Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

Instrument PTS Answered

PREFLIGHT PREPARATION

WEATHER INFORMATION

TAFS & METARS

http://aviationweather.gov/products/fa/?area=ftworth
http://adds.aviationweather.gov/tafs/

TAF (Terminal Aerodrome Forecast);

- Your best sources for surface winds, obscurations, ceilings forecast. No turbulence, icing or temperature.
- Usually valid for a **24-hour period** and are scheduled **four times a day every 6 hrs** (0000Z, 0600Z, 1200Z, 1800Z)
- **"BECMG"** = a gradual change in the weather
- **"FM"** = a significant change in the forecast is expected.
- **"TEMPO"** = expected to last less than an hour at a time
- **"PROB"** = used when a probability of occurrence is between 30 and 49 %
- **"NSW'** means that no significant weather change is forecast to occur. Only appears in BECMG or TEMPO groups.
- **"CB"**Cumulonimbus clouds are the only cloud type included.
- **"WS"** = low-level wind shear(<2000 ft) not associated with convective activity; WS015/30045kt = wind shear is expected at 1,500 ft with wind from 300 at 45 kts.

METAR (Aviation Routine Weather Report):

- METAR taken every hour & **(SPECI)** unscheduled.
- Winds reported are referenced to true north.
- **00000KT** = Calm;
- **"VRB"**= wind direction varies
- **"V"** wind direction varies 60 degrees or more ie-**VRB180V26019KT**
- **"G"=**gusting to. ie- **32015G25KT**
- Visibility is reported in statue miles, **"SM"**
- Ceiling is defined as the height above the Earths surface of the lowest broken or overcast layer or vertical visibility into an obscuration.
- Definition of VFR is visibility of at least 5 miles and ceilings of at least 3000 ft.

TAF and METAR Codes
Intensity or Proximity

- \- Light
- "no sign" Moderate
- \+ Heavy
- VC Vicinity: but not at aerodrome; between 5 and 10SM of the point(s)

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

of observation

Descriptor

- MI Shallow
- BC Patches
- PR Partial
- TS Thunderstorm
- BL Blowing
- SH Showers
- DR Drifting
- FZ Freezing

WEATHER PHENOMENA
Cloud Cover three digit height in hundredths

- **Skc 0/8**
- **FEW >0/8-2/8**
- **SCT 3/8-4/8**
- **BKN 5/8-7/8**
- **OVC 8/8**
- **Tccb towering cumulous**
- **VV vertical visibility**
- **CLR clear below 12000 ft**

Precipitation

- DZ Drizzle
- RA Rain
- SN Snow
- SG Snow grains
- IC Ice crystals
- PL Ice pellets
- GR Hail
- GS Small hail/snow pellets
- UP Unknown precipitation in automated observations

Obscuration

- BR Mist(>= 5/8SM)
- FG Fog(< 5/8SM)
- FU Smoke
- VA Volcanic Ash
- SA Sand

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

- HZ Haze
- PY Spray
- DU Widespread dust

Other

- SQ Squall
- SS Sandstorm
- DS Duststorm
- PO Well developed
- FC Funnel cloud
- +FC tornado/waterspout
- dust/sand whirls
  - o Explanations in parentheses "( )" indicate different worldwide practices.
  - o Ceiling is defined as the lowest broken or overcast layer, or vertical visibility.

FA (Aviation Area Forecast): conditions over a wide region (several states). It's a good source of information for enroute weather.

- FA's are issued three times a day and include any airmets forecast for the area.
- **"SYNOPSIS" 1ST -**18th hr. after published
- **"SIG CLDS AND WX"** = is the section that contains a summary of cloudiness and weather significant to flight operations broken down by states or other geographical areas. 1st -12th hr. after published
- **"OTLK"** = the outlook for a specific period of time. 6hrs after the **"SIG CLDS AND WX" (12th-18th hr.)**
- The **HAZARDS** section lists hazards to aviation, such as turbulence and icing, for selected areas.

Pilot and radar reports.

http://adds.aviationweather.gov/pireps/

PIREP (Pilot Weather Reports): confirm information on height of bases and tops of cloud layers, in-flight visibility, icing conditions, wind shear, and turbulence.

	PIREP ELEMENT	PIREP CODE	CONTENTS
1.	3-letter station identifier	XXX	Nearest weather reporting location to the reported phenomenon
2.	Report type	UA or UUA	Routine or Urgent PIREP
3.	Location	/OV	In relation to a VOR
4.	Time	/TM	Coordinated Universal Time
5.	Altitude	/FL	Essential for turbulence and icing reports
6.	Type Aircraft	/TP	Essential for turbulence and icing reports
7.	Sky cover	/SK	Cloud height and coverage (sky clear, few, scattered, broken, or overcast)
8.	Weather	/WX	Flight visibility, precipitation, restrictions to visibility, etc.
9.	Temperature	/TA	Degrees Celsius
10.	Wind	/WV	Direction in degrees magnetic north and speed in knots
11.	Turbulence	/TB	See AIM paragraph 7-1-24

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

12.	Icing	/IC	See AIM paragraph 7-1-22
13.	Remarks	/RM	For reporting elements not included or to clarify previously reported items

EXAMPLE-
1. *KCMH UA /OV APE 230010/TM 1516/FL085/TP BE20/SK BKN065/WX FV03SM HZ FU/TA 20/TB LGT*

NOTE-
1. *One zero miles southwest of Appleton VOR; time 1516 UTC; altitude eight thousand five hundred; aircraft type BE200; bases of the broken cloud layer is six thousand five hundred; flight visibility 3 miles with haze and smoke; air temperature 20 degrees Celsius; light turbulence.*

EXAMPLE-
2. *KCRW UV /OV KBKW 360015-KCRW/TM 1815/FL120//TP BE99/SK IMC/WX RA/TA M08 /WV 290030/TB LGT-MDT/IC LGT RIME/RM MDT MXD ICG DURC KROA NWBND FL080-100 1750Z*

NOTE-
2. *From 15 miles north of Beckley VOR to Charleston VOR; time 1815 UTC; altitude 12,000 feet; type aircraft, BE-99; in clouds; rain; temperature minus 8 Celsius; wind 290 degrees magnetic at 30 knots; light to moderate turbulence; light rime icing during climb northwestbound from Roanoke, VA, between 8,000 and 10,000 feet at 1750 UTC.*

7-1-23. Definitions of Inflight Icing Terms TBL 7-1-7, and TBL 7-1-8, Icing Conditions.

7-1-24. PIREPs Relating to Turbulence TBL 7-1-9.

1. Aircraft location.

2. Time of occurrence in UTC.

3. Turbulence intensity.

4. Whether the turbulence occurred in or near clouds.

5. Aircraft altitude or flight level.

6. Type of aircraft.

7. Duration of turbulence.

Surface analysis charts. shows weather conditions as of the valid time shown on the chart
http://adds.aviationweather.gov/data/progs/hpc_sfc_analysis.gif

- atmospheric pressure patterns at the earths surface.
- Transmitted every three hours
- Station Models—round station symbols depict stations where observations are taken by human observers and square symbols indicate automated sites.

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

Weather Depiction Chart: chart is derived from aviation routine weather reports (METARs)

- Transmitted every 3 hours, and is valid at the time of the plotted data.
- Pressure patterns and wind information are not provided (areas of adverse weather)
- Station Models—depicted as circles; a bracket ( ]) to the right indicates an automated station.
- Sky cover& cloud height
- Visibility
- Contours depict MVFR,VFR, & IFR conditions

Radar summary charts.

http://aviationweather.gov/obs/radar/

Radar Summary Chart (SDs) : data depicts the location, size, shape, intensity, and intensity trend and direction of movement. Also shows echo heights of the tops and bases of precipitation areas.

- Produced 35 minutes past each hour. Conditions that existed at the valid time.
- Only detects precipitation and does not detect all cloud formations.

Satellite Weather Pictures: two types, Visible and Infrared (IR)

- Both are transmitted every 30 minutes except for nighttime when visible photo are n/a.
- Visible pictures are used to determine the presence of clouds, the shape and texture.
- IR photos depict the heat radiation emitted by the cloud tops and earth's surface.

Significant weather prognostics.

http://aviationweather.gov/data/products/swl/ll_06_4_cl_new.gif

U.S. Low-Level Significant Weather Prog Chart: helps you avoid areas of low visibility and ceilings as well as where turbulence and icing may exist.

