

# IFR Course Notes

Other DOCS \* \*Henry Holistic Landing, Holding Pattern detail \*

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# 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!

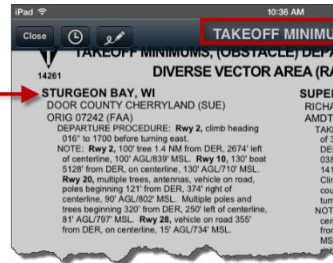
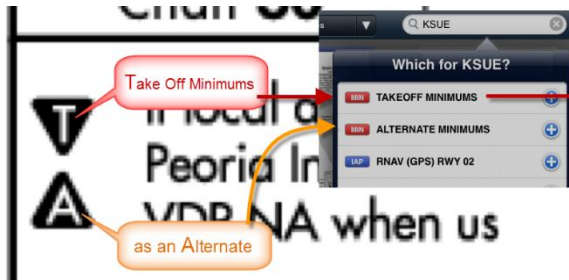
Common 'Parts':

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)

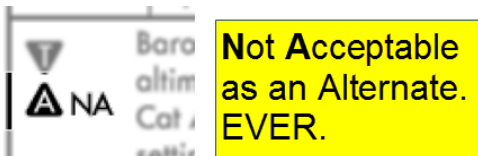
Us Part 91 guys can take off in 0/0. [T] only for commercial Part 135/121, though SOME parts ARE applicable to everyone like OBSTACLE DEPARTURE. These are called **ODP** (Obstacle Departure Procedures).

So **CHECK THE TAKEOFF MINIMUMS** 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)

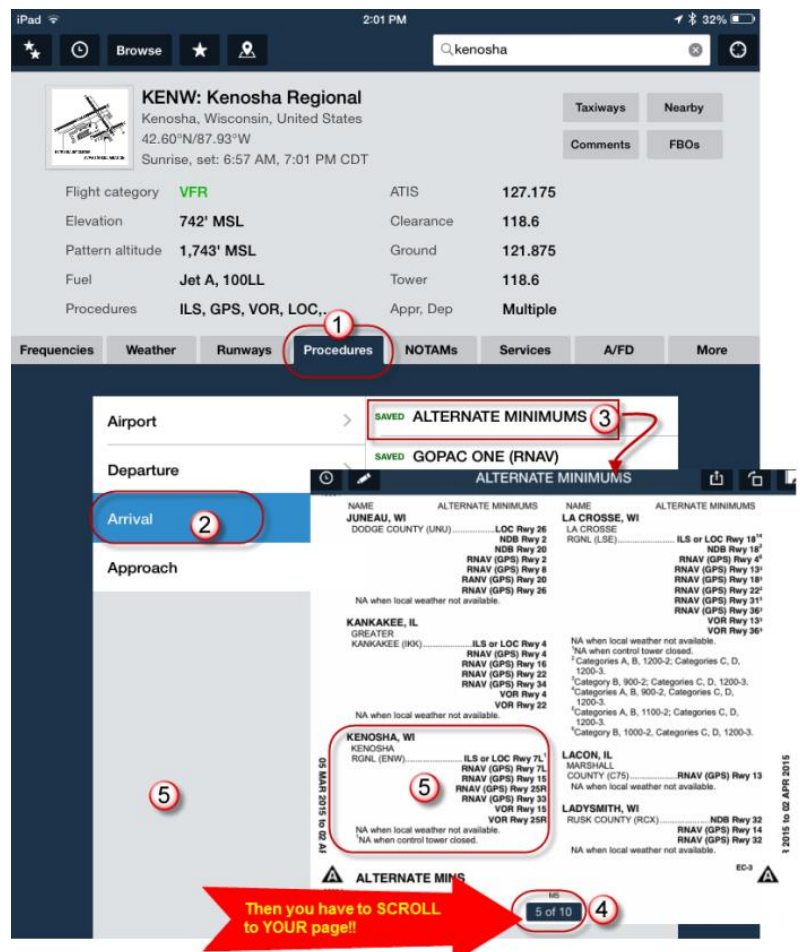
### **A** Alternate Considerations



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)

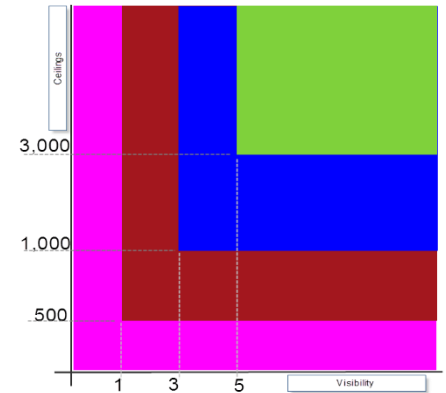
### Rules for having an Alternate:

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
<b>Destination</b>	2,000	3	
<b>Alternate Precision Appr</b>	600	2	For this purpose, only ILS counts
<b>Non-Precis Appr</b>	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)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

$$\text{FPNm} = \frac{\text{Feet}}{\text{Nm}} = \frac{(\text{Feet/Min})}{(\text{Nm/Hr})/60} = \frac{\text{FPM}}{\text{Kts}/60} = \frac{\text{FPM} \times 60}{\text{Kts}} \leftarrow \text{GROUND Speed, not IAS}$$

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)

$$\begin{aligned} \text{FPNm} &= \text{FPM} \times 60 / \text{Kts} = \text{FPM} \times 60 / 96 = \text{FPM} \times 0.63 \sim \text{FPM} \times 0.6 \sim 2/3\text{rds of FPM} \\ &= 300 \times 0.6 = 180' / \text{Nm} \\ &= 500 \times 0.6 = 300' / \text{Nm in N78HF, typically} \\ &= 750 \times 0.6 = 450' / \text{Nm} \\ &= 800 \text{ fpm} \times 0.6 = 480 \text{ FtPNm (500 Ft/Nm using exact value)} \end{aligned}$$

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

$$\text{FPM} = \text{FPNm} \times \text{Kts} / 60 = \text{FPNm} \times 96/60 = \text{FPNm} \times 1.6 \sim 1 \frac{1}{2} \times \text{FPNm}$$

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

# IFR Course Notes Departures

## (Operations, Procedures and Considerations)

### 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 > LAST 30 DAYS  
Updated Feb 02, 2015 6:42 AM CST

Obstacle >  
TFR >  
ARTCC >

**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

PM CST  
PM CST

⚠ If local altimeter setting not received, use Chicago-O'Hare Intl altimeter setting and increase all  
DAs 22 feet, and all visibilities 1/4 mile; increase all MDAs 40 feet, and S-LOC Cat C and D  
visibilities 1/4 mile. Helicopter visibility reduction below 1 SM NA. When Rwy 16 VGSB inop,  
Straight-in and Circling to Rwy 16 NA at night. Night landing: Rwy 6, 12, 24, 30, 34 NA.

MISSED  
to 1400  
turn to 27  
VOR/DME

ATIS 124.2	CHICAGO APP CON 120.55 306.925	EXECUTIVE TOWER * 119.9 (CTAF) 0	GND CON 121.7	CLNC DEL 124.7
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RADAR REQUIRED

PROCEDURE  
CHICAGO/  
WHEELING, IL. ILS  
AMENDMENT 2A...  
ED  
25. 15 OCT  
19:04 2015  
OCT 19:04

# 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.

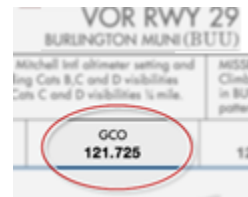
To cancel on the ground you can call 800-WX BRIEF or 888-766-8267 or use the RCO or GCO if available

## 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???

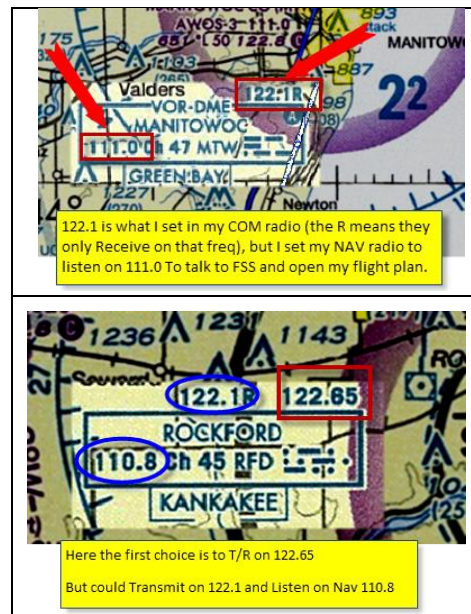
Example: "Clearance void if not off by (clearance void time) and, if required, if not off by (clearance void time) advise (facility) not later than (time) of intentions."

