nm before FAF☺
Between the IAF and the FAF is the 'Intermediate Segment', term for altitudes.

FAF **Final Approach Fix** **is ~ 5Nm from MAP,** and about **~1,700' AGL**
Begin ~ 500 fpm drop at this point *(Gear down at GS Intercept, will prompt 500 fpm drop)*
E.g, slightly above Pattern Altitude if VFR, but from MDA/DH

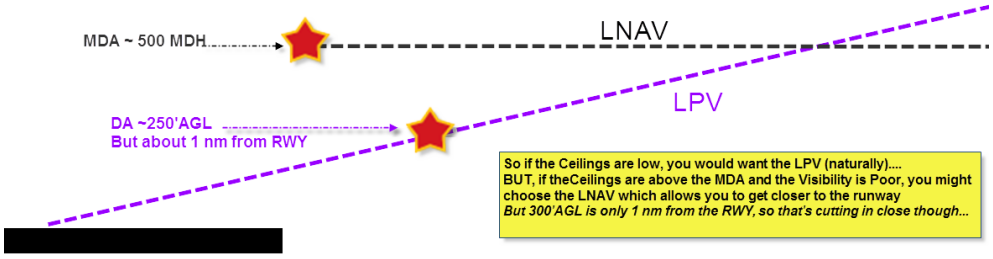
MDA/DH takes you down to about **Precision** (~1nm from Rwy): **~250'**
Non-Precision (~ 2nm from Rwy): **~500'**

Drop about 1,400 in 2-3 min = ~ 600 fpm drop

Barometric Aiding (Baro-Aiding)
Barometric aiding is an integrity augmentation that allows a GPS system to use a non-satellite input source (e.g. the aircraft static system) to provide vertical reference and reduces the number of required satellites from five to four. Baaiding requires four satellites and a barometric altimeter to detect an integrity anomaly. The current altimeter setting may need to be entered into the receive as described in the operating manual. Baro-aiding satisfies the RAIM requirementin lieu of a fifth satellite

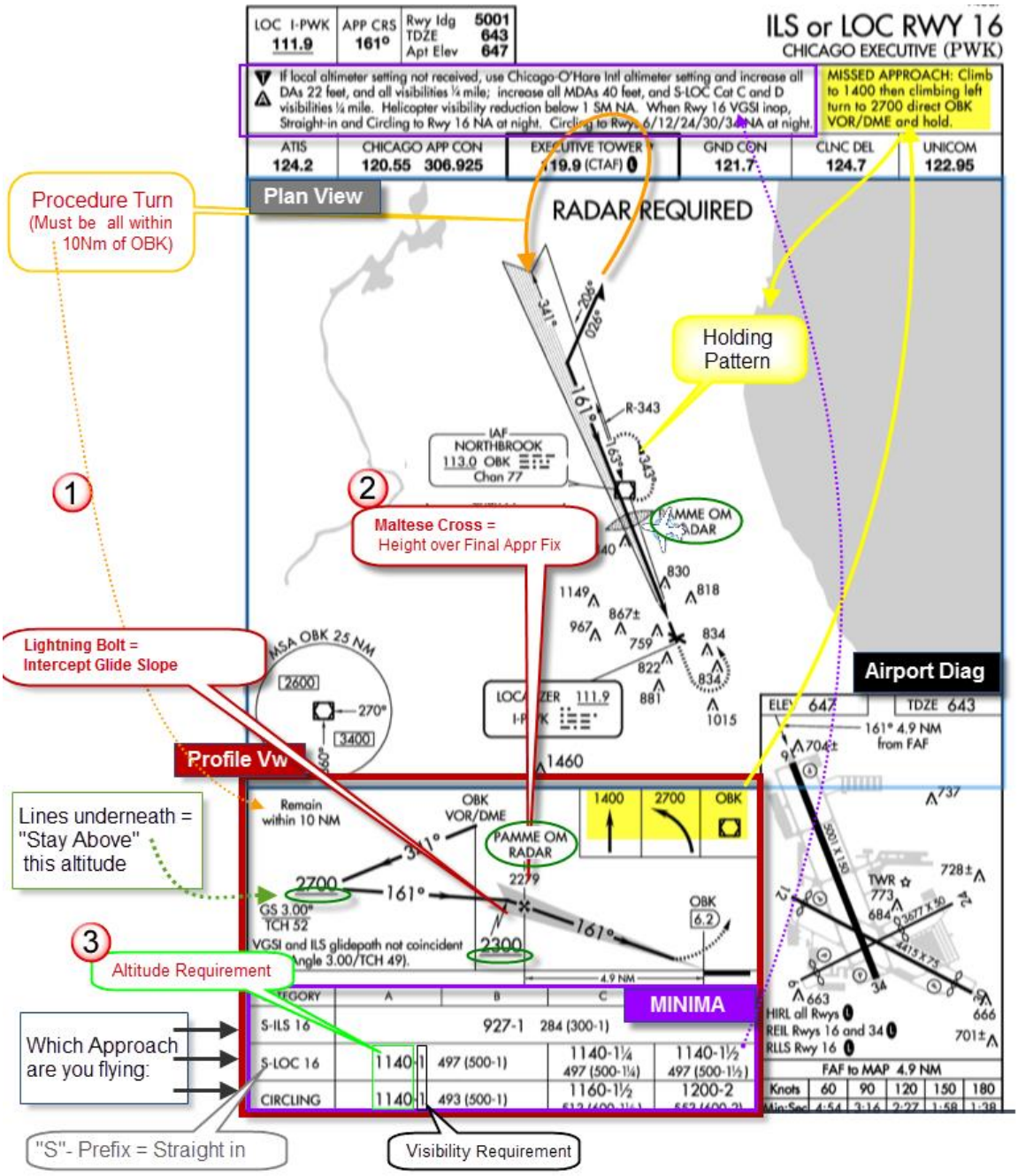
Barometric Vertical Navigation (Baro-VNAV)
Baro-VNAV is an RNAV system which uses barometric altitude information from the aircraft's altimeter to compute vertical guidance for the pilot. The specified vertical path is typically computed between two waypoints or an angle from a single way point. When using baro-VNAV guidance, the pilots should check for any temperature limitations which may result in approach restrictions.

<u>CDI Readout</u>: The CDI provide a TO indication and a left/right readout in relation to the DTK (Desired Track). The GPS CDI measures the Distance off course, unlike ht readout from a VOR, which measures DEGREES off course.



IFR Course Notes – Approaches/Plates:Overview

[APPROACH PLATES Overview]
There are basically 2 types of Approach Plates: ILS and RNAV (GPS)
Both are categorically identical, but differ in some details.



Frequencies:	VORS:	108.0	to	117.9	
	LOC	108.1	to	111.9	(and odd number decimal)

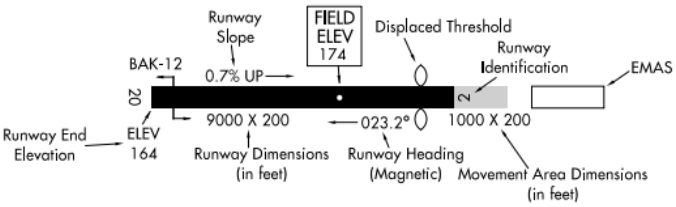
[Airport Diagram]

REFERENCE FEATURES

Buildings..... ■
Tanks..... ●
Obstructions..... Λ
Airport Beacon #..... ☆
Runway
Radar Reflectors..... ⧗
Hot Spot ..... ○
Control Tower #.....TWR ■

When Control Tower and Rotating Beacon are co-located, Beacon symbol will be used and further identified as TWR.

Runway length depicted is the physical length of the runway (end-to-end, including displaced thresholds if any) but excluding areas designated as stopways.



Lights:

HIRL/MIRL **R**unway Edge Lights (**H**i **I**ntensity or **M**edium **I**ntensity). The white lights running down the entire length of the runway. The HIRL and MIRL systems have variable intensity controls, whereas the LIRLs normally have one intensity setting. Runway edge lights are white, except on instrument runways where yellow replaces white on the last 600 metres (2,000 ft) or half the runway length (whichever is less), to form a caution zone for landings.[1] The lights marking the ends of the runway emit red light toward the runway to indicate the end of runway to departing or arriving aircraft and emit green outward from the runway end to indicate the threshold to landing aircraft.

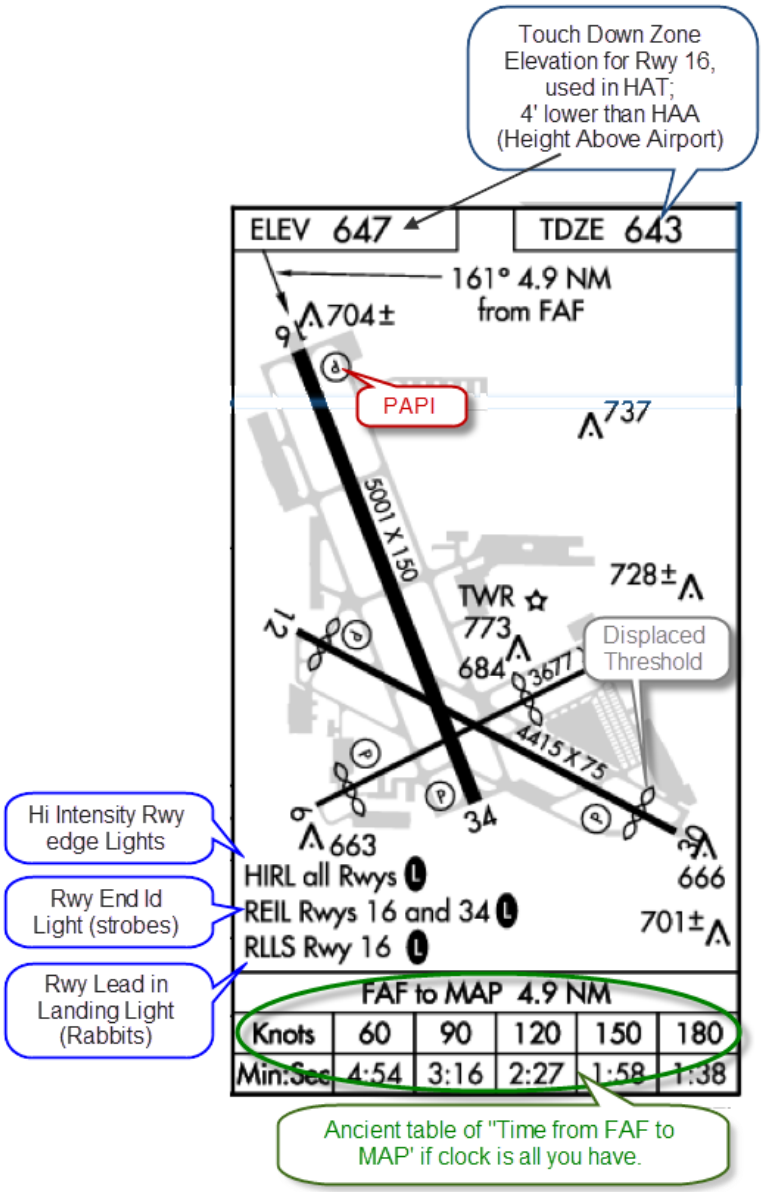
VASI 1 set of Red/White lights at the beginning of TD zone, another that the far edge of TD zone

PAPI 4 lights that go from Red to White depending on angle/height

REIL Runway End Identifier Lights – strobes on the approach edge of the runway

RAIL Runway Alignment Indicator Lights- Sequenced Flashing Lights which are installed only in combination with other light systems. ***"Rabbits"***

RLLS Runway Lead-in Light System- Consists of one or more series of flashing lights installed at or near ground level that provides positive visual guidance along an approach path, either curving or straight, where special problems exist with hazardous terrain, obstructions, or noise abatement procedures. ***Rabbits***



TDZ/CL Touch down zone, Centerline, Lights buried directly into the runway. E.g., at Rockford

MALSR* Medium intensity Approach Lighting System with Runway Alignment.