- Valid from the surface up to the 400-millibar pressure level (24,000 ft)
- Consists of four panels, is issued at 0000Z, 0600Z, 1200Z, 1800Z; the two lower panels are 12 and 24 hour forecasts of surface weather conditions , the two upper panels are 12 and 24 hour forecasts of weather between the surface and 24,000 ft. (surface Prog Panels)
- The upper panels show areas of non-convective turbulence and freezing levels as well as IFR and Marginal VFR (MVFR) weather
- The lower panels show fronts and pressure centers, and forecast precipitation and thunderstorms.

Winds and temperatures aloft.

http://aviationweather.gov/products/nws/winds/?area=ftworth&fint=06&lvl=lo

FD (Winds & Temperatures Aloft Forecasts): wind direction in relation to true north, wind speed in knots, and temperature in degrees Celsius, for nine levels between 3,000 and 39,000 ft.

- Temperatures are assumed negative above 24,000ft
- FD does not include levels within 1,500 ft of the stations elevation, and temperatures are not forecast for the 3,000-foot level or for a level within 2,500 ft. of the stations elevation.
- Winds of 100 to 199 kts have 50 added to the direction.
- **"9900"** = light & variable and less than 5 kts.

Forecast Winds and Temperatures Aloft Chart:

- 12-hour forecast valid at 0000Z and 1200Z daily.

Freezing level charts.

1915 Biscayne Little Rock, AR 72227
(501) 680-7283

http://adds.aviationweather.gov/icing/

Stability charts.

- Four panel chart
- Precipital water
- Freezing level
- Average relative humidity
- Upper level air data
- K index high positive levels to low negative levels
    - Temp/dew-point/spread
- LI lifted index

Severe weather outlook charts.

http://aviationweather.gov/products/cwsu/
http://www.spc.noaa.gov/products/wwa/

Severe Weather Outlook Chart: is a 48-hour forecast of thunderstorm activity

- Issued every morning at about 0800Z
- Left panel depicts the outlook for general and severe thunderstorm activity for the first 24-hours
- Right panel depicts a forecast for the next day beginning at 1200Z

SIGMETs and AIRMETs.

http://adds.aviationweather.gov/airmets/

Airmet - Of significance to light aircraft,

- moderate turbulence,
- icing and
- winds, sustained winds of 30 kts or more at the surface
- IFR ceilings less than 1,000 ft and/or visibility less than 3 miles affecting over 50 percent of an area at any one time
  extensive mountain obscurement.
  Sierra: for IFR conditions and mountain obscuration.
  Tango: for turbulence, strong surface winds, and low-level wind shear.
  Zulu: for icing for freezing levels.
- After the first issuance of the day, AIRMETs are numbered sequentially.

Sigmet(WSs)- Of significance to all aircraft

- Severe, extreme or clear air turbulence not associated with Thunderstorms,
- severe icing
- duststorms, sandstorms lowering Visibility below 3 miles
- Volcanic ash,
- Use alphanumeric designators November through Yankee

Convective Sigmet (WSTs)- Severe conditions always imply severe or greater turbulence, severe icing, and low-level wind shear.

- Surface winds better than 50 knots
- hail greater than or equal to 3/4 inch in diameter
- Tornadoes,
- embedded thunderstorms,

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

- a line of thunderstorms,
- thunderstorms producing precipitation affecting 40% of an area 3000 sq miles
- Issued for the eastern (E) central (C), and western (W) and are numbered sequentially for each area (01-99) each day.
- Bulletins are issued 55 minutes past each hour
- or when needed
- valid for 2 hours from the time of issuance or until it is superseded by the next hourly issuance.

- **Hazardous In-Flight Weather Advisory Service** (HIWAS) –CWA, UUA, AWW: AIRMETs, SIGMETs, Convective SIGMETs, and urgent PIREP. When HIWAS is updated, ARTCC and terminal facilities will broadcast an alert on all but emergency frequencies.

ATIS reports. Automated Terminal Information System

ASOS –Automated Surface Observation System: is the primary surface weather observing system.

1. Measures everything in AWOS-3 as well as variable cloud height, variable visibility, rapid pressure changes, precipitation type, intensity, accumulation, and beginning and ending times.

AWOS - **Automated Weather Observing System**: was the first widely installed automated weather data.

1. AWOS –A = only reports altimeter setting
2. AWOS-1 = also measures and reports wind speed, direction and gust, temperature, and dewpoint.
3. AWOS-2 = everything in AWOS-1 plus, visibility
4. AWOS-3 = everything in AWOS-2 plus, cloud and ceiling data.

TWEB Transcribed weather enroute briefing: including winds aloft and route forecast for a cross-country flight.

Weather sources

- FSS – Fight Service station Flight Service Station (FSS), National Weather Service (NWS), DUATS, and internet.
- Flight Service Stations (FSS):
  - 122.2; Airport Advisory/Information (Local Airport Advisory LLA) 123.6;
  - Weather briefings; Standard, Abbreviated, Outlook, and Inflight
- EFAS/Flight Watch – Enroute Flight Advisory Service Enroute Flight Advisory Service (EFAS) “Flight Watch” 122.0 above 5,000 ft AGL and below 18,000 from 6 A.M to 10 P.M.

Weather Review

- **Prevailing Visibility**—is the greatest distance a weather observer or tower personnel can see throughout one-half the horizon. Prevailing Visibility or RVR in the aviation routine weather report should normally be used only for informational purposes. The current visibility at the time of departure is the value you should use for determining compliance with takeoff minimums.
- **Runway Visibility Value (RVV)** - is the distance down the runway you can see unlighted objects or unfocused lights of moderate intensity; it is reported in statue miles or fractions of miles.

- **Runway Visual Range (RVR)** - represents the horizontal distance a pilot will see when looking down the runway from a moving aircraft at the approach end. It is always a transmissometer value.
- **When RVR is out of service,** convert published RVR minimums to visibility in statute miles.

Atmosphere: 78% nitrogen 21% oxygen 1% other

- Standard Temperature and Pressure values for sea level are **15 degrees C and 29.92" Hg.**

Circulation—refers to the movement of air relative to the earths surface

Temperature—every physical process of weather is accompanied by, or is the result of heat exchange

Atmospheric Pressure—Isobars reveals pressure gradient

- Isobars spread widely apart, the gradient is considered weak; results in lighter winds v/v
    1. **High** = center of high pressure surrounded on all sides by lower pressure
    2. **Low** = an area of low pressure surrounded on all sides by higher pressure
    3. **Ridge** = elongated area of high pressure
    4. **Trough** = elongated area of low pressure
    5. **Col** = can designate either a neutral area between two highs or two lows.
- Unequal heating of the Earth's surface causes variations in altimeter settings between weather reporting points.

Frictional Force:

- High always what to go to low pressure; however, as soon as the air begins to move, it is deflected by a phenomenon know as Coriolis force deviates the air to the right.
- High pressure areas flow clockwise; low pressure areas flow counterclockwise, roughly parallel to the isobars
- Below 2000 ft AGL friction caused by the earths surface slow the moving air and reduces Coriolis force; pressure gradient force is now greater than Coriolis force and wind is diverted from its path along the isobars toward the lower pressure.

Local Wind Patterns:

- **Sea Breeze**—since land surfaces warm or cool more rapidly than water surface, land is usually warmer than water during the day; wind blows from cool water to warmer land.
- **Land Breeze**—at night, land cools faster than water and wind blows from the cooler land to the warmer water
- **Valley Breeze**—as mountain slopes are warmed by the sun during the day, the adjacent air also is heated, since heated air is less dense than the air at the same altitude over the valley an upslope flow is created.
- **Mountain Breeze**—at night, the high terrain cools off and eventually becomes cooler than air over the valley.

Atmospheric Stability: is the atmosphere's resistance to vertical motion

- Air that moves upward expands due to lower atmospheric pressure. When air moves downward, it is compressed by the increased pressure at lower altitudes.
- Stability of the air can be measured by its actual lapse rate
- A characteristic of stable air is the presence of stratiform clouds.
- Characteristics of unstable air include turbulence and good surface visibility.
- **The average lapse rate is 2 C (3.5 F) per 1,000 ft.**

Temperature Inversions: temp. usually decreases with an increase in altitude, the reverse is sometimes true. When temperature increases with altitude.

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

- The most frequent type of ground or surface-based temperature inversion is that which is produced by terrestrial radiation on a clear, relatively still night.
- The weather conditions that can be expected beneath a low-level temperature inversion layer when the relative humidity is high are smooth air, poor visibility, fog, haze or low clouds.
- A temperature inversion is associated with a stable layer of air.

Moisture: the processes by which moisture is added to unsaturated air.