## 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

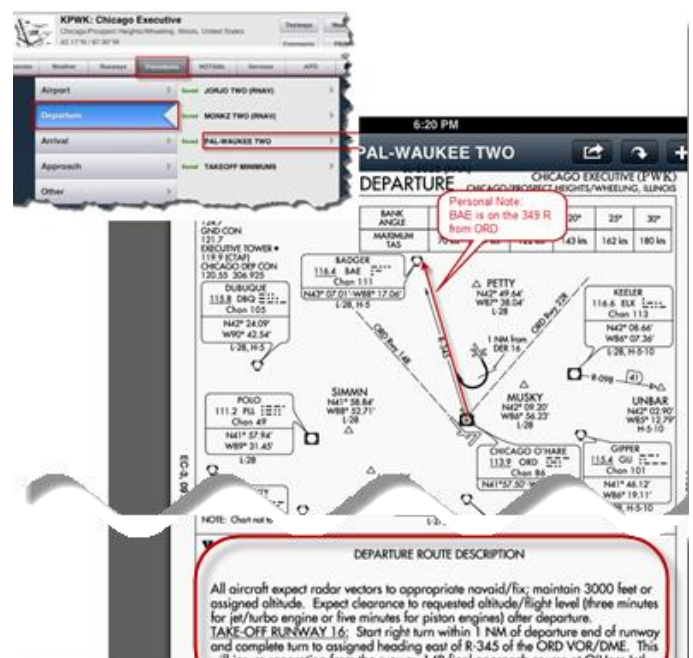
*Cessna 12345 cleared to Nashville as filed, fly runway heading, climb and maintain three thousand, expect seven thousand one zero minutes after departure, departure frequency one two four point six five, squawk two seven one three.”*

IFR CLEARANCE CRIB													
Clearance Fix:													
Route	(AF)											(RH)	
	((Done) + Swipe to go to P.2 →)												
Climb & Maint:	2	3	4	5	6	7	8	9	+500				
Expect	10+								Min after Dep:		5	10	15
Via SID:													
Freq	1 2												
Squawk	1												

Flight Watch is 122.0

Some airports 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

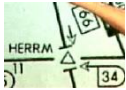
VOR Nav aids

- 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

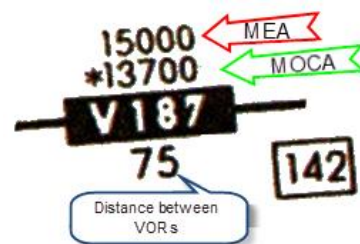
**Change Over points** for VOR Frequency

- 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 3<sup>rd</sup> (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

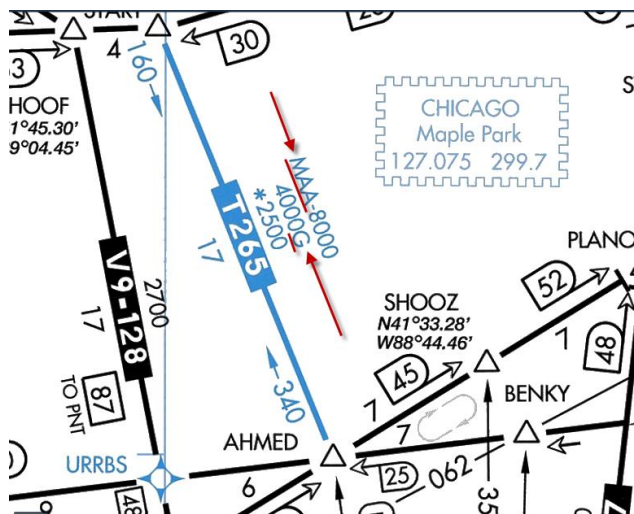


The standard service volume (SSV) defines the reception limits of NAVAIDs used for navigation off established airways. Below 18,000 feet the SSV for "L" class VORs is 40 NM, therefore for IFR operations off established airways below 18,000 feet MSL use navigational aids not more than 80 NM apart (40 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 Terminal Transition Routes that help pilots avoid detours in busy areas





# IFR Course Notes – Enroute Charts

## 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](http://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

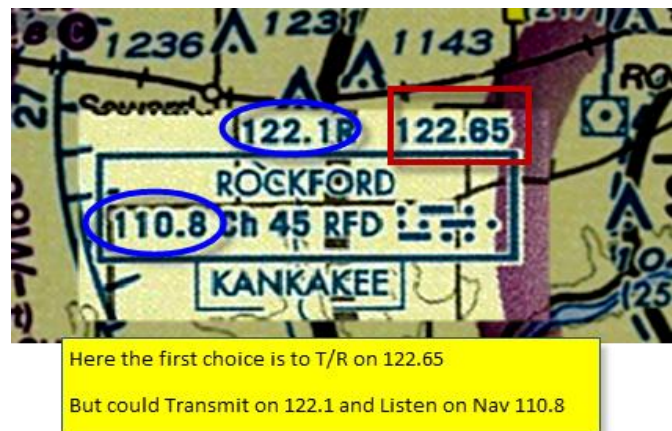
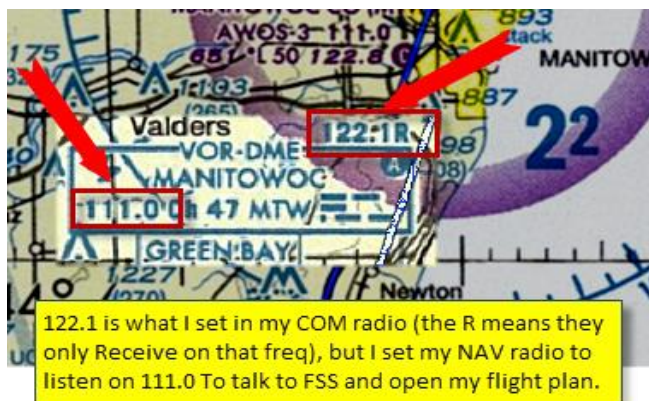
Flight Watch is available on a single common frequency, **122.0 MHz**. Flight Watch may be unavailable below 5,000 feet AGL, depending on terrain and the distance from the nearest station FW is available from 6am-10pm and above 5000 ft. If you can't hear them, see if you need to climb a bit.

**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



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

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, unless GPS is WAAS

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.

## Overview of Approaches...

	V/Loc (Ground Based)	GPS (Satellite Based)
<b>Non-Precision</b> MDA ~4-500' AGL	<b>VOR Localizer</b> (no GS) <b>BackCourse</b> (Localizer only) <b>LDA</b> (ILS but at angle) <b>SDF</b> (no GS, wider, offset)	<b>LP (+v)</b> <u>Localizer</u> Precision <b>LNAV(+v)</b> <u>Lateral</u> Navigatn (+v is GNS advisory GS)
<b>Precision</b> DH ~2-300' AGL	<b>ILS</b> (Localizer + GS)	<b>LPV</b> <u>Localizer</u> w/ Vertical <b>LNAV/VNAV</b> (Baro vert) <b>L/VNAV</b> ← GNS label
<b>Visibility</b>	Ceiling minima are a function of Vertical guidance; Visibility minima are a function of runway lighting.	

Localizer is approx. 5 deg wide.

LP has horizontal *narrowing* as you get closer (*circa 2012*)

LNAV has *parallel* edges, so higher minimums than LP or LPV

BC. Same ILS antennas but going out the back, so fly the needle backwards.

LDA is regular ILS, but it comes in at an angle or offset!

**SDF -Simplified Directional Facility** is

- 6 or 12 degrees wide, and
- may not be lined up with the runway

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

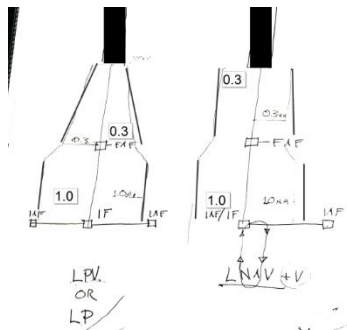


Table from the Garmin PDF Users manual → Does not include the ~2012 LP, though such is part of my GNS530W

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.

# IFR Course Notes – Approaches/Overview

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:  $3^\circ$  is about 20:1; 1Nm=6,000';

1Nm@ $3^\circ$  = 300' AGL (Precision)

2 Nm@ $3^\circ$  = 600' AGL (Non-Prec)

5 Nm@ $3^\circ$  = 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*

# IFR Course Notes – Approaches/Overview

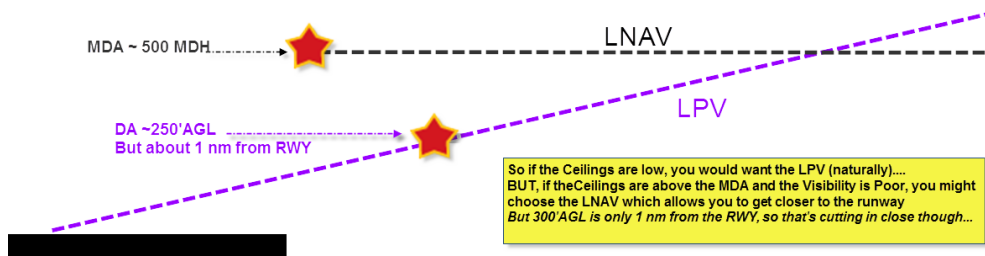
## Barometric Aiding (Baro-Aiding)

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. Baro-aiding requires four satellites and a barometric altimeter to detect an integrity anomaly. The current altimeter setting may need to be entered into the receiver as described in the operating manual. Baro-aiding satisfies the RAIM requirement in 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 waypoint. When using baro-VNAV guidance, the pilots should check for any temperature limitations which may result in approach restrictions.