SSALS(R)* Simplified Short Light Approach Landing System (w/Rwy alignment indicators)

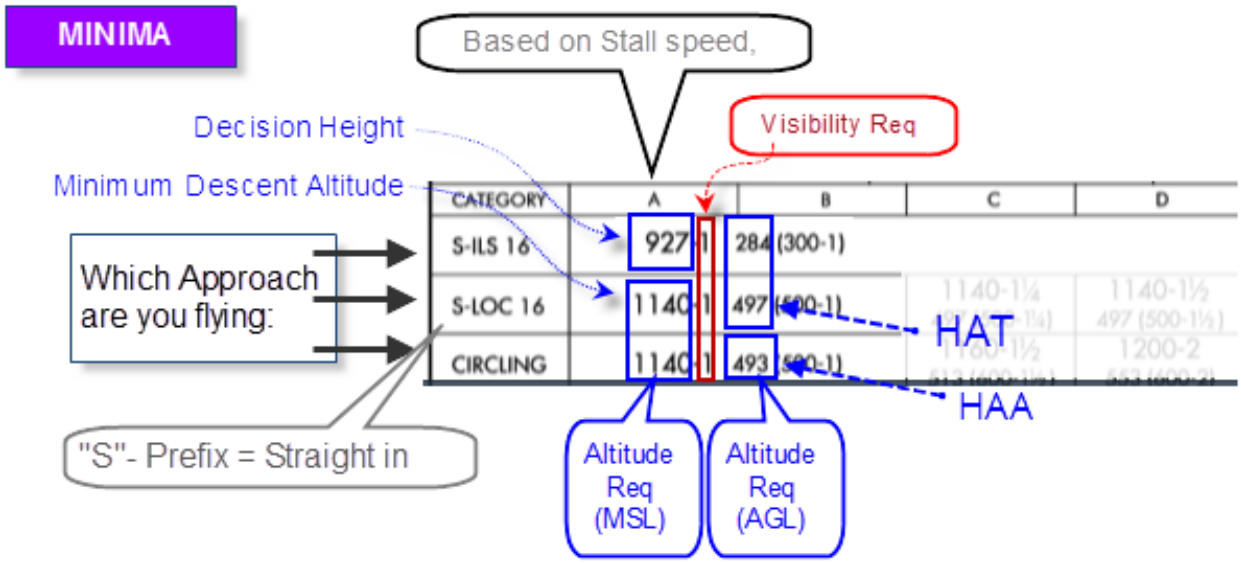
'*' = Requires extra visibility if INOP, but only for Non-Precision Approaches

RAIL are similar to sequenced flashing lights, except that they end where the white approach light bars begin. Sequenced flashing lights and RAIL do not extend past the Decision Bar to avoid distracting the pilot during the critical phase of transitioning from instrument to visual flight.[3]

Sequenced flashing lights are sometimes colloquially called *the rabbit* or *the running rabbit*

IFR Course Notes – Approaches/Plates:Minima

[Approach_Plates_Minima]



What are the numbers in parens? Military?

HAA = DH + Field Elevation (Circle to Land) HAT = DH + TDZE (specific Runway)

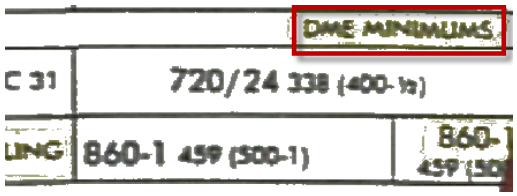
When Circling, the HAT is now called the Height Above Airport (HAA) because you may not touchdown, and technically each runway can have a few feet variance in field elevation.

Category is determined by : 1.3 x V_{so} , = 55 x 1.3 = 72Kts = A for me.

But that's a surrogate for your approach speed. If you find yourself doing 91+ kts for whatever reason, go up to Group B. **Bonanzas are Group B.**

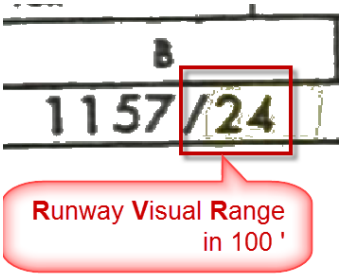
On a Glide Slope (ILS), your altitude is directly correlated with your distance from the airport. But on just a Localizer (no GS), you can descend to the DH as early as allowable and fly at that altitude as long as you want…But you can NOT go below that altitude.

Hence, an ILS is called a Decision Height because any longer delay/procrastinating results in lower altitude. On Glide Slope, you can being pull up at DA and drop a few feet below, but on MDA you may NOT ever drop below that altitude.



And w/o a GS, you may have an additional row of minimas if you have DME, and such is offered on the Chart

Runway Visual Range



RVR of 2400 is equivalent to a visibility of just under one half SM.

A statute mile if 5280 '; a Nm is 6072. Neither is an even multiple of 2400.

These are usually only at Cat II or Cat III airports (like Rockford) that have exceptional lighting, like CL/TDZE

IFR Course Notes – Approaches/Plates:Minima

INOPERATIVE COMPONENTS OR VISUAL AIDS TABLE

Landing minimums published on instrument approach procedure charts are based upon full operation of all componei and visual aids associated with the particular instrument 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 glide slope inoperative minimums are published on the instrument approach charts as localizer minimums. This table may be amended by notes on the approach chart. Such notes apply only to the particular approach category(ies) as stated. See legend page for description of components indicated below.

(1) ILS, MLS, PAR and RNAV (LPV line of minima)

Inoperative Component or Aid	Approach Category	Increase Visibility
ALSF 1 & 2, MALSR, & SSALR	ABCD	¼ mile

(2) ILS with visibility minimum of 1,800 RVR

ALSF 1 & 2, MALSR, & SSALR	ABCD	To 4000 RVR
TDZL RCLS	ABCD	To 2400 RVR
RVR	ABCD	To ½ mile

(3) VOR, VOR/DME, TACAN, LOC, LOC/DME, LDA, LDA/DME, SDF, SDF/DME, GPS, ASR and RNAV (LNAV/VNAV and LNAV line o

Inoperative Visual Aid	Approach Category	Increase Visibility
ALSF 1 & 2, MALSR, & SSALR	ABCD	½ mile
SSALS,MALS, & ODALS	ABC	¼ mile

General rules about visibility as a function of Approach/Lighting

	Visibility	**Lights**
No Approach Lights	1+ Mile visibility	
Localizer	3 / 4 to 1.0 sm	?
ILS	1 /2 24(00) RVR	
ILS Cat II	18 (00) RVR	CL & TDZ

"Must have Approach Lights to get under 1 sm visibility Minimums" Ask Al about the missing cells above!

Additional Minima may be (and usually are) on the top:

T A If local altimeter setting not received, use Chicago-O'Hare Intl altimeter setting and increase all DAs 22 feet, and all visibilities ¼ mile; increase all MDAs 40 feet, and S-LOC Cat C and D visibilities ¼ mile. Helicopter visibility reduction below 1 SM NA. When Rwy 16 VGSI inop, Straight-in and Circling to Rwy 16 NA at night. Night landing: Rwy 6, 12, 24, 30, 34 NA.

ATIS | CHICAGO APP CON | EXECUTIVE TOWER ★ | GND CON

The "T" and "A" are for Take off minimas (ATPs, not me) and Alternates noted elsewhere (see my section for Fuel and Alternates many pages below)

From the FAA (According to a QA website):
Decision altitude (DA) *is a specified altitude in an instrument approach procedure at which the pilot must decide whether to initiate an immediate missed approach if the pilot does not see the required visual reference, or to continue the approach.* ***Decision altitude is expressed in feet above mean sea level.***

Decision height (DH) *is a specified height above the ground in an instrument approach procedure at which the pilot must decide whether to initiate an immediate missed approach if the pilot does not see the required visual reference, or to continue the approach.* ***Decision height is expressed in feet above ground level.***

Minimum descent altitude (MDA) *is the lowest altitude specified in an instrument approach procedure,* ***expressed in feet above mean sea level****, to which descent is authorized on final approach or during circle-to-land maneuvering until the pilot sees the required visual references for the heliport or runway of intended landing.*

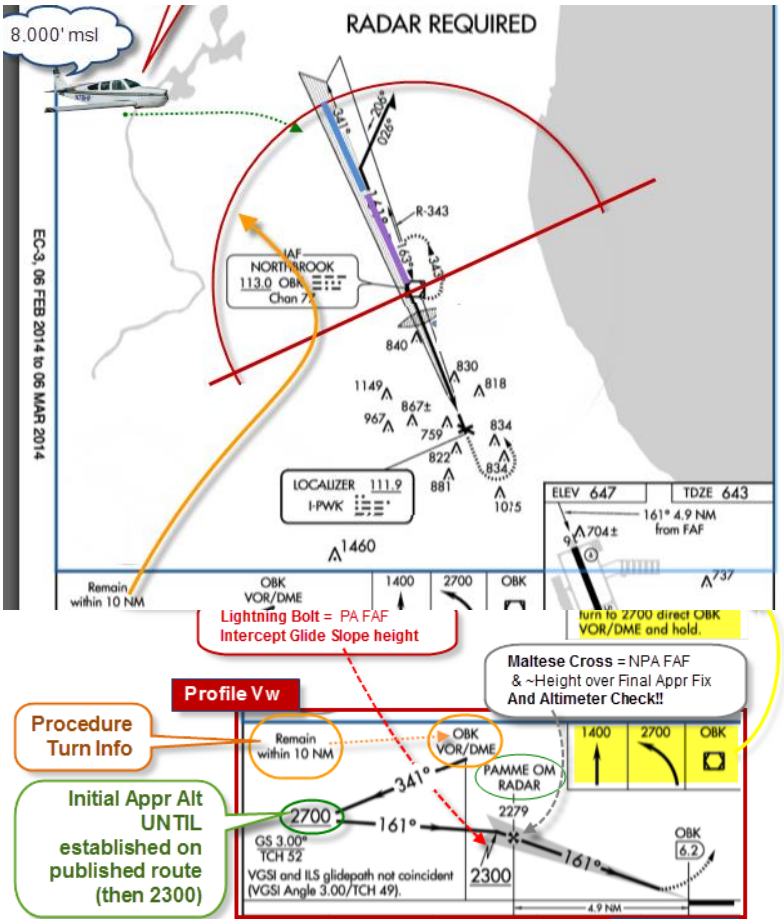
You will have 250' of obstruction clearance on Final segment

IFR Course Notes – Approaches/Plates:Profiles+Main

[Profiles, and Main Page]

The Main section is graphically very different between V/LOC and GPS

The **Maltese cross** is at an established INTersection The Maltese Cross indicates the FAF if this is being used w/o the Glide Slope (e.g., a Localizer approach) which is for the Non-Precision approach.
Lightning bolt is minimum altitude to intercept the glide slope and Final Approach Fix for the Precision, ILS approach. The Lightning Bolt will be at the nearest even number of 100 ft, just at or 'upstream' of the Maltese cross.



<u>By definition, the **FAF** for a precision approach is an ALTITUDE, not a landmark/INT per se</u>. Only if the INT happens to be at a distance that ***is*** an even # of 100' at 3 degrees will the 2 FAF be coincident

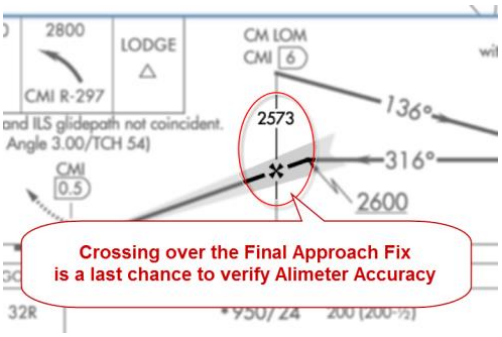
NOTE: for the PRECISION Approaches, it is a 'slope' as shown. But for NON-Precision (Localizer, LNAV, GPS), you can dive down to MDA past the FAA and fly level at the MDA until the MAP!

<u>By definition the **MAP** on</u>

a **Precision Approach** is your DA: your vertical + horizontal movement are joined (at 3 deg). Once you descend to the DA, you are by definition to close (low-near) the airport to continue unless you have the runway environment in sight

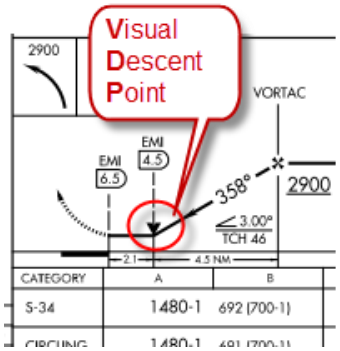
a **Non-Precision** Approach is the approach end of the runway. You have already dropped down to the MDA a while ago, and are flying along level/horizontally at MDA.

You will have 250' of obstruction clearance on Final segment



Visual Descent Point:

The VDP is the distance where the 3 degree glide slope intercepts the MDA.
So if you descend beyond the VDP, you will be at a steeper than 3 degree angle, which is 'risky'



Missed approach points come in all sizes and colors. They are not only based on distance to the runway but in some cases the ability to meet what is known as second segment climb. If there are obstructions in the climb path the descent minimums may be higher. They want you to be able to miss the approach and miss the obstructions too.

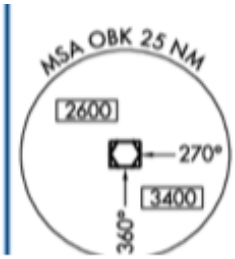
The necessary visual references for the intended runway must be distinctly visible and identifiable to the pilot and includes FAR 91.175:

1. Approach lighting system with the red terminating bars or the red side row bars (the approach lighting system alone will only allow the pilot to descend up to 100 feet above the touchdown zone elevation)
2. Threshold
3. Threshold markings
4. Threshold lights
5. Runway end identifier lights
6. Visual approach slope indicator
7. Touchdown zone or touchdown zone markings
8. Touchdown zone lights
9. Runway or runway markings
10. Runway lights.

You can descend to the Intermediate Leg Altitude the moment you finish your PT/Course Reversal
This is the Lightning bolt/ maltase cross – see ILS Plate for full explanation!