- If the air is very moist, poor, or even severe weather can occur; if the air is dry, the weather usually will be good.
- **Change of State:** Water is present in the atmosphere in three states: Solid, Liquid, and Gas.

1. Evaporation = changing of liquid water to invisible water vapor (latent heat of evaporation)
2. Condensation = water vapor changes to a liquid (latent heat of condensation, important in cloud development.
3. Sublimation = changing of ice directly to water vapor
4. Deposition = water vapor to ice
5. Melting + Freezing

Humidity: refers to moisture in the air; Relative Humidity, is the actual amount of moisture in the air compared to the total amount that could be present at that temperature; the amount of moisture in the air depends on air temp.

Dewpoint: is the temperature to which the air must be cooled in order to become saturated.

Clouds often form at altitudes where temp. and dewpoint converge. (4.5 f per 1,000 ft)

Frost:

- If the temperature of the collecting surface is at or below the dewpoint of the adjacent air, and the dewpoint is below freezing, frost will form.
- Frost on the wings affects takeoff performance by disrupting the smooth flow of air over the airfoil, adversely affecting its lifting capacity. Frost may prevent the airplane from becoming airborne at normal takeoff speed. Frost is considered a hazard to flight for this reason.

Clouds

- Clouds, fog or dew will always form when water vapor condenses.
- **Condensation Nuclei**—can be dust, salt from evaporating sea spray or products of combustion.

  Types: clouds are divided into four families according to their height range.
  - **Low** = surface to 6,500 AGL. **Middle** = 6,500 to 20,000 (alto)
  - **High** = above 20,000 AGL (cirrus)
  - **Clouds w/Vertical Development** (cumulus, towering cumulus, cumulonimbus); associated turbulence can be expected when an unstable air-mass is forced upward.
- **Nimbus** = denotes a rain cloud
- **Stratus** = form when moist, stable air flows upslope.

Fog: if the temp./dewpoint spread is small and decreasing, and the temperature is above freezing, fog or low clouds are likely to develop.

- **Radiation fog**—forms as warm, moist air lies over flatland areas on clear, calm nights.
- **Advection fog**—forms when a warm air mass moves inland from the coast in winter.
- **upslope fog**—when moist stable air is forced up a sloping land mass.
- **Steam fog**—occurs as cold dry air moves over warmer water.
- **Precipitation Induces fog—**when warm rain or drizzle falls through cooler air near the surface.

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

Precipitation: defined as any form of particles, whether liquid or solid, that fall from the atmosphere.

- Snowflakes, raindrops, drizzle, ice pellets, hail, or virga.
- The presence of ice pellets at the surface is evidence that there is a temperature inversion with freezing rain at a higher altitude.

Airmasses: is a large body of air with fairly uniform temperature and moisture content.

- Airmasses are classified according to the regions where they originate. (stable or unstable)

Fronts: the boundary between two different Airmasses

- **Cold front; warm front; stationary front; occluded front.**
- One of the most easily way to determine the cross of a front is a change in temperature.
- One weather phenomenon which will always occur when flying across a front is a change in the wind direction.

Thunderstorms: cumulonimbus clouds have the greatest turbulence.

- **3 conditions must be present:** **1. lifting action** **2. unstable** **3. moist air**
- A non-frontal, narrow band of active thunderstorms that often develops ahead of a cold front is known as a squall line.
- **Life Cycle:** **1. cumulus** **2. mature** **3. dissipating**
- If there is thunderstorm activity in the vicinity of an airport at which you plan to land, you can expect to encounter wind-shear turbulence during the landing approach. ; lighting is always associated with thunderstorm

Turbulence: upon encountering severe turbulence, the pilot should attempt to maintain a level flight attitude.

Wake Turbulence: wingtip vortices are created only when an aircraft is developing lift.

- Greatest vortex strength occurs from aircraft heavy, clean and slow.
- Taking off or landing
- The wind condition that requires maximum caution on landings is a light, quartering tailwind.

Mechanical Turbulence: when buildings or rough terrain interfere with normal wind flow.

Convective Turbulence: which is also referred to as thermal turbulence. (indicated by towering cumulus)

Mountain Wave Turbulence: Standing lenticular cloud, rotor cloud.

Wind Shear: is a sudden, drastic shift in wind speed and/or direction that may occur at any altitude in a vertical or horizontal plane.

- May be expected in areas of low-level temperature inversion, frontal zones and clear air turbulence, and whenever the wind speed at 2000 to 4000 ft above the surface is at least 25 knots.

Icing: must have visible moisture and freezing temp. two types; Structural and Induction Icing

Rime
Clear Ice
Mixed
Frost

Thunderstorm formation
Fog formation
Frontal Activity
    Wave fronts
    Occluded fronts

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

Cloud Formations and types

Temperature inversions

Dry adiabatic lapse rate

Ice pellets indicate that a warm front is about to pass

In a convective current temp and dewpoint converge at 2.5 deg per 1000 ft

ALTERNATE FILING REQUIREMENTS §91.169

Airport with an instrument approach procedure you must file an alternate if (1-2-3 rule):

- 1 hour before and 1 hour after the estimated time of landing at an airport
- the ceiling is predicted to be below 2000'
- and visibility less than 3 SM..

Standard Alternate airport weather minimums(no alternate weather minimums are published).

- **Precision approach-** at ETA 600' AGL ceiling and 2 miles visibility forecast.
- **Non-precision approach-** at ETA must have 800' ceiling and 2 miles visibility forecast.
- No published approach procedure- ceiling above MEA (must allow descent from the MEA, approach, and landing under basic VFR.)

Non standard alternate weather minimum requirements

- check the approach plate to see if the airport/ approach can legally be filed as an alternate
- or has non standard minimums.
  - Airports must have ***approved*** weather reporting
  - and a monitored facility to be authorized to be filed as an alternate. Look for (A NA) on individual approach plates.
- If you actually proceed to the selected alternate, the landing minimums used at that airport should be the minimums specified for the approach procedure.

Q: You are flying from Fort Smith to Little Rock in IFR conditions and have filed Stuttgart as an alternate. Enroute, you find out that Little Rock is socked-in yet North Little Rock is within minimums. Can you fly to NLR even though you filed Stuttgart as your alternate?

A: *Yes! Having an alternate is for planning purposes and radio failure only. You may land at any airport when it is above or equal to minimums.*

CROSS-COUNTRY FLIGHT PLANNING

- Regulatory requirements for IFR within the airspace

Pilot-In-Command Responsibility

- You are the final authority in the airplane you are flying. It's a good idea to verbally establish Pilots responsibilities amongst crew before the flight.

Instrument Rating is Required:

- In weather conditions less than the minimum for VFR flight,
- in Class A airspace.
- To file an IFR flight plan even if the flight is in VFR conditions.
- A commercial airplane pilot must hold an instrument rating to carry passengers for hire on cross-country flights of more than 50 NM and to carry passengers for hire at night.

A pilot on an IFR flight plan is responsible for avoiding other aircraft whenever whether conditions permit.

Weather Minimums for airport surface areas 91.155.

- lateral boundaries of controlled airspace designated to the surface
- ceiling must be above1,000 ft. AGL
- ground visibility must be at least 3 statue miles.

VFR Cloud clearance visibility requirements 91.155.

- 3 statute miles flight visibility
- 2000ft horizontal 1000ft above 500 ft below cloud clearance
    - Exceptions:
        - Class B- 3mile flight visibility/ clear of clouds
        - > 10000 ft msl- 5statute mile flight visibility 1 mile horizontal/ 1000ft above/ 1000 ft below
        - <10000 msl, >1200agl, class G, Day,- 1statute mile flight visibility 2000ft horizontal/ 1000ft above/ 500 ft below
        - <1200 agl, class G, Day,- 1statute mile flight visibility/ clear of clouds
        - class G night in traffic pattern within ½ mile of airport- 1statute mile flight visibility/ clear of clouds

Special VFR requires §91.157—

- Day- ATC Clearance; Clear of clouds; flight visibility is at least 1sm;
- Night- Instrument rating, IFR aircraft, Clear or clouds, flight visibility is at least 1sm.

Oxygen Requirements § 91.211

Above 15,000ft - supplemental oxygen provided for all passengers.
Above 14,000ft- all crew members use supplemental oxygen for
Above 12,500ft beyond 30 minutes- flight crew uses O2

Transponder mode C Required 91.215:

- In all controlled airspace at and above 10,000 feet MSL,
- within and above Class C airspace,
- above, below and within Class B and the 30nm mode C veil,
- ADIZ.

