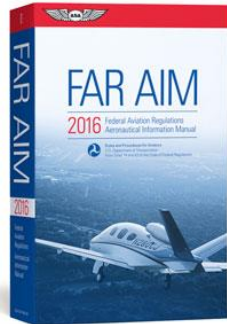


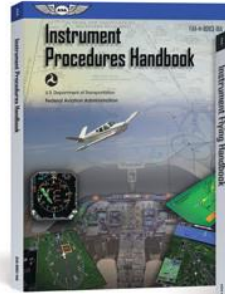
# **INSTRUMENT STAGE CHECK ORAL GUIDE**

**(REVISION I)**

# REFERENCES



FAR/AIM



IPH



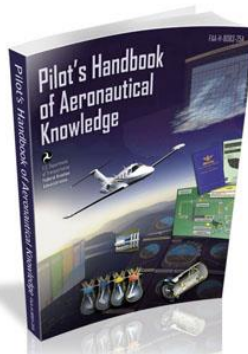
IFH



AC 00-45G



AC 00-6A



PHAK



POH

# RECOMMENDED READINGS



# Selected Advisory Circulars

- ✚ 120-57 Surface Movement Guidance Control System
- ✚ 120-91 Airport Obstacle Analysis
- ✚ 90-100 RNAV Operations
- ✚ 20-138 Airworthiness of Navigation Systems
- ✚ 120-71 SOP for flight deck crew members
- ✚ 90-101 RNP certification
- ✚ 97-1 RVR

## Certificates and Documents

**How long is your pilot certificate valid? (61.19 c)**

Your pilot certificate is issued without a specific expiration date

**What privileges and limitations apply to you as a private pilot? (61.113) (91.146)**

Privileges – Act as PIC and carry passengers – conduct search and rescue operations; fly for charitable, non-profit, or community event; act as an aircraft salesman if you have at least 200 hours.

Limitations – Cannot fly for hire; must pay no less than pro rata share

**What documents must you have with you to fly the airplane? (61.3)**

Pilot certificate, medical certificate, and government issued photo ID

**How long is a medical certificate valid for? (61.23)**

### Under 40

Months	12	24	36	48	60	
First Class Certificate Granted	First Second and Third Class	Third Class	▶	▶	▶	Expired
Second Class Certificate Granted	Second and Third Class	Third Class	▶	▶	▶	Expired
Third Class Certificate Granted	Third Class	▶	▶	▶	▶	Expired

## 40 and Older

Months	6		12	24
First Class Certificate Granted	1st, 2nd, 3rd	2nd, 3rd	Third Class	Expired
Second Class Certificate Granted	2nd, 3rd		Third Class	Expired
Third Class Certificate Granted	Third Class		▶	Expired

### How do we keep our pilot certificate current? (61.56, 61.57)

Student pilot: with valid medical certificate

PPL: Flight review every 24 calendar months

### What are the currency requirements for carrying passengers? (61.57)

3 take offs and landings within the preceding 90 days in an aircraft of the same category, class and type if required. At night, these 3 landings must be made to a full stop.

### Night definition? When can you perform required night landings? (1.1, 61.57)

Night = the time between evening civil twilight and morning civil twilight

Night landings can be logged 1 hour after sunset to 1 hour before sunrise.

### When is an instrument rating required? (61.3 (v)(e) 91.157 (4) (i) (ii))

In Class A airspace

Operating under IFR

Anytime the weather is beneath VFR minimums: Ceiling below 1000' or visibility less than 3 miles

Anytime you are operating special VFR at night

**What are the recency-of-experience requirements to be PIC of a flight under IFR? (61.57c)**

Within the preceding 6 months of the flight, 6 instrument approaches and holding procedures and intercepting and tracking courses must be completed either in actual IMC, in VMC while using a view limiting device, or in a flight simulator/FTD.

**Define “appropriately rated safety pilot.” (91.109)**

The safety pilot must possess at least a private pilot certificate with the category and class ratings appropriate to the aircraft being flown and he/she must have adequate vision forward and to each side of the aircraft.

**If a pilot allows his/her instrument currency to expire, what can be done to become current again? (61.57)**

If you fail to meet the instrument experience requirements for more than 6 months, the only way to reestablish currency is with an IPC.

**What aircraft/instruments/equipment are required for IFR operations? ATOMATOF LAMES, FLAPS, and GRABCARD (91.205)**

**G**enerator/alternator  
**R**adio  
**A**ltimeter (adjustable)  
**B**all (inclinometer)  
**C**lock w/ hours, minutes, and seconds  
**A**ttitude indicator  
**R**ate of turn indicator  
**D**irectional gyro

\*DME is required at or above FL240 if VOR navigation is required

**What are the required tests and inspections of aircraft and equipment to be legal for IFR flight? AVIATES**

**A**nnual – every 12 calendar months (91.409)

**V**OR – every 30 days for IFR (91.171)

**100** hour if airplane is being operated for hire (91.409)

**A**ltimeter/Pitot Static – 24 calendar months; required for IFR flight **(91.411)**

**T**ransponder – 24 calendar months **(91.413)**

**E**LT – 12 calendar months or after 1 hour cumulative use or half of battery life **(91.207)**

**S**ervice bulletins and ADs complied with **(PHAK 8-12)**

**What are the different methods for checking the accuracy of VOR equipment?  
(91.171) (IPH 2-29) VGAAD**

VOT  
Ground Check  
Airborne  
Airway  
Dual VOR

**What records must be kept concerning VOR checks?**

Date, place, bearing error, and signature

**Where can you find the location of airborne, ground and VOT testing stations?**

Chart Supplement (see back cover)

**What documents need to be on board an aircraft to make it legal for IFR flight?**

**ARROW (91.9, 91.203)**

**A**irworthiness Certificate

**R**egistration

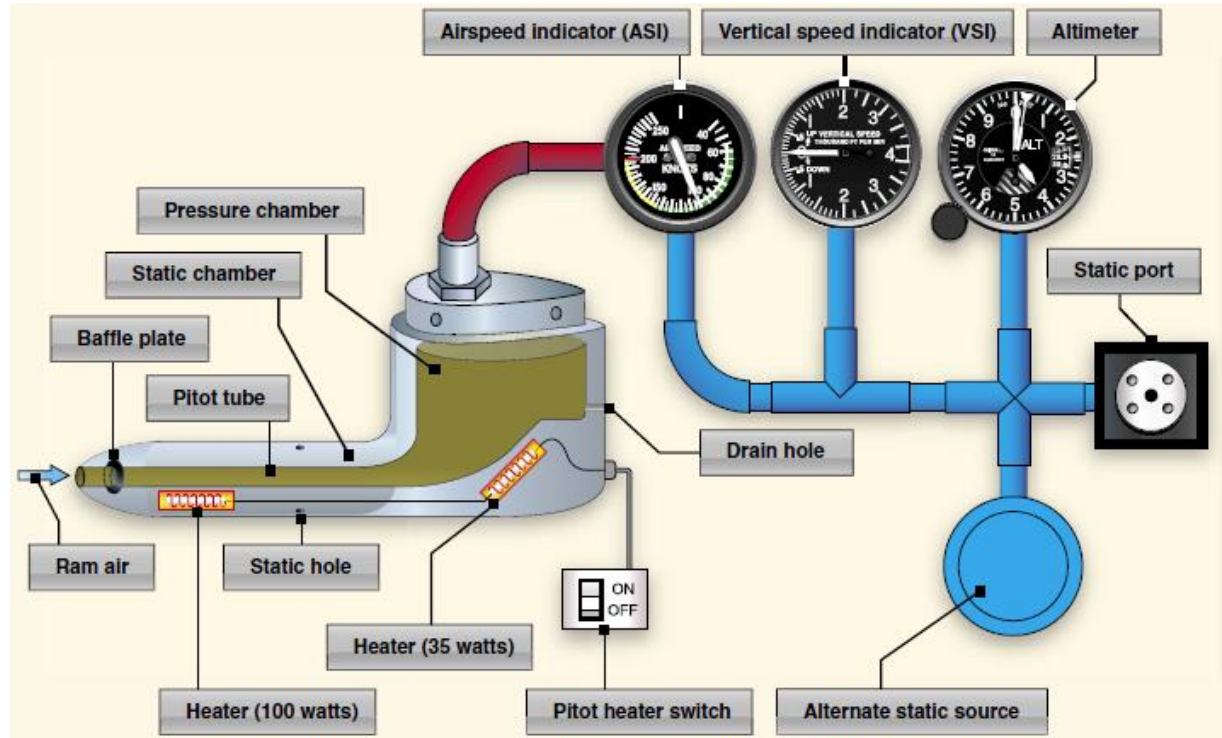
**R**adio License (required for international flight)

**O**perating Limitations (found in the POH)

**W**eight and Balance equipment list

## Aircraft Systems (PHAK Chapter 7) (IFH Chapter 5) (POH)

Describe the pitot-static flight instruments






**Airspeed Indicator** – This is the only instrument that uses both the pitot and static ports. It measures the difference between dynamic pressure (ram air entering the pitot tube) and static pressure (air that is unaffected by the aircraft's flight path). Ram air exerts a force on a diaphragm inside of the instrument. The instrument case is full of static air.

**Altimeter** – This measures the difference between static pressure inside of the instrument case and standard pressure (29.92" Hg) sealed inside of an aneroid wafer. When the airplane is climbing and ambient pressure begins to decrease, the wafer is able to expand because the air that is sealed inside is now of higher pressure. The altimeter is a sensitive altimeter meaning that it can be calibrated to the local barometric pressure by adjusting the Kollsman window.



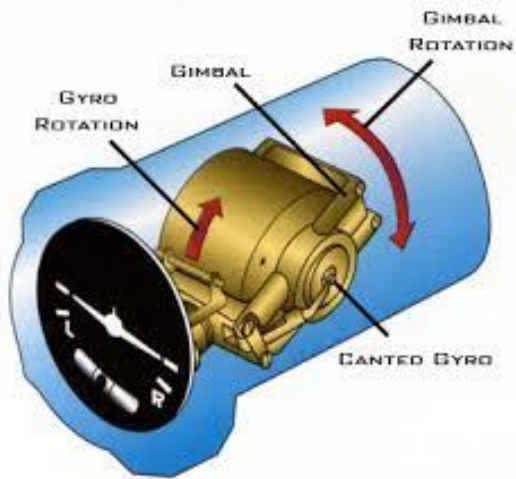
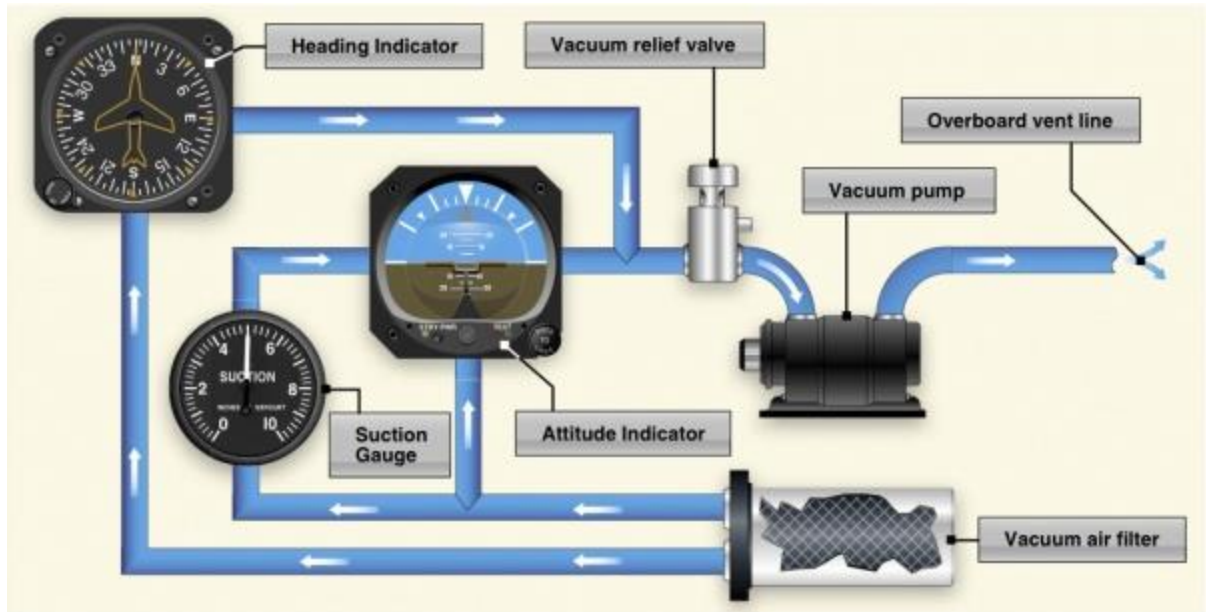
VSI – Measures the difference between static pressure and static pressure that is subject to a calibrated leak approximately every 6-9 seconds.

**How do the pitot- static instruments respond to blockages?**

	 Indicated Airspeed	 Indicated Altitude	 Indicated Vertical Speed
<b>Pitot Ram Air Source and Drain Hole Blocked</b>	Increases with altitude gain; decreases with altitude loss	Unaffected	Unaffected
<b>Pitot Ram Air Source Blocked and Drain Hole Open</b>	Displays zero knots	Unaffected	Unaffected
<b>Static Source Blocked</b>	Decreases with altitude gain; increases with altitude loss	Does not change with altitude gain or loss	Does not change with vertical speed changes
<b>Both Static and Pitot Sources Blocked</b>	All indications remain constant, regardless of changes in airspeed, altitude, and vertical speed.		

*\*Note the very first error – this error would be highly uncommon in the Piper Archer because there is no drain hole on the pitot mast like most other training aircraft. If there is a blockage in the pitot mast, the drain hole would more than likely be unaffected.*

## Describe the gyroscopic instruments



The Gyroscopic instruments are powered by an engine driven vacuum pump with the exception of the turn coordinator which is electrically powered. The two principles that gyroscopes operate off of are:

*Rigidity in space: while spinning, a gyroscope will tend to stay fixed in its plane of rotation. Think of a bicycle wheel. With enough momentum, you are able to stay naturally balanced.*

*Precession: when a force is applied to a gyroscope, the resultant force is felt 90° ahead in the direction of the rotation.*

Attitude Indicator – Rotates in the horizontal plane and operates off of the principle of rigidity in space. The aircraft pitches and rolls around the erect gyroscope. The effects of precession are not felt because pendulous vanes attached to the base of the gyro duct high pressure air from the vacuum through small doors that open and close by the force of gravity to keep the gyro in its original position.