TCH (not always shown) is Threshold Crossing Height. Not sure why we need this… (cf KSUE RNAV 20)

An MSA provides only 1000 feet of terrain clearance, no comm or nav reception is guaranteed.
It is to be used only for emergencies



MSAs are published for V/LOC as well as GPS approaches
Do not confuse MSAs with TAA (Terminal Arrival Areas) on GPS approaches that are 'published section' (ergo, approved descent) of Approach Plates

IFR Course Notes – Appr/Plates:Profiles-ILS & Localizer

[Approach_Plates_Profiles_ILSlocalizer]

As you come in (say from the NW at 8,000')

The Northbrook VOR (OBK) is our reference point.

Once you intercept the Localizer, then you are on a 'published section' and the altitudes printed apply to you. E.g., you may now descend to 2700' (per lower left corner of Profile view), so long as you remain within 10nm of OBK if you need to do the Procedure Turn (e.g., the 'barb').

If/once you are established Inbound, you are now on the INTERMEDIATE segment of the Approach, and you may descend to 2,300' (within 10nm of OBK)

From AI:
2,700 only applies to someone doing the procedure turn,
2,300 is the altitude for the intermediate segment which begins following a procedure turn.
The PT is limited to to 10NM.
Therefore, **2,300 applies to aircraft inbound on the localizer and within 10nm of OBK (or the OM).**

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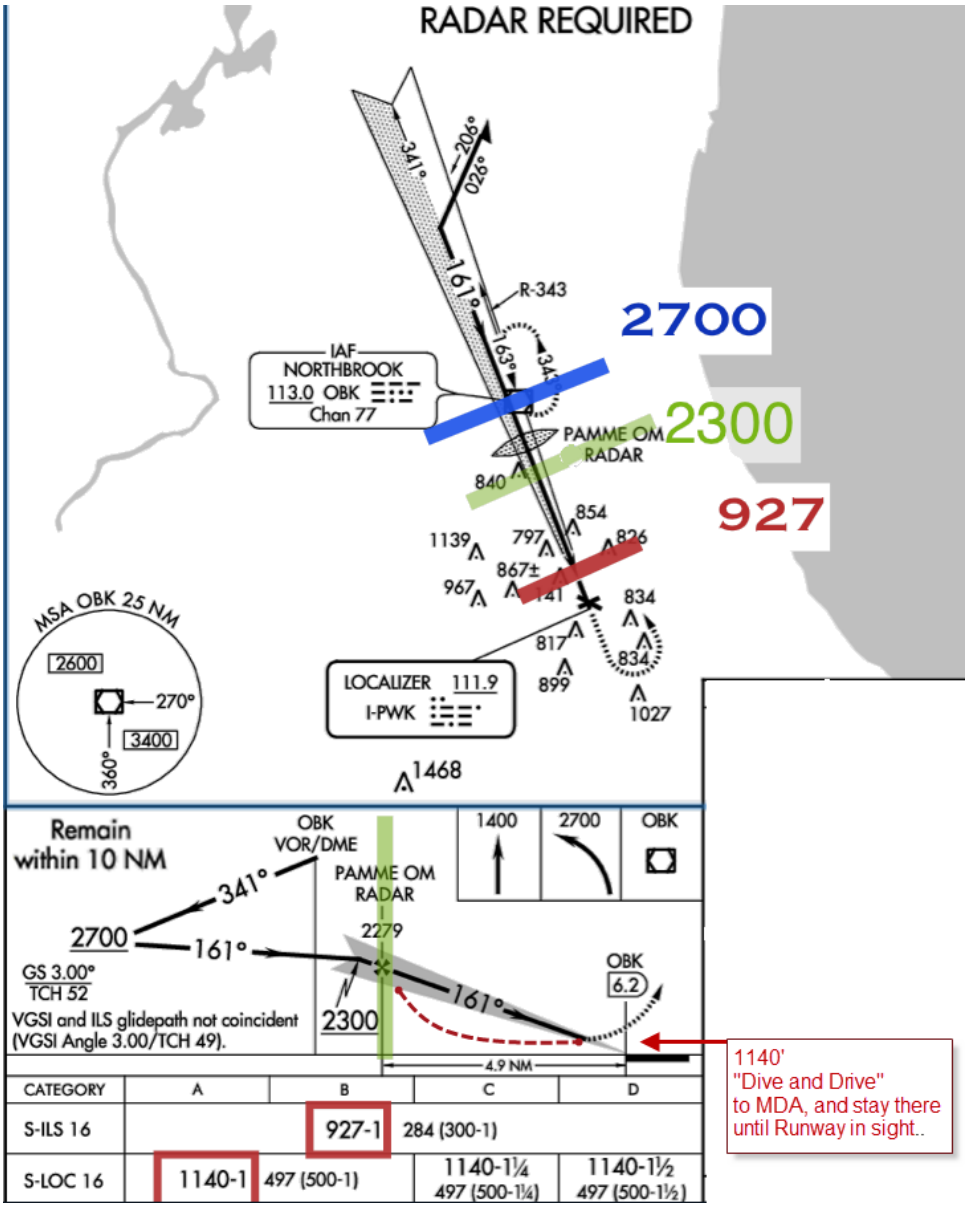


IFR Course Notes – Appr/Plates:Profiles-ILS & Localizer

5 parts to an ILS: Localizer, Glide Slope, Outer Marker, Middle Marker and LIGHTS! (usually do NOT get Inner Marker on ILS

CDI Deflection (full scale):
LOCalizer: 2.5 degrees
VOR: 10 degrees
GPS) 0.3 nm t

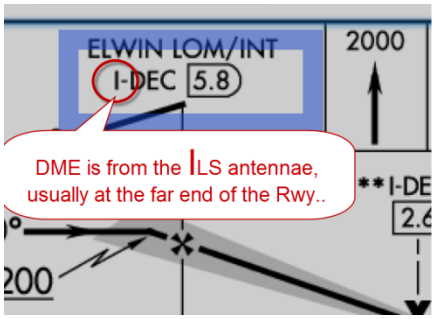
Localizer is only 2.5 degrees wide, on either side of the centerline (5 deg total)

Markers

- Outer BLUE light ~5 miles dash dash
  Outer Compass Locater Beacon (OCLM), or Outer Compass Marker (OCM) or Locater Outer Marker (LOM)

- Middle Amber/Yellow ~0.5 mi dot dash (missed approach pt)
  Usually about 200' AGL
- Inner White runway end (rare) dot dot

You do get IM on Cat 2 and Cat3, but on Cat 2+3, you also get CL (CenterLine lights) and TDZE (Touch Down Zone) lights built into the runway..



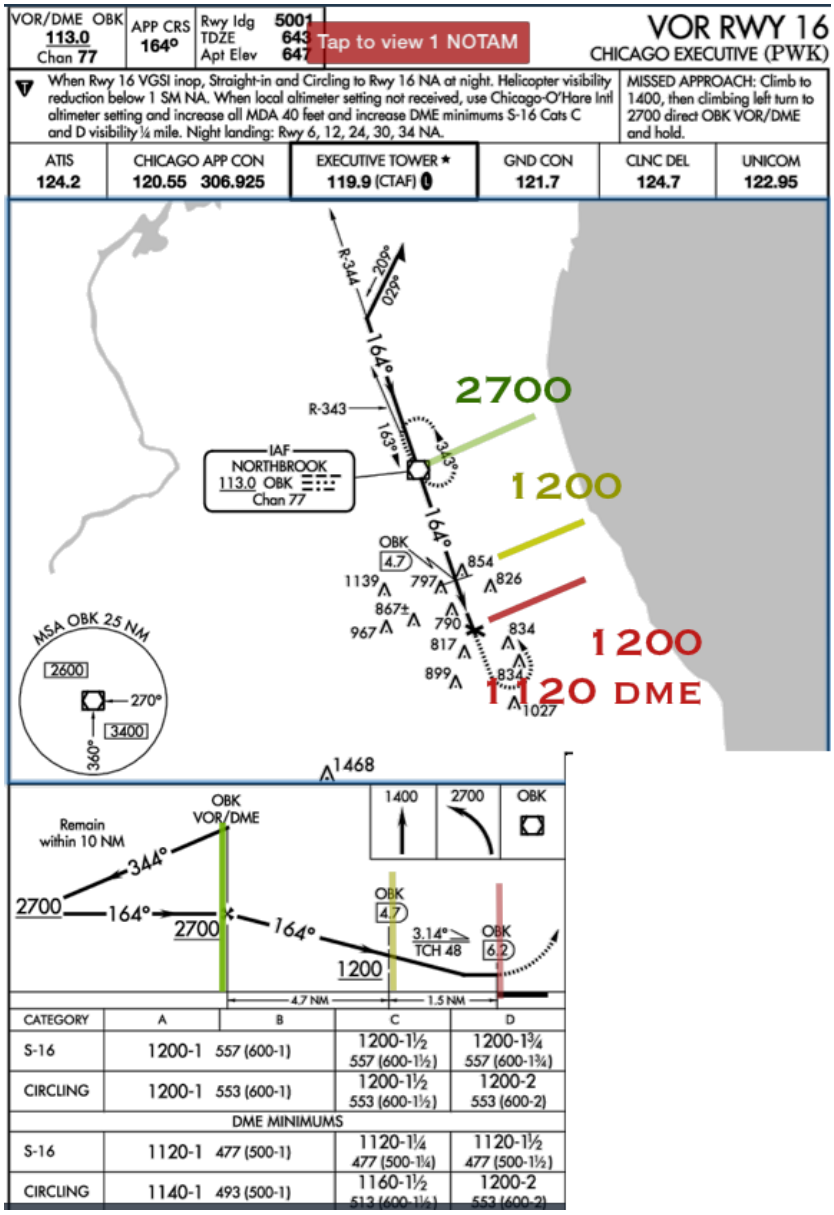
IFR Course Notes – Appr/Plates:Profiles-VOR

[Approaches_Plates_Profile_VOR]

CDI Deflection (full scale):
LOCalizer: 2.5 degrees
VOR: 10 degrees
GPS) 0.3 nm t

VOR Full needle deflection: +/- 10° of centerline (20° total)

"A VOR-A, or –B, It means this approach procedure (VOR-A) is a circling only approach; there will be no straight-in landing minimums published because:
1. The final approach course alignment with the runway exceeds 30 degrees, and or2. The descent gradient is > 400'/nm from the FAF to the TCH.

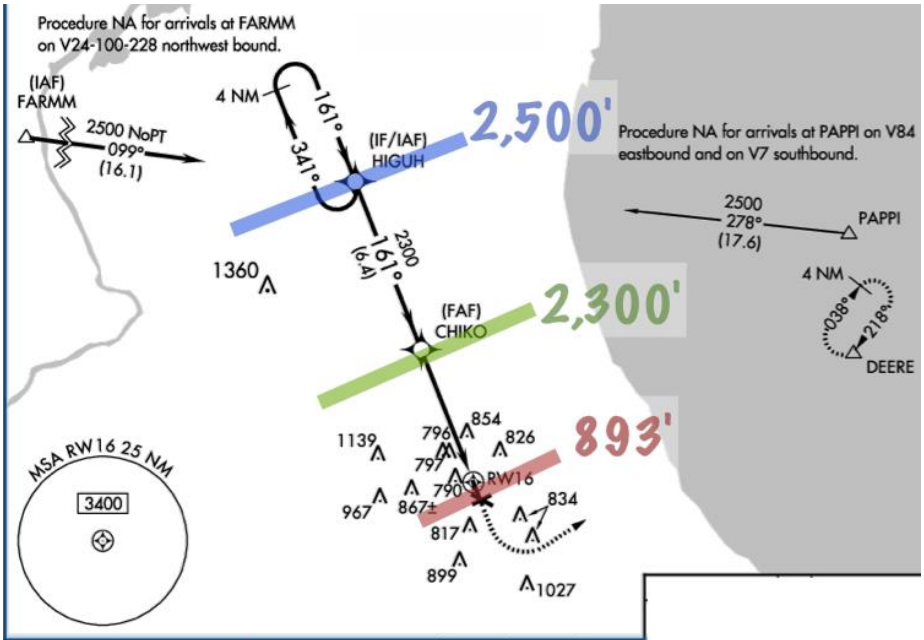


IFR Course Notes – Appr/Plates:Profiles - LPV &LNAV

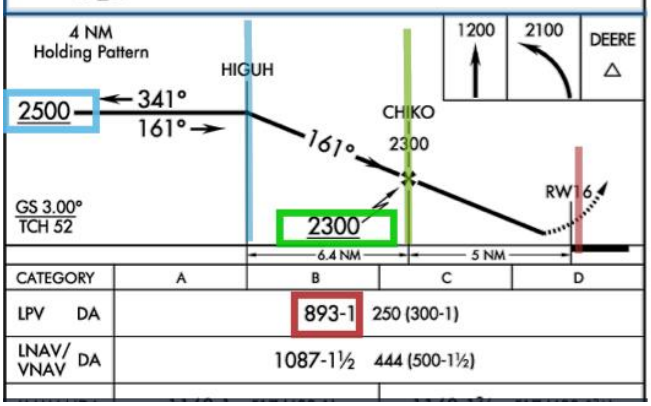
[Approaches_Plates_Profile_LPVlnav]

RNAV approaches are sooo much cleaner/easier to read!