Minimum safe Altitude IFR 91.177

- Except when necessary for takeoff or landing or unless otherwise authorized by the Administrator, the **minimum altitude for IFR flight** is 2,000 feet above the highest obstacle over designated mountainous terrain; 1,000 feet above the highest obstacle over terrain elsewhere.

Airspeeds limit 91.117

- 200 knots < 2500 agl and W/I 4-NM from primary airport Class C and D airspace ,
- Airspeed limit is 250 in Class B and 200 below class B.

Special Use Airspace (7 Types)

- Prohibited Area
- Restricted Area
- Warning Area
- MOA
- Alert Area
- CFA

Other Airspace Areas;

Other Airspace (5 Types)

- Airport Advisory/Information;
- MTR when route is a three digit number, the route contains one or more sections above 1500 ft AGL
  - IR training routes aircraft may fly at speeds in excess of 250 kts
- TFR
- Parachute Jump Areas
- PVFR Routes
- (TRSA)
- NSA

Other Regulations:

- Electronic devices are prohibited on aircraft that are being operated under IFR or in certain commercial passenger-carrying operations.
- A person who occupies the other control seat as safety pilot during simulated instrument flight must be appropriately rated in the aircraft.

Safe Habit Patterns:

- You remain the final authority as to the safety of the flight. You may also need to coordinate responsibility with other pilots that fly with you.

PREFLIGHT

Required Aircraft Documents: ARROW

- Airworthiness Certificate
- Registration
- Radio License (International flight only)

- Operation Limitations (POH)
- Weight and Balance (Aircraft specific)

Required Instruments 91.205
Navigation For IFR flight**:**

- must have working navigation equipment appropriate to the ground facilities to be used.
- pilot in commands to esure aircraft is in compliance

VFR DAY	VFR NIGHT	IFR
G-Gas gauge	F-Fuses (spare)	G-Generator or alternator
O-Oil Temperature gauge	L-Landing Light (if for hire)	R-Radios (nav and comm)
O-Oil Pressure gauge	A-Anti-Collision	A-Altimeter (sensitive)
S-Seat belts	P-Position Lights	B-Ball
E-ELT	S-Source of power (Alt)	C-Clock (Hrs, min, sec)
		A-Attitude Indicator
A-Altimeter		R-Rate of turn indicator
		D-Directional Gyro
C-Compass		
A-Airspeed indicator		
T-Tachometer		

Pilot Documents

- Pilots certificate
- Medical certificate
- Photo ID

Aircraft Inspections 91.409, 91.411 91.117, “Aviates”

Annual end of the 12^{th} Calendar Month

Vor 30 Days *Note date, place, bearing error, and signature*

- *Over airborne checkpoint: +/- 6^0*
- *Over ground checkpoint: +/- 4^0*
- *Against two VOR’s: 4^0 maximum difference.*
- *VOT test signal: +/- 4^0 -with 180^0course/TO indication (182)360^0 course selected/ from indication*

I00 hr100 hours-If for hire

1915 Biscayne Little Rock, AR 72227
(501) 680-7283

Altimeter 24 Calendar Months *Transponder/Mode C , Altimeter/Pitot/Static are usually recorded under a single logbook entry.*

Transponder24 Calendar Months
Elt 12 Calendar Months **& Elt Battery** *Battery: Replace or recharge after more than 1 hour of continuous use or at ½ the average shelf-life*

- *To test: Tune to 121.5 during the first 5 min of every hour*

Static/pitot check24 Calendar Months

Pilot Currency §61.57

- **To act as PIC:** Flight review by the end of the 24th month after last one.
- **To act as PIC carrying passengers:** Last 90 days3 takeoffs/ landings in cat, class, & type (full stop at night or tail wheel)
- **PIC Commercial:** If not current can not take passengers on commercial operations beyond 50 NM or at night ?
- **PIC under IFR or IMC** within last 6 months- 6 approaches holds/ intercepting/tracking. After six moths 6 approaches holds/ intercepting/tracking may be accomplished with a safety pilot. After 12 months an Instrument proficiency check is required with a CFII or greater.

Logging Instrument Time:

- If the pilot enters the condition of flight in the pilot logbook as simulated instrument conditions, the place and type of each instrument approach completed and name of safety pilot must also be entered?
- When on an instrument flight plan, you may log as instrument time only the time you controlled the aircraft solely by reference to flight instruments.

A/F D Review

Know the 11 Sections without looking and have a general understanding of what's in them.

1. Seaplane Operations
2. Notices
3. LAHSO
4. FAA phone Numbers
5. ARTCC / FSS
6. FSDO
7. Routes / Waypoints
8. VOR Checks
9. Parachute Ops
10. Chart Bulletins
11. Airport Diagrams

Be able to decipher thes entries without using the legend.
Amarillo

Sanantonio
Little Rock
Abilene
Albuquerque
Alexandia LA
Altus AFB OK
Austin Bergstrom
Batron Rouge Metropolitan
Beumont-port Arthur
Ney Orleans -lakefront
Vicksburg

Preflight Planning Required For a flight not in the vicinity of an airport:

- **W**eather reports and forecasts
- **K**nown traffic delays as advised by ATC
- **R**unway lengths of intended use
- **A**lternatives if flight cannot be completed as planned
- **F**uel requirements
- **T**akeoff and landing distance data in the approved aircraft flight manual

Planning a Flight in IFR Conditions

Flight Planning:

- **Preferred IFR routes** beginning with a fix indicate that departing aircraft will normally be routed to the fix via a departure procedure (DP), or radar vectors. Check for published departure or arrival procedures relevant to your intended flight.
- **NOTAMs** should be reviewed for items like navaid and lighting outage or runway closures that can significantly affect your flight.
- **Review the A/FD** for specific information about departure and arrival airport as well as possible alternate airports that are pertinent to your flight.
- In case the weather at your intended destination is forecast to have a ceiling less than 2,000 feet or visibility less than 3 miles, you need to file an alternate.
- The most current enroute and destination weather information for an instrument flight should be obtain from the FSS.

Planning Steps

1) **Check enroute chart**
2) **Distance**
3) **Direction**
   a) TC (-L + R) WCA = TH (-E +W) VAR = MH (+-) DEV = CH
4) **ETE**
5) **Altitude**
6) **Alternate**
7) **File**
8) **Weather Briefing**
   a) **Adverse weather**

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

   b) **Altimeter settings**
   c) **Temperature**
   d) **Winds aloft**
   e) **Freezing levels**

9) **Performance charts**

- **Take off distance**
- **Time fuel distance to climb**
- **Cruise performance**
- **Endurance**
- **Landing distance**

10) **Fuel requirements**

11) **Terminal Procedures review**
   a) **Consider: Take off mins, enroute weather, obstacle clearances, navigational aids**
   b) **Check for SID and DP's- Ensure you look for Terrible T's and A's and N/A's**
   c) **Enroute Consideration: - Obstructions clearance, Navigation aids,**
   d) **Destination approaches** Consider: Weather mins, , is an alternate required (1-2-3 rule), other ways to get into field, check foot notes on approach plates
   e) **Alternate**

- Performance, estimated time en route and total fuel requirement based upon factors, such as—
  - power settings.
  - operating altitude or flight level.
  - wind.
  - fuel reserve requirements.
    - **IFR Fuel Requirements**: (Use personal minimums such as 1- 1 ½ hours) fuel to reach primary airport, shoot an approach, fly to alternate airport if required, and then 45-min thereafter at normal cruise power.

- Calculated aircraft's performance capability and operating limitations.
- En route charts,

  Airports, Airspace and Other Information:
  - Localizers and back courses are shown only when they serve an enroute ATC function, such as establishing a fix or intersection.
  - **Area charts**—are created to portray these locations in a larger scale, to improve readability and provide more detail.

- Instrument departure procedures (DPs),

- Instrument Approach Procedure Charts (IAP) and RNAV, STAR,

- NOTAM information.

Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
1915 Biscayne Little Rock, AR 72227
(501) 680-7283

(L) Local State or FSS: taxiway etc, closures runway closures
(D)Distant National: Nav aids out etc.
(FDC)Changes in Published Procedures

- Filing a flight plan

IFR Flight Plans 91.173

- *No person may operate in controlled airspace under IFR unless that person has filed an IFR flight plan AND received an appropriate ATC clearance*.
- A flight plan can be filed 24 hours in advance. ATC will hold it for 2 hours after estimated departure time.
- Pick up your IFR clearance 10 minutes before departure. Usually it will stay in the system for 2 hours from the time you pick it up.
- If on a VFR/IFR composite flight plan, close the VFR 5 minutes before the IFR portion.
- When filing IFR plan, file the plan and then request Wx brief because FSS will now know your intended route.
- If you are flying to an airport that does not have an operating control tower, you are responsible for closing your own IFR flight plan by phone through FSS, or by direct communications with ATC.