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



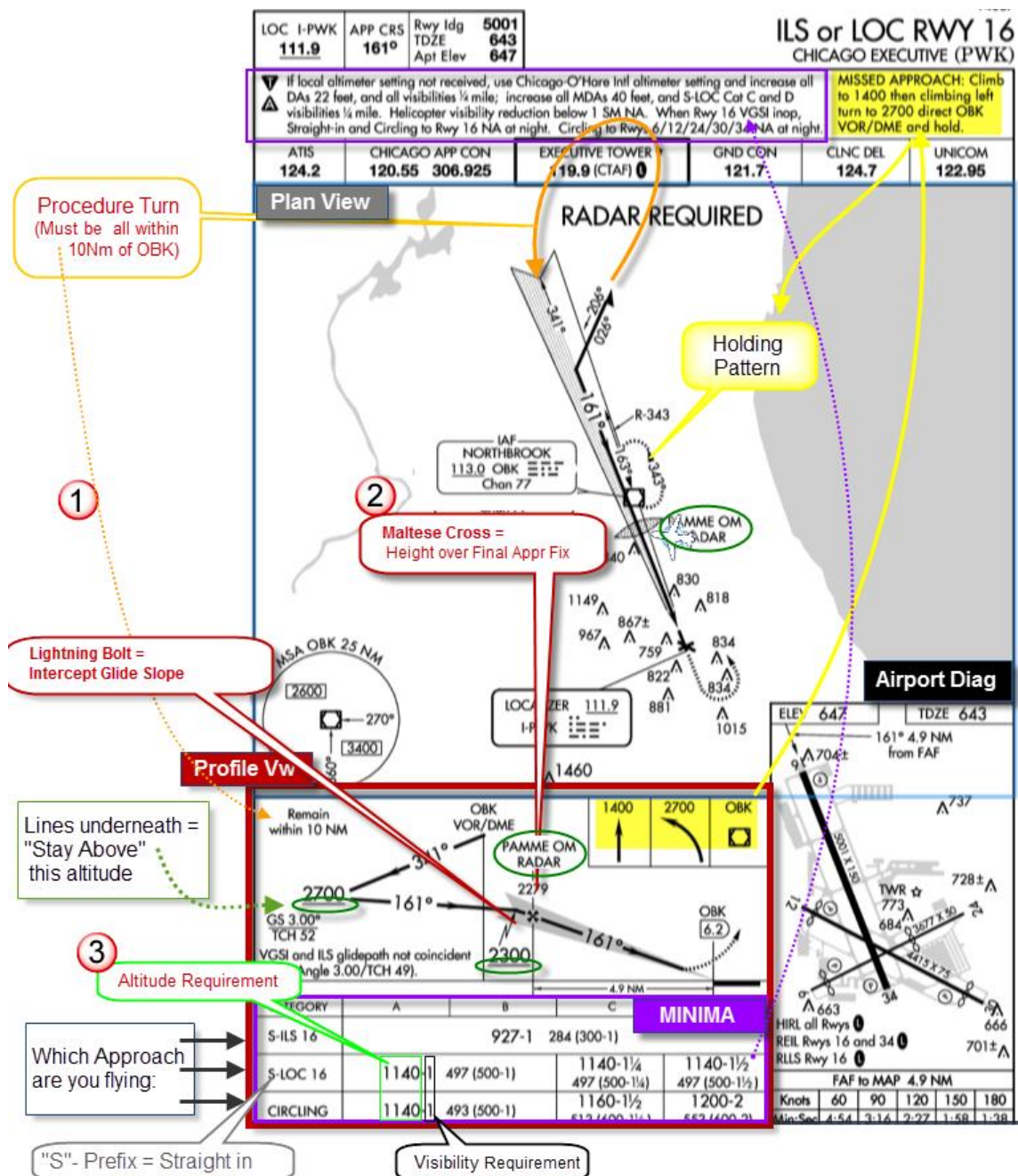


# IFR Course Notes – Approaches/Plates: Overview

[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)



# IFR Course Notes – Approaches/Plates:Airport\_Diagram

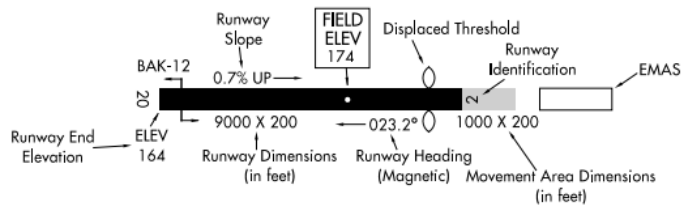
## [Airport Diagram]

### REFERENCE FEATURES

Buildings.....	■
Tanks.....	●
Obstructions.....	△
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.



# IFR Course Notes – Approaches/Plates:Airport\_Diagram

## Lights:

**HIRL/MIRL** Runway Edge Lights (**Hi** Intensity or **Medium Intensity**). 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.<sup>[1]</sup> 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

**MALS(R)\*** Medium intensity Approach Lighting System with Runway Alignment.

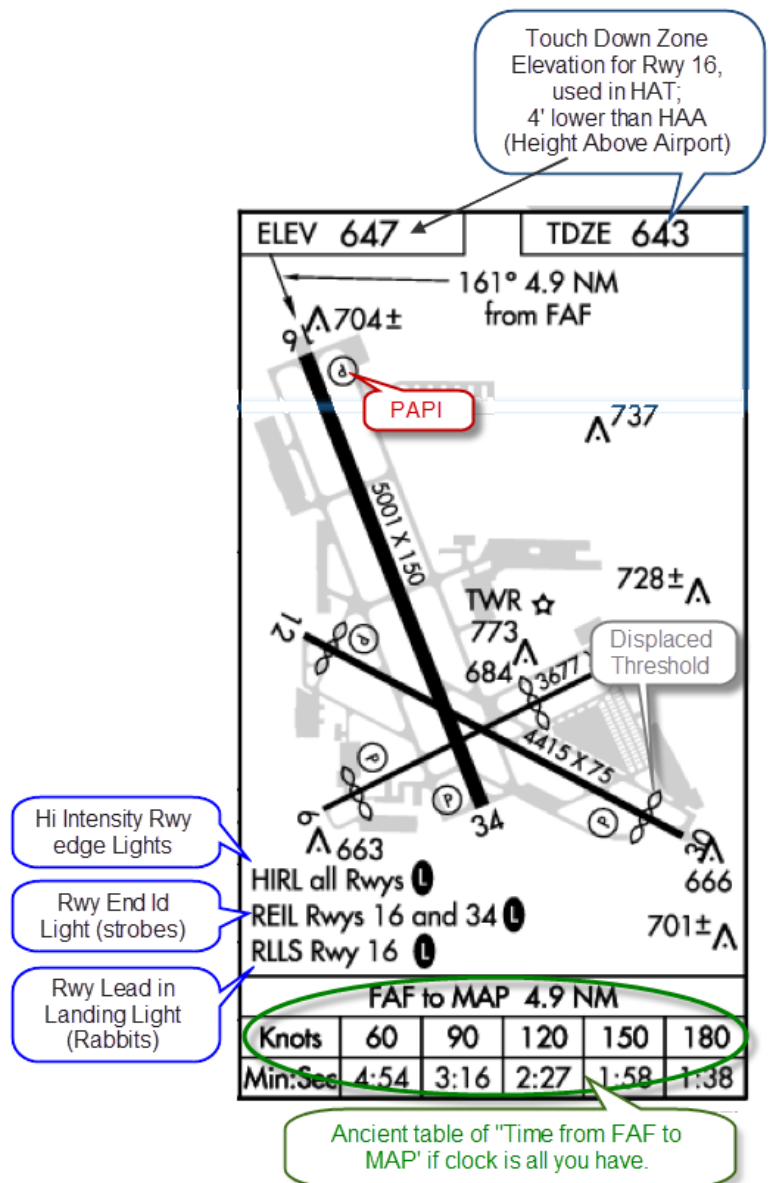
**SSALS(R)\*** Simplified Short Light Approach Landing System (w/Rwy alignment indicators)

**"\*" = 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.<sup>[2]</sup>

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



# IFR Course Notes – Approaches/Plates:Minima

[Approach\_Plates\_Minima]

## MINIMA

Based on Stall speed,

Decision Height

Minimum Descent Altitude

Which Approach are you flying:

"S"- Prefix = Straight in

Visibility Req

CATEGORY	A	B	C	D
S-ILS 16	927-1	284 (300-1)		
S-LOC 16	1140-1	497 (500-1)	1140-1½ 497 (500-1½)	1140-1½ 497 (500-1½)
CIRCLING	1140-1	493 (500-1)	1140-1½ 497 (500-1½)	1200-2 553 (600-2)

Altitude Req (MSL)

Altitude Req (AGL)

HAT

HAA

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 :  $1.3 \times V_{SO} = 55 \times 1.3 = 72\text{Kts} = A$  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 be pulled up at DA and drop a few feet below, but on MDA you may NOT ever drop below that altitude.