Heading Indicator – Rotates in the vertical plane and operates off of rigidity in space as well. As the aircraft yaws around the gyro, a gear inside of the instrument case rotates the compass card to show the magnetic direction. Precession caused from aircraft movement and friction causes error that must be corrected by resetting the heading indicator to the magnetic compass approximately every 15 minutes.

Turn Coordinator – This electrically powered gyro rotates in the vertical plane and it uses precession to measure rate of turn and rate of roll. When the aircraft yaws, the gyro precesses and the airplane on the face of the instrument indicates the direction and rate of the turn. Notice in the diagram of the instrument that it is slightly canted upwards. This is so rate of roll can be indicated as well. When the aircraft begins a bank the aircraft will also indicate the direction of the bank. If it is a rapid roll the airplane will respond by

banking more steeply. Once the turn is established it will properly indicate the rate of the turn.

**What is the difference between the turn coordinator and the turn and slip indicator?**

**How does the vacuum system operate? (PHAK 7-17) (POH 7-17) (IFH 5-17)**

An engine driven vacuum pump creates suction. Air is pulled through a filter and then directed to the instrument case. Rotor vanes on the gyros catch the air like a water wheel and cause it to rotate at a high speed. In the Archer IIIs, there is also an electrical vacuum pump to be used as a backup.

**Explain the errors associated with the magnetic compass.**

Variation – Since the magnetic north pole and the geographic North Pole are not collocated, we need to consider this when planning flights. Easterly variation is subtracted from true heading while westerly variation is added to get our magnetic heading. Remember: East is least and West is best!

Deviation – Since a compass depends on aligning with the Earth's magnetic fields to read accurately, any kind of other local magnetic fields will cause an error known as deviation. This other magnetic fields are produced from electrical currents from the aircraft avionics and varies on different headings. The compass correction card located on the compass tells the pilot which compass heading to steer to for a desired magnetic heading.

Dip Errors – While flying on a north or south heading, these turning errors are most pronounced. While flying a north heading and turning to the left, the compass will initially show a turn in the opposite direction and lag behind the turn. When on a south heading, the compass will lead the turn and show that the turn is being made a much faster rate than it actually is.

*\*Imagine that north is home to the compass. While at “home” the compass wants to stay there during a turn and will lag behind before it finally decides to catch up reluctantly. Conversely, while most far away from home on a south heading, when a turn is commenced, the compass gets excited and races there (leading the turn)*

Northerly Turning Error – CG displacement of the float assembly in the compass causes false turn indications. When turning to the north, the turn should be stopped prior to arrival at the desired heading. When turning south, turn past the desired heading. The rule is: UNOS Undershoot North Overshoot South

Acceleration Error – While on east or west headings, acceleration results in a slight turn to the north. Deceleration results in a slight turn to the south. The rule is: ANDS

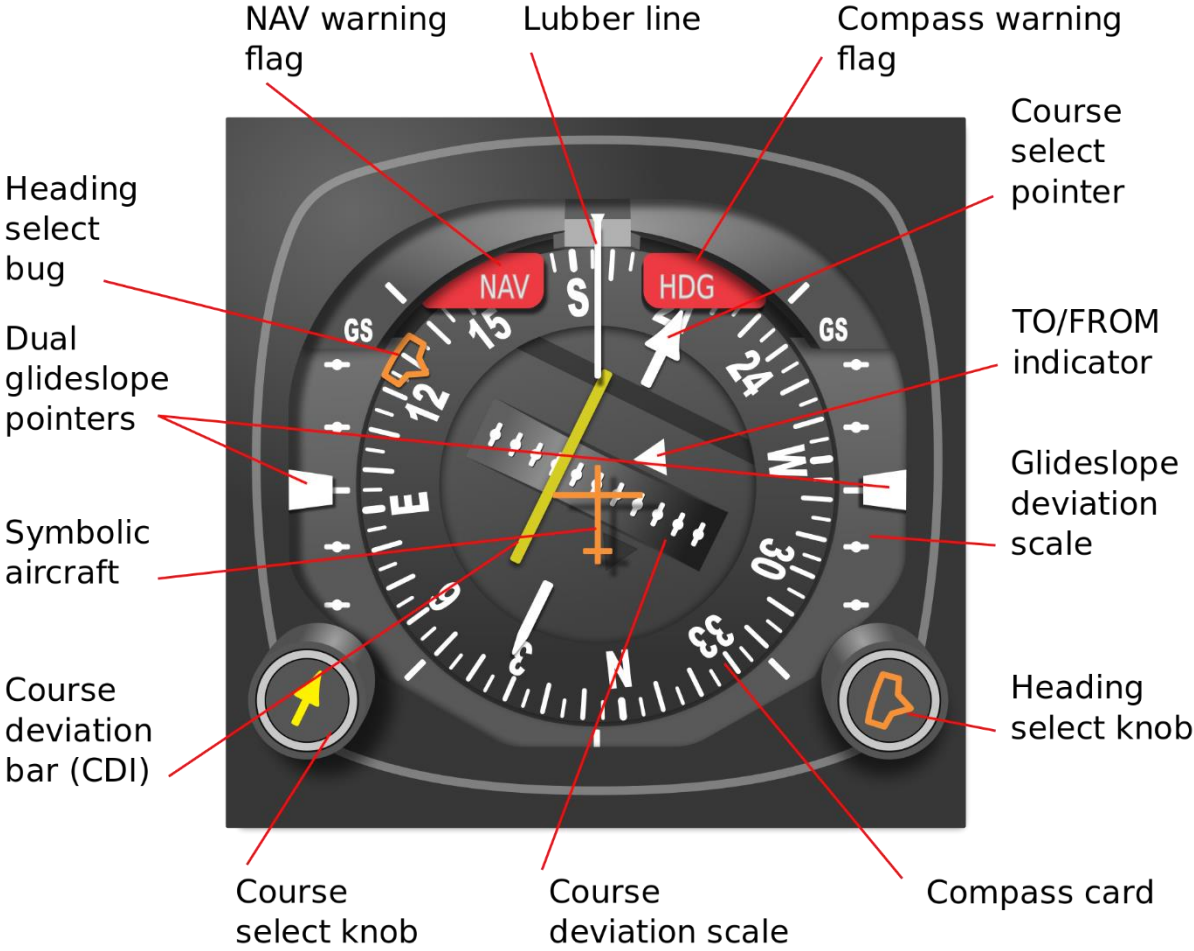
Accelerate North Decelerate South

Oscillation Error – A combination of all of these errors and results in the compass swinging back and forth around the headings being flown

**Navigational Equipment (AIM Chapter 1) (PHAK Chapter 15) (IFH**

**Chapter 9)**

**What is an HSI? (IFH 5-15)**



The Horizontal Situation Indicator combines the functions of the heading indicator and the VOR receiver into one instrument display. The major benefit is that most of the reverse sensing problems associated with a VOR receiver are precluded. This is because when an HSI is tuned to a VOR station, a course deflection of left or right always mean

left or right notwithstanding the course you select with the course indicating arrow. The exception is when flying a localizer backcourse. To avoid reverse sensing, the head of the needle must be set to the localizer front course!

### **Why doesn't the HSI precess? (IFH 5-15)**

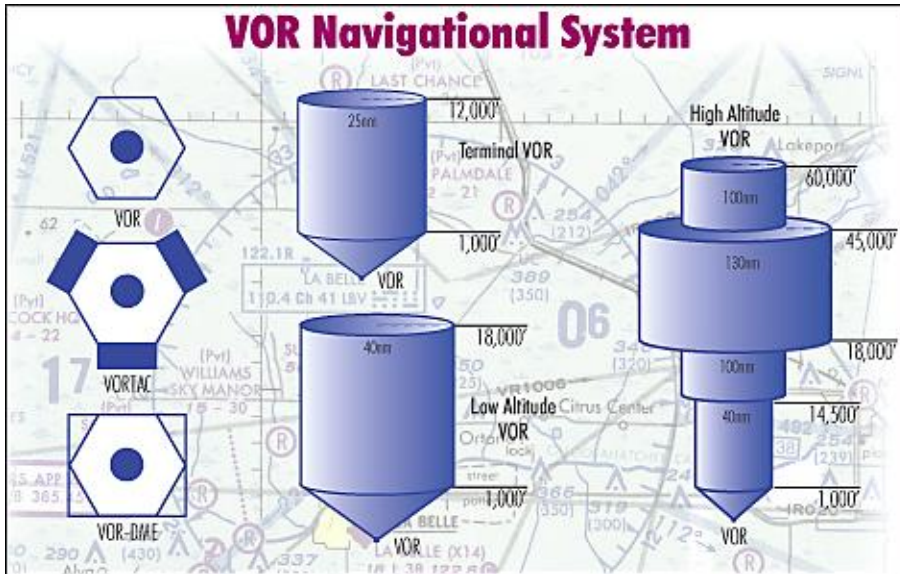
It makes use of the lines of flux associated with the Earth's natural magnetic field. These have two basic characteristics:

1. Magnets align with these lines
2. When a wire crosses them, an electrical current is induced

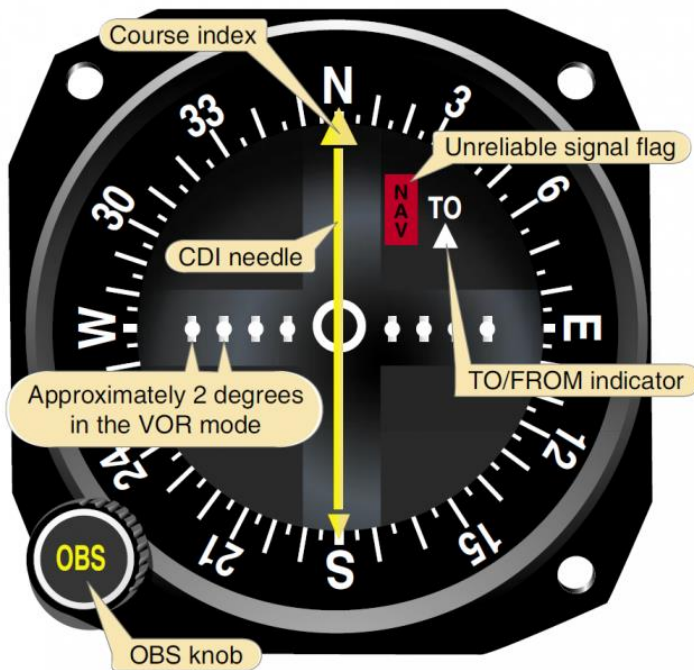
The **flux gate compass** uses the second principle to drive gyros that slaved to its inputs. A **flux valve**, which is a small segmented ring that accepts the lines of flux, is the direction sensing component of the system. It is located as far as possible away from the aircraft's local magnetic fields to ensure accurate indications (usually in the wingtip). The **magnetic slaving transmitter** sends an electric signal to the HSI which operates a **torque motor** to align the instrument with the appropriate magnetic heading.

What are the different classes of VOR stations? What are their service volumes?

(AIM 1-1-8)



What are the components of the VOR indicator instrument? (IFH 9-11)





**How many degrees of deviation does each dot represent? What angular deviation from a VOR course is represented by half-scale deflection of the CDI? (IFH 9-11)**

Each dot represents 2° of deviation. Half scale deflection is 5° off course.

**How do you determine the VOR station is operating properly? (PHAK 15-25)**

1. Tune the appropriate VOR frequency
2. Use the Ident. feature to listen to the associated Morse Code
3. Make sure the NAV warning flag is not in view

**What would happen if the VOR station were undergoing maintenance? (AIM 1-1-3)**

It may translate a Morse Code of TEST ( – • •• – ) or the code may be removed entirely

**What does it mean if there is only a single coded identification every 30 seconds on a VORTAC station? (AIM 1-1-7) (IFH 9-17)**

The VOR function is not working but the DME function is working

**What are the limitations of a VOR (PHAK 15-26) (IFH 9-14)**

Line of sight only

“Cone of confusion” – During passage of a station the aircraft is directly above the VOR and this causes large needle deflections and momentary loss of signal

Pilot Error

- Failure to properly tune and identify
- Failure to check for accurate signal

- Reverse sensing

*\* To avoid reverse sensing, when towards a VOR you should always have a TO flag – when flying away from the station you should always have a FROM flag.*

*In other words, the top of the heading indicator should always match the top of the VOR receiver*

**What is DME? When is DME equipment required? (91.205 (e)) (AIM 1-1-7) (IFH 9-17)**

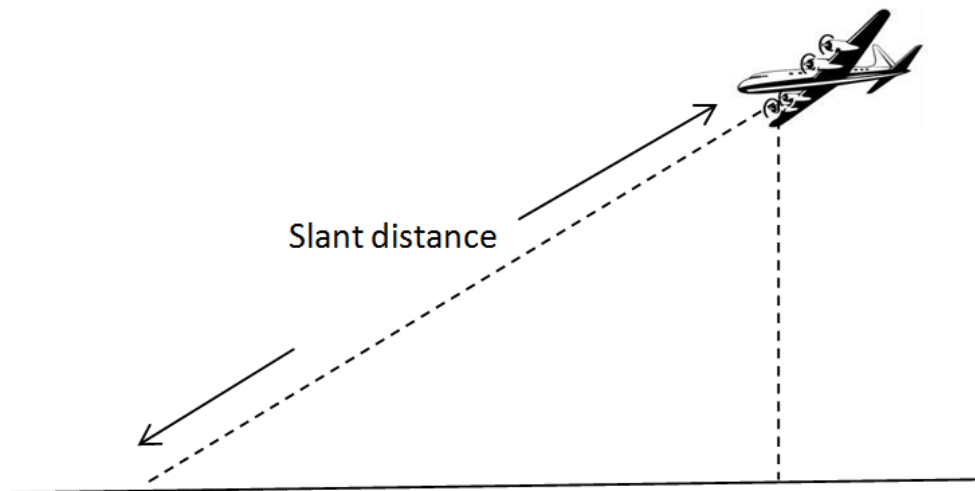
DME is distance measuring equipment. It is a separate ground station that may be collocated with a VOR, ILS, or localizer. It provides slant range distance in NM. When using VOR navigation above 24000, DME or a suitable RNAV system is required.