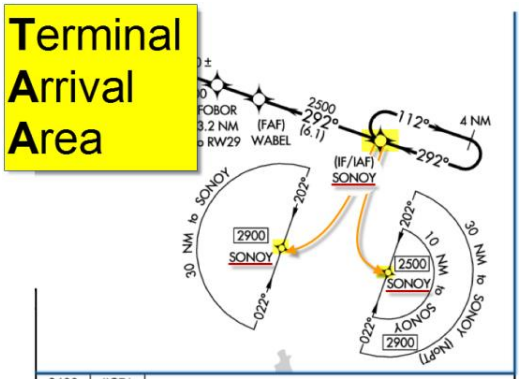
CDI Deflection (full scale):
LOCalizer: 2.5 degrees
VOR: 10 degrees
GPS) 0.3 nm t

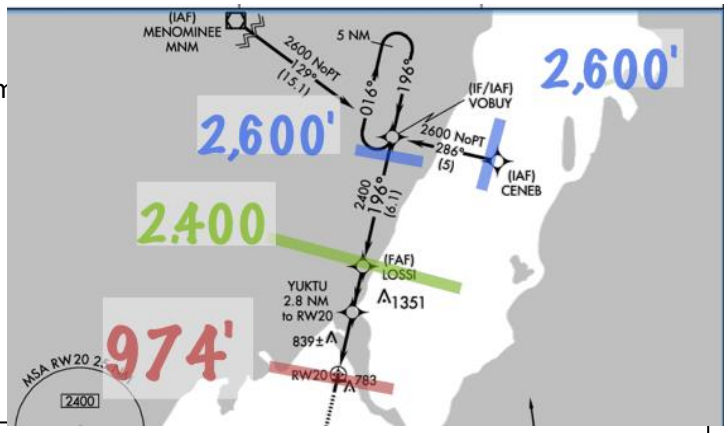


Terminal Arrival Area (TAA). UNLIKE a MSA (which provides MOC, but not Com or Nav reception, and only to be used for an emergency) , a TAA is around certain GPS approaches **<u>and is considered a published segment of the Approach</u>**. If you are cleared to an IAF on the approach and are in the protected airspace of the TAA you may leave your last assigned altitude and descend to the altitude shown in the TAA.



This is a way for ATC to transition you from the enroute environm
keyed around one of the arrival points that begin an RNAV (GPS)





Many GPS approaches have a 'T' entry method to avoid any Procedure Turn Course Reversals

Does a GPS require a 'backup'

- **Non-WAAS:** When using a GPS as the primary means of navigation under IFR, pilots are required to have a secondary, non-GPS navigation system appropriate to the route being flown
- **WAAS:** No**.**

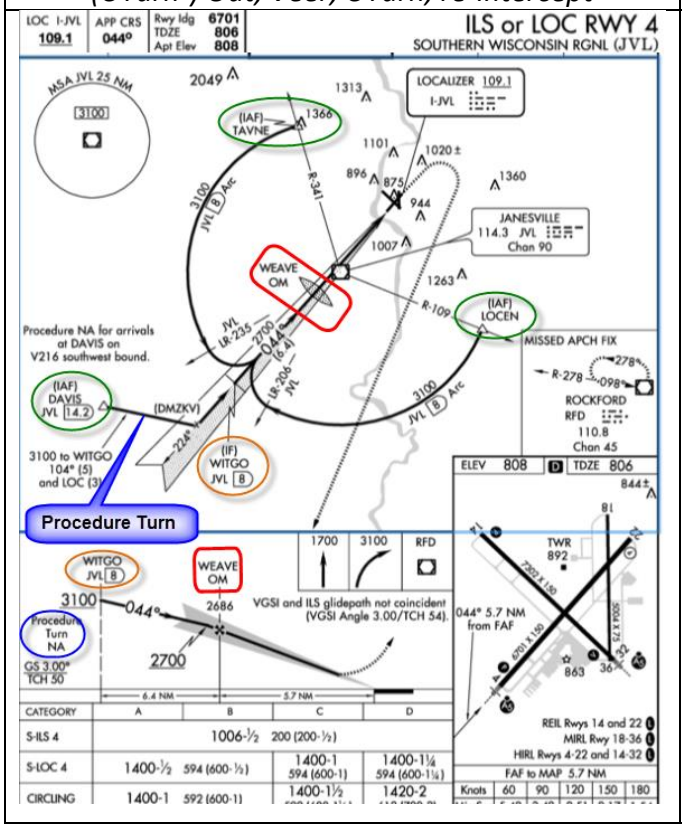
IFR Course Notes Approaches/Beginning the Approach

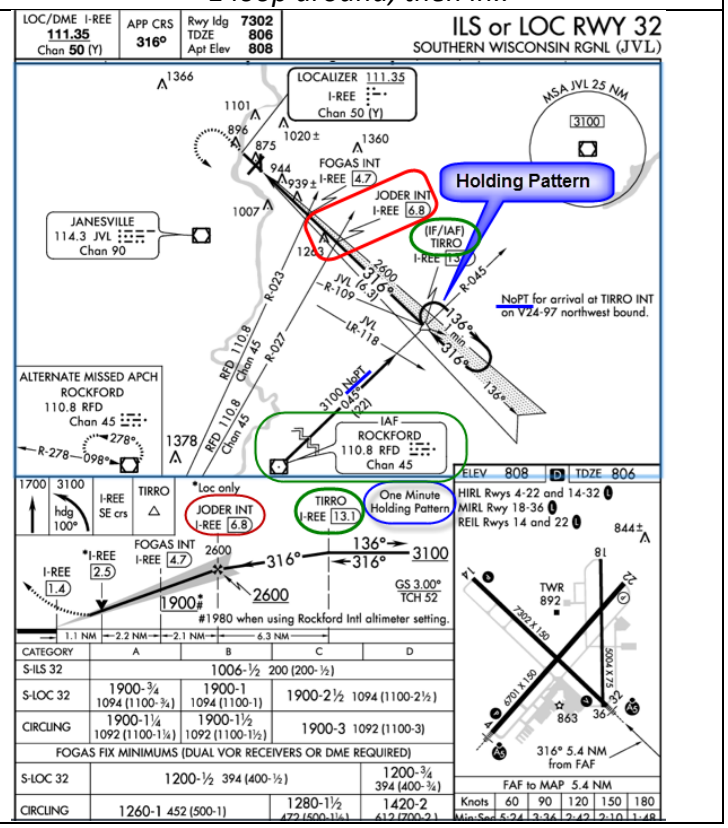
[Beginning The Approach]

There are 2 or 3 categorically different ways to get to the FAF (Final Approach Fix):

- **A) You are vectored to the FAF by ATC**
- **B) You are following a DME Arc** (no Course Reversal required)
- **C)** You execute a **"Course Reversal"** via one of ~~3~~ 2 methods to line up with the Localizer *(note that "Procedure Turn" is also (sadly) used in lieu of "Course Reversal" to describe all 3)*:
  1. **a "Procedure Turn"**
  2. **a "Holding Pattern"** (race track oval, sometimes called a 'holding pattern procedure turn')
  3. ~~**a "Teardrop**~~" (apparently, no longer used/found)

Radar Vectors:	**Sent to Intercept localizer upstream of FAF**
Or :	**Course Reversal** .
Procedure Turn *(UTurn-) Out, Veer, UTurn, re-intercept*	**Holding Pattern** *1 loop around, then in..*





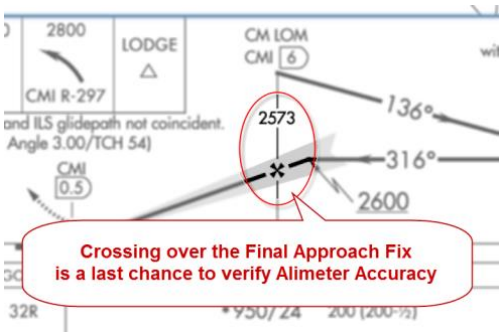
Note Well: Everyone including the FAA is loose with the term Procedure Turn, using it when they should more properly use the term "Course Reversal" which is the categorical term for those 3 maneuvers. "No PT" meaning No Procedure Turn is used to mean no 1) Procedure Turn, 2) Holding Pattern, or 3) Teardrop; the correct usage w/b "No Course Reversal". Furthermore, "Holding Patterns" (#2) above will be called "Holding Pattern Procedure Turns" (not Holding Pattern Course Reversals). So what would they call the 'barbed' Procedure turn when they mean to refer to that form of Course reversal only, in specific exclusion of Holding Pattern or Teardrop? ??

IFR Course Notes Approaches/Beginning the Approach

If coming from upwind, consider a 'Circling Approach' to a runway if the Wx is good (e.g., 1500 agl and 3nm Visibility), as that saves you from overflying the field by a long ways to line up for the nice long instrument approach from the other (upwind) direction.

When **Cleared for the Approach**: You maintain your altitude until established on a segment of a published Segment of an Instrument approach procedure. "**Cleared for AN Approach**" (usually only in non-radar areas, e.g., Rhinelander WI) gives *you* carte blanche to select and fly the approach of my choice.

A Published ROUTE means like an Airway, which has an MEA



No Gyro Approach: ATC will tell you when to turn. SRT until final, ½ SRT on final

Timed Approaches from a Holding Fix: Time specified is the time you pass over the holding point, heading into the airport..

You can descend to the Intermediate Leg Altitude the moment you finish your PT/CourseReversal

GPS approaches used for IFR must be loaded from the menu, you cannot just load the waypoints in yourself individually, even though such would presumably end up with the same result.

Please read below from the AIM: 5-4-21

5-4-21. Missed Approach

You may want to cancel IFR while in good Wx while you still have radio communications…

5-4-23. Visual Approach

a. A visual approach is conducted on an IFR flight plan and authorizes a pilot to proceed visually and clear of clouds to the airport. The pilot must have the **airport or the preceding identified aircraft in sight**. This approach must be authorized and controlled by the appropriate air traffic control facility. Reported weather at the airport must have a ceiling at or above **1,000 feet and visibility 3 miles** or greater. ATC may authorize this type approach when it will be operationally beneficial. Visual approaches are an IFR procedure conducted under IFR in visual meteorological conditions. Cloud clearance requirements of 14 CFR Section 91.155 are not applicable, unless required by operation specifications. See also the appendix
The Pilot does NOT request this, ATC initiates; but Pilot can decline
This is kind of like a VFR landing, but still under IFR. Does NOT cancel your IFR Flight Plan. You must cancel if landing at a non-towered airport

c. Operating to an Airport With an Operating Control Tower. Aircraft may be authorized to conduct a visual approach to one runway while other aircraft are conducting IFR or VFR approaches to another parallel, intersecting, or converging runway. When operating to airports with parallel runways separated by less than 2,500 feet, the succeeding aircraft must report sighting the preceding aircraft unless standard separation is being provided by ATC.

d. Separation Responsibilities. If the pilot has the airport in sight but cannot see the aircraft to be followed, ATC may clear the aircraft for a visual approach; however, ATC retains both separation and wake vortex separation responsibility. When visually following a preceding aircraft, acceptance of the visual approach clearance constitutes acceptance of pilot responsibility for maintaining a safe approach interval and adequate wake turbulence separation.

e. A visual approach is not an IAP and therefore has no missed approach segment. If a go around is necessary for any reason, aircraft operating at controlled airports will be issued an appropriate advisory/clearance/instruction by the tower. At uncontrolled airports, aircraft are expected to remain clear of clouds and complete a landing as soon as possible. If a landing cannot be accomplished, the aircraft is expected to remain clear of clouds and contact ATC as soon as possible for further clearance. Separation from other IFR aircraft will be maintained under these circumstances.

f. Visual approaches reduce pilot/controller workload and expedite traffic by shortening flight paths to the airport. It is the pilot's responsibility to advise ATC as soon as possible if a visual approach is not desired.

5-4-25. Contact Approach

a. Pilots operating in accordance with an IFR flight plan, provided they **are clear of clouds** and have at least **1 mile flight visibility** and can reasonably expect to continue to the destination airport in those conditions, may request ATC authorization for a contact approach.

b. Controllers may authorize a contact approach provided:

1. **The contact approach is specifically requested by the pilot. ATC cannot initiate this approach**. kind of like a SVFR, but for an IFR landing..

See also the appendix

Initial Approach Altitude (IAA) is what 2700' is in the Profile View.

PAPI and GS are 3 degrees. Here's the math for that

1Nm = 6076'. Tangent (slope) of 3° is 0.052 or about **20:1**, so…
318' rise for every 1nm out (6076 x 0.052).

So even if you are coming in at 4,000' msl, you will intercept the GS (above you) at HIGUH, follow it down to 2300 (FAF) and then some more to 895 (200agl) as your MAP.