DME MINIMAS	
C 31	720/24 338 (400-1½)
LOC	860-1 459 (500-1) 860-459 (500-1)

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 is 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

B
1157/24

Runway Visual Range in 100'

# 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 components 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.

### General rules about visibility as a function of Approach/Lighting

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

“Must have Approach Lights to get under 1 sm visibility Minimums” Ask AI about the missing cells above!

### (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 of minima)

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

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

<b>T</b>	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.			
<b>A</b>				
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.

By definition, the **FAF** for a precision approach is an ALTITUDE, not a landmark/INT per se. 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

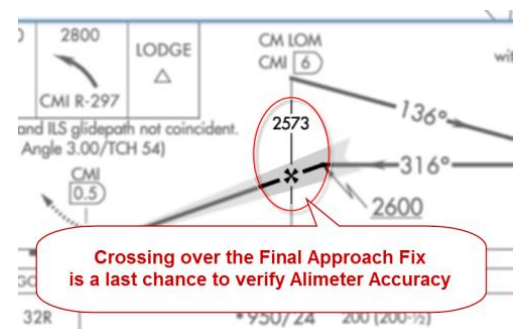
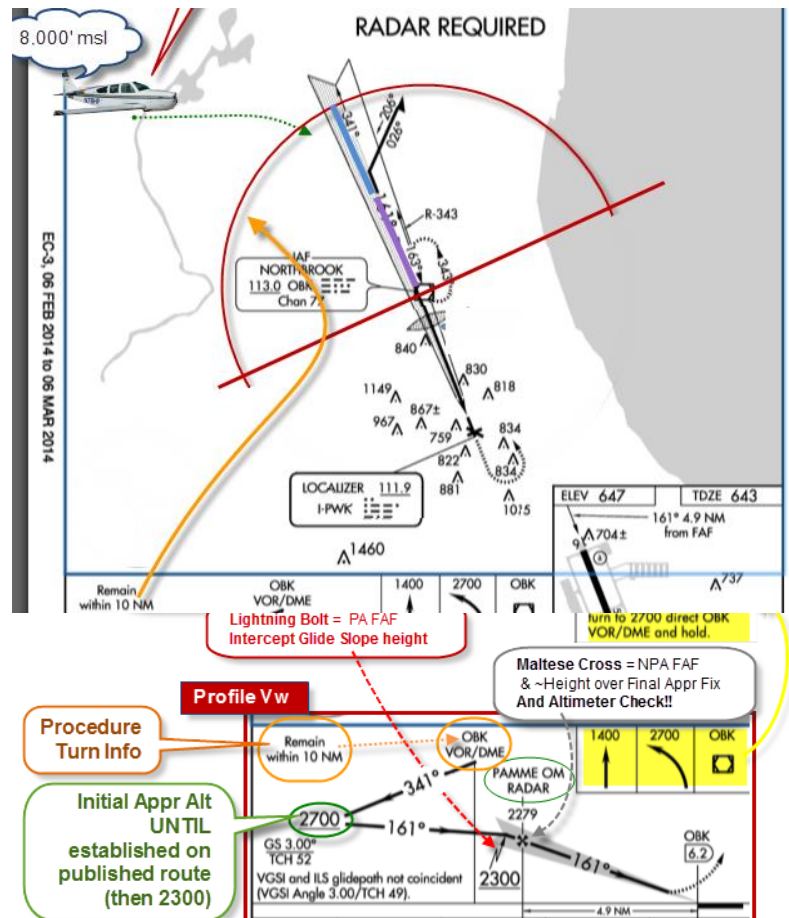
NOTE: for the PRECISION Approaches, it is a 'slope' as shown. But for NON-Precision (Localizer, LNAV, GPS), you can dive down to MDA past the FAF and fly level at the MDA until the MAP!

By definition the **MAP** on

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



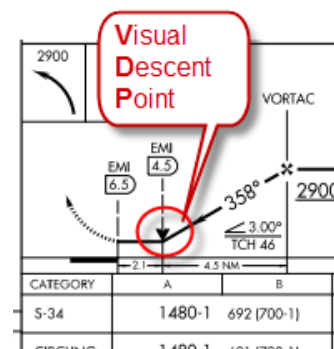


# IFR Course Notes – Approaches/Plates:Profiles+Main

## 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')

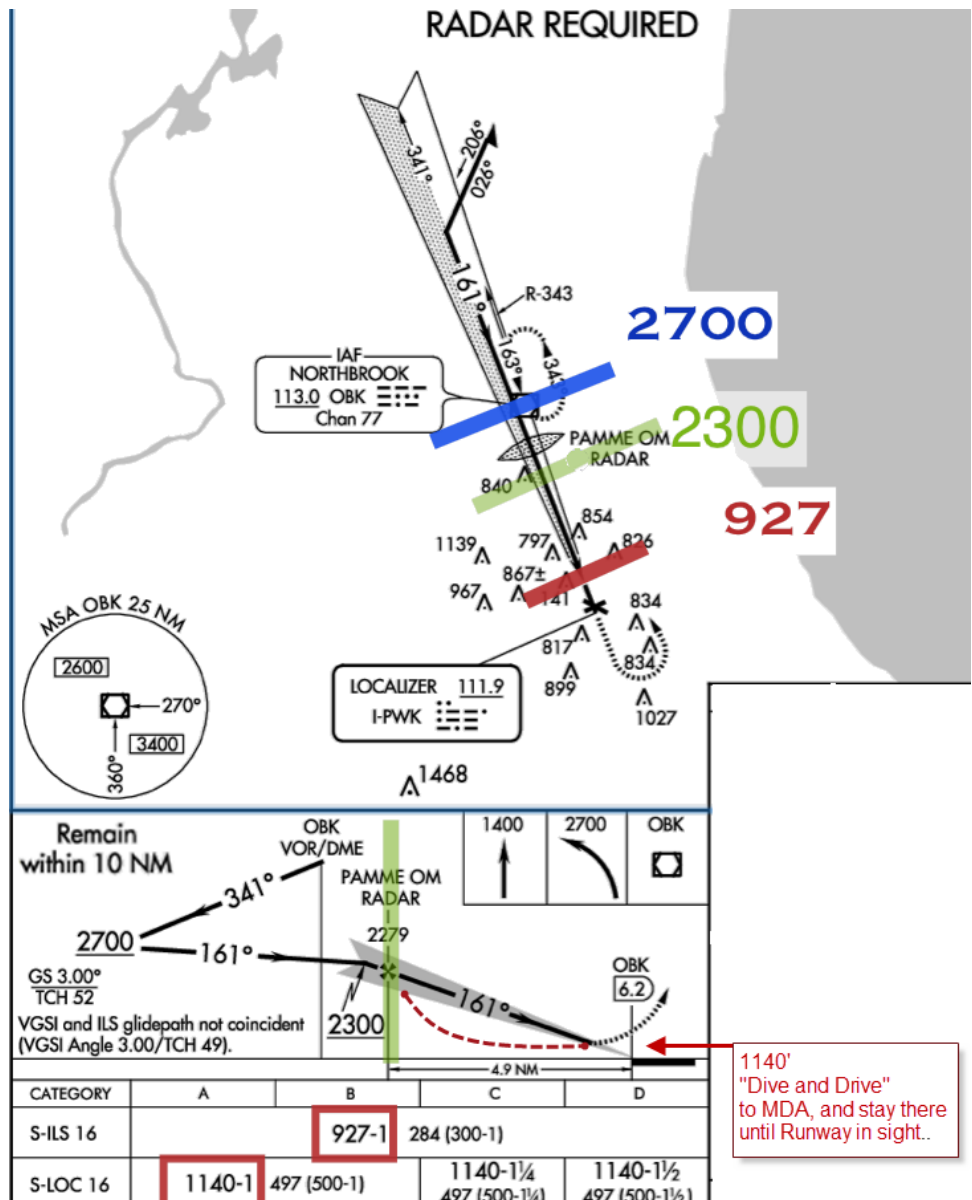
The Northbrook VOR (OBK) is our reference point.