- GPS and RAIM capability knowledge.

PREFLIGHT PROCEDURES AIRCRAFT SYSTEMS RELATED TO IFR OPERATIONS

ANTI-ICING/DEICING SYSTEMS

  - Airframe.
  - Propeller.
  - Intake.
  - Fuel.
  - Pitot-static.

AIRCRAFT FLIGHT INSTRUMENTS AND NAVIGATION EQUIPMENT

Instrument Errors

condition	Altimeter*	True altitude*	VSI	Airspeed indicator	Density altitude	Air density	Air pressure	CAS/True spread*
Hotter air	Reads lower	increases		Reads slower	increase	decrease	increase	increase
Colder air	Reads higher	decreases		Reads faster	decreases	increase	decrease	decrease
Lower pressure	Reads higher	decreases		Reads slower	increase	decrease	decrease	increase
Higher pressure	Reads lower	increases		Reads faster	decrease	increase	increase	decrease
Blocked static	freezes		zero					
Blocked pitot			n/a	Acts as altimeter				

Gyroscopic Instruments:

- Include the turn coordinator, attitude indicator and heading indicator. They operate off of a gyro's tendency to remain rigid in space.

Give the vacuum-driven heading indicator and attitude indicator 5 minutes to spin up during taxi.

- pitot-static.

  Pitot-Static Instruments:
  - Supplies ambient air pressure to operate the **altimeter** and **vertical speed indicator**, and both ambient and ram air to the **airspeed indicator**.

- altimeter.
  - Always get current altimeter setting before an approach
  - "Low-to-high, clear the sky", "High-to-low, look out below."
  - There is 1" Hg per 1000'
  - Pressure and temperature affect altimeter
  - Colder than standard temperature will give a reading higher than actual

  <u>Types of Altitude</u>
    - Altimeter setting is the value to which the barometric pressure scale of the altimeter is set so that the altimeter indicated true altitude at field elevation.
    - Variations in temperature affect the altimeter, as pressure levels are raised on warm day and the indicated altitude is lower than the true altitude.
    - **True, Absolute, Pressure, Density, Indicated, Pressure**
    - On inch of change of Hg in the altimeter causes 1000 ft of altitude change in the same direction.
    - The aircraft will be lower than indicated when flown into areas of colder than standard air temperature, or lower pressure.
    - An increase in ambient temperature will increase the density altitude at a given airport

- If the pitot tube becomes clogged, the airspeed indicator is affected; if the static vents are clogged, the altimeter, airspeed indicator, and vertical speed indicator are affected.

- airspeed indicator.

Airspeed Indicator

- Measures difference between ram air and static pressure
- If pitot tube freezes, the ASI acts like an altimeter
- Good practice to use pitot heat where there is visible moisture (even in the summer, the pitot heat evaporates moisture

V-Speeds

- Red line = never exceed speed
- Yellow line = indicates the caution range
  - Green line = normal operating range
- White arc = normal flap operating range
  - Maneuvering speed
  - **Indicated, Calibrated, True, and Ground Speed.**

- vertical speed indicator.
- attitude indicator.

Attitude Indicator (Vacuum driven)

- A pilot determines the direction of bank from the attitude indicator by the relationship of the miniature airplane to the deflected horizon bar.
- The only instrument that give both pitch and bank info.
- The most noticeable errors occur when the aircraft rolls out of a 180 degree turn and cancels after 360 of turn.
- During acceleration, the horizon bar moves down, indicating a climb, and during deceleration, the instrument may indicate a slight descent.

Vacuum Driven/ Gyroscopic

- Accelerate - Indicates a climb
- Decelerate - Indicates a descent
- 180 Turn to Right - Shows slight left turn and nose up attitude upon rollout
- 180 Turn to Left - Shows a slight right turn and nose up attitude upon rollout

- horizontal situation indicator.
- magnetic compass.

Magnetic Compass; contains a bar magnet, which swings freely to align with the Earth's magnetic field.

Deviation; caused by the magnetic field in the aircraft distorting the lines of magnetic force.

Variation; angular difference between the true and magnetic poles (Isogonic + Agonic)

Acceleration Errors (ANDS); on a East or West heading the compass will show a turn towards the north if accelerated and a turn toward the south if decelerated.

Turning Errors (UNOS); on a North heading a turn to the right will indicate a turn to the left and on a south heading a turn to the right will indicate a accelerated turn to the right. There is no turning errors on the east west heading.

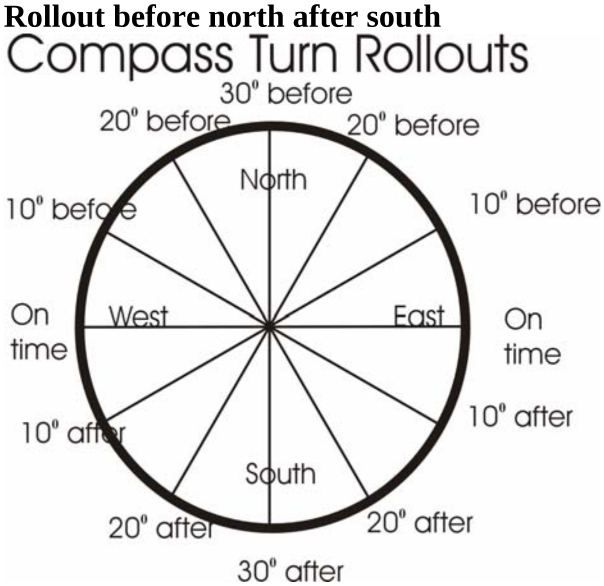
Compass Errors

Compass deviation- caused by metals and electrical accessories in aircraft
Variation- Difference between true north magnetic north
Magnetic dip- magnetic north is deep into earth
Mechanical error When using compass, banking more than 18^0 will cause compass to drag on the side of the case and give inaccurate readings

Standard rate timed turns

360 2 mi
270 90 sec
180 60 sec
90 30 sec
30 10 sec
10 3.333 sec
3 1sec
1 .333 sec

Rollout before north after south



Magnetic Dip Compass Turns "the old fashioned way"

UNOS -"Undershoot North Overshoot South"

- - Undershoot (rollout Before)Northerly headings, [undershoot $060^0/300^0$ headings-10^0- undershoot $030^0/330^0$ headings-20^0 undershoot northerly headings 30^0]
- Overshoot Southerly headings. [overshoot $120^0/240^0$ headings-10^0- overshoot $150^0/210^0$ headings-20^0 overshoot (Rollout After) southerly headings 30^0]
- When on a North heading, turning West initially indicates East turn.
- And an East Turn initially indicates a West heading

1915 Biscayne Little Rock, AR 72227
(501) 680-7283 geoff@geoffhatcher.com www.geoffhatcher.com

ANDS "Accelerate North Decelerate South" - When on an East or West heading, an acceleration of the aircraft shows turn toward North. Deceleration shows a turn towards the South

- turn-and-slip indicator/turn coordinator.
  Turn Coordinator (Vacuum driven)
  - Provides an indication of the aircraft's rate of movement about the vertical axis.
- During taxi turns, the ball should move to the outside of the turn, and the needle should deflect in the direction of the turn. Skids and Slips
  - The **inclinometer** is part of the turn indicator that tells whether you are using the correct angle of bank for the rate of turn. Step on the ball to correct a slipping or skidding condition.
- Allows you to establish and maintain standard-rate turns of 3 degrees per second.
- During a constant-bank turn, an increase in airspeed results in a decreased rate of turn, and an increased turn radius.

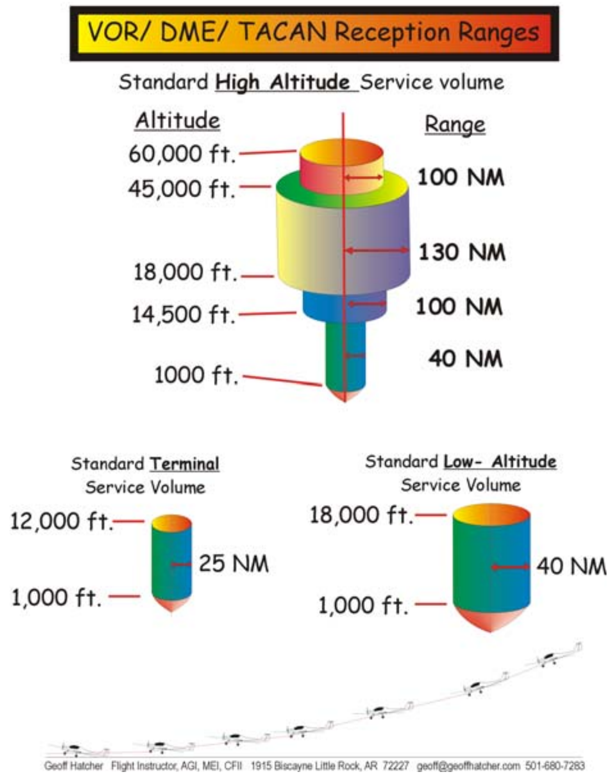
- heading indicator.
  Heading Indicator (Electric)
- Must be periodically realigned with the magnetic compass.
  - Is your primary source of heading information.