Maltese Cross vs. Lightning bolt on ILS/RNAV IAPs…

The Maltese cross is at a pre-established INTersection

The Lightning Bolt is by definition the GS intercept altitude that defines the PA FAF, and always a multiple of 100'. May be near the Maltese Cross (NP FAF), but that's kinda 'coincidence'

1.5 mile diagonal separation on parallel ILS approaches

Let's spend a moment talking about Procedure Turns (PT). Excerpts from AIM are below.
LOGICALLY, you would expect to only need a PT if you are intercepting the Localizer > 90 degrees. That is, if you just need a 30 degree turn to intercept the Localizer inbound, you would expect to do so. But no. Unless exempt per the above (ATC Vectors, Hold, DME), and ridiculous as it may seem, you MUST execute what may well be over 360 degrees of turns to: come back outbound (even if you were already pretty much inbound to begin with), veer off, make a U-Turn, then re-intercept the Localizer.

Moral: Always ASK for a straight in or Radar Vectors to avoid the requirement for a PT.

AIM: 5-4-26: **4.** If proceeding to an IAF with a published course reversal (procedure turn or hold-in-lieu of PT pattern), except when cleared for a straight in approach by ATC, the pilot must execute the procedure turn/hold-in-lieu of PT, and complete the approach
AIM 5-4-29: **5−4−9. Procedure Turn and Hold−in−lieu of Procedure Turn** **a.** A procedure turn is the maneuver prescribed when it is necessary to reverse direction to establish the aircraft inbound on an intermediate or final approach course. The procedure turn or hold−in−lieu−of−PT is a required maneuver when it is depicted on the approach chart, unless cleared by ATC for a straight−in approach
The procedure turn is a time-consuming and fuel-wasting procedure, and sometimes the only way to "legally" eliminate it is with radar vectors.

A **descent clearance** may also include a segment where the **descent is at the pilots' discretion—**such as "**cross the Joliet VOR at or above 12,000**, descend and maintain 5,000." This clearance authorizes pilots to descend from their current altitude whenever they choose, as long as they cross the Joliet VOR at or above 12,000 feet MSL. After that, they are expected to descend at a normal rate until they reach the assigned altitude of 5,000 feet MSL.

[Missed Approach]

MISSED APPROACH

(In practice, when under radar contact, you almost never go all the way to the Missed Approach Hold)

Precision Approach:

- Just follow the GS down; your Lateral distance will be a function of your vertical height (e.g., 1nm lateral for every 320' vertical). If you don't have the RE a the Decision Height (DH), you have to go missed. So your MAP for PA is a function of altitude

Non-Precision Approach

- MAP on NPA is a function of distance to the rwy, which cannot be inferred by your altitude.
- You do not descend below MDA until VDP or the 3 items below?
    - VDP is the inverted V, aka "Visual Decision Point"
    - Answer:Missed approach points come in all sizes and colors. They are not only based on distance to the runway but in some cases the ability to meet what is known as second segment climb. If there are obstructions in the climb path the descent minimums may be higher. They want you to be able to miss the approach and miss the obstructions too.

If there IS a VDP on the NPA IAP, then

- Just fly along no lower than the MDA…
    - If you see the Rwy Environment *before* the VDP, do NOT go ahead and land
    - Otherwise, you have to missed, once you have laterally passed the VDP

If there is NOT a VDP listed on the NPA, then ..

- Just fly along no lower than the MDA…
    - If you see the Rwy Environment in time to land (e.g., not over the threshold at 1,200 AGL…), feel free to do so.
    - Otherwise, assume you must have overflown the airport and go 'missed'

To land after an IFR approach, before arriving at the MAP (Missed Approach Point), you must (FAR 91.175):

1. Have the Runway environment in sight
2. You are in a position for a normal approach and landing
3. The visibility is at least as good as indicated on the approach chart.

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

When Circling, the HAT is now called the Height Above Airport (HAA) because you may not touchdown, and technically each runway can have a few feet variance in field elevation.

Abort/Missed Approach:

Glide Slope: Decision Height is the time to abort

NO Glide Slope: Either a Navigation Fix, or timing from FAF (Final Approach Fix), that is your Missed Approach Point (MAP) Q:Gee, why don't they use GPS DME??? ☹

GPS: RAIM is Receiver's Automatic Integrity Monitoring…
If you get a RAIM annunciator, immediately institute a Missed Approach

We discussed missed approach procedures with Paul today at lunch. As we discussed, rarely does a pilot actually fly the complete missed approach procedure. That is the case in a radar environment such as PWK, where often the controlled will actually tell the pilot, "In case of a missed approach, turn left heading 010 and maintain 3,000 feet," or after the pilot reports a missed approach, the radar controller will immediately say, "Roger, fly heading 010, maintain 3,000, say your intentions."

However, in a non-radar environment, the pilot is likely to get much further along in the missed approach procedure, and may even reach the missed approach fix to begin holding, as there may be a delay in getting back in radar contact or radar contact may not be possible at altitudes less than 5,000 feet in some areas. In such a case, once the pilot reaches the missed approach holding fix, ATC, even without radar contact, can issue a clearance along published routes for the pilot to re-attempt the approach, or proceed to another airport. FYI, after a missed approach, the pilot is not required to proceed to the listed alternate airport, but can request clearance to any airport, no matter the weather observation at that airport.

IFR Course Notes Approaches/Avionics*: Auto-Pilot*

[Avionics Usage] **See the separate doc for this. This is extensive stuff.**

NOTE: On the GNS 530W, if you delete the HOLD and then want to re-add it, you must DELETE the Entire Approach, then re-enter it. You can NOT Load/Activate until you Delete the current one or it will think it is already loaded (with the Hold absent ☹)

D:\Users\Personal\Flying\Education-Doc - IFR & N78HF (avionics) specifically\IFR\My IFR Notes

\ AutoPilot and IFR_Approaches.DocX

KFC 200	Aspen	Garmin
 		

Lateral Guidance: HDG, NAV and APPR:

These 3 are mutually exclusive, though HDG may temporarily be active while NAV or APPR are ARMd and waiting to be CPLD. Nav and APPR are instantly exclusive

- **HDG** steers either via the value of the
  - Aspen Heading **Bug**, or
  - **GPS S**teering (with valid GPS course being sequenced). Is best choice for lateral navigation, until coming up on FAF (at which time APPR will provide more accurate lateral guidance, and will lock onto the Glide Slope if ALT is enabled)

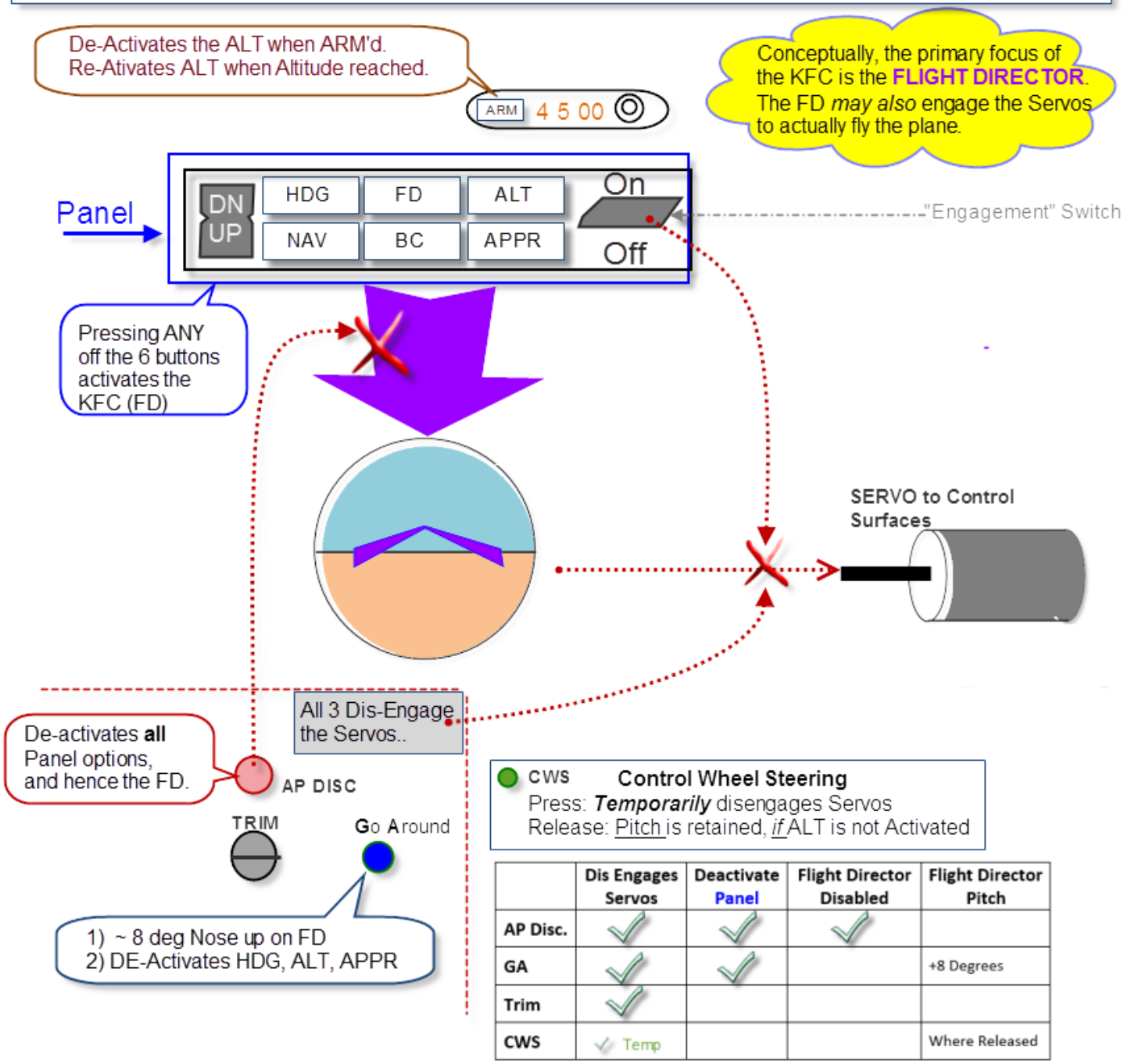
  HDG is never ARMd or CPLD. Unless deactivated by NAV or APPR, it is always active.
- **NAV** will provide lateral course guidance from the G530 course (GPS or VLOC). Will ARM before it CPLDs, typically
- **APPR** will provide more accurate lateral course guidance AND Glide Slope information if ALT is selected. Will ARM before it CPLDs, typically. I select APPR (replacing HDG/GPSS) when
  - **RNAV:** arriving at first/IAF (before Intermediate Segment, to line up with intermediate segment!
  - **ILS** when approaching either the Localizer or my fix (e.g., OBK)

  NAV and APPR are mutually exclusive. Activating APPR will unconditionally de-activate NAV, and vice-versa. Think of APPR as a 'subset' of HDG

Notably because the Flight Director (FD) manifests itself on the Aspen, it is easier to view the Aspen as the 'central hub' of Navigation/AutoPilot activity, even if such is not technically true. Example: the Aspen provides heading Bug information, but its GPSS button probably tells the KFC to ignore the heading Bug input and listen directly to the G530 – but I model the Aspen as a 'pass through' of the GPS.

Activated vs Engaged: I am coining my own terms here. When you press ANY button on the KFC (e.g., HDG, ALT, etc.) the FD appears, indicating the AP's suggested guidance. I call this ACTIVATING the autopilot. But only if you ENGAGE the AP (the toggle switch on the right) does that FD info get fed to the servos that affect the airplane control surfaces.

KFC 200 Auto Pilot



	Dis Engages Servos	Deactivate Panel	Flight Director Disabled	Flight Director Pitch
AP Disc.	✓	✓	✓	
GA	✓	✓		+8 Degrees
Trim	✓			
CWS	✓ Temp			Where Released

KFC 200	Aspen	Garmin
 		

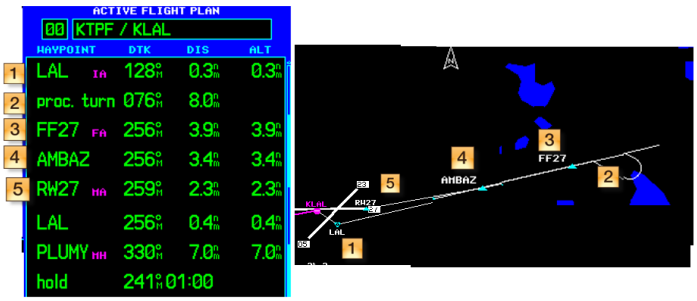
For **VOR** navigation however, the Aspen is also functioning as your VOR, and so like any VOR you need to set the CRS/OBS setting for it to work properly. To wit, if your Aspen CRS setting is not set to the correct/desired VOR radial then just like any VOR your CDI will never center, and you will drift aimlessly, forever awaiting the course intercept. And so whenever you are doing a VOR approac, you must also do a 3rd thing, which is to set the CRS on the Aspen to the desired radial.