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).**

=====





# 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

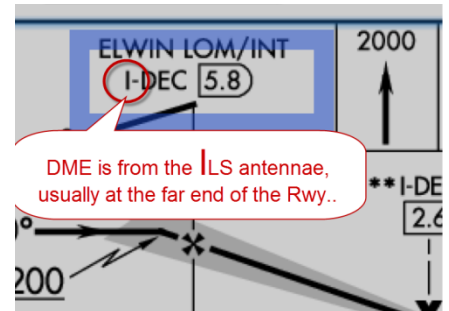
GPS ) 0.3 nm t

**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 Locator Beacon (OCLM), or Outer Compass Marker (OCM) or Locator 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

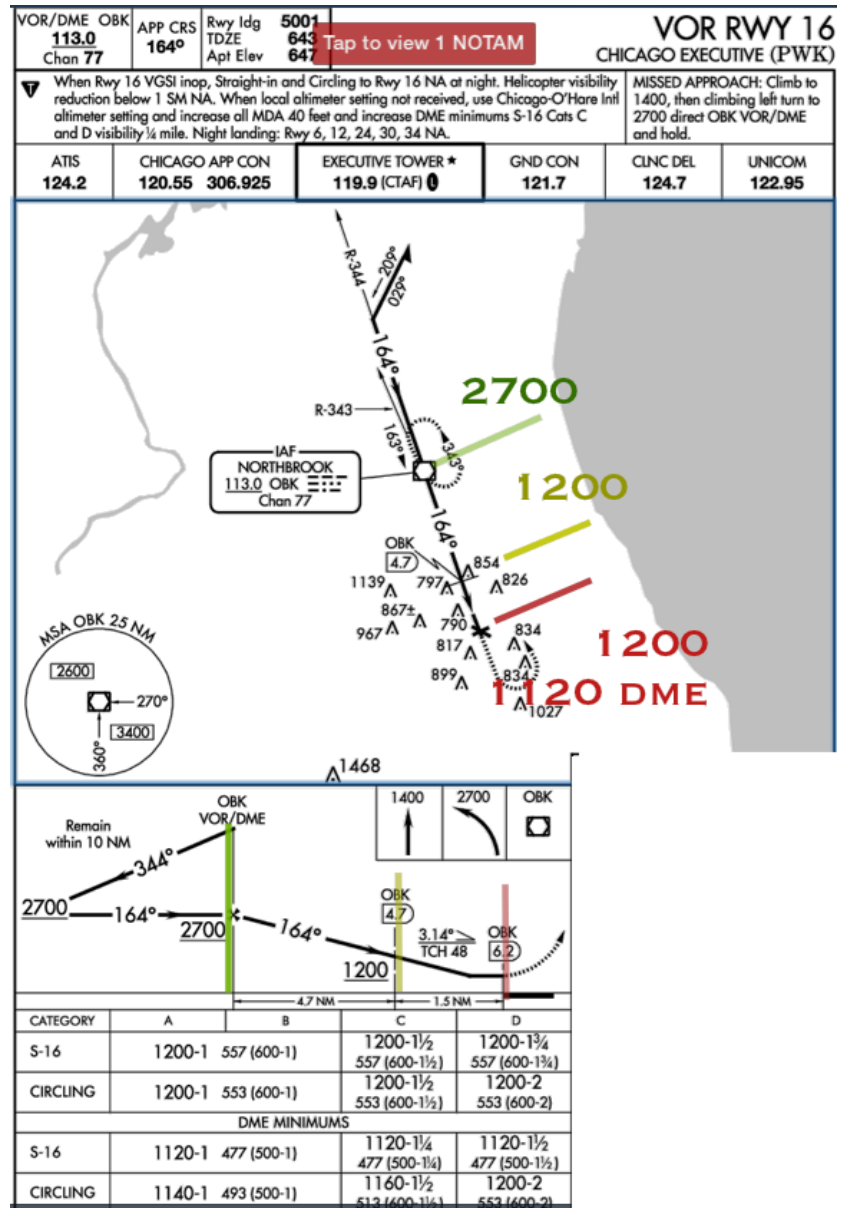
VOR: 10 degrees

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 or 2. The descent gradient is > 400'/nm from the FAF to the TCH.*



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

[Approaches\_Plates\_Profile\_LPVinav]

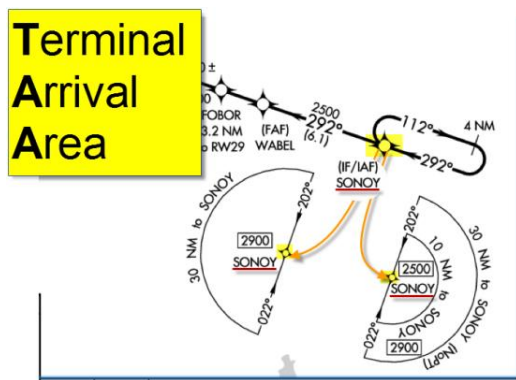
RNAV approaches are sooo much cleaner/easier to read!

## CDI Deflection (full scale):

LOCALizer: 2.5 degrees  
VOR: 10 degrees  
GPS ) 0.3 nm t

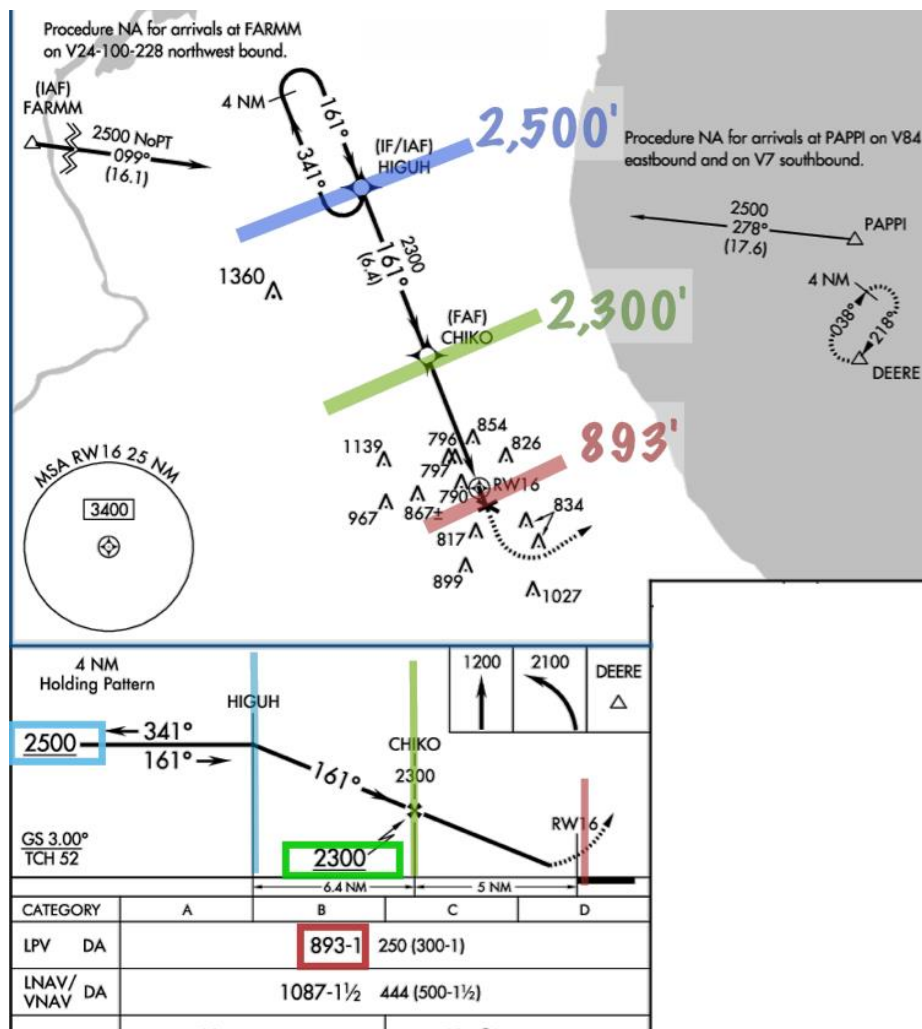
Terminal Arrival Area (TAA). UNLIKE a MSA (which provides MOC, but not Com or Nav reception, and only to be used for an emergency), a TAA is around certain GPS approaches **and is considered a published segment of the Approach**. If you are cleared to an IAF on the approach and are in the protected airspace 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 environment keyed around one of the arrival points that begin an RNAV (GPS)



## 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.



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

# 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 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:

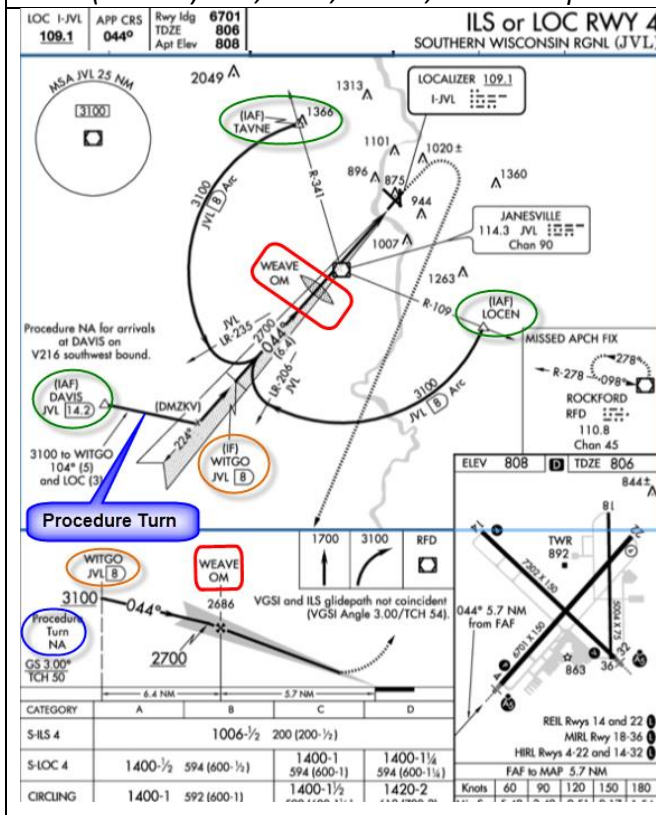
Sent to Intercept localizer upstream of FAF