**Do all VOR stations have the capability of providing distance information?**

VOR stations do not provide distance information by themselves. VOR/DMEs and VORTACs (VORs collocated with a TACAN) provide distance information.

**What is slant-range distance? To minimize slant-range error, how far from the facility should you be and at what altitude? (IFH 9-19)**

Slant range distance is the actual distance between the aircraft and the ground station (as opposed to the horizontal distance). Altitude aircraft has a direct effect on slant range error. This error will be minimized if the aircraft is at least 1 mile away from the station for every 1000' of altitude.



**How does GPS work? (AIM 1-1-17) (PHAK 15-32) (IFH 9-24)**

GPS is a space based navigation system as opposed to land based NAVAIDs such as VORs, DME, etc.

Satellite constellation consists of 24 NAVSTAR satellites arranged in 6 orbital planes 11,000 miles above the Earth.

Arranged so that at least 5 satellites in view at all times

Distance is determined by the time it takes for radio signal to travel from satellite to aircraft

Position is triangulated from multiple satellites

4 satellites are needed to determine a 3D position (latitude, longitude, and altitude)

5 are needed for RAIM

**What is RAIM? (AIM 1-1-17)**

Receiver Autonomous Integrity Monitoring

The purpose is to determine the accuracy or “integrity” of the GPS signal. It does this by comparing the signals from the 5 satellites. If there is a discrepancy RAIM gives you an alert that the signal may not be reliable.

There are 2 error messages you can potentially receive:

1. A discrepancy or potential error has been detected
2. There are not enough satellites in view to give you RAIM

### **What is FDE? (AIM 1-1-17)**

Fault Detection and Exclusion

RAIM detects an error but does nothing about it except give you a warning. FDE is a function of some RAIM capable GPS. It requires 6 satellites so that info from the faulty satellite can be excluded.

### **What is WAAS? (AIM 1-1-18) (IFH 9-32)**

Wide Area Augmentation System

Enhances the GPS integrity and availability by:

Incorporating wide-area ground reference stations to monitor the signal from the GPS satellites.

The information is sent to a master station where the correction occurs

The corrected signal is sent to a GEO (geostationary satellite) and is broadcast on the same frequency as GPS to WAAS receivers.

### **What are the requirements of using GPS for IFR? (AIM 1-1-17) (IFH 9-28)**

GPS must be certified by TSO-C129 (RAIM) or TSO-C145 or 146 (WAAS)

The installation must be done in accordance with AC 20-138

If not, then the GPS can only be used to enhance situational awareness but ACTIVE MONITORING or an alternate navigation source is required.

### **What are the benefits and limitations of RAIM capable GPS? (AIM 1-1-18 e. 2) (IFH 9-26) (IPH 1-12)**

As long as RAIM is assured, no requirement to ACTIVELY MONITOR other navigational sources

Generally only provides lateral guidance (with the exception of Baro-Vnav equipment)

Alternate airport must have an IAP other than GPS and those ground based NAVAIDS must be monitored

RAIM is not guaranteed – signal could be lost due to

1. Inadequate number of satellites in position at the airport
2. Satellite malfunction
3. Antenna location on the aircraft
4. Changes in pitch or bank angle

**How do we verify that we will have RAIM during the flight? (AIM 1-1-18)**

<http://sapt.faa.gov/>

FSS Briefers can provide RAIM predictions for a 3 hour period

Alternatively, go to AUX page 3 on the GNS 430 and use the RAIM prediction tool

**What are the benefits of WAAS capable GPS? (AIM 1-1-18 e. 2) (IFH 9-26) (IPH 1-12 and 4-23)**

More precise than RAIM

Provides lateral and vertical navigation without the temperature errors associated with Baro-Vnav

No RAIM prediction necessary

An airport that only has a GPS approach may be selected as an alternate

*\*for flight planning purposes – only LNAV minimums can be considered*

**What are the components of the ILS? (AIM 1-1-9) (IFH 9-35)**

Visual: approach lighting system, VASI/PAPI, and precision approach runway

Range: marker beacons/compass locator and/or DME

Lateral and vertical guidance: localizer and glideslope

**What are the distances from the threshold of the outer, middle and inner markers?  
(AIM 1-1-9) (IFH 9-37)**

Outer marker: 4-7 miles – usually at the glideslope intercept position

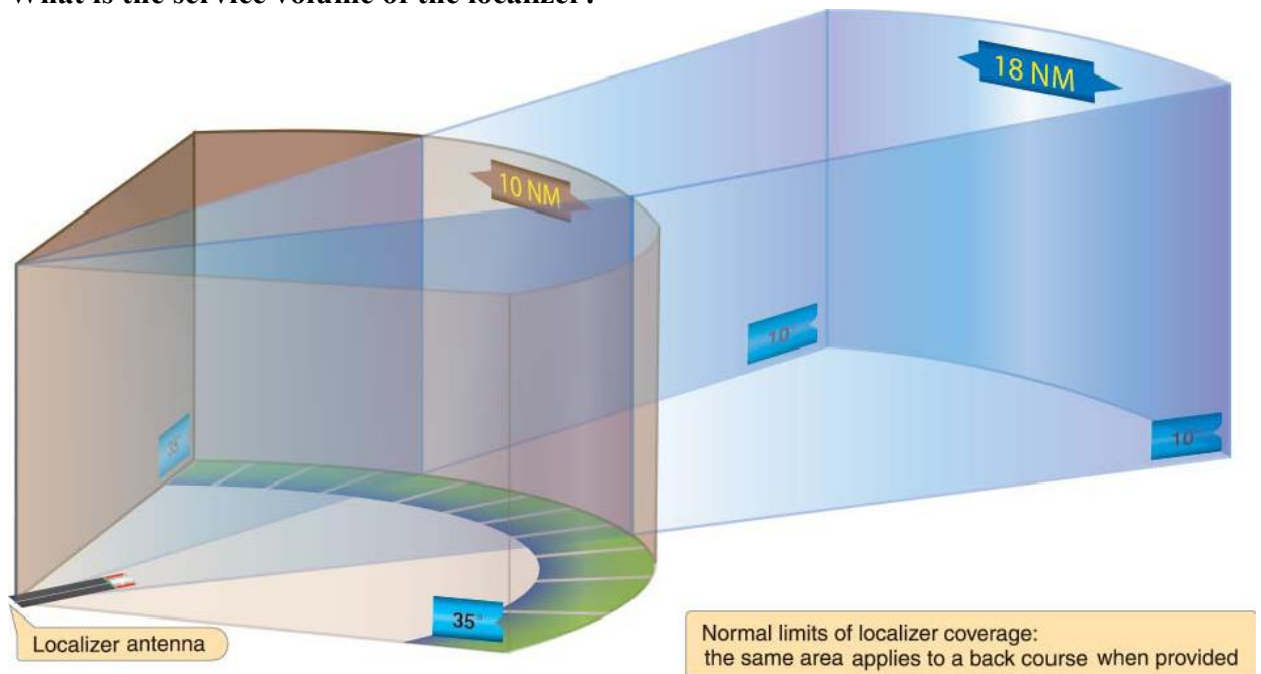
Middle marker: 3500' – represents the decision altitude (200' above TDZE)

Inner marker: Located between the MM and the landing threshold – represents the DH for a CAT II ILS approach

**What are substitutes for an ILS outer marker? (91.175(k))**

Compass locators, DME, VOR, GPS, Precision Approach Radar (PAR), or Airport Surveillance Radar (ASR)

**What is the service volume of the localizer?**



**Where is the localizer antenna array located (AIM 1-1-9 Figure 1-1-7)?**

The departure end of the runway aligned with the centerline

**What is the course width of a localizer signal?**

Localizer courses vary between 3° and 6° so that at the landing threshold the total width is 700'

**What is the sensitivity differences between the CDI tuned to a VOR and a CDI tuned to a LOC?**

Full scale deflection represents at least 10° when tuned to a VOR and only 2.5° when tuned to the localizer.

**What is the usable range of the glide slope?**

10nm

**Where is the glideslope equipment located?**

Between 750'-1250' from the approach end of the runway and 400-600' to one side of the centerline

**What are the dimensions of the glideslope course?**

The total width is 1.4° therefore full scale deflection represents at least .7°

**What errors is the ILS subject to?**

Reflection – Radio waves can bounce off of surface vehicles or other aircraft leading to erroneous indications

False courses – Intercepting the GS at other than the published altitude can cause confusion because the GS equipment inherently produces various courses at higher vertical angles.

**What is a Simplified Directional Facility (SDF)? (AIM 1-1-10) (IFH 9-43) (IPH 4-88)**

It provides lateral guidance similar to a localizer but less accurate because the course is fixed to either 6° or 12°. The SDF antenna may be offset from the runway centerline but usually not by more than 3°. There is no vertical guidance.

**What is a Localizer Type Directional Aid (LDA) (AIM 1-1-9)**

More precise than an SDF because the course is usually between 3° - 6° just like a localizer (hence, localizer type). An LDA may also provide a glideslope for vertical guidance in some instances. These are published as LDA/Glideslope and are characterized as APVs (approaches with vertical guidance).

So what makes this different from a localizer or ILS? An LDA is NOT aligned with the runway. Upon arriving at the MDA/DA, the pilot will have to maneuver the aircraft into position to make a normal landing. LDAs may have straight in minimums, however, if the alignment is within 30° of the runway centerline.

## **IFR Departures (AIM Chapter 5) (IFH Chapter 10) (IPH Chapter 1)**

**What are the elements of an IFR clearance?**

Clearance Limit

Route

Altitude

Frequency

Transponder code

**What is the minimum visibility needed to takeoff?**

There are no weather limitations for aircraft operating under Part 91. Standard takeoff minimums however are 1 sm for aircraft having two engines or less.

**What are the 2 different types of departure procedures? (AIM 5-2-8)**

Obstacle Departure Procedure (ODP)

Standard Instrument Departure (SID)

**Why are ODPs published? (AIM 5-2-8) (IFH 10-5) (IPH 1-14) (AC 120-91)**

The primary purpose is to provide the pilot with a means to get from the terminal area to the en route structure while remaining clear of obstacles. There is an imaginary plane



called the 40:1 Obstacle Identification Surface. If an obstacle penetrates this plane then the following may happen:

1. There will be a steeper than normal (200fpm) climb gradient published
2. Other than standard takeoff minimums will be published so that pilot can maintain visual separation
3. A specific departure route will be published

**What criteria determines that you will remain clear of obstacles when flying an ODP?**

1. Cross the departure end of the runway at or above 35' AGL
2. Make first turn no earlier than 400' AGL (unless otherwise specified)
3. Maintain climb gradient of at least 200fpm (unless otherwise specified)

**What is the pilot's responsibility concerning ODPs?**

1. Determine that an ODP has been published
2. Determine whether or not to fly it even if not issued by ATC in a clearance. Pilots are encouraged to fly ODPs at night, in MVFR, and IFR conditions
3. Determine aircraft performance is adequate for the procedure
4. Be aware of low close-in obstacles

**How would you know if an ODP has published for an airport? (IFH 1-16)**

The **T** symbol in the notes section of an IAP means that the takeoff minimums are not standard. Refer to the takeoff minimums section of the TPPs for the new criteria and ODPs. ODPs are always textual and sometimes graphic. Graphic ODPs will have (OBSTACLE) printed on them.

**How can you determine if your aircraft will be able to meet the required climb gradient?**

Determine your aircraft's rate of climb with the POH. Use the chart in the back of the TPPs to convert it to climb gradient.

Alternatively:  $Rate\ of\ Climb = \frac{groundspeed}{60} \times \text{climb gradient}$

### **What are low close-in obstacles?**

Obstacles that are located within 1nm of the departure end of the runway that penetrate the 40:1 OCS. Avoidance can be assured by early liftoff or visually. The obstacle location and their heights are contained in the notes section of the takeoff minimums in the TPPs.

### **What does VCOA mean? When would this option be published? (IPH 1-38)**

A visual climb over airport allows the pilot to climb while circling to get to a safe altitude. It is developed if there are obstacles beyond 3sm from the airport that require a climb gradient of more than 200fpm. It must be conducted in VMC.

### **Why are SIDs published? (AIM 5-2-8) (IFH 10-5) (IPH 1-23)**

While SIDs still provide obstacle clearance, they are designed to

1. Reduce ATC and pilot workload
2. Minimize communications
3. Increase airspace capacity
4. Simplify clearances
5. Comply with noise abatement procedures

SIDs must be issued in a clearance by ATC and are always printed graphically in the TPPs.

# Where can you find SIDs?

SIDs are always printed graphically and can be located in the TPPs after the last approach chart for a given airport.

05300
LEGEND

## LEGEND

### STANDARD TERMINAL ARRIVAL (STAR) CHARTS DEPARTURE PROCEDURE (DP) CHARTS

#### RADIO AIDS TO NAVIGATION

- VOR
- VOR/DME
- VORTAC
- NDB (Non-directional Radio Beacon)
- LMM, LOM (Compass locator)
- Marker Beacon
- Localizer Course
- SDF Course

(T) indicates frequency protection range (Y) TACAN must be placed in "Y" mode to receive distance information

Frequency: 112.25 (T) ORLANDO (ORL) Chan 59 (Y) N28°32.56' W81°20.10' Geographic Position

Underline indicates no voice transmitted on this frequency

Coordinates: PRAYS N38°58.30' W89°51.50' Waypoint Name

Frequency: 112.7 CAP 187.1°-56.2' Identifier Reference Facility Elevation Radial-Distance (Facility to Waypoint)

#### ROUTES

4500 MEA-Minimum Enroute Altitude  
\*3500 MOCA-Minimum Obstruction Clearance Altitude  
← 270° Departure Route - Arrival Route  
(65) Mileage between Radio Aids, Reporting Points, and Route Breaks

Transition Route  
R-275 Radial line and value  
Lost Communications Track

V12 J80 Airway/Jet Route Identification

(IAS) Holding Pattern Changeover Point

Holding pattern with max. restricted airspeed (175K) applies to all altitudes (210K) applies to altitudes above 6000' to and including 14000'

#### SPECIAL USE AIRSPACE

R-Restricted W-Warning  
P-Prohibited A-Alert

R-352

#### ALTITUDES

Mandatory Altitude (Cross at)	Minimum Altitude (Cross at or above)	Maximum Altitude (Cross at or below)	Recommended Altitude
5500	2300	4800	2200

MCA (Minimum Crossing Altitude)

Altitude change at other than Radio Aids

#### AIRPORTS

Civil Military Civil-Military

#### FIXES/ATC REPORTING REQUIREMENTS

Reporting Points N00° 00.00' W00° 00.00'

75 DME Mileage (when not obvious)

▲ Fix-Compulsory and  
△ Non-Compulsory Position Report

→ DME fix Distance not to scale

◆ WAYPOINT (Compulsory) ◆ WAYPOINT (Non-Compulsory)

○ FLYOVER POINT

X Mileage Breakdown/Computer Navigation Fix (CNF)  
N00° 00.00'  
W00° 00.00'

#### NOTES

All mileages are nautical.  
# Indicates control tower temporarily closed UFN.  
★ Indicates a non-continuously operating facility, see A/FD or flight supplement.  
All radials, bearings are magnetic.  
All altitudes/elevations are in feet-MSL.  
MRA- Minimum Reception Altitude.  
MAA- Maximum Authorized Altitude.  
(NAME2.NAME) - Example of DP flight plan Computer Code.  
(NAME.NAME2) - Example of STAR flight plan Computer Code.  
SL-0000 (FAA) - Example of a chart reference number.  
▼ Take-Off Minimums not standard and/or Departure Procedures are published.