1) **On the Garmin: Select [Proc], Appr, and the VOR approach, then Load it.**
2) **TOGGLE the VOR freq from NAV Stby to Active**
3) **Press CDI to toggle from GPS to NAV (this is what the outside world is getting from the Garmin, namely the Aspen.**

Scenario, but I do NOT like this way. It is the first way I learned, but I think it is very inveriour

A) The magenta line is 'straight up, North', you are 4 miles to the West of the course, and the Heading bug is 045
You Press:
1) HDG — the HDG light comes on
2) NAV — NAV and ARMd lights come on
3) If not already turn on the AP — the AP light comes on. Otherwise only the Flight Director is being affected
The plane will fly at 45 degrees until it intercepts the magenta course line. At that time:
ARM light goes OUT, CPLD light comes on. Does HDG light go off?
The AP will now steer you North, and you are now locked onto the magenta line
HDG light goes off, and GPSS is no longer available

B) A better way to have done this is to just press HDG and then GPSS



Cancelling a FPL AIM 5-1-15

To CLOSE an IFR flight plan

- Towered Airport:
  - No need to do anything. They know when you are handed off to them that you are IFR, and they close your IFR flight plan
- Non-Towered
  - In the Air: *IF* your destination is VFR, you can cancel IFR and land VFR, telling whoever it is you are talking to at the time to 'Cancel IFR'
  - On the ground:
    - Phone
      - 800 WX BRIEF
      - National Clearance Delivery 888/766-8267
    - Radio
      - Some airports have an RCO (Remote Control Outlet) Frequency
      - Some airports have an GCO (Ground Control Outlet) Frequency

IFR Course Notes – Holds

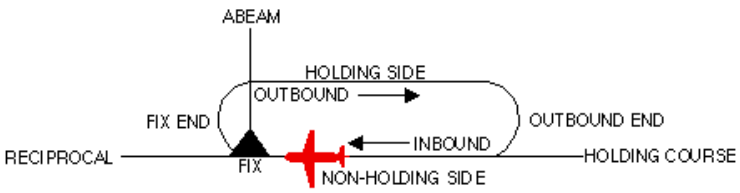
[HOLDs]

See the section on IFR Requirements, like checking your VOR every 30 days.
Other than that, I don't find much value in this section….

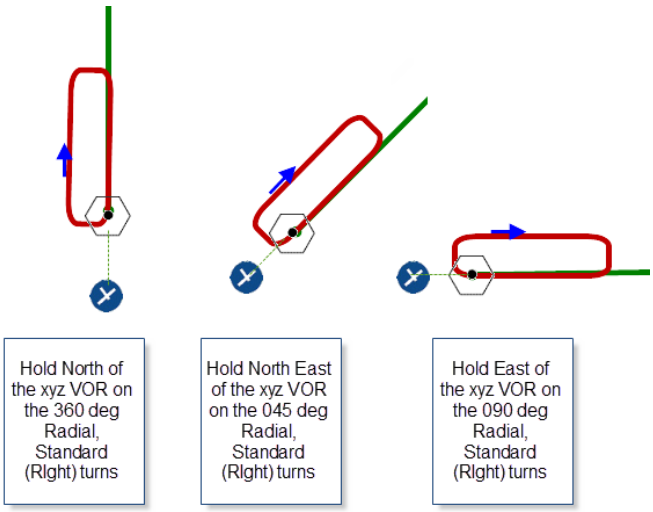
See my separate document on HILDING PATTERNS.DOCX

"Holding Pattern"

Only 1 loop is permitted unless you are approved by ATC for an extra lap

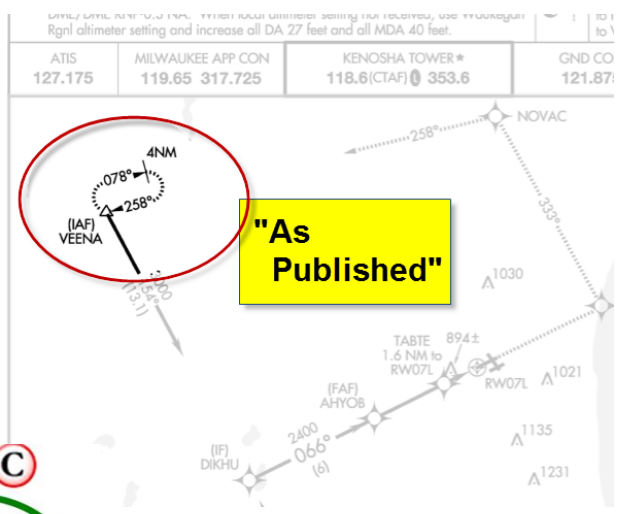


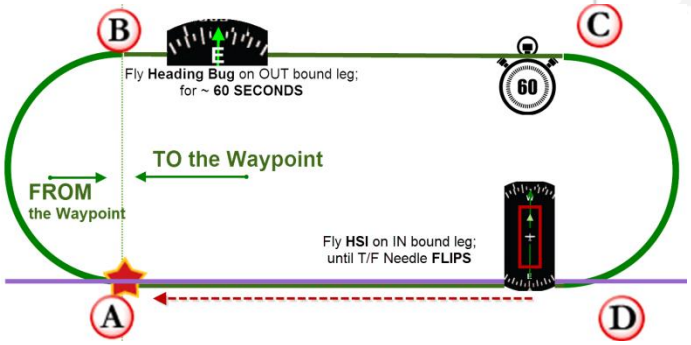
he direction specified (of the Hold) is the direction FROM the hold point.
(The direction of the radial, if you will.)



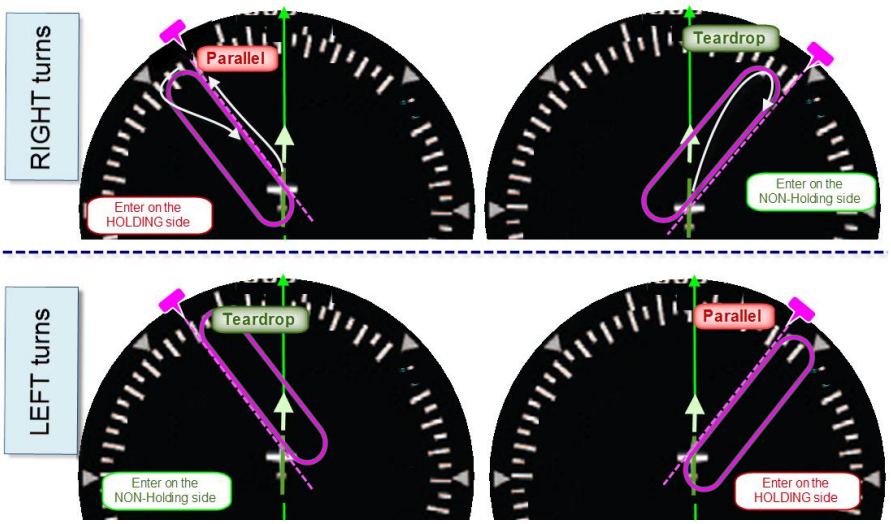
The 'width' of the oval is :

Speed = 120Kts = 2Nm/min, Standard Rate Turn is 2 minutes, so Circumference = 4Nm. Diameter = Circum/3.14 = 4/3 = 1.25 – 1.50 nm



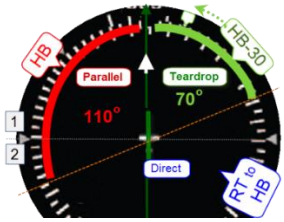


IFR Course Notes – Holds



Consolidated steps for Entering a Holding Pattern…

(A) Before you hit the Waypoint for the first time:



Set the **HEADING BUG** to the HOLD RADIAL

This will be your **OUT** bound Course

Irrespective of wind, your Aspen ground Track should match this heading bug!

(B) Entering, & Flying the Alignment leg

Parallel:	**Teardrop** :	**Direct** :
HB	HB – 30	Right, Std Rate Turn to HB

For 60 sec after T/F flips to FROM

Then, set the **HSI** for the HB Reciprocal (tail of HSI to the HB)

This will be your **IN** bound Course

(C) Turning to Inbound leg (the current HSI setting)

Turn:	**Left** 225 deg	**Tight Right** 210 deg	**Tight Right** 180 deg
	180+45	180+30	

See also my separate doc just on Entering and flying holds, how to use the ASPEN as a 'visual bug' / crib, etc.

King IFR DVD

Section 8 Weather

Weather (TAG)
1,000 millibars is Sea Level 500 mb is 18,000'

Temperature inversion is stable air

If you encounter freezing rain, that indicates warmer air above you (it is freezing as it comes down), so climbing will likely get you into warmer air.

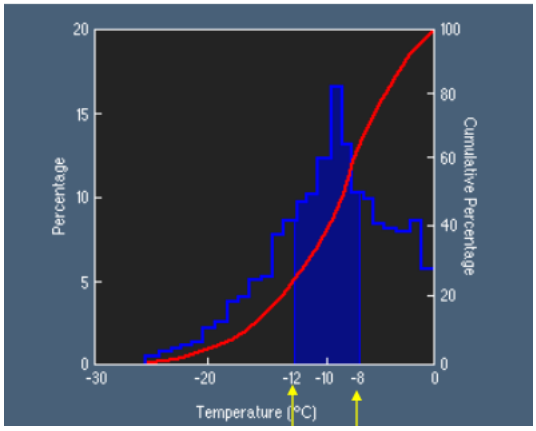
The most dangerous freezing temps are from about 0C to -10C
ICING: Most likely between +2C and -10C

Most icing tends to occur between 0 and -20 C
More than 50% occurs between -8 and -12C

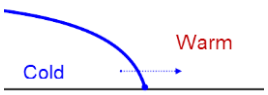
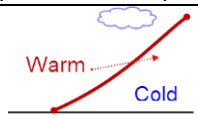
Ok, let's call it +2C to -20C

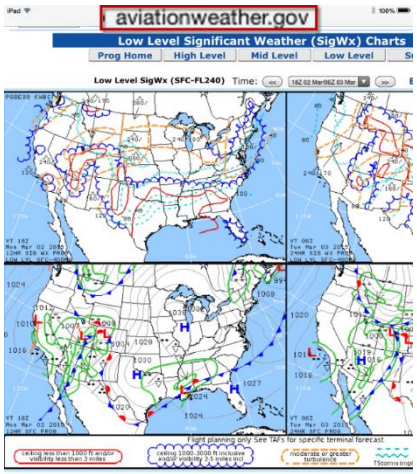
. I've experienced icing in aircraft up to +10C and the **FAA recommends PITOT heat on +10C and below**… probably for the same reason.

Most icing tends to occur between 0° and -20°C
– More than 50% of those occur between -8 and -12° C

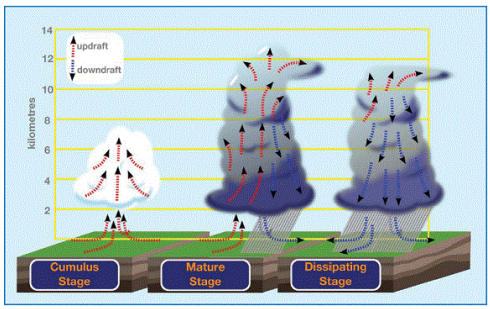


A 'Front' is defined by what air (cold or warm) is moving forward

	
Lifts more steeply, more intense Wx	Fronts are a Lifting Device

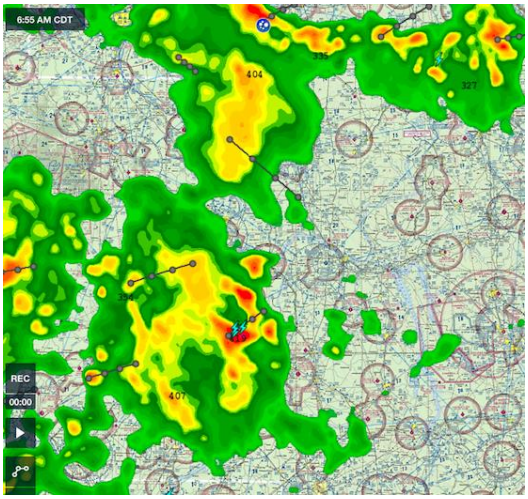


The *LESSON* to this point is that the old advice about avoiding thunderstorm activity—**to remain 20 miles from the edges** of any storm cell's radar return, and to remain in visual conditions if at all possible while doing so—is just as valid now as it was in the days before weather data uplinks and moving map displays.



It's generally safe to fly through areas of light precipitation ("green" returns on most radar plots), if there is no moderate or greater precipitation associated with those clouds. However, Dr. Strahle tells us, if there is any moderate precipitation in the radar plot (generally yellow), you need to

remain **at least *10 miles* away from even the light (green) returns** that surround the heavier precipitation. If there is heavy (often, but not always orange or red) or extreme (darker red, white or other) precipitation, remain **at least *20 miles* away from even the light (green) returns**.