Or :

## Course Reversal

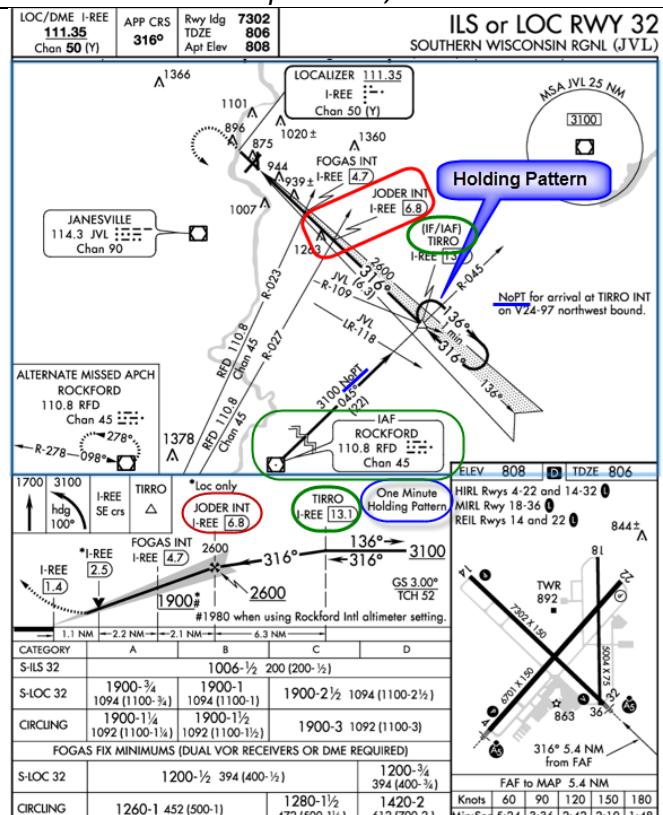
### Procedure Turn

(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

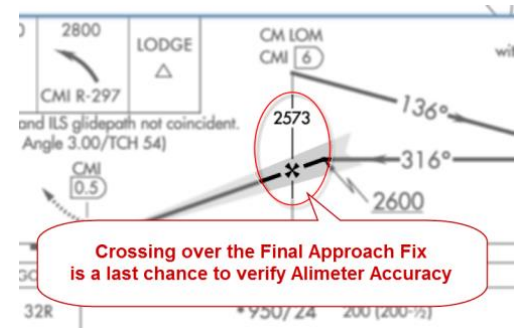
If coming from upwind, consider a 'Circling Approach' to a runway if the Wx is good (e.g., 1500 agl and 3nm Visibility), as that saves you from overflying the field by a long ways to line up for the nice long instrument approach from the other (upwind) direction.

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.



# IFR Course Notes Approaches/Beginning the Approach

- 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.

# IFR Course Notes Approaches/Beginning the Approach

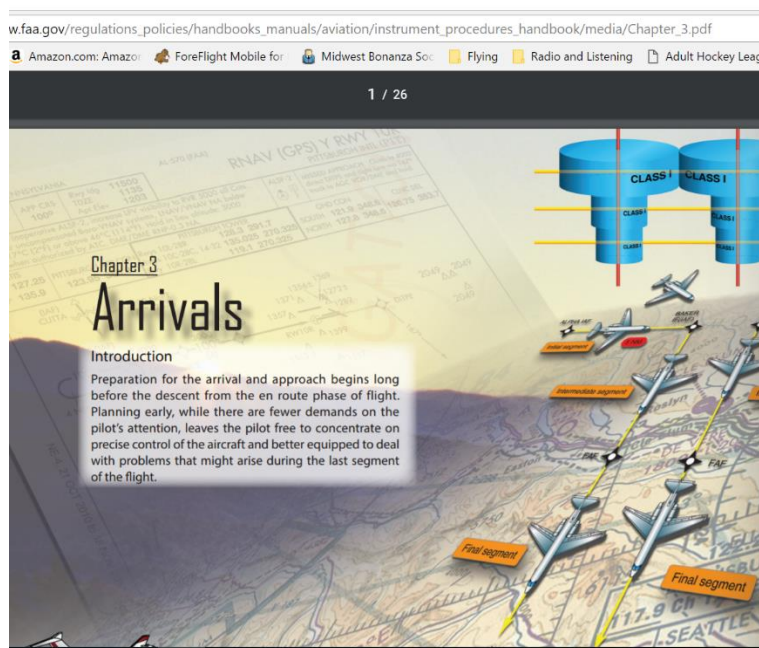
Moral: Always ASK for a straight in or Radar Vectors to avoid the requirement for a PT.

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.



# IFR Course Notes Approaches/Missed Approach)

## MISSED APPROACH

**ASSUME THAT EVERY APPROACH WILL BE A MISSED APPROACH!**

### GOING MISSED,

#### Going Missed

Before you decide to Go Missed, the following should have been configured previously:

- A/P: APPR + AP engaged
- Gear: Down
- Flaps: 1 notch (of 2)
- Mixt: Rich
- Prop: In at ~2500
- G3 ALT Bug: Set for initial MA Altitude

If you decide to Go Missed, here's your sequence:

(Left hand is on the yoke where TOGA is, Right hand is (always) on the Throttle)

- **Press TO/GA**
  - Will arm the ALTS (Altitude Select)
  - Will immediately set FD to +7deg, Servos will follow
  - G3 will not let you stall:
    - it will nose down from +7 if you can't maintain minimal airspeed
- Power in Full
- Gear up
- Flaps up
  - Once the gear is up (3 seconds), that will more than compensate for the lost lift from the 1<sup>st</sup> notch of flaps. In addition, it takes another 1-2 seconds for flaps to retract.,

So "Wait until airspeed is established before retracting Flaps" seems moot.

#### Autopilot/Navigation:

Once you are passed the RWY waypoint, the GNS will make the MA hold be the next waypoint, but it will **SUSP**end sequencing. You then

- Press the CDI on the GNS 530 to **UN-SUSP**end, and the MA hold is your next waypoint, which the autopilot will take you to, laterally.
- The GA automatically sets **ALTS** (climb-and-hold at **Selected ALT**itude)
  - So your vertical navigation is also now set
  - So if your MA instructions are "Climb to xxx Altitude and go straight to the MA hold WPT", you are set!
    - Note: For many – but not all – Holds, you climb and go direct to the Hold. But at PWK, you climb-then-turn-then go to the hold. I am not sure how this system handles that

(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 Runway Environment at the Decision Height (DH), you have to go missed. So your MAP for Precision Approach 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.

# IFR Course Notes Approaches/Missed Approach)

- 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 overflowed the airport and go ‘missed’

# IFR Course Notes Approaches/Missed Approach

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 controller 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



## 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
  - G3Heading **Bug**, or
  - **GPS Steering** (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 G3as the 'central hub' of Navigation/AutoPilot activity, even if such is not technically true. Example: the G3 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 G3as 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.

Need to update this for the GFC 500 My G3X/507 Doc is mor extensive...

## . - - - IFR GPS Approach

**Incredibly easy:** Just set everything up like you normally would, using the EXTERNAL GPS (530) as your G3 GPS source, and then – as usual – select PROCEDURES/APPROACH/etc on the 530 - and ACTIVATE when Cleared for the APPROACH

Then, just select APPRoach mode on the 507.

You could even do this 20nm from the IAF.

APPR mode mostly just engages vertical navigation (notably including GP capture) in addition to the Lateral navigation.

**Special Case:** Normally, you will be assigned an Initial Approach Fix (RFD 25: “Direct TONGE”). But sometimes they will vector you INSIDE the IF (intermediate Fix) to a point just ahead of the FAF (eg, “SUGEE” at RFD) and tell you “Continue heading and join the Final Approach Course...” The 530/507 is not specifically designed for this.


It DOES have a “Vectors to Final” option on the 530, but that deprecates the approach to LNAV! 😞 So you do this

- 507 AP is in **HDG** Mode
- Load and Activate the Approach on the 530, for the nearest IAF offered on the 530 (often includes the IF),
  - Select the FAF and press DIRECT TO
  - The 530 will output navigation instructions, but with the 507 in the HDG mode, these navigation instructions are ignored.
- When you are nearly aligned with the Approach Course (extended centerline), Press **APPR** on the 507
  - This will disable HDG mode and start obeying the 530 GPS Approach instructions.
- This is now a standard RNAV approach.