16 DEC 2010 to 13 JAN 2011
16 DEC 2010 to 13 JAN 2011

## LEGEND

**En Route Operations (AIM Chapter 5) (IFH Chapter 10) (IPH**

**Chapter 2)**

**What are the dimensions of victor airways? (IPH 2-2 and 2-18)**

Victor airways begin at 1200' AGL and extend up to 17,999' MSL. The width is 8nm (4nm from each side of the centerline)

**When navigating from VOR to VOR, when do you change frequencies to maintain course guidance? (IPH 2-20)**

At that point depicted on the airway as the changeover point

In the absence of a changeover point, the halfway point on the airway

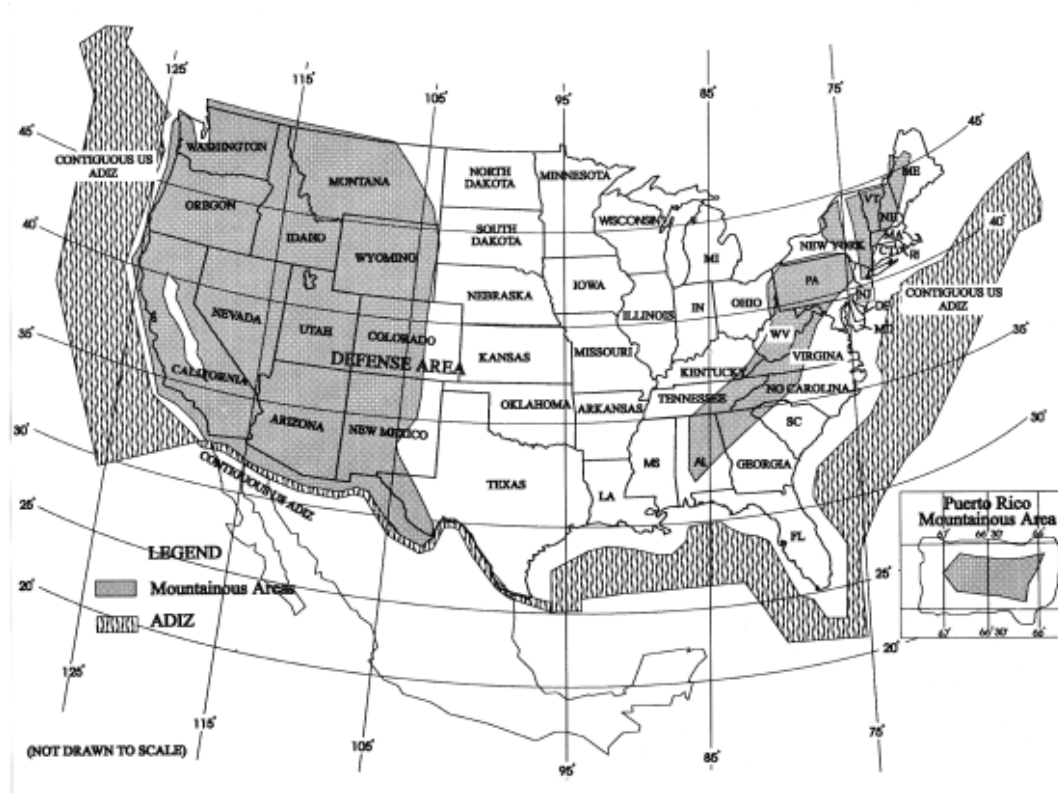
Whenever there is a bend in an airway

**What is a minimum altitude for IFR flight? (91.177)**

In mountainous areas, 2000' above the highest obstacle within 4nm

In non-mountainous areas, 1000' above the highest obstacle within 4nm

**What areas are considered mountainous? (AIM 5-6-5)**



**What are the different en route altitudes? (91.177) (IPH 2-35)**

MEA (minimum en route altitude) – lowest altitude that provides both obstacle clearance and NAVAID reception.

*Adequate communication is not always guaranteed at the MEA. In some instances, NAVAID reception at the MEA isn't guaranteed either! When this happens, the words MEA GAP are printed on the airway. See V187 that extends NW from the RSK VORTAC*

MOCA (minimum obstacle clearance altitude) – lowest altitude that meets obstacle clearance requirements but only guarantees NAVAID reception within 22nm. The MOCA is designated with an \* symbol

MRA (minimum reception altitude) – lowest altitude at which a fix can be identified. For example, if there is a fix marked by two intersecting VOR radials, the aircraft must be at or above the MRA if one is published in order to receive both signals. It is marked on the low en route chart with a flag and an R inside of it at the fix.

MAA (maximum authorized altitude) – highest altitude where adequate NAVAID reception is guaranteed

MTA (minimum turning altitude) – lowest altitude at which an aircraft can safely turn from one leg of an airway to the next. Different factors such as aircraft speed and the angle at which the airways join create a need for obstacle clearance in a greater area. The MTA provides obstacle clearance for both, fly by fixes (where the turn is begun prior to reaching the fix) and also for fly over fixes (where the turn can only begin after crossing the fix). The aircraft must be at or above the MTA before beginning the turn in either case. See the JAC VOR for an example of an MTA.

MCA (minimum crossing altitude) – lowest altitude at which a fix can be safely crossed. It is marked on the low en route chart with a flag and an x inside of it at the fix.

# Chart Symbols

L E G E N D		
AIRPORTS		
<p>Airports/Seaplane bases shown in BLUE and GREEN have an approved Low Altitude Instrument Approach Procedure published. Those in BLUE have an approved DOD Low Altitude Instrument Approach Procedure and/or DOD RADAR MINIMA published in DOD FLIPS or Alaska Terminal. Airports/Seaplane bases shown in BROWN do not have a published Instrument Approach Procedure.</p>		
<p><b>LAND</b></p> <p> <span style="color: blue;">⊙</span> <span style="color: green;">⊙</span> <span style="color: brown;">⊙</span> Civil  <span style="color: blue;">⊙</span> <span style="color: green;">⊙</span> <span style="color: brown;">⊙</span> Civil - Military  <span style="color: blue;">⊙</span> <span style="color: green;">⊙</span> <span style="color: brown;">⊙</span> Military  <span style="color: blue;">⊙</span> <span style="color: green;">⊙</span> <span style="color: brown;">⊙</span> Heliport                 </p> <p><b>SEA</b></p> <p> <span style="color: blue;">⊙</span> <span style="color: green;">⊙</span> <span style="color: brown;">⊙</span> Civil                 </p>	<ol style="list-style-type: none"> <li>1. A solid-line box enclosing the airport name indicates 14 CFR part 93 Special Requirements—see Directory/Supplement</li> <li>2. "NO SVFR" above the airport name indicates 14 CFR part 91 fixed-wing special VFR flight is prohibited</li> <li>3. <span style="border: 1px solid black; padding: 0 2px;">C</span> or <span style="border: 1px solid black; padding: 0 2px;">D</span> following the airport name indicates Class C or Class D Airspace</li> </ol>	<ol style="list-style-type: none"> <li>4. Pvt—Private use</li> <li>5. Associated city names for public airports are shown above or preceding the airport name. If airport name and city name are the same, only the airport name is shown. The airport identifier in parentheses follows the airport name. City names for military airports are not shown.</li> </ol>
<p style="text-align: center;"> <span style="color: blue;">CITY</span>  <span style="color: blue;">Airport Name (APT) (ICAO) <span style="border: 1px solid black; padding: 0 2px;">D</span> ★</span>  <span style="color: blue;">280 <span style="border: 1px solid black; border-radius: 50%; padding: 0 2px;">0</span> ★ 43s</span>  <span style="color: blue;">(A) ★ 109.8</span> </p> <p>             Airport Ident ICAO Location Indicator shown outside contiguous U.S. →              Airport Elevation →              Automatic Terminal Information Service →              Part-time →              Frequency →              Lighting Capability: →              Part-time or established by NOTAM. See A/G tabulation for times of operation. In Alaska see Supplement Alaska →              Longest runway length to nearest 100 feet with 70 feet as the dividing point (add 00) s indicates soft surface →         </p> <p>               Lighting available              ⊙ Pilot Controlled Lighting              ★ Part-time or on request         </p> <p>             - No lighting available at private facilities—indicates no lighting information is available.         </p>		

# AIR TRAFFIC SERVICES AND AIRSPACE INFORMATION

## ROUTE DATA

VHF/UHF data is depicted in BLACK.  
LF/MF data is depicted in BROWN.  
RNAV data is depicted in BLUE.

- VOR Route
- LF/MF Airway
- Uncontrolled LF/MF Airway
- Oceanic Route
- ATS Route
- Low Altitude RNAV Route  
TSO-145a/146a required
- Substitute Route  
Via/bypassing temporarily shutdown NAVAID.  
See NOTAMS or appropriate publications for specific information.
- Unusable Route Segment
- Preferred Single Direction Route

Direction of Flight Indicator (Canada only)

- EVEN
- Facility Locators used in formation of Reporting Points
- Radial outbound from a VHF/UHF NAVAID
- Bearing inbound to an LF/MF NAVAID
- Magnetic Reference Bearing, outbound from a NAVAID or Fix
- Total Mileage between Compulsory Fixes and/or NAVAID
- Mileage between other Fixes, NAVAID and/or Mileage Breakdown

Changeover Point giving mileage to NAVAIDs (Not shown at midpoint locations)

\*0000 \*0000 Minimum Obstruction Clearance Altitude (MOCA)  
•0000

0000 0000 Minimum En Route Altitude (MEA)  
0000G GPS/WAAS MEA

MAA-00000 Maximum Authorized Altitude (MAA)

MEA, MOCA and/or MAA Change at other than NAVAIDs

Minimum Reception Altitude (MRA)

Minimum Crossing Altitude (MCA)

Holding Pattern with max restricted airspeed  
210K applies to altitudes above 6,000' to and including 14,000'  
175K applies to all altitudes

## BOUNDARIES

- Air Route Traffic Control Center (ARTCC)
- ARTCC Remoted Sites with discrete VHF and UHF frequencies
- Flight Information Region (FIR)

Type of Area Traffic Service

CTA/FIR  
OAKLAND OCEANIC  
KZAK  
UNLTD  
FL 55  
ACC

- Air Defense Identification Zone (ADIZ)
- Off Route Obstruction Clearance Altitudes (OROCA)  
Example: 12,500 feet
- International Boundary (Not shown when coincident with ARTCC or FIR)
- US/Russia Maritime Boundary
- Area of Enlargement (contains only data for through flights)  
See Area Charts for complete data
- Official Time Zone
- International Date Line

## FIXES/ATC REPORTING REQUIREMENTS

- Fix Compulsory and Non-compulsory Position Report
- RNAV Waypoint Compulsory and Non-Compulsory Position Report
- Denotes DME Fix (Distance same as route mileage)
- Denotes DME Fix and Mileage
- Offset arrows indicate facility forming a fix (away from VHF/UHF, toward LF/MF NAVAID)
- Mileage Breakdown or Computer Navigational Fix (CNF) (no ATC functions)

## AIRSPACE INFORMATION

Open area (white) indicates controlled airspace (Class E) unless otherwise indicated  
All airspace 14,500' and above is controlled (Class E)

Shaded area (brown) indicates uncontrolled airspace below 14,500' (Class G)

- In Canada - Indicates Class B Airspace above 12,500'
- Oceanic Control Area (CTA)
- Additional Control Area limit

Class B Airspace    Class C Airspace    Mode C Area  
See 14 CFR section 91.215

## EXAMPLE OF GROUPING

Magnetic Reference Bearings are not shown on joint Victor/RNAV routes.