- electrical systems.
- vacuum systems.
- electronic flight instrument display.

AIRCRAFT NAVIGATION SYSTEM(S) AND THEIR OPERATING CHARACTERISTICS TO INCLUDE—

a. VOR.

AIM 1-1-8



VOR signal I.D. every 15 seconds

DME signal I.D. every 30 seconds

VOR Navigation

- Reception is strictly line of sight
- Basic **VOR's** provide course guidance; **VOR/DME** and **VORTAC** also provide distance information to aircraft equipped with distance measuring equipment (DME)
- VOR stations transmit radio beams, or **Radials**, outward in every direction. Compass Rose.
- **Victor Airways** are class E starting at 1200 ft AGL, 8 miles wide.

3 classes of VOR according to their normal reception and altitude range.

1. Terminal VOR = is normally located on an airport
2. Low Altitude
3. High Altitude

Identifying A station

- VOR's Morse code identifier or voice identification
  - If the station is down for maintenance, it may transmit a T-E-S-T signal or no identifier.
- Flying a heading that is reciprocal to the bearing selected on the OBS would result in Reverse Sensing on the conventional VOR indicator.
- Each Dot equals course deviation of 2 degrees deviation, or 200 ft per nm., when tuned to a VOR.
- Two VOR receivers makes it easier to identify a fix defined by the intersection of radials from two VOR ground stations, one VOR receiver is the minimum equipment needed.

VOR Checks

- Every 30 day; VOR checkpoints or VOT (test facilities)
- $\pm$ 4 ; and $\pm$ 6 for airborne checks; and 4 degrees difference between to VORs

Time and Distance to a Station

- You can calculate the time and distance to a station by turning perpendicular to the direct course to the station and measuring the time to move a specific number of degrees to a new radial.

1915 Biscayne Little Rock, AR 72227
(501) 680-7283 geoff@geoffhatcher.com www.geoffhatcher.com

- [**Time to the Station**] = [**Time to move to the new radial x 60**) **Divided** [**Degrees to the new radial**]
- **Example:** if it takes 3 minutes to traverse 10 degrees of DME arc, the time to the station is 3 minutes x 60 divided 10 = 18 minutes. If your speed is 120 knots (2 n.m. per minute), the distance to the station is 18 x 2 = 36 nm.
- Time to the station; turn 10 degrees to the side of your course and twist your course selector the same amount in the opposite direction. Time to station is the same as the time it takes for your CDI to center (assuming no wind)

b. DME.

Distance Measuring Equipment

- Is accurate to within 1/2 mile or 3% (whichever is greater)
- **Slant-Range**—resulting in greatest error at high altitudes close to a VORTAC. Should be 1 nm when you are directly over a VORTAC site at approximately 6,000 ft AGL.
- When tuning to a VORTAC, you receive a single coded identification approximately once every 30 seconds.

c. ILS.

d. marker beacon receiver/indicators.

e. transponder/altitude encoding.

f. ADF.

NDB Types and Ranges

NDB (LOM)	15 NM
NDB (MH)	25 NM
NDB (H)	50 NM
NDB (HH)	75 NM

ADF formulas

MH+RB=MB
MB-MH=RB

ADF Navigation

- **Magnetic Heading (MH) + Relative Bearing (RB) = Magnetic Bearing (MB)**
- ADF is based on your Compass
- 45 degree intercept angle.
- NDB station passage occurs when the needle passes behind the wingtip position

g. GPS.

GPS Navigation:

- Your aircraft must be equipped with an alternate means of navigation, such as VOR-based equipment, appropriate to the flight.
- Active monitoring of alternate navigation equipment is not required if the GPS receiver uses receiver autonomous integrity monitoring (RAIM)

h. FMS.

INSTRUMENT COCKPIT CHECK

1915 Biscayne Little Rock, AR 72227
(501) 680-7283 geoff@geoffhatcher.com www.geoffhatcher.com

- preflighting equipment cockpit check (reasons for the check and how to detect possible defects)
- uses a checklist
- determines the aircraft is safe for instrument flight including—
  - communications equipment.
  - navigation equipment, as appropriate to the aircraft flown.
  - magnetic compass.
  - heading indicator.
  - attitude indicator.
  - altimeter.
  - turn-and-slip indicator/turn coordinator.
  - vertical speed indicator.
  - airspeed indicator.
  - clock.
  - power source for gyro-instruments.
  - pitot heat.
  - electronic flight instrument display
  - traffic awareness/warning/avoidance system.
  - terrain awareness/warning/alert system.
  - FMS.
  - auto pilot.
- Notes any discrepancies or required maintenance.

Instrument cockpit check (Before Take-off)

Airspeed	Reads "0" on ground and is active on T/O
Attitude Indicator	+/- 5^0 within 5 minutes, banks no more than 5^0 in a turn
Altimeter	Accurate within +/- 75' of airport elevation
Turn Coordinator	Level, no "Off" flag, banks in direction of taxi turn
Slip/Skid Indicator	Ball moves to outside of taxi turns, race is full of fluid, ball rests in center
Directional Gyro	Precession of no more than 3^0 in 15 minutes
VSI	Note VSI indication-Set to 0 if necessary (note: not required)
Magnetic Compass	Full of fluid, level, and free-turning
Engine Gauges	Check for normal engine-off indications as well as normal engine-on indications
Procedures	Review departure procedures, charts, and clearance, ATIS
Radios	Set radios and identify navaids if possible
Checklists	Complete all checklist including T/O checklists

AIR TRAFFIC CONTROL CLEARANCES AND PROCEDURES

Communication

1915 Biscayne Little Rock, AR 72227
(501) 680-7283 geoff@geoffhatcher.com www.geoffhatcher.com

- Read back of ATC clearances is crucial in the IFR environment. Do not assume controller silence after a read-back is verification of your transmission. Ask for a verbal confirmation.
- It is important to use standard terminology and verify that your meaning is understood.

- ATC must be complied with unless you declare an emergency, may be asked to submit a report in 48 hours by airport manager if declared an emergency.

Clearances Through Restricted Areas

- ATC usually does not issue an IFR route clearance that crosses an active restricted area, but inactive areas are often released for use.

IFR Altitudes:

- Though you may request and be assigned any altitude in controlled airspace, most pilots file flight plan altitudes that correspond to the hemispheric rule.
- When you are given a descent clearance "at pilots discretion" you are authorized to begin the descent whenever you choose, and level off temporarily during the descent, but you cannot return to an altitude once you vacate it.

Q: Is the controller providing obstacle clearance when he says: N72B, radar contact." ?
A: *No, not until he gives you a heading or any other navigational guidance*.

General Communication Procedures:

- During a radar handoff, the controller may advise you to give the next controller certain information, such as a heading or altitude.
- If you cannot establish contact using a newly assigned frequency, return to the one previously used and request an alternate frequency.

ATC Facilities:

- The Air Traffic Control (ATC) system consists of en route and terminal facilities. The main facility is air route traffic control center (ARTCC), while approach and departure control, the control tower, ground control, and clearance delivery are terminal facilities.

ARTCC Traffic Separation:

- You must file an IFR flight plan and receive an ATC clearance prior to entering controlled airspace in IFR conditions. IFR flight plans should be filed at least 30 minutes before departure.
- ATC's first priorities are separating IFR traffic and issuing safety alerts when in the controllers judgment, and aircraft is in unsafe proximity to terrain, an obstruction, or another aircraft.
- ATC is not obligated to advise an IFR pilot of conflicting VFR traffic, and may not be aware of all VFR traffic, it is the responsibility of the pilots to see and avoid other aircraft whenever weather conditions permit.
- IFR flight plans are usually deleted from the ARTCC computer if they are not activated within one hour of the proposed departure time.
- Due to weather, unplanned pilot requests, flow control restrictions, etc., controllers may alter your clearance to maintain proper aircraft separation. An ATC request for a speed reduction means you should maintain the new indicated airspeed within 10 knots.
- If you have a transponder and it has been inspected within the previous 24 months, it must be turned on and squawking Mode C, if available, anywhere in controlled airspace.