Anomaly: as of 7/31/24: When I did the above on an IPC at RFD Rwy 19 (Direct CAGRA (FAF)), the 530 FPL highlighted the segment *between* the FAF (CAGRA) and the *next* waypoint (JUNUP) as if it were already between those two, and the G3 “Next Waypoint” was showing JUNUP 😞.

The VDI and everything else seemed to be correct, only the “Next Waypoint” display on the G3 was wrong.

# IFR Course Notes Approaches/Avionics: Auto-Pilot- VOR

		<b>Garmin</b>
		

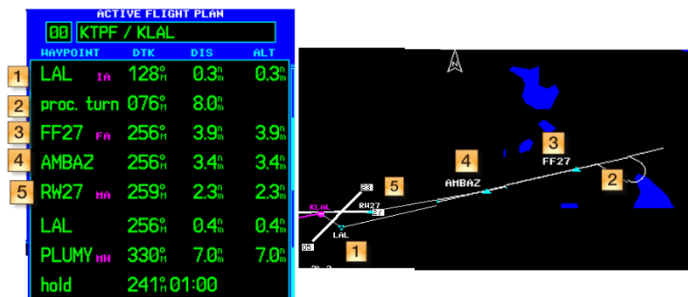
For **VOR** navigation however, the G3is also functioning as your VOR, and so like any VOR you need to set the CRS/OBS setting for it to work properly. To wit, if your G3CRS setting is not set to the correct/desired VOR radial then just like any VOR your CDI will never center, and you will drift aimlessly, forever awaiting the course intercept. And so whenever you are doing a VOR approach, you must also do a 3<sup>rd</sup> thing, which is to set the CRS on the G3to 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





# IFR Course Notes – Approaches/ Closing & Misc

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

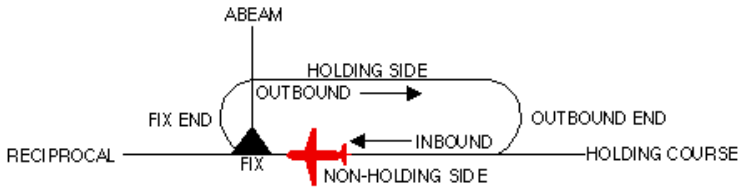
[HOLDs]

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**

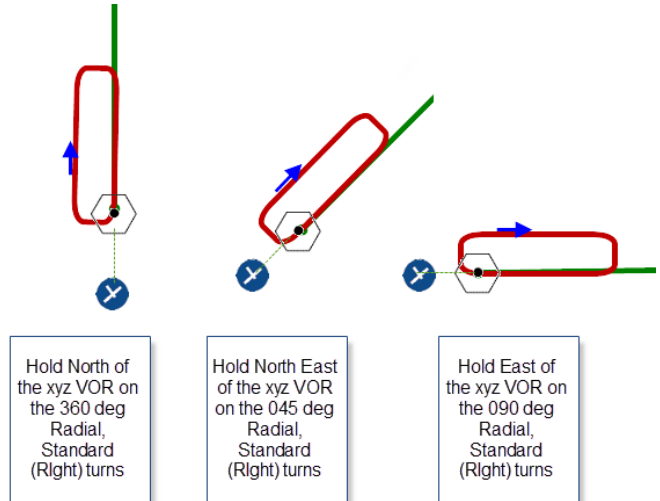
## “Holding Pattern”

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



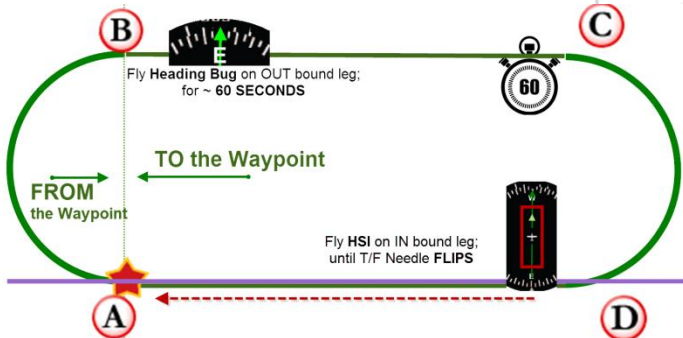
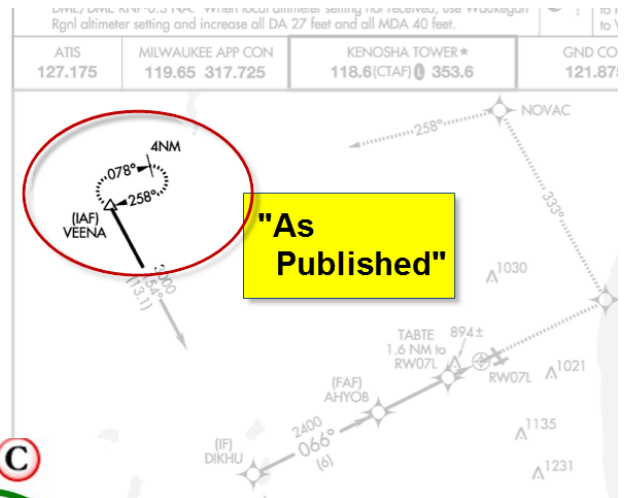
he direction specified (of the Hold) is the direction FROM the hold point.

(The direction of the radial, if you will.)

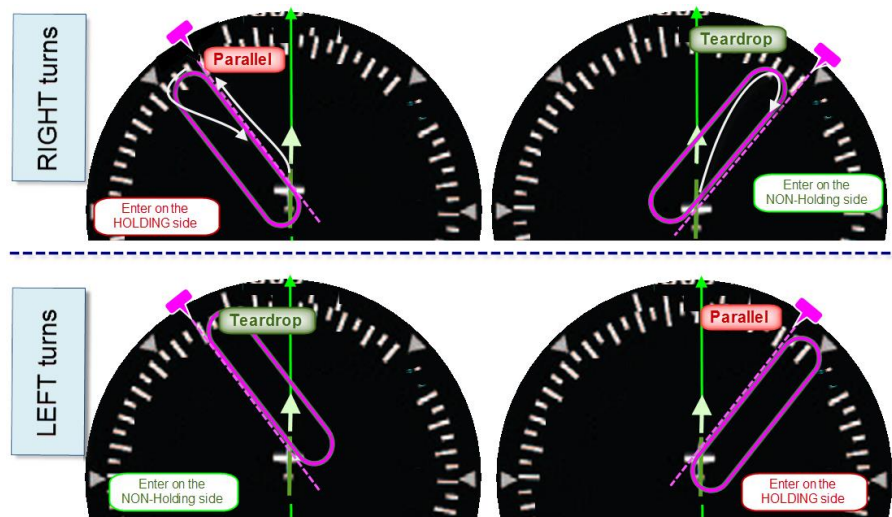


The 'width' of the oval is :

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 G3ground Track should match this heading bug!



- (B) Entering, & Flying the Alignment leg

**Parallel:**

HB

**Teardrop :**

HB – 30

**Direct :**

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 G3as 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

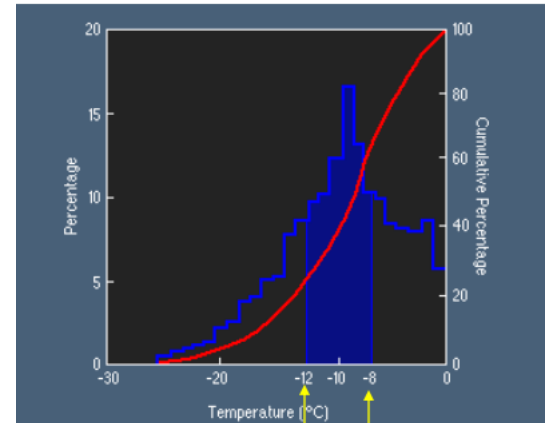
More than 50% occurs between -8 and -12C

**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**

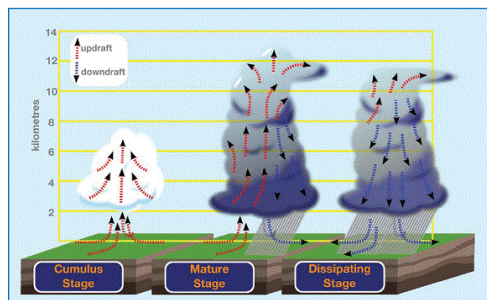
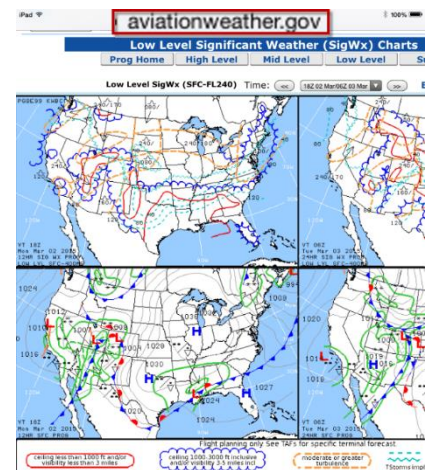
– More than 50% of those occur between -8 and -12° C



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**

# King IFR DVD

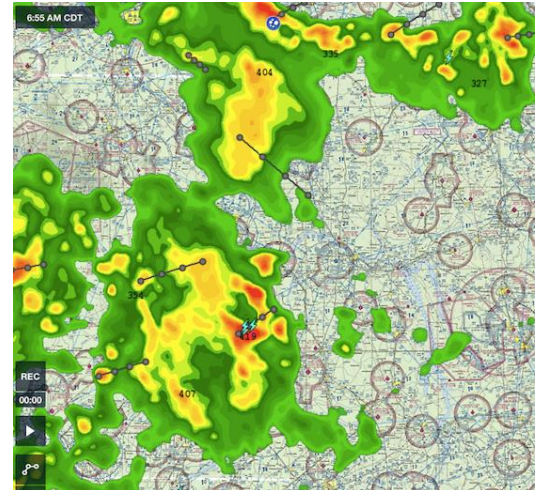


## Section 8 Weather

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** precipitation 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



# IFR Course Notes Regulations/ Requirements

[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 hr
50 cu. ft.	26 1/2"l x 7" dia.	36 lbs.	46:21 hrs.   15:27 hr

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.