Flying in an area that looks like this? Avoid all the radar returns…even the green

If there's *moderate*, *heavy* or *extreme* precipiation in the cell at all, it's not safe to be anywhere in the precipitation footprint of that cell. Remember that with thunderstorms, ***it's not the beat, it's the fluidity***. Remaining 20 miles clear of the storm means staying 20 miles or more away from the *outside edges* of the lightest, green radar returns

[Regulations]

Oxygen **FAR 91.211**

- Below 12,500 Never
- Below 14,000 after 30 minutes for Pilot only
- Above 14,000 always for Pilot
- Above 15,000 provided for crew/passengers

Pulse Oximeter: 95% is minimum;
Below 90% is a warning (AOPA:Oxygen Use In Aviation)

SkyOx 2 place:$515-$545

Capacity	Construction	Weight	Duration (man hours at 15,0 w/Cannula | w/Mas
6 cu. ft. C	16 3/8"l x 3 1/4" dia.	6 lbs.	5:28 hrs. | 1:49 hrs
9 cu. ft. C	15 1/2"l x 4 3/8" dia.	7 lbs.	8:07 hrs. | 2:45 hrs
15 cu. ft.	21 1/4"l x 4 3/8" dia.	11 lbs.	13:48 hrs. | 4:36 hr
20 cu. ft.	17 3/4"l x 5 1/4" dia.	15 lbs.	17:33 hrs. | 5:51 hr
24 cu. ft.	30 1/4"l x 5 1/4" dia.	14 lbs.	22:42 hrs. | 7:34 hr
40 cu. ft.	21 3/4"l x 6 3/4" dia.	28 lbs.	39:27 hrs. | 13:09 h
50 cu. ft.	26 1/2"l x 7" dia.	36 lbs.	46:21 hrs. | 15:27 h

Oxygen use, especially at night, does help the brain and eyes work better. If you are doing just a short flight at night I doubt you will notice a difference. Certainly if you plan any type of high altitude flight you should suck on the bottle. If nothing else you will feel less fatigued.

The military uses **10,000 feet as the altitude that their aviators must use oxygen during the day** and I believe they use **5,000 for night ops**.
There are several pretty good systems on the market today. Almost all use a cannulas plus a mask. **AEROX**, **Mountain High**, **PreciseFlight** and **Sky OX** seem to be the most prominent.

That ideal flow rate turns out to be **one liter of oxygen per minute per 10,000 feet of altitude**.
There are five methods of regulating oxygen flow:
Continuous flow . This is the least expensive method of delivering oxygen. Here, oxygen flow is governed by a regulator set at a constant flow rate — usually about 2.5 liters per minute. This flow rate is a compromise. It's more than enough for lower altitudes, but not enough for flying above 25,000 feet. So you can end up wasting oxygen at lower altitudes — a problem that can be solved by the use of a flow meter.
Altitude adjustable . With this system, there's an adjustable control on the oxygen tank's regulator. Flying at 20,000 feet? Then dial in the necessary oxygen flow until the indicator needle (also on the regulator) shows 20,000. Altitude-adjustable systems are more costly than the continuous-flow types, but they give you better assurance of a proper flow rate.
Altitude compensating . This type of system is typically used in **permanently installed oxygen systems**, not most portable ones. As the name indicates, oxygen flow changes automatically with changes in altitude. Some systems, however, don't turn on until reaching 8,000 to 10,000 feet, so if you want or need oxygen below those altitudes, it may not be available.
Demand system . This is designed for airplanes capable of flying **up to 35,000 feet**. Oxygen is provided in bursts whenever the pilot inhales, and the tight-fitting, alien-face-grabbing masks (they have to fit tightly to avoid dangerous leaks) have switches that let you select between a normal and a 100-percent oxygen setting.
Pressure-demand systems . **Now we're in fighter country**. With this system, oxygen is pumped continuously to the mask under positive pressure. This makes it easy to inhale, but sometimes rather difficult to exhale. The whole idea is to make absolutely sure that the pilot has enough oxygen up to 45,000 feet — even when pulling high Gs or performing other extreme maneuvers. At 45,000, TUC is a scant 10 seconds or so, making positive pressure and a well-designed mask absolutely essential.

Use the term "Minimum Fuel" to advise ATC, which is not declaring an emergency, but works well for everyone..

Communications Error (Lost Communications)

- In VFR: Stay VFR, land as soon as practical
- In IFR: squawk 7600, continue with last agreed upon altitude and course.
  - If you have to ascend for planned MEA, do so, but descend back to last 'agreed upon' altitude ASAP.
- If at a HOLD, depart at your prescribed time.
  - This also why the Time Enroute on your flight plan is so important: this is used to know when to expect you at your IAF.

- If you are there *before* that time, you have to Hold
- At/after that time, you may descend and land is if you were given Carte Blanch by ATC explicitly.

FAR 91.185

- ALSO, you may have just not switched from one Center sector, to another! ☺.
  - Try looking for the 'Center' frequency for the nearest airport (FFM) and try them!

Compulsory IFR Reports (5-3-3)

- Missed Approach
- Leaving Assigned Altitude
- If VFR on top, any change of altitude
- If unable to climb/descend 500 fpm or more
- Change in TAS of 10kts (or 5% (of 150kts is 7.5 kts)), whichever is MORE, so 10Kts in my case
- Unforecast or Severe weather
- Any malfunction of Nav equipment, including intermittent loss of Com
- Entering or Leaving a Hold (WITH Altitude information)
- NON-Radar environment
  - Crossing FAF inbound
  - Compulsory IFR reporting point
  - Change in estimate +/- 3 minutes

Position Report

a) ID
b) Position
c) Time over reporting point
d) Altitude
e) Type of flight plan (only to FSS)
f) ETA & name of next reporting point
g) Name of reporting point after the next one
h) Pertinent remarks

PILOT – Physical Items on your person:

- Current Pilot's License exp at the end of every 24 months w/o a BFR
- Current Medical exp at the end of every 24 months.
- Photo ID (e.g., Driver's License)

PILOT- Training/Certification/Training

- Even VFR, you must have 3 TO/Lands (T/G ok) in the last 90 days . (90??)
  - If landing at night, you must have 3 landings (full stop only) in past 90 (?) days
  - For this purpose, 'night' is defined as 1 hr after sunset, and 1 hr before sunrise
  - Nav lights are twilight, which is ½ hr before sunrise, after sunset

- For IFR, you either need to have logged
  - 6 Approaches
  - Hold
  - Intercept

    in the past 6 months. I have a full page table on that…

Must be on the PLANE

- A irworthiness certificate (on plane, in pouch in cargo section)
- R egistration (where do I keep that??)
- ~~R adio~~ no longer needed
- O perating Handbook (under knees in cockpit)
- W eight & Balance (in POH, above. EFB version not acceptable)

Maintenance:

		94.403 'sh…
• Annual Inspection	12 months	91.409
• Transponder Check	24 month	91.413
• Altimeter Check	24 months	91.411 Part 43 subpart E,
• Pitot Static	24 months	technically separate from altimeter
• ELT	12 months	91.207
• VOR	30 days	

In your log book, you must note **Date**, **Location**, **Degrees of Error**, and **signature**.

- VOT in AF/D; OBS set to 360 +/- 4 degrees
- Ground Checkpoint +/- 4 degrees
- Dual VORs installed 4 degrees dif
- At altitude, find a landmark at least 20nm from the VOR. +/- 6 degrees
- If you are travelling on a VOR airway, that can be a VOR check.

FAR 91.205 specifies Minimum Equipment Checklist

91.215 Mode C Over 10,000' MSL, in Class Bravo and Charlie

AIM 1-1-18 GPS info, background reading..

AIM 4-1-3 FSS

AIM 5-2-5 Clearances

IFR Currency Requirements:

Status	What you must do in a real airplane	
	IMC	VMC
"A" Presently Current	Need 6 AHITs in most recent 6 months	
	Obviously…	Stay with ATC on IFR FPL to the Rwy and it still counts for AHIT. Can count for AHIT credit, whether on IFR FPL or not.
	Adds a 'credit point in time'	
"B" Your Currency lapsed less than 6 months ago	Need 6 AHITs in most recent 6 months	
		You fly under the hood but with a Safety Pilot. SP need be VFR in type.
	Adds a 'credit point in time'	
"C" Your currency lapsed more than 6 months ago		Need a full IPC (Instrument Proficiency Check ride). with a CFII (or FAA examiner)
	This resets the 6 month clock.	

§61.57 Recent flight experience: Pilot in command.

(c) ***Instrument experience.*** Except as provided in paragraph (e) of this section, a person may act as pilot in command under IFR or weather conditions less than the minimums prescribed for VFR only if:

(1) *Use of an airplane.* Within the 6 calendar months preceding the month of the flight, that person performed and logged at least the following tasks and iterations in an airplane, powered-lift, helicopter, or airship, as appropriate, for the instrument rating privileges to be maintained in **actual weather conditions**, or under simulated conditions using a view-limiting device that involves having performed the following—

(i) Six instrument approaches.

(ii) Holding procedures and tasks.

(iii) Intercepting and tracking courses through the use of navigational electronic systems.

To log IFR flight time (who cares???) the log book must include the PLACE, the Type of APPROACH, and the NAME of the safety pilot (who must hold a PPL for that type aircraft).

14 CFR 61.57 (d) describes the requirements for an instrument proficiency check (IPC), and includes a description of when an IPC is necessary. While certain exceptions apply, a pilot may reestablish instrument currency that has been lapsed for more than 6 months only through obtaining an IPC. On December 16, 2011, the FAA issued a technical correction to section 61.57 (d) in order to clarify the meaning of the regulation. This clarification was simply just that, a clarification, and no change to the application of the rule was intended. As the FAA explained in that technical correction (emphasis added):

The revised language makes it clear that a pilot who has failed to maintain instrument currency for more than six calendar months may not serve as pilot in command under IFR or in weather conditions less than the minimums prescribed for VFR until completing an instrument proficiency check. ***A pilot whose instrument currency has been lapsed for less than six months may continue to reestablish instrument currency by performing the tasks and maneuvers required in paragraph (c).***

Rules for Listing an Alternate:

- Destination airport does not have an approved Instrument Approach
- The 1-2-3 Rule below, as regards Wx at your Destination airport
  "1 2 3 Rule"
  Look at your Destination Airport:
  What is the TAF **1** hr. before and 1 hr. after your ETA.
  If the CEILINGS are at least **2**,000'
  and VISIBILITY is **3** nm, then you do NOT need to list an Alternate
- And the ALTERNATE has TAF Wx Requirements:

		Wx at ETA of Alternate		
		Ceilings	**Visibility**	
Destination		2,000	3	
Alternate	**NO Instrument Approach**	1,000 /MEA (VFR)	3 (VFR)	
	Non-Precis Appr	800	2	
	Precision Appr	600	2	For this purpose, only ILS counts

- This only refers to filing. At the time of actual need, you can attempt to SHOOT the approach even if forecast is down to 0/0. To actually land of course, you need to meet the IAP minimums listed.

VFR on Top- VFR rules and altitudes while on an IFR flight plan

Fuel = Destination + Alternate (If required) + 45 minutes

Equipment required for IFR (above and beyond basic VFR minimums)

- 2 way radio
- Nav equipment (e.g., VOR)
- Rate of Turn
- Slip/skid indicator
- Altimeter
- Alternator
- Attitude indicator
- DG (heading indicator)

Even updating your GPS card is 'maintenance' that has to be logged (though no one does). NO LONGER TRUE IN 2015, I AM TOLD…

Any item that does not work, even if optional, must be labelled and logged.

Misc. notes that I need to find a more appropriate home for, eventually…

Logging Instrument time:

Can only be done when manipulating by instruments alone, even if only 0.2 of 1.2.
But DO LOG the approaches IFR, with at least 0.1 hrs. of IFR (surely it was the IAF that was IMC!)

Clearance Deviation

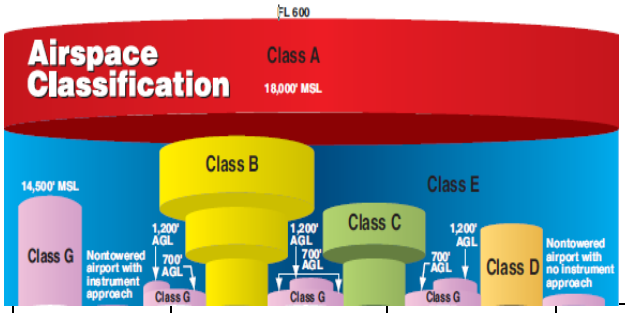
Is NOT a violation if a) Necessary, and b) you tell them you are about to do it.
If 'priority' is given to another aircraft because of this, then you'll need to write a letter.