Reporting Points (coordinates are shown for offshore and holding fixes)

Airway Restriction (airway penetrates Prohibited & Restricted Airspace)

MAA-14900 4000

2000G \*2000

MEAS GAP

MEAS is established with a gap in navigation signal coverage

Water Vignette

NAVIE MRA 4000

Even 4200 \*3000

3000

## SPECIAL AREA OF OPERATION

- P—Prohibited Area
- R—Restricted Area
- A—Alert Area
- W—Warning Area
- MOA—Military Operations Area

In Canada:  
CYA—Advisory Area  
CYD—Danger Area  
CYR—Restricted Area

Line delimits internal separation of same Special Use Area

See Airspace Tabulation for complete information



**What are the required reporting points while en route? MARVELOUS VFR 500**

**(AIM 5-3-3) (IPH 2-45)**

**Missed approach**

**Airspeed change of 5% or 10 knots (whichever is greater)**

**Reaching clearance limit or holding fix**

**Vacating an altitude**

**ETA change of more than 2 minutes**

**Leaving assigned altitude**

**Outer Marker inbound (non-radar environment only)**

**Unforecasted weather conditions**

**Safety of flight (anything that affects it)**

**VFR on top altitude change**

**Final approach fix inbound (non-radar environment only)**

**Radio failure**

**500fpm – unable to maintain**

**What information should be included in each report? (AIM 5-3-3) (IPH 2-45)**

- 1. Aircraft identification**
- 2. Position**
- 3. Time**

4. **Altitude or flight level**
5. **ETA and name of next reporting point**
6. **The name only of the next succeeding reporting point**
7. **Pertinent remarks**

**What are the appropriate procedures for in the case of a communications failure under IFR? AVEF MEA (91.185) (IPH 2-47)**

Squawk 7600. In the event that you are in VMC, stay VMC and land as soon as practical

Choose your route in this order

1. Assigned route
2. Vectors (if you are receiving vectors to a fix and you lose communication, fly direct to that fix)
3. Expected
4. Filed

Choose whichever altitude is highest

1. MEA
2. Expected
3. Assigned

What are the maximum holding speeds? (AIM 5-3-3) (IPH 2-51)

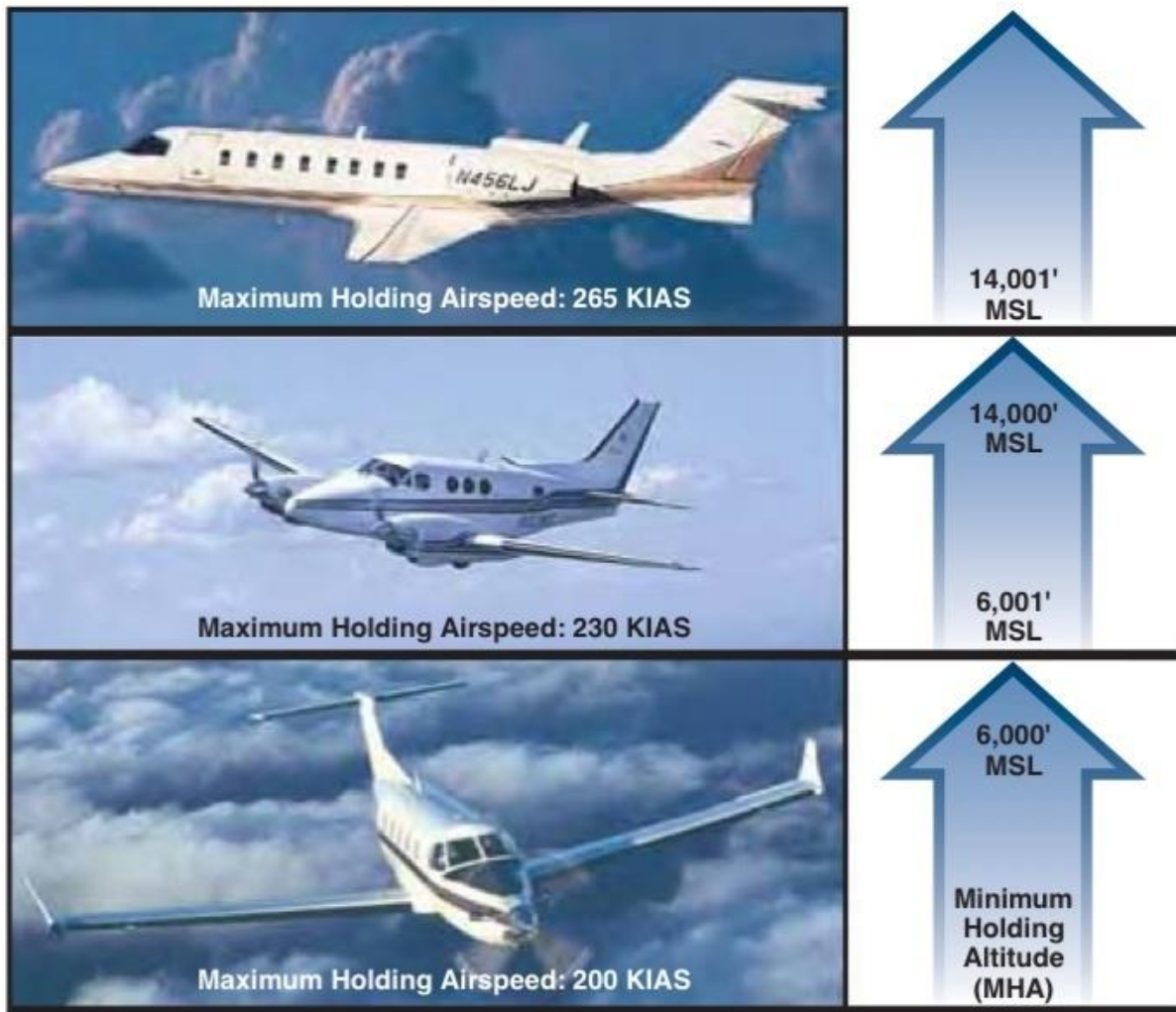


Figure 3-30. Maximum Holding Speed Examples.

In what direction should turns be made in a standard holding pattern?

To the right

What are the IFR fuel requirements? (91.167)

Enough fuel to fly to the destination with a 45 minute reserve. When an alternate is needed, there must be enough fuel to fly to the destination and the alternate with a 45 minute reserve.

**When is an alternate required?**

Whenever the weather at the destination airport has a ceiling of less than 2000' or visibility less than 3sm during a period beginning 1 hour before the ETA and ending 1 hour after.

**What are the standard weather requirements to file an airport as alternate?**

Precision approach – 2 miles visibility and 600' ceiling

Nonprecision approach – 2 miles visibility and 800' ceiling

**Can you choose an airport without an IAP as an alternate?**






If there is no published procedure, the weather must allow a descent from the MEA to a landing under VFR.

**How would you know if an airport has other than standard alternate minimums?**



When you see this symbol, go to the alternate minimums section of the TPPs to see what the weather requirements are to file this airport as an alternate.

**What airports cannot be filed as alternates? (IPH 1-12)**

SANFORD, NORTH CAROLINA		AL-9472 (FAA)		15288
LOC/DME I-TTA <b>110.75</b> Chan <b>44</b> (Y)	APP CRS <b>029°</b>	Rwy Idg TDZE Apt Elev	<b>6500</b> <b>246</b> <b>246</b>	<b>ILS Y or LOC Y RWY 3</b> RALEIGH EXEC JETPORT AT SANFORD-LEE COUNTY (TTA)
 When local altimeter setting not received, use Raleigh/Durham altimeter setting and increase DA to 527 feet; increase all MDA 100 feet and S-LOC 3 Cats C and D visibility to 1 mile, and Circling Cat C visibility to 2 miles and Cat D to 2¾ miles. For inop MALSR, increase S-LOC 3 Cats C and D visibility to 1 mile. For inop MALSR, when using Raleigh/Durham altimeter setting, increase S-ILS 3 all Cats visibility to ¾ mile and increase S-LOC 3 Cats C and D visibility to 1¾ mile. VDP NA when using Raleigh/Durham altimeter setting. GPS required.		 MALSR  MISSED APPROACH: Climb to 1300 then climbing left turn to 2100 direct IKTOW and hold.		
AWOS-3 <b>120.625</b>	RALEIGH APP CON <b>125.3 353.675</b>	UNICOM <b>123.075</b> (CTAF) <b>0</b>	GCO <b>135.075</b>	
 A633  117.2/19				

NA means that alternate minimums are not authorized due to either an unmonitored facility, absence of weather reporting, or inadequate navigation coverage.

**Can an airport that only has a GPS be filed as an alternate? (AIM 1-1-18 e. 2) (IPH 9-26) (IPH 1-12 and 4-23)**

Only if the aircraft is equipped with WAAS capable GPS certified under TSO-C145 or TSO-146

**What are TEC routes? (AIM 4-1-19) (IPH 2-10)**

Tower En route Control is a service that allows pilots to travel between airports in select metropolitan areas without leaving approach control airspace. It is designed to expedite air traffic and reduces ATC and pilot communications. You can find these routes in the Tower En route Control section of the Chart Supplement.

### What are preferred IFR routes? (IPH 2-7)

Established between busier airports to increase system efficiency and capacity and help pilots plan their route of flight. See the preferred IFR routes section of the Chart Supplements for more details.

### What is RNP? (AIM 1-2-2 and 5-4-5) (IFH 9-44) (IPH 1-30, 2-34, 4-26)

RNP describes the course route width of an RNAV route. The aircraft's total system error must remain bounded to the appropriate level for 95% of the total flight time.



**When does the sensitivity change from en route to terminal and terminal to approach mode? (AIM 1-1-17 5(e))**

The navigation system will operate in en route mode until 30nm away from the airport at which point it will change to terminal mode. Within 2nm of the final approach waypoint the approach mode will become active.

**IFR Arrivals and Approaches (AIM Chapter 5) (IFH Chapter 10) (IPH**

**Chapter 3 & 4)**

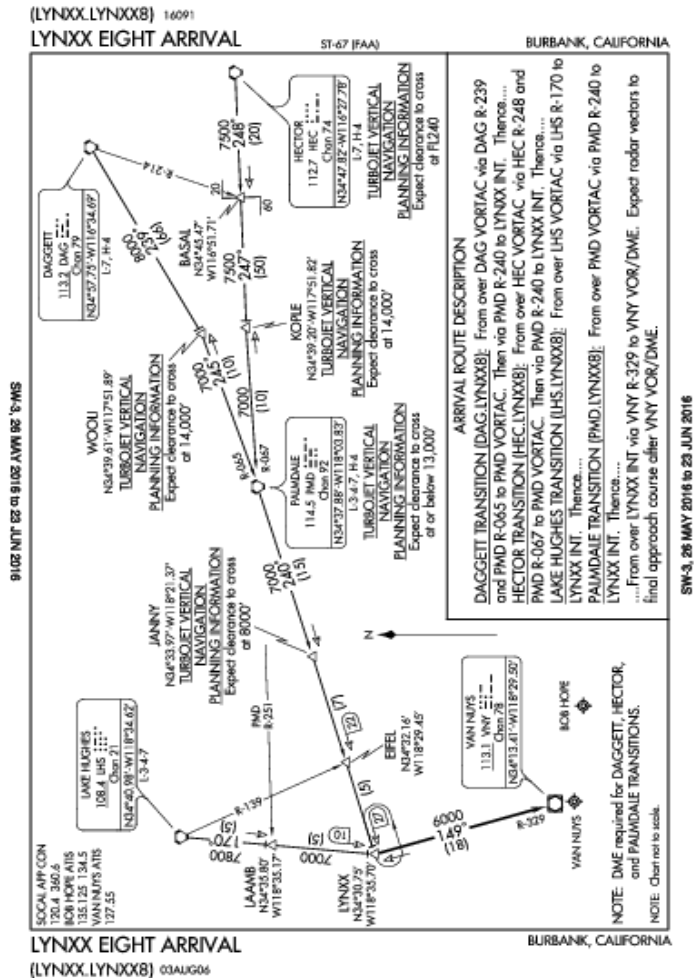
**What is a STAR? (AIM 5-4-1) (IFH 10-9) (IPH 3-10)**

Standard Terminal Arrival Procedures are designed to leave the en route structure and bring the pilot to a NAVAID or fix (usually an IAF) to begin an approach.

The purpose is provide a seamless transition between different phases of flight and to maintain descent and deceleration profiles. They require an ATC clearance and the pilot must have the chart in his/her possession

Unlike DPs, transitions occur before the STAR itself. The STAR is named after the fix where the transitions come together.

## Why is “eight” included in the title of this STAR?



When there is a significant change made to a procedure (altitude, route, fix, etc.) the number of the procedure increases by 1.

## What does (LYNXX.LYNXX8) mean?

It is the associated compute code for the arrival used for electronic filing of an IFR flight plan. The name of the desired transition comes before the name of the STAR. If, for example, we would like to file this arrival using the Palmdale transition, we would do it thusly: PMD.LYNXX8

## How are the transitions routes differentiated from the arrival route?

The heavy black lines represent the arrival. The thinner lines are the transitions. The thinnest lines (e.g. R-214 extending from DAG) are only used to identify fixes.

## What are some of the sections of an instrument approach plate?



GULFPORT, MISSISSIPPI

AL-576 (FAA)

**VOR RWY 14**  
GULFPORT-BILOXI INTL (GPT)

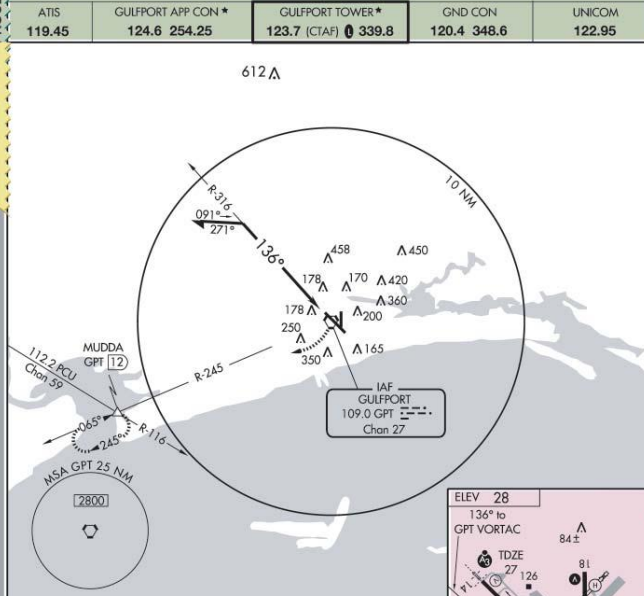
PILOT BRIEFING  
PROCEDURE NOTES

VORTAC GPT	APP CRS	Rwy Idg	9002
109.0	136°	TDZE	27
Chan 27		Apt Elev	28



MISSED APPROACH: Climbing right turn to 2000 via GPT R-245 to MUDDA Int/12 DME and hold.