# IFR Course Notes Regulations/ Requirements

- If you are there \*before\* that time, you have to Hold
- At/after that time, you may descend and land 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

# IFR Course Notes Regulations/ Requirements

## 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
  - Interceptin the past 6 months. I have a full page table on that...

## **Must be on the PLANE**

- Airworthiness certificate (on plane, in pouch in cargo section)
- Registration (where do I keep that??)
- ~~Radio~~ no longer needed
- Operating Handbook (under knees in cockpit)
- Weight & Balance (in POH, above. EFB version not acceptable)

# IFR Course Notes Regulations/ Requirements

## Maintenance:

- 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

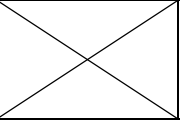
AIM 5-2-5 Clearances

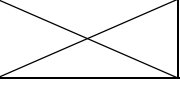
# IFR Course Notes Regulations/ Requirements

## IFR Currency Requirements:

Status	What you must do in a real airplane	
	IMC	VMC

<b>"A"</b>  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>"B"</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'		

<b>"C"</b>  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).***

# IFR Course Notes Regulations/ Requirements

## 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.

## IFR Course Notes *VFR and basics*

**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

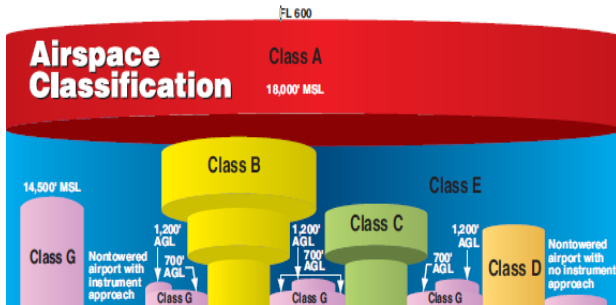
There is none between VFR and IFR

*But doesn't landing traffic have ROW over departing (as if it matters...)*



# IFR Course Notes *VFR and basics*

[VFR and Basics]



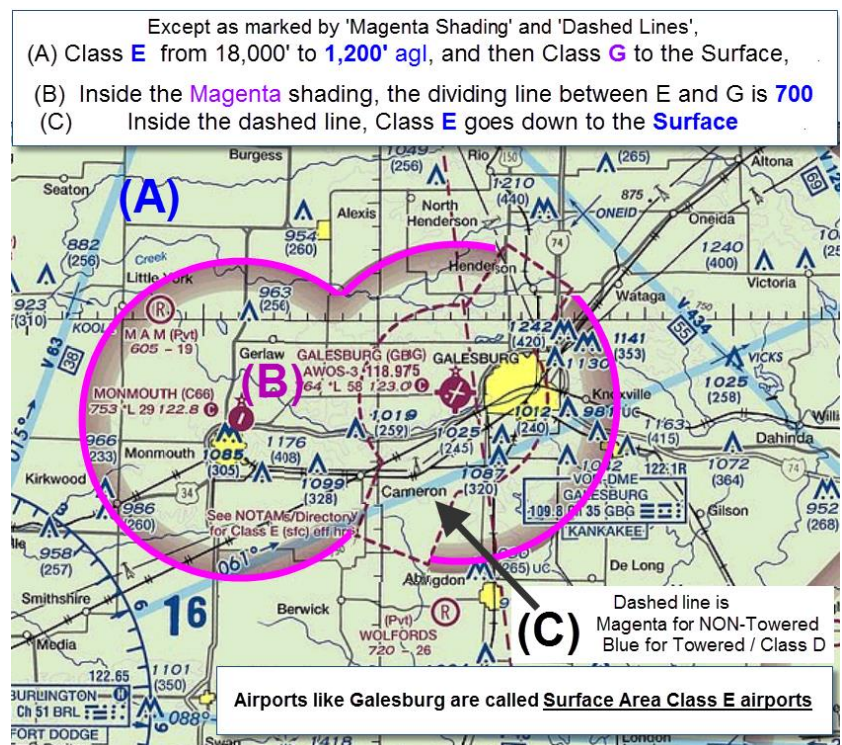
On the Sectional Maps: Airports with a Control Tower are shown in BLUE, others are in Magenta  
And Paved airports are in a circle

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		
D		PWK	Cylinder (~3500 agl')					Tower
E	A	Everyplace else you <i>fly</i>	1,200' +			1,000' ceilings for VFR		
	B	in shaded area	700'					
	C	in dotted Line	0'					
G	Day 'uncontrolled'	Non-Tower Airports w/o Instrmnt app	0' – 1200'	1 sm	Clear of Clouds (no ceiling req)*			← <b>Special VFR</b> (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.

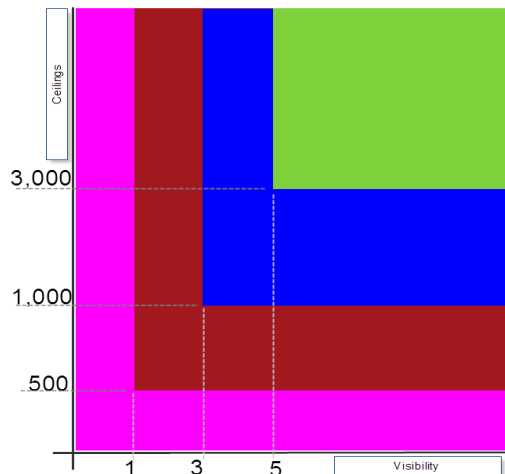
Ex: To take off at Monmouth (B), in G Airspace you need only 1sm and clear of clouds. Once you climb to 700' AGL there, you're in E and need 3sm and the 500/2k/1k cloud separation.

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.



# IFR Course Notes *VFR and basics*

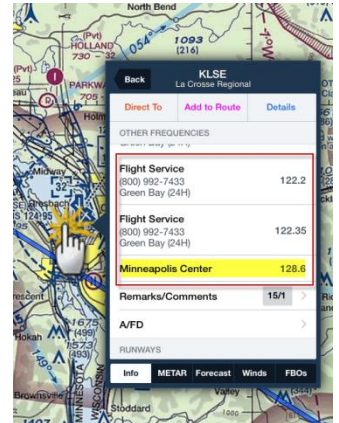
	Ceiling	Visibility
<b>VFR</b>	>3,000'	5+
<b>MVFR</b>	1-3,000	3-5
<b>SVFR</b>	Clear of	1+
<b>IFR</b>	500-1k	1-3
<b>LIFR</b>	<500	0-1
Alternate: if Primary TAF is $\pm 1$ Hr, < 2k' AGL ceilings or < 3sm vis Alternate TAF must have : 600' ceilings for ILS, 800 otherwise		



## CLOUDS - defined

Abbrev	Meaning	
SKC	"No cloud/Sky clear" used worldwide but in North America is used to indicate a human generated report	
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 (eighths)	<a href="#">Mostly Sunny</a> ('Clear' at night)
SCT	"Scattered" = 3–4 oktas	<a href="#">Partly Sunny</a> ('Clear' at night) is 3/8 to 5/8; same values (3/8-5/8) as <a href="#">Partly 'Cloudy'</a>  so 'Partly Sunny' could be 5/8 which is 'Broken' and therefore a ceiling.
BKN	"Broken" = 5–7 oktas	
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.	

# IFR Course Notes *VFR and basics*



# IFR Course Notes *VFR and basics*

## 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 20° 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  $\frac{1}{2}$  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 line says “E” or “W” you really are, and you can stop
  - When Acc/Decelerating
    - **ACCELERATING** dips to the **NORTH**
    - **DECELEARTING** dips to the **SOUTH**
- 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.

# IFR Course Notes

## Appendix- Approaches ...

### 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.<sup>[3]</sup> 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



# IFR Course Notes

## *Appendix- Approaches ...*

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