Right of Way

There is none between VFR and IFR
But doesn't landing traffic have ROW over departing (as if it matters…)

IFR Course Notes *VFR and basics*

[VFR and Basics]



On the Sectional Maps: Airports with a Control Tower are shown in **BLUE**, others are in **Magenta**

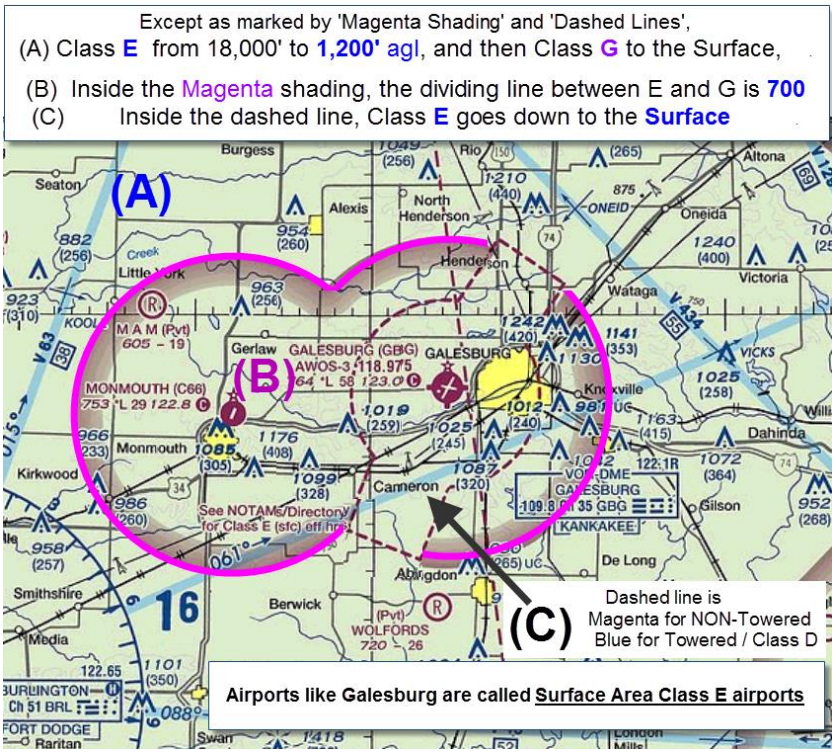
And Paved airports are in a circle

Class		Example	Height	Visibility	Cloud Dist	Entry Req		Notes
A			FL 18+	n/a	n/a	IFR		
B		ORD	Inv 3Tier (~10,000' agl)	3 sm	Clear	Clearance	Mode C Even to fly over	Tower
C		MDW	Inv 2Tier (~5,000' agl)		500 below 2,000 side 1,000 above	Radio Contact		Tower
D		PWK	Cylinder (~3500 agl')					Tower
E	*A*	Everyplace else you *fly*	**1,200' +**		1,000' ceilings for VFR			[C] is fpr *airports **w/** Instrmnt approaches to keep VFR at bay.* Blue lines if Towered, Magenta if Non-Tower.
	B	in shaded area	**700'**					
	C	in dotted Line	**0'**					
G Day 'uncontrolled'		Non-Tower Airports w/**o** Instrmt app	**0' – 1200'**	1 sm	Clear of Clouds (no ceiling req)*			← **Special VFR** (day only)
Night			**(- 700'** in shaded area**)**	3 sm	500 below 2,000 side 1,000 above			← SVFR at night requires IFR license
E 2			10k+	5 sm	1k/ 1sM / 1k			

* Still IFR though.

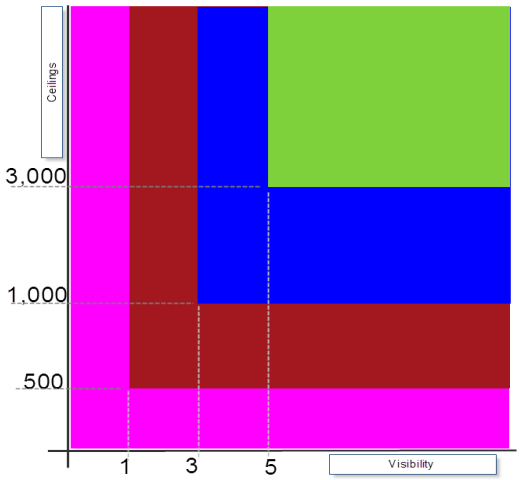
Ex: To take off at Monmouth (B), in G Airspace you need only 1sm and clear of clouds. Once you climb to 700' AGL there, you're in E and need 3sm and the 500/2k/1k cloud separation.

Taking off from Galesburg (C), you are in Class E from 0' and need 3sm and 500/2k/1k cloud clearance as well as 1,000 ceilings. No SVFR from a non-towered airport.



	Ceiling	Visibility
VFR	>3,000’	5+
MVFR	1-3,000	3-5
SVFR	Clear of	1+
IFR	500-1k	1-3
LIFR	<500	0-1

Alternate: if Primary TAF is
± 1 Hr, < 2k’ AGL ceilings or < 3sm vis
Alternate TAF must have :
600’ ceilings for ILS, 800 otherwise



CLOUDS - defined

Abbrev	Meaning	
SKC	"No cloud/Sky clear" used worldwide but in North America is used to indicate a human generated repor	
CLR	"No clouds below 12,000 ft (U.S.) (or 10,000 ft Canada)", indicates a station that is partly automated	
FEW	"Few" = 1–2 oktas (eigths)	Mostly Sunny (‘Clear’ at night)
SCT	"Scattered" = 3–4 oktas	Partly Sunny (‘Clear’ at night) is 3/8 to 5/8; same values (3/8-5/8) as Partly ‘Cloudy’
BKN	"Broken" = 5–7 oktas	so ‘Partly Sunny’ could be 5/8 which is ‘Broken’ and therefore a ceiling.
OVC	"Overcast" = 8 oktas, i.e., full cloud coverage	
OBS	OBScured – for whatever weird reason (Mt St. Helen erupts), it is considered a ceiling	
VV	Clouds cannot be seen because of fog or heavy precipitation, so vertical visibility is given instead.	
	FAR 1.1: “Thin” or “Partial” as prefix to cloud coverage does NOT qualify as a ceiling.	


North Bend
Back
KLSE
La Crosse Regional
Direct To
Add to Route
Details
OTHER FREQUENCIES
Flight Service
(800) 992-7433
Green Bay (24H)
122.2
Flight Service
(800) 992-7433
Green Bay (24H)
122.35
Minneapolis Center
128.6
Remarks/Comments
15/1
A/FD
RUNWAYS
Info
METAR
Forecast
Winds
FBOs
Stoddard

CRAIG NOTES

Ok, magnetic wet compass notes:

- Remember to steer AWAY from your course heading
  - E.g., if you want to go W and W is to the left of the lubber line, turn to the RIGHT.
  - Another way to visualize this is that the compass never moves, the PLANE is what is moving.
    So you have to move the plane around the compass

"Standard Rate" turns are 20º bank angle; 1 minute =180 degrees, 30 seconds =90 degrees.

Start your timer when you are in your bank,

OR start it as you start your bank, and then when you hit 30 seconds you start to come out of your bank

I prefer this, as the work flow is easier: Press Start before Aviating, start roll out at 30.

Vs.: Roll into std rate, remove a hand in turn to press start. Then at x seconds before 30, begin roll out .

Remember to roll out at ½ your bank angle in degrees; e.g., start rolling out at 170 to end up at 180.

- East West
  - Turning to end up on a heading of
    - When ending up on a heading of E or W there is no lead nor lag.
    - When the lubber lines says "E" or "W" you really are, and you can stop
  - When Acc/Decelerating
    - **A**CCELERATING dips to the **N**ORTH
    - **D**ECELEARTING dips to the **S**OUTH
- North South
  - Turning to end up on a heading of
    - Compass 'wants' to head North
    - Compass will Lag actual heading when turning away from North
    - Compass will Lead actual heading when turning away from South
  - When Acc/Decelerating
    - There is no dip due to acc/de-celeartion when heading N/S
    - If you are heading 180 or 360, De/Acceleration has no effect

IFR Course Notes

Appendix- Approaches …

In 2013, we will celebrate ten years of the Wide Area Augmentation System's (WAAS) availability to the public. Pilots are now benefiting from the proliferation of Area Navigation (RNAV) Global Positioning System (GPS) approaches and lower minimums provided by WAAS-enabled systems. As of July 2011, there were twice as many WAAS approaches as Instrument Landing Systems (ILS) approaches. Currently, there are over 3000 Localizer Performance without Vertical Guidance (LP) and Localizer Performance with Vertical Guidance (LPV) procedures.

Without Vertical Guidance

Localizer Performance without Vertical Guidance (LP) and Lateral Navigation (LNAV)

LPs are non-precision approaches with WAAS lateral guidance.
They are added in locations where terrain or obstructions do not allow publication of vertically guided LPV procedures. Lateral sensitivity increases as an aircraft gets closer to the runway (or PinS type approaches for helicopters). LP is not a fail-down mode for an LPV. LP and LPV are independent.
LP minimums will not be published with lines of minima that contain approved vertical guidance (LNAV/VNAV or LPV).

LNAV approaches are non-precision approaches that provide lateral guidance. The pilot must check RAIM (Receiver Autonomous Integrity Monitoring) prior to the approach when not using WAAS equipment. See AIM 1-1-19, 5-1-16, and AC 90-105. Both LP and LNAV lines of minima are Minimum Descent Altitudes (MDAs) rather than DAs. It is possible to have LP and LNAV published on the same approach chart. An LP is published if it provides lower minima than the LNAV. See AIM 1-1-20

CATEGORY	A	B	C	D
LP MDA	1660-1 295 (300-1)			NA
LNAV MDA	1800-1 435 (500-1)		1800-1¼ 435 (500-1¼)	NA
CIRCLING	1900-1 506 (600-1)		1900-1½ 506 (600-1½)	NA
MESA/FALCON FIELD (FFZ)				

With Vertical Guidance

Localizer Performance with Vertical Guidance (LPV)

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

Lateral Navigation/Vertical Navigation (LNAV/VNAV)

LNAV/VNAV approaches provide both horizontal and approved vertical approach guidance.
Vertical Navigation (VNAV) utilizes an internally generated glideslope based on WAAS or baro-VNAV systems. Minimums are published as a DA. If baro-VNAV is used instead of WAAS, the pilot may have approach restrictions as a result of temperature limitations and must check predictive RAIM (Receiver Autonomous Integrity Monitoring). See AIM 1-1-19, 5-1-16, and AC 90-105.

Important terms and Concepts

LIGHTING

Several ALS configurations are recognized by the International Civil Aviation Organization (ICAO); however, non-standard ALS configurations are installed at some airports. Typically, approach lighting systems are of high-intensity. Many approach lighting systems are also complemented by various on-runway light systems, such as Runway End Identifier Lights (REIL), Touchdown Zone Lights (TDZL), and High Intensity Runway Lights (HIRL). The most common approach light system configurations include:

BOLD if inop, needs extra visibility always, Underline only for VOR, LOC, LDA, SDF, ASR and RNAV(LNAV/NAV)

- **MALSR**: Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights
- MALSF: Medium-intensity Approach Lighting System with Sequenced Flashing lights
- SALS: Short Approach Lighting System
- **SSALS**: Simplified Short Approach Lighting System
- **SSALR**: Simplified Short Approach Lighting System with Runway Alignment Indicator Lights
- SSALF: Simplified Short Approach Lighting System with Sequenced Flashing Lights
- ODALS: Omnidirectional Approach Lighting System
- **ALSF-1 & -2** : Approach Lighting System with Sequenced Flashing Lights configuration 1
- LDIN: Lead-in lighting
- REIL: Runway End Identification Lights
- RAIL: Runway Alignment Indicator Lights

In configurations that include sequenced flashing lights, the lights are typically strobes mounted in front of the runway on its extended centerline. RAIL are similar to sequenced flashing lights, except that they end where the white approach light bars begin. Sequenced flashing lights and RAIL do not extend past the Decision Bar to avoid distracting the pilot during the critical phase of transitioning from instrument to visual flight.[3] Sequenced flashing lights are sometimes colloquially called *the rabbit* or *the running rabbit*

Approach lighting systems provide landing approach guidance for pilots. Several different configurations are available:

ALSF I (Approach Lighting System with Sequenced Flashing Lights) is used on Category I runways during instrument landing approach to align the aircraft with the centerline of the runway and to establish vertical orientation. Up to twenty-one white lights create a sequential strobing flash pattern that rolls toward the runway threshold.

The Dual Mode ALSF II/SSALR approach lighting system allows Category II runways to operate in either the full ALSF II mode or in the economical SSALR mode, depending on weather conditions.

ALSF II (Approach Lighting System with Sequenced Flashing Lights) mode is used on Category II runways during instrument landing approach to align the aircraft with the centerline of the runway and to establish vertical orientation. Up to 174 steady burning white lights serve as a reference plane, and two rows of red side row barrettes increase the pilots horizontal perception. Up to

twenty-one white lights create a sequential strobing flash pattern that rolls toward the runway threshold. Three intensity settings allow the approach to be used under changing weather conditions.

SSALR (Simplified Short Approach Lighting System with Runway Alignment Indicator Lights) mode is used during instrument landing approach to align the aircraft with the centerline of the runway. The white steady burning lights of the ALSF II are greatly reduced to conserve power under improved visibility and the side row barrettes are not powered. Up to sixty-three steady-burning lights are used to create a reference plane, and up to eight lights create a sequential strobing flash pattern that rolls toward the runway threshold. SSAL (Simplified Short Approach Lighting System) is available.

MALSR (Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights) is used by pilots during instrument landing approach to align the aircraft with the centerline of the runway. Up to sixty-three (63) steady-burning lights are used to create a reference plane, and up to eight (8) lights create a sequential strobing flash pattern that rolls toward the runway