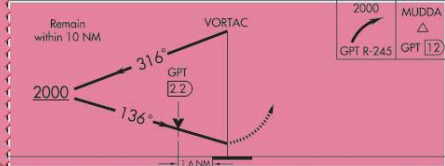
PLAN VIEW



SC-4, 06 JUL 2006 to 03 AUG 2006

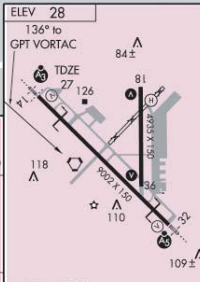
SC-4, 06 JUL 2006 to 03 AUG 2006

PROFILE



MINI-MIMS

CATEGORY	A	B	C	D
S-14	580/24	553 (600-1/2)	580/50	580/60
			553 (600-1)	553 (600-1 1/4)
CIRCLING	580-1	660-1	660-1 3/4	660-2
	552 (600-1)	632 (700-1)	632 (700-1 3/4)	632 (700-2)



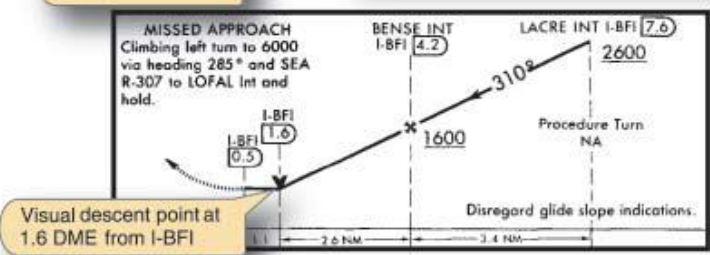
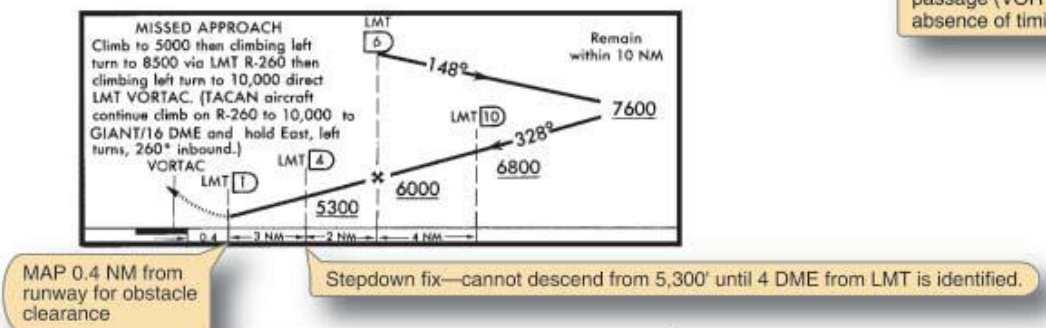
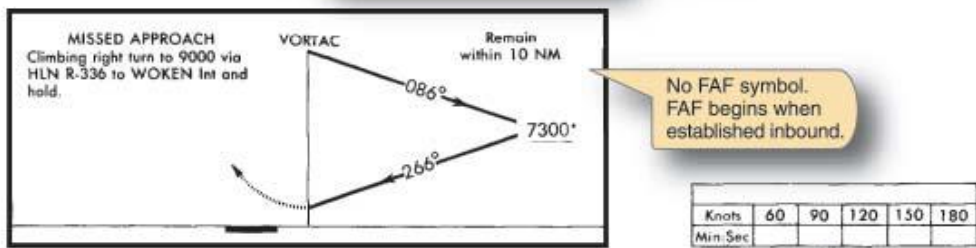
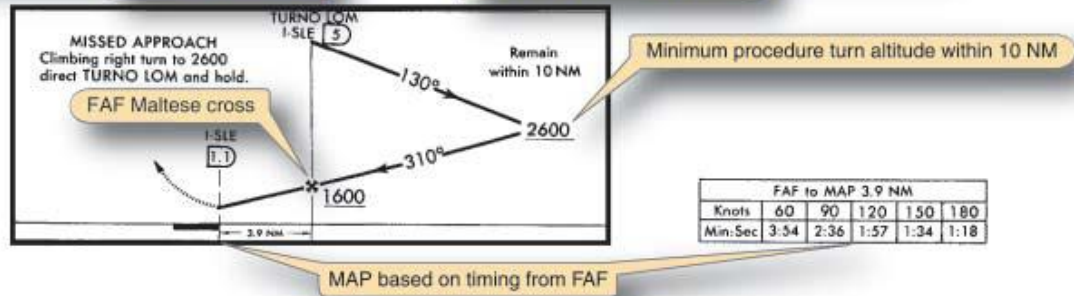
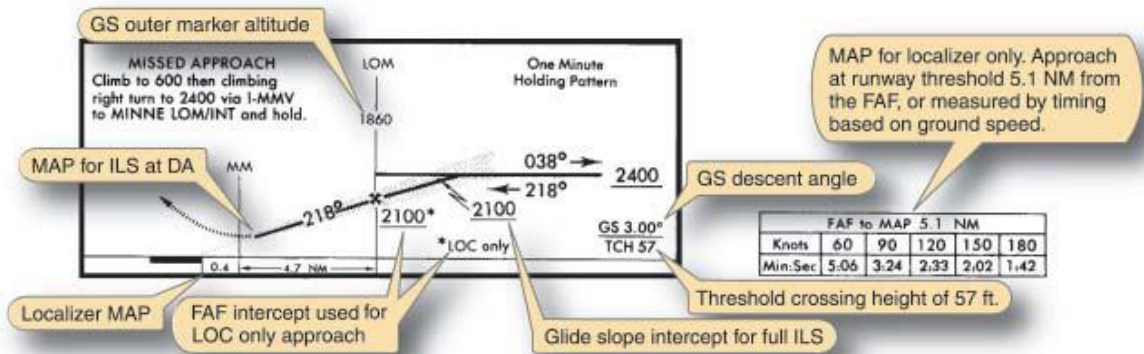
AIRPORT DIAGRAM

MIRL Rwy 18-36					
HIRL Rwy 14-32					
Knots	60	90	120	150	180
Min:Sec					

GULFPORT, MISSISSIPPI  
Amdt 22 06159

30°24'N-89°04'W

GULFPORT-BILOXI INTL (GPT)  
**VOR RWY 14**



### **What are the different segments of an instrument approach? (IPH 4-53)**

Initial – Begins at the Initial Approach Fix (IAF) and aligns the aircraft with the intermediate or final approach segment and also allow a descent in the process. The section can include, DME arcs, holding patterns, or course reversals.

Intermediate – Begins at the Intermediate Fix (IF) and is designed to position the aircraft for the final descent. It is normally aligned within 30° of the final approach course.

Final – Begins at the Final Approach Fix (FAF) and brings the aircraft down to the appropriate minimum for a landing.

Missed – Begins at the Missed Approach Point (MAP) and ends at a designated fix. During a precision approach or APV this occurs at the DA. On a nonprecision approach, it is a designated fix, waypoint, NAVAID, or it may occur after a specific amount of time has elapsed.

### **When is a procedure turn not authorized? (AIM 5-4-9) (IFH 10-13) (IPH 4-53)**

1. When No-PT is printed
2. When there is a hold in lieu of a PT
3. When cleared straight in
4. Timed approaches from a fix (AIM 5-4-10) (IFH 10-18)
5. Radar vectors

*When a teardrop pattern is depicted and a course reversal is required, that is the pattern that must be flown.*

### **What are the differences between precision approaches, nonprecision approaches, and APVs, and radar approaches? (IFH 10-15) (IPH 4-54)**

Precision approaches – Provide both lateral and vertical guidance and meet the standards set forth in ICAO Annex 10

Non precision approaches – Provide only lateral guidance

APV – Approaches with Vertical Guidance provide course and glidepath information but do not conform to the ICAO Annex 10 standards so they cannot rightfully be called precision approaches although LPV minimums are often identical to that of an ILS.

Radar approaches (AIM 4-5-3) (IPH 4-87) – An ATC controller monitors the progress with radar. With a Precision Approach Radar approach (PAR), ATC can give pilots both lateral and vertical guidance. Airport Surveillance Radar approaches (ASR) is only lateral guidance.

**What is the difference between a contact and visual approach? (AIM 5-4-23) (IPH 4-56)**

Visual Approach

- Issued by ATC or by pilot request
- Requires at least 3sm vis. and 1000' ceilings
- Pilot must have runway or aircraft to follow in sight
- Radar service is terminated
- Pilot is responsible for traffic and obstacle avoidance

Contact Approach

- Must be requested by pilot (ATC will not issue)
- Airport must have an IAP
- Requires only 1sm vis. and pilot must stay clear of clouds
- Pilot retains IFR clearance and squawk code
- Pilot is responsible for traffic and obstacle avoidance

**How are speeds determined for the aircraft approach categories? (AIM 5-4-7) (IPH 10-20) (IPH 4-8)**

Speed is based on Vref (reference landing speed when specified or 1.3 Vso)

Category	Maneuvering Table	Circling Approach Area Radii
A	0–90 knots	1.3 miles
B	91–120 knots	1.5 miles
C	121–140 knots	1.7 miles
D	141–165 knots	2.3 miles
E	166 knots or more	4.5 miles

Since turning radius (at a constant bank angle) varies directly with speed, an increase in speed requires a larger area needing protection. This usually results in the upper categories having higher MDAs and/or visibility requirements.

*If an aircraft that is normally Category A flies an approach at a higher speed, it must conform to those higher minimums. Conversely, an aircraft certified in a higher approach category cannot use lower minimums, even if flying at a slower speed.*

**What does the C symbol represent?**

 CIRCLING	1460-1 600 (600-1)	1480-1 620 (700-1)
--	-----------------------	-----------------------


Expanded circling minimums:

STANDARD CIRCLING APPROACH MANEUVERING RADIUS

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

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

 EXPANDED CIRCLING APPROACH MANEUVERING AIRSPACE RADIUS

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

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

**What does the A represent in the title of this approach? (IPH 4-11)**

OCEANSIDE, CALIFORNIA			AL-5666 (FAA)		16091
VORTAC OCN 115.3 Chon 100	APP CRS 090°	Rwy Idg TDZE Apt Elev N/A N/A 28	VOR-A BOB MAXWELL MEMORIAL AIRFIELD (OKB)		

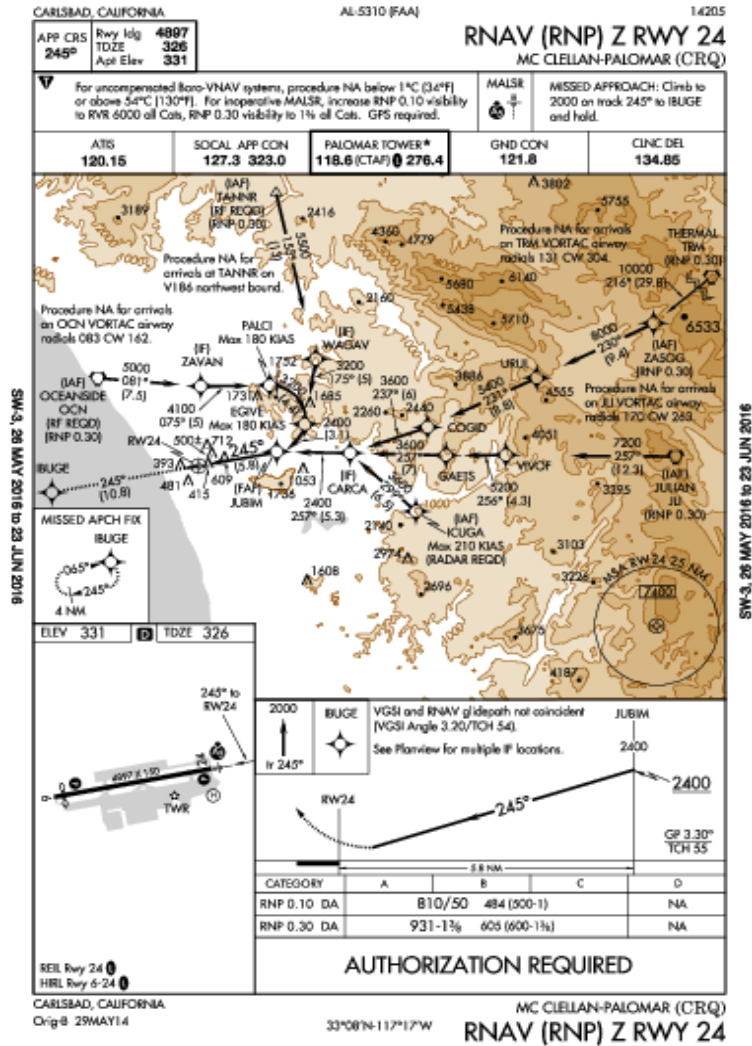
Circling minimums only – the first approach for an airport with these minimums begin with A and continue in alphabetical order

**When are circling only minimums published? (AIM 5-4-20)**

1. When the final approach course alignment with the runway exceeds 30°
2. Descent gradient is greater than 400fpm

3. The runway is not clearly defined

What does the Z represent in the title of this approach? (IPH 4-9)



When there is more than 1 straight in approach with the same type of guidance, a letter suffix is added to the title starting with Z and continues in reverse alphabetical order. In this case, there is more than one GPS approach to RWY 24 at KCRQ.



**What is the visibility requirement to fly this approach down to RNP .10 minimums?**

CATEGORY	A	B	C	D
RNP 0.10 DA	810/50	484 (300-1)		NA
RNP 0.30 DA	931-1 $\frac{3}{4}$	606 (600-1 $\frac{3}{4}$ )		NA

**AUTHORIZATION REQUIRED**

5000' RVR

**What is RVR? (AIM 7-1-15) (AC 97-1)**

Runway Visual Range is the maximum distance that runway lights or markings can be made out from a specific point on the runway. It is measured by transmissometers that are mounted on top of 14 foot towers and the value is given in hundreds of feet.

**What does RNP mean in the context of this approach? (AIM 5-4-18) (IPH 2-34 and 4-26)**

Required Navigation Performance - special training by aircrews in aircraft that meet the standards specified in AC 90-101 – hence: AUTHORIZATION REQUIRED

The RNAV equipment must have monitoring and alerting capabilities. The different levels of RNP represent the width of the route from the centerline to the boundary (e.g. .1nm or .3nm) The RNAV equipment must be able to alert the pilot if reception is not adequate enough to maintain the required performance.

*The bend in the approach course is called a radius-to-a-fix (RF) leg. These are constant radius turns much like DME arcs and allow pilots to avoid terrain or airspace that would otherwise be impractical with traditional straight RNAV paths.*

**What is an MDA? DA? (IPH 4-20)**

MDA – the lowest altitude in MSL to which a descent is authorized on final approach. There is no requirement to arrive at the MDA at a certain point so long as the procedure is being flown as published. Upon arriving at the MDA, the pilot holds this altitude until either the runway environment is sight or the missed approach point is reached.