ATC Weather Services

1915 Biscayne Little Rock, AR 72227
(501) 680-7283 geoff@geoffhatcher.com www.geoffhatcher.com

- If adverse weather exists or is forecast, an on-site meteorologist at the ARTCC may issue a **center weather advisory** (CWA)
- ATC may be able to provide vectors around hazardous weather. However, you should be aware that ATC radar limitations and frequency congestion may limit a controllers capability to provide in-flight weather avoidance assistance.

Procedures at Tower-Controlled Airports
- **Automatic Terminal Information Service** (ATIS) - broadcasts are updated upon receipt of any official weather information. The absence of sky condition and visibility on an ATIS broadcast specifically implies the ceiling is more than 5,000 ft AGL and the visibility is more than 5 statue miles.
- To relieve congestion on ground control frequencies, clearance delivery is used for ATC clearances at busier airports.
- When departing from a runway intersection, always state your position when calling the tower for takeoff.

Terminal Procedures
- Terminal radar service for VFR aircraft includes basic radar service, terminal radar service area (TRSA) service, Class C service, and Class B service.
  - Departure control provides separation of all aircraft within Class B and Class C airspace.
  - They only see your ground track.
  - A **Local Airport Advisory** (LAA) is provided by flight service at FSS airports not served by an operating control tower, or when the tower is closed. Not mandatory for VFR operations.
  -

ATC Clearances (Chapter 3)

Pilot Responsibilities: You are not to deviate from a clearance unless;
- In an emergency
- An amended clearance is received
- Complying with that clearance will cause you to violate a rule or regulation

*** if you do deviate you must submit a written report to the manager of the ATC facility within 48 hour if requested***

See And Avoid: it is your responsibility to see and avoid whenever able.

IFR Climb Considerations:
- ATC expects you to maintain a continuous rate of climb of at least 500 fpm. To your assigned cruising altitude. If unable, notify ATC of your reduced rate of climb.
- Unless ATC advises "At pilot's discretion," you are expected to climb at an optimum rate consistent with your airplane's performance to within 1,000 ft of your assigned altitude. Then attempt to climb at a rate of between 500 and 1,500 fpm. For the last 1,000 ft of climb. You should notify ATC if you are unable to maintain a 500 fpm. Rate of climb.
- While climbing on an airway, you are required by regulation to maintain the centerline except when maneuvering in VFR conditions to detect and/or avoid other air traffic.

IFR Flight Plan and ATC Clearance:
- A IFR flight plane is required before flying into Class A airspace or any other controlled airspace when the weather is below VFR minimums.
- You must receive an ATC clearance before entering Class A or B airspace regardless of the weather, and in Class C, D, and E when the weather is below VFR minimums.
- You may cancel IFR flight plan anytime your are operating under VFR conditions outside of Class A, However, once you cancel the flight must be conducted in VFR conditions.

Types of IFR Clearances:

- **Cruise Clearance**—authorizes you to operate at any altitude from the minimum IFR altitude up to and including the altitude specified in the clearance without reporting changes in altitude to ATC. A cruise clearance also authorizes you to proceed to an execute an approach at the destination airport.
- **Abbreviated Clearance**—When your route of flight has not changed substantially from that filed in your flight plan. Always contains the words "cleared as filed" as well as the name of the destination airport or clearance limit.
- **VFR-on-top Clearance**—can be issued upon pilot request when suitable weather conditions exist. It allows you to fly in VFR conditions and at the appropriate VFR cruising altitude of your choice. You must remain above the minimum IFR altitude and comply with all instrument flight rules while also maintaining VFR cloud clearances. Prohibited in Class A airspace.
- **Climb-to-VFR-on-top Clearance**—should be requested in order to climb through a cloud layer or an area of reduced visibility and then continue the flight VFR.

Approach Clearances:

- **Contact Approach**—must be initiated by the pilot; it cannot be initiated by ATC. In order to fly a contact approach, the reported ground visibility must be at least one statue mile, and you must be able to remain clear of clouds with at least one statue mile flight visibility.
- **Visual Approach**—may be initiated by the controller or the pilot when the ceiling is at least 1,000 ft. and the visibility is at least 3 statue miles and the pilot has the airport or the aircraft to follow in sight. During a visual approach, radar services is terminated when ATC tells you to contact the tower.

ATC Clearances

VFR Restrictions To An IFR Clearance:

- VFR restrictions can be included in an IFR clearance if requested by the pilot. If weather conditions permit, you might request a VFR climb or descent to avoid a complicated departure or arrival procedure.

Composite Flight Plan:

- When you wish to operate IFR on one portion of a flight and VFR on another portion. Check both the VFR and IFR boxes on the flight plan form, and if the IFR portion of the trip is first, include the clearance limit fix where you anticipate the IFR portion will end. If the VFR portion is first, contact the nearest FSS while still in VFR conditions to close the VFR portion, then contact ATC and request a clearance.

Tower En Route Control:

- Is intended to be used by non-turbojet aircraft at altitudes less than 10,000 ft MSL where the duration of the flight is less than 2 hours. It is available in certain, more densely populated, areas of the United States where it is possible to conduct a flight in continuous contact with local towers and approach control facilities.

Departure Restrictions:

- Such as a **Release Time**, **Hold for Release**, and a **Clearance Void Time** may be imposed to separate IFR departure traffic from other traffic in the area or to regulate the flow of IFR traffic. When departing from a non-tower airport, and receiving a clearance containing a void time, you must advise ATC as soon as possible, and **no later than 30 minutes**, of your intentions if not airborne by the void time.

Clearance Copying and Read Back:

- Shorthand should be used to quickly copy IFR clearances. The type of shorthand you use is not as important as whether you can read the clearance at a later time.
- You should read back those parts of a clearance which contain altitude assignments, radar vectors, or any instructions requiring clarification.

- ATC clearances and pilot/controller responsibilities

  - tower
  - approach
  - center
- Clearance void times.
- Copies ATC clearance correctly, as issued in a timely manner
- Correctly Interprets & complies with ATC clearance or requests clarification, verification, or change.
- Reads back clearance correctly in sequence received.
- Standard phraseology.
- Appropriate com and nav frequencies and transponder codes.

Clearances (key things **) C-R-A-F-T

- ****Clearance Limit Destination
- ****Route A/F or Route, Normally "as filed"
- ****Altitude Maybe an EFC
- **F**requency Departure
- **T**ransponder Squawk
- Void Time if at an Uncontrolled field

Clearances:

- Void Time Clearance is a specific takeoff time window, usually 10 minutes, issued by ATC when departing into IFR conditions from an uncontrolled field. Notify ATC if not airborne within 30 min
- Special VFR allows pilot to operate VFR in Class B, C, D, and E to the surface of the airspace with 1-mile visibility and clear of clouds. SVFR at night requires an instrument-equipped plane and an instrument rated pilot who is current.
- Tower Enroute Control (TEC) are short flights less than 2 hours and under 10,000' MSL that are common in California and the New England area. Basically, departure radar coverage of one airport meets approach radar coverage of another airport
- VERY IMPORTANT: If canceling IFR flight plan, be sure you have the VFR weather requirements for that particular airspace. In addition, before canceling IFR while *within* controlled airspace, you MUST get a VFR clearance into the airspace *prior* to canceling or you are in violation.

Where to Get Clearance

- Clearance Delivery
- Call FSS for designated area departing direct via phone
- Airborne- radio flight service station/
- **Cruise Clearance -** Can fly between MEA and assigned altitude at Pilot's discretion but must request lower once altitude attained.
- "**CRUISE 6000"**
  - "You may climb and descend between your clearance altitude and MEA all you want unless you report leaving an altitude. The key is to not report leaving an altitude!
  - You are cleared to your destination airport and may shoot ANY of the instrument approaches upon arrival without further clearance.