DA – the lowest altitude on a precision approach or an approach with vertical guidance (APV) expressed in MSL. Upon arriving at the DA, the missed approach must be executed if the required visual reference is not in sight.

*The number in smaller print besides the MDA and DA are the altitudes expressed in height above TDZE. This value is also called the decision height or DH when referencing the DA.*

**When you can descend below the MDA or DA? (91.175) (IFH 10-20) (IPH 4-22)**

1. The aircraft must be continuously in a position to descend to a landing using normal maneuvers at a normal rate
2. The flight visibility is at or above that which is prescribed in the IAP
3. When the approach lighting system because visible the pilot may descend down to 100 above the TDZE
4. When any of the following become visible, a descent to a landing may be made (considering all of the previous stipulations were also met):

Red terminating bars or red side row bars  
REILS  
VASI/PAPI  
Threshold, threshold markings, or threshold lights  
Touchdown zone, touchdown zone markings, or touchdown zone lights  
Runway, runway markings, or runway lights

**How is the touchdown zone elevation determined?**

The highest elevation in the first 3000' of the runway





**What are the different landing minimums available for GPS approaches (IPH 4-24)**

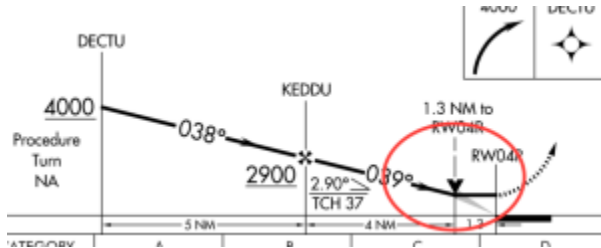
Approach Minimum	Minimum Altitude Type	Equipment Required	Guidance	Integrity
LNAV	MDA	GPS w/ RAIM	Lateral	Larger than a localizer
LNAV+V	MDA	WAAS or baro-VNAV	Lateral – vertical guidance is advisory only (stay at or above the step down fixes!)	Larger than a localizer
LNAV/VNAV	DA	WAAS or baro-VNAV	Lateral and Vertical	Larger than an ILS
LPV	DA	WAAS	Lateral and Vertical	Close to an ILS
LP	MDA	WAAS	Lateral	Close to a localizer

**What is baro-VNAV equipment? What are its limitations? (IPH 4-31)**

Baro-VNAV equipment uses barometric altitude information to compute a vertical guidance path. Extreme temperatures can cause readings that are inadequate for an instrument approach. Different IAPs have temperature limitations for which uncompensated baro-VNAV equipment can be used. Also, if the local altimeter setting is not available, this approach may not be used. See the notes section of the IAP below:

MADISON, WISCONSIN		AL-245 (FAA)		16035
WAAS CH 42829 W21A	APP CRS 212°	Rwy Idg 7015 TDZE 887 Apt Elev 887	<b>RNAV (GPS) RWY 21</b> DANE COUNTY REGNL-TRJAX FIELD (MSN)	
 For uncompensated Baro-VNAV systems, LNAV/VNAV NA below -20°C (-4°F) or above 54°C (130°F). DME/DME RNP-0.3 NA. For inop MALSR, increase LNAV/VNAV all Cats visibility to 1 1/2 mile and LNAV Cat C/D visibility to 1 1/2 mile.	 MALSR	MISSED APPROACH: Climb to 3600 direct WROD and hold.		

Identify the following symbol (AIM 5-4-5(h)) (IPH 4-37)



A Visual Descent Point (VDP) identifies a point at which a normal descent to a landing can be made at the TDZ. If we are flying a larger and faster airplane and you reach the VDP without the runway insight, although you are not required to go missed, this point warns us that if we continue down to the MDA, we will land beyond the TDZ. This could be an important factor when available landing distance is critical.

## **Weather Information (AC 0045G; AC 00-6A)**

**What are the standard temperature and pressure values for sea level? (pg. 13)**

15C or 59F – 29.92" Hg or 1013.2 mb

**Discuss isobars. What does it mean when the isobars are close together? (pg.15 and 24)**

Isobars connect equal lines of pressure. Closely spaced isobars means that there is a strong pressure gradient and winds will be strong.

**How do surface winds flow in relationship to isobars? Why? Winds aloft? (pg.25)**

At the surface winds flow at an angle to the isobars because of surface friction.

Aloft, winds from more or less parallel because of the Coriolis force.

**What type of clouds, visibility and precipitation would you expect from stable air?**

**Unstable air? (Chapter 6)**

Stable air: stratiform clouds, poor visibility, smooth air, steady or continuous precipitation

Unstable: Cumuliform clouds or clouds with vertical development, good visibility, turbulence, and showery precipitation

**What are the general characteristics of low/high pressure areas? (pg.35)**

Low – Cyclone – counterclockwise and rising air

High – Anti Cyclone – clockwise and descending air

**What is a ridge? Trough? (pg.35)**

Ridge – extended area of high pressure – descending air

Trough – extended area of low pressure – rising air

**What must be present in order for a thunderstorm to form? (pg.111)**

Unstable atmosphere (pg.52) – an unstable atmosphere can be noted by the ambient lapse rate. We know that the standard lapse rate is about 2 degrees Celsius per 1000' of altitude. If the ambient lapse rate is greater than the standard lapse rate (i.e. the temperature is decreasing rapidly as you climb), this means the atmosphere is unstable.

Sufficient Moisture – the temperature/dew point spread can be used to determine how moist the air is. The closer the temperature and dew point spread, the closer the air is to becoming saturated or so full of moisture that it can hold no more. Warmer air can hold more moisture than cooler air.

Lifting Action – Some of these lifting actions may include heating from below (rising warm air called thermals), orographic lifting (wind pushing a moist unstable air mass upslope), or frontal lifting (a fast moving cold front displacing warm, moist, and unstable warmer air for example).

**What are the stages of a thunderstorm?**

Cumulus – the building stage of a thunderstorm characterized by updrafts only. All thunderstorms begin as cumulus clouds but not all cumulus clouds become thunderstorms.

Mature – Updrafts and downdrafts both occur at this point. Violent turbulence can be experienced if flight is attempted beneath a cumulonimbus cloud because of this shear zone. The mature stage can be recognized by the beginning of rainfall.

Dissipating – At this point the cloud is only giving off downdrafts and the thunderstorm is dissipating. During this stage, large cumulonimbus clouds may have a recognizable “anvil top” that is a portion of the cloud that has been sheared off by the jet stream. The direction in which the anvil top is facing also shows the direction in which the storm is moving.

**What is wind shear? Why is it an operational hazard? (pg.86)**

Rapid change in wind direction or velocity – it can cause dramatic changes in indicated airspeed and causes severe turbulence within the shear zone

**What does dew point mean? (pg.38)**

The temperature at which the air becomes saturated

**Discuss the types of fog. Advection, Radiation, Upslope, Precipitation-Induced (pg. 126-128)**

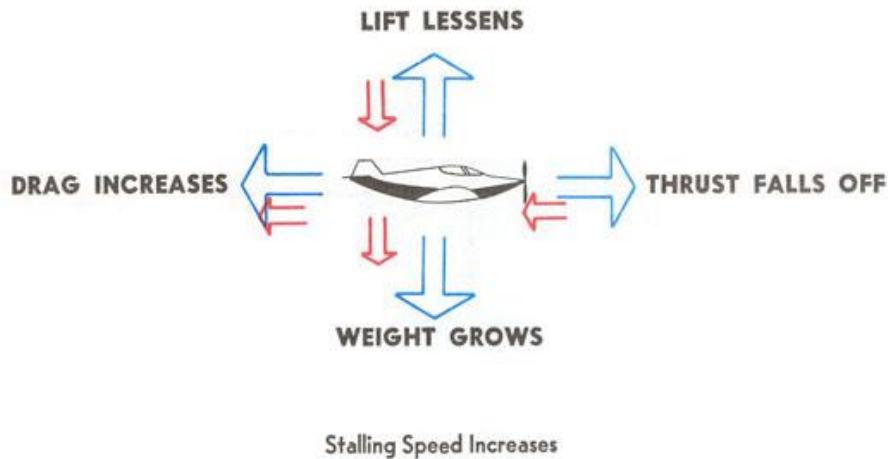
Advection: moist warm air moves over colder land or water

Radiation: forms on clear nights with little or no wind and only over land

Upslope: moist unstable air is cooled as wind pushes it up a slope

Precipitation Induced: warm rain falls through cool air. Evaporation from the rain saturates the cool air and fog forms.

## How does icing affect aircraft performance? (Chapter 10)



### Discuss the types of icing.

Induction Icing – This includes any icing that impedes that process of air entering the intake manifold to be mixed with fuel. Ice that builds up on the air intakes is an obvious form of this. Carburetor ice is also a form of induction icing. This can be attributed to the incomplete vaporization of fuel in combination with the pressure decrease inside of the venturi. Even on a day as warm as 70°F, carburetor ice can begin to form with adequate moisture in the air.

Instrument Icing – Icing of the pitot tube or static ports can cause the instruments to give inaccurate readings or to fail completely.

Structural Icing – Ice that forms on the surface of the aircraft. Since airfoils create lift by decreasing the pressure and thus the temperature of the air around them, icing on the propeller, horizontal and vertical tail surfaces, and wings can form at ambient temperatures that are above the freezing level. Structural icing includes:

Rime Ice – Small rain drops found in stratified clouds or drizzle freeze upon impact with the airfoil. Air that is trapped between the droplets give the ice a white or opaque appearance. It builds up typically at the leading edge only and has an irregular shape. This makes it more easily recognizable to the pilot and easier to remove by deicing equipment.

Clear Ice – Large super-cooled water droplets found in either heavy rain or in cumuliform clouds strike the airfoil but do not freeze immediately. Instead they slide backwards across the surface as they freeze. Clear ice is smooth and glossy making it very difficult to see from the cockpit. Because it adheres to the surface beyond the leading edge it can be difficult to remove.

Mixed Ice – Occurs when drops vary in size.

**What types of weather briefings can you get from a Flight Service Station briefer?**

**(AIM 7-1-4)**

Standard – Should be requested when planning a flight and no previous weather information has been gathered

Abbreviated – Used to supplement mass disseminated data or to update a previous briefing

Outlook – Request when proposed departure time is 6 or more hours away.

**What is EFAS (Flight Watch)? (AIM 7-1-5)**

Enroute Flight Advisory Service – provides up to date weather advisories for pilots while enroute

**On what frequency can you contact EFAS?**

Contact FSS – 122.0 no longer in use as of October 2015

**What is a METAR? Types, issue, and valid times? (3-1) (AIM 7-1-31)**

Aviation Routine Weather Report

Routine or special

Issued hourly

Valid for the hour

**What is a TAF? Issue, valid times, area of coverage? (7-19) (AIM 7-1-31)**

Terminal Aerodrome Forecast

3 types: Routine (TAF) Amended (TAF AMD) or Corrected (TAF COR)

Issued 4 times a day (every 6 hours)

Valid for 24-30 hours

Forecast for area within 5sm of airport

**What is the definition of a ceiling? (7-26) (AIM 7-1-16)**

The height above the ground of a broken or overcast layer

**Does a TAF report cloud ceilings in MSL or AGL?**



MSL

**Describe FROM, BECMG, TEMPO, PROB, on a TAF? (7-28 - 7-31)**

FROM – Rapid change occurring within 1 hour

BECMG – Gradual change to take place over the course of 1 hour

TEMPO – Between the predicted period, this weather will only occur for less than an hour

PROB – number placed afterwards is the probability of the weather forecasted to occur

**Area Forecast? Issue, valid times? What are the four sections of an Area Forecast? (7-1)**

Issued 4 times daily

Header

Synopsis: Valid for 18 hours – contains a short description of weather affecting the area during the valid period. This includes location and movement of pressure system.

VFR clouds and weather: Valid for 12 hours – gives a general description of clouds and weather that are significant to VFR operations.

Outlook: Valid for 6 hours –describes the prevailing condition

**Does an Area Forecast report cloud ceilings in MSL or AGL?**

MSL unless preceded by AGL or CIG (ceiling)

**AIRMET? Issue, valid times, Sierra, Tango, Zulu? (6-23) (AIM 7-1-10) (PHAK 12-12)**

Airmen's Meteorological Information

Issued for: Mountain obscuration and widespread IFR conditions (Sierra)

Moderate turbulence and surface w inds greater than 30kts (Tango)

Moderate Icing (Zulu)

Valid for 6 hours

**SIGMET? Issued? Valid? Why are they issued? (6-1)**

Significant Weather Information

Issued for: Severe Turbulence not associated with T-storms

Widespread dust storms and volcanic ash

Severe Icing

Valid for 4 hours

**CONVECTIVE SIGMET? Issued? Valid? Why issued? (6-4)**

Issued for thunderstorm (convective) activity

Winds greater than 50 kts

Hail greater than  $\frac{3}{4}$ "

**Winds and Temperatures aloft Forecast? (7-39)**

Issued twice a day every 12 hours and provide wind and temperature information for specific areas within the U.S.

**How are temperatures above 24,000 identified?**

Temperature above 24000 feet are negative

**What does 710556 mean on a Winds and Temperatures Aloft Forecast if the forecast level is 30,000 feet?**

Winds are from 210 at 105 kts and temperature is -56 C

**Winds will not be forecast within how many feet of station elevation on an FD? (7-39)**

1500'

**Temperatures will not be forecast within how many feet of station elevation? (7-39)**

2500'

**Discuss the Surface Analysis Chart? Issued? Valid? Information? (5-1) (PHAK 12-15)**

Issued 8 times daily and valid for 3 hours

Shows position of pressure systems, fronts, local weather, wind speed and directions, and visual obstructions.

**Discuss the Weather Depiction Chart? Issued? Valid? Information? (5-38) (PHAK 12-16)**

Graphical depiction of METAR information

Issued 8 times daily and valid for 8 hours

It is a flight planning tool to see overall surface conditions across the U.S.

**Discuss the Significant Weather Prognostic Chart? Issued? Valid? Info? (8-8)**

Forecast of aviation weather hazards such as icing, freezing levels, and turbulence

Issued 4 times a day there is a 12 hour forecast and a 24 hour forecast

**Discuss the Radar Summary Chart? Issued? Valid? Info? (5-47) (PHAK 12-17)**

Issued 35 minutes past every hour and valid for 1 hour.

Displays areas of precipitation and indicates the height of the radar echo tops in hundreds of feet MSL. Movement of cells is indicated by an arrow that points in the direction of the movement with the speed in knots beside it. This chart does not show clouds or fog, only precipitation.

## **Aeromedical Factors (AIM Chapter 8) (PHAK Chapter 16)**

**What are the body systems that are used to ascertain our orientation and movement in space? (PHAK 16-5)**

Vestibular – The inner ear system composed of 3 semicircular hollow but fluid filled canals arranged in the pitch, roll, and yaw axes. This endolymph fluid inside the canals moves when the head or body moves and displaces tiny hair cells that stimulate nerve impulses. These signals are then sent to the brain and interpreted as motion.

Somatosensory – The nerves in our skin cells. This is basically “flying by the seat of your pants” or the sensations of motion that we feel in our bodies from acceleration or turning.

Visual – Our Eyes. Light from the sun is constantly being reflected by everything on Earth. This light enters the eyeball through the cornea, travels through the lens and falls on the photoreceptors of the retina. The two kinds of photoreceptors are rods and cones. Rods are used for night and peripheral vision while cones are used to sense color.

**What is the cause of middle ear pain in flight and how can we mitigate it? (PHAK 16-4)**

Air inside of the middle ear is normally equalized through the Eustachian tube: a tube that travels from the ear to the back of the throat on each side. If there is any kind of congestion or blockage it makes this equalization difficult or impossible. In a climb, the air outside becomes less dense and the trapped higher pressure air in the middle ear tends

to expand. In a descent, the trapped air is of lower pressure than the outside air and feeling of compression is experienced. This is typically more painful and more difficult to resolve. Sinus congestions cause pain from similar circumstances and can be very painful. The first step in avoiding this pain is to not fly with head colds or ear/sinus infections. In flight, equalization can be helped along by swallowing, yawning, tensing the throat muscles, or by executing the Valsalva maneuver. This is accomplished by pinching the nostrils, closing the mouth, and attempting to exhale. Oral decongestions do not provide adequate relief and may have adverse side effects.

### **What is hypoxia and what are the different types? (AIM 8-1-2) (PHAK 16-2)**

Hypoxia is a state of oxygen deficiency in the body. It occurs at 4 different levels

#### **Lung: Hypoxic Hypoxia**

Oxygen is not available at adequate pressure for the lungs to absorb. This occurs when we climb higher in altitude and the air becomes less dense.

#### **Blood: Hypemic**

This is the inability of the red blood cells to carry oxygen to the other cells. The most common cause in aviation is carbon monoxide poisoning especially with small piston aircraft. Cabin heat is provided by ducting engine heat from the exhaust manifold into the cockpit. If there is any kind of leak in this system, exhaust fumes containing carbon monoxide will enter the cockpit as well. Carbon dioxide molecules bond to the hemoglobin in red blood cells 200x faster than oxygen molecules, leaving no more room for the blood cells to carry the oxygen. Smoking cigarettes will also induce hypemic

hypoxia because you are inhaling carbon monoxide. Other causes of this type of hypoxia include anemia (a sickness caused by lowered hemoglobin) or donating blood.

**Cell: Histotoxic**

This is the cells' (other than blood cells) inability to use the available oxygen. Using drugs or alcohol can cause this. When using even over-the-counter medicine, consult an AME to see if it is okay for use in flight.

**Transport: Stagnant**

Inability of oxygen to reach cells because of poor circulation. The most common form of this in aviation is when the body experiences excessive G-forces.

**What are the symptoms of hypoxia?**

Poor judgement, memory, alertness, visual acuity and coordination. Sensation of euphoria or sometimes even belligerence can occur (a macho attitude). Other symptoms include, dizziness, headache, drowsiness and cyanosis (blue coloration of lips and fingernails).

**What is hyperventilation? How do you treat a hyperventilating passenger? (AIM 8-1-3) (PHAK 16-3)**

It is an abnormal increase in the breathing rate that leads to a deficiency of carbon dioxide. This is usually brought on by stress or fear while flying and often begins subconsciously. Symptoms include, lightheadedness, dizziness, drowsiness, tingling in the extremities and feeling of suffocation that may ultimately lead to unconsciousness. Treat a hyperventilating passenger by having them consciously control their breathing

rate. Talking out loud can help. Having them breathe into a paper bag can help reintroduce carbon dioxide into the lungs.

**What are the in-flight illusions? ICEFLAGS (AIM 8-1-5) (PHAK 16-6)**

**I**nversion – Abrupt change in altitude creates the illusion of tumbling backwards

**C**oriolis – Rapid head movement causes the illusion of accelerating or turning

**E**levator – An updraft causes the pilot to think that aircraft is in a climb. Pilot reacts by forcing the nose down inducing a dive.

**F**alse Horizon – Sloping cloud formations or obscured horizons confuse the pilot into misaligning with the horizon.

**L**eans – Abrupt recovery from a roll can mislead pilot into thinking aircraft is in a turn in the opposite direction.

**A**utokinesis – At night, stationary lights may appear to be in motion. Pilot may lose control of aircraft trying to align it with “moving” light.

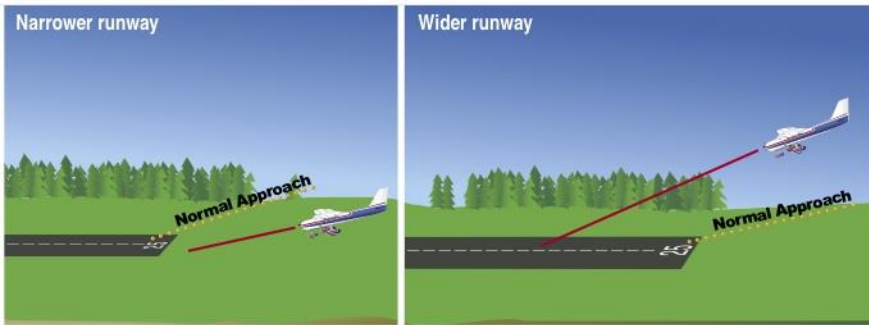
**G**raveyard Spiral – In a prolonged constant rate turn, sensation of the turn is not felt. In recovery to straight and level, the pilot may sense a turn in the opposite direction and pull back on the yoke, only tightening the spiral.

**S**omatogravic – Rapid acceleration causes the illusion of the being in a nose up attitude.

Rapid deceleration will have the opposite effect.

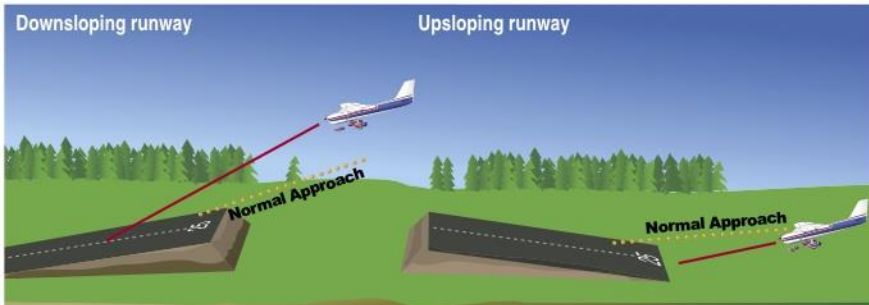
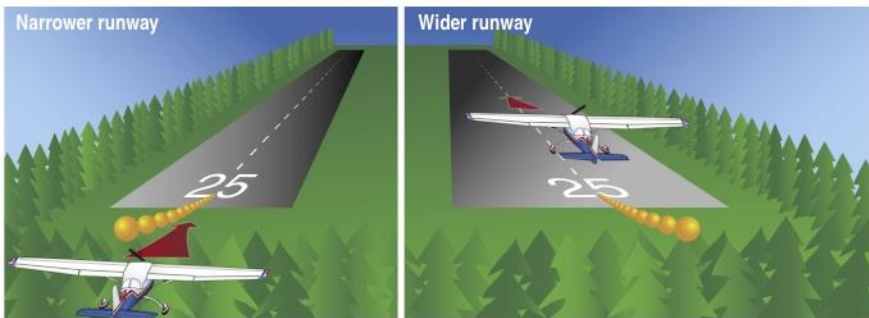


## What are the runway illusions?



### Runway width illusion

- A narrower-than-usual runway can create an illusion that the aircraft is higher than it actually is, leading to a lower approach.
- A wider-than-usual runway can create an illusion that the aircraft is lower than it actually is, leading to a higher approach.



### Runway slope illusion

- A downsloping runway can create the illusion that the aircraft is lower than it actually is, leading to a higher approach.
- An upsloping runway can create the illusion that the aircraft is higher than it actually is, leading to a lower approach.



- Normal approach
- Approach due to illusion

## **Aeronautical Decision Making (PHAK Chapter 17)**

### **What is the definition of ADM?**

A systematic approach to risk assessment and stress management. The two defining elements of ADM are hazard and risk.

### **What are the hazardous attitudes and their antidotes? **RAIIM****

**R**esignation – The feeling of uselessness or inability or effect change. A pilot who exhibits resignation is an essentially a victim of circumstance.

Antidote: I am not helpless. I can make a difference.

**A**ntiauthority – Disregard for regulations. This is the “Don’t tell me what to do” attitude.

Antidote: Follow the rules. They are usually right.

**I**mpulsivity – Acting without thinking.

Antidote: Not so fast. Think first.

**I**nvulnerability – The thought that “it can’t happen to me”.

Antidote: It could happen to me.

**M**acho – An attitude that “you can do it”. This is often associated with trying to impress others or show off.

Antidote: Taking risks is foolish.

**What are some of the ways we can mitigate risk? IMSAFE PAVE 5Ps**

**I**llness – Am I sick?

**M**edication – Am I taking any medication? If so, have I discussed with my AME if it is safe for flight?

**S**tress – Am I under psychological stress? School/Work? Money? Health? Family/Social life?

**A**lcohol – Have I been drinking within the previous 8 hours? Am I still experiencing the effect of alcohol?

**F**atigue – Have I gotten adequate rest?

**E**ating – Am I hungry?

**P**ilot – Am I ready for this trip (IMSAFE)? Are my certificates/ratings current? Am I proficient?

**A**ircraft – Is the airplane airworthy (**AVIATES**)? Does it have all of the required documentation (**ARROW**)? Is it equipped for the intended operation (**ATOMATOFLAMES/FLAPS**)? Can it carry the intended passengers/load (weight and balance/fuel)? Performance characteristics?

**e**nVironment – (**NWKRAFT**)

**E**xternal pressures – Are my passengers/employer urging me to get somewhere? Do I have stress influencing my life?

**P**ilot – physical fitness, currency, and proficiency

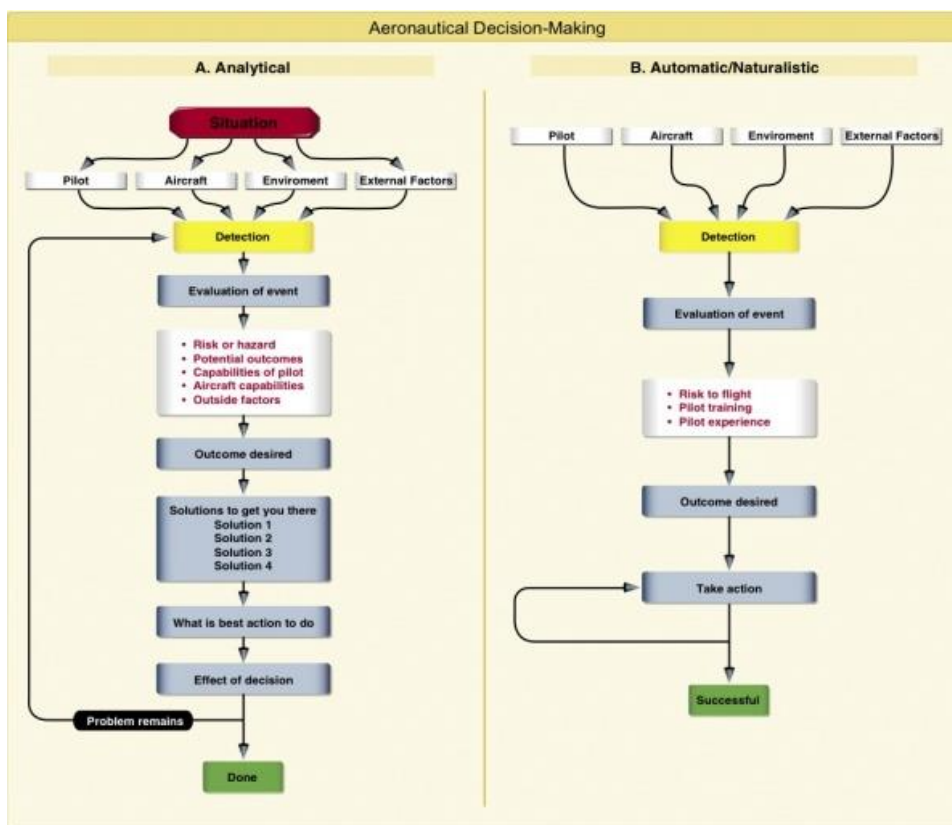
**P**assengers – Are they fit to fly? Are they comfortable flying?

**P**lane – Airworthiness and documentation

**P**rogramming – Are you proficient using the avionics? Are the GPS databases up to date?

**P**lan - (NWKRAFT)

**How do we assess risk in flight? DECIDE**



#### The DECIDE Model

1. **Detect.** The decision maker detects the fact that change has occurred.
2. **Estimate.** The decision maker estimates the need to counter or react to the change.
3. **Choose.** The decision maker chooses a desirable outcome (in terms of success) for the flight.
4. **Identify.** The decision maker identifies actions which could successfully control the change.
5. **Do.** The decision maker takes the necessary action.
6. **Evaluate.** The decision maker evaluates the effect(s) of his/her action countering the change.

## Special Emphasis Areas

- Positive exchange of flight controls
- Stall/Spin awareness
- Collision avoidance
- Wake turbulence avoidance (**AIM 4-6-7**) (**PHAK 13-15**)
- Land and Hold Short Operations (**AIM 4-3-11**)
- Runway incursion avoidance (**PHAK 13-18**)
- CFIT awareness
- ADM and risk management (personal minimums)
- Checklist usage
- TFRs
- Special use airspace
- Aviation security (1-866-GA-SECURE)
- SRM