1915 Biscayne Little Rock, AR 72227
(501) 680-7283 geoff@geoffhatcher.com www.geoffhatcher.com

  - Cannot get a cruise clearance on the ground.
  - Review a sectional for terrain and obstacles to avoid CFIT.
- **VFR on Top** - Maintain visual separation but still IFR, and may want to get back down. Must maintain cloud clearances (2000' hor, 1000' above, 500 below)
- **Climb to VFR on Top** - Cancel IFR once VFR on Top, your on your own, NOT ALLOWED ABOVE FL 180.
- **SVFR –** Special VFR must be 1 mile clear of clouds, and can only be accepted at night if pilot and aircraft are IFR. Allowed in Class B, C, D, E airspace.
- **Weather Minimums of LAHSO -** 1000 feet, 3 miles visibility

Filing and Picking Up Clearances

- File at least 30 minutes before you need it
- Pick up clearance 10 minutes before take-off
- Filed flight plans remain in system for 2 hours from ETD
- Void time allows you to depart IMC from an uncontrolled field

NOTE:"Clearance on request" means to standby for clearance. (They have to retrieve it)

DEPARTURE, EN ROUTE, AND ARRIVAL PROCEDURES AND CLEARANCES

Takeoff Weather Minimums

- part 91 - No Take Off minimums unless Takeoff minimums or (obstacle)DP are published

- Part 121 and 135 must comply with
- 121/135 published take off minimums in the front of the Approach plate book
  - Two engines or less 1 mile visibility no ceiling requirement
  - Three engines or more ½ mile visibility no ceiling requirement

IFR Departure Options:

- You have four alternatives when departing an airport on an IFR flight. A DP, an IFR departure procedure, a radar departure, or a VFR departure.
- To accept a clearance with a DP, you must possess the charted DP procedure or at least the textual description. Otherwise, you should file NO DP in your flight plan.
- IFR departure procedures are not assigned as a portion of your IFR clearance unless required for separation purposes. In general, it is your responsibility to determine if one has been established, then comply with it.
- Radar departures are often assigned at radar-equipped approach control facilities and require close coordination with the tower.

General Procedures:

- During the IFR departure, you should not contact departure control until advised to do so by the tower.
- During departure, terrain and obstruction clearance remains your responsibility until the controller begins to provide navigational guidance in the form of radar vectors.
- The term **"radar contact"** means your aircraft has been identified and radar flight following will be provided until radar identification has been terminated.
- **"Resume own navigation"** is a phrase used by ATC to advise you to assume responsibility for your own navigation.

It generally cancels assigned vectors or other restrictions previously imposed by ATC.

- **"Radar Service Terminated"** means that you are no longer under ATC radar surveillance and must resume position reports at compulsory reporting points.

Departure Procedures (DP's) can be either

SIDs – Established for traffic flow, can be avoided by requesting "no sids' on flight plan.
or
DP's – Established for obstacle clearance, must be followed.

Q: What's the difference between SID and DP?
A: *A SID gives obstacle clearance, but is mostly used to simplify clearance procedures. A DP is used when obstacles penetrate the 152-ft/NM slope that is assessed for obstacles during departure and gives specific departure procedures.*

- Part 91 do not have take-off minimums but must comply with non standard departure procedures
- If no procedure is specified, standard is climb to 400 feet before beginning a turn.

Standard if not published is 400 feet before beginning turns

Departure Procedures Overview:

- Instrument Departure Procedure (DPs) - are used after takeoff to provide a transition between the airport and enroute structure.
- Departure charts help simplify complex clearances, reduce frequency congestion, ensure obstacle clearance, and control the flow of traffic around an airport. They help reduce fuel consumption, and may include noise abatement procedures.
- Because of the large area covered, most DPs usually are not drawn to scale.
- DPs initial takeoff procedures may apply to all runways, or apply only to the specific runway identified.
- DP transition routes are shown with dashed lines on Jeppesen charts and with light, solid lines on NOS charts.

Flight Plans and Clearances:

- When you accept a DP in a clearance, or file one in your flight plan, you must possess the DP chart or the textual description.
- To avoid being issued DPs, enter the phrase "NO DP" in the remarks section of your flight plan.

Performance Requirements:

- When you are issued a DP, you must ensure your aircraft is capable of achieving the DP performance requirements. Minimum climb gradients are given in feet per nautical mile and must be converted to feet per minute for use during departure.
- DPs require minimum climb gradients of at least 200 feet per nautical mile, to ensure you can clear departure path obstacles.
- DPs may specify a minimum ceiling and visibility to allow you to see and avoid obstacles, a climb gradient greater than 200 feet per mile, detailed flight maneuvers, or a combination of these procedures.
- **Groundspeed [divided] 60 = n.m. per minute** **n.m.**

1915 Biscayne Little Rock, AR 72227
(501) 680-7283 geoff@geoffhatcher.com www.geoffhatcher.com

per minute x feet per nautical mile = feet per minute
140 / 60 = 2.33 2.33 x 210 = 490 ft per minute.

Pilot NAV and Vector DPs

- Allows you to navigate along a route with minimal ATC communications. They usually contain instructions to all aircraft, followed by transition routes to navigate to an enroute fix, and may include radar vectors that help you join the DP.
- Vector DPs exist where ATC provides radar navigation guidance. They usually contain a heading to fly, and an altitude for initial climb. When ATC establishes radar contact, they provide vectors to help you reach fixes portrayed on the chart. When special lost communication procedures are necessary for a DP, they are included on the chart.

- If you are instructed to maintain runway heading, it means you should maintain the magnetic heading of the runway centerline.

Preferred IFR Routes

- Are correlated with DPs and STARs and may be defined by airways, jet routes, and direct routes between NAVAIDs.

DEPARTURE PROCEDURES

Takeoff Minimums:

- IFR takeoff minimums do not apply to private aircraft under IFR and Part 91, but good judgment should dictate compliance.
- Standard takeoff weather minimums are usually based on visibility. Greater than standard takeoff minimums may be due to terrain, obstructions, or departure procedures.

Q: When given a turn as part of the departure, where should you start your turn?
A: *Above 400 ft. AGL and when past the end of the runway. Climb at least 200-ft/NM and cross the departure end of the runway at least 35 ft. AGL.*

Q: Can you as an instrument pilot legally take off in a C172 in zero-zero conditions?
A: Yes. If you are operating under Part 91 regulations you may legally do so, however, if you had an emergency, you would not be able to land safely or legally. A rule of thumb is to abide by landing weather minimums before takeoff.

ATC- Pilot Navigation – Formerly SIDs
ATC- Radar Vectors - Formerly SIDs

Obstacle Clearance (front or TRPPS) note terrible "T"s •
Standard minimum required climb gradient 200 ft/nm
Climb rate =Ground speed/60 xfeet/nm=climb rate

When do I begin my Arrival Descent?

3 x Altitude /1000. (ie. 3 x 15,000ft / 1000 = 45 miles) or.003 x altitude

- ATC routes, and related pilot/controller responsibilities.

Airways:

- Airways below 18,000 ft MSL are called **Victor airways**. Airways at and above 18,000 ft MSL are

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

Jet Routes.

- Airways are 8 nm wide within 51 nm of a navaid. At distances greater than 51 miles, the airway widens, and is defined by lines diverging at 4.5 degrees from the center of each navaid.

IFR Altitudes:

- **Minimum Enroute Altitude (MEA)** - guarantees both obstruction clearance and navigation signal coverage for the length of the airway segment. It is normally the lowest altitude you can use on an airway.
- **Off Route Obstruction Clearance Altitude (OROCA)** - provides obstruction clearance when flying outside of the established airways.
- **Minimum Obstruction Clearance Altitude (MOCA)** - guarantees obstruction clearance, but only promises reliable navigation signal coverage within 22 nm of the facility.
- **Maximum Authorized Altitude (MAA)** - keeps you from receiving more than one VOR station at a time.
- **Minimum Reception Altitude (MRA)** - ensures reception of an off-course navaid that helps define a fix. Below the MRA and above the MEA you still have course guidance, but may not be able to receive the off-course navaid.
  - When an MEA changes to a higher altitude, you normally begin your climb upon reaching the fix where the change occurs. When rising terrain does not permit a safe climb after passing the fix, a minimum crossing altitude (MCA) is published. **A flag with an X** signifies the MCA on NOS charts. The altitude and applicable flight direction appear near the symbol. Plan your climb so that you will reach the MCA before crossing the fix.
  - In mountainous areas where no other minimum altitude is prescribed, IFR operations must remain 2,000 ft above the highest obstacle within a horizontal distance of 4 nm from the intended course.

Special IFR Positions:

- Intersections are defined by two navaids, or by a navaid and a DME distance. All intersections can be used as reporting points. Compulsory reporting points are charted as filled triangles.
- You normally change frequencies midway between navaids, unless a **changeover point (COP)** is designated. A COP is established where the navigation signal coverage from a navaid is not usable to the midpoint of the airway segment.
- ARTCC boundaries are shown with distinctive lines on both Jeppesen and NOS charts.

Communications:

- Most **FSS** are able to use 122.2 MHz, as well as the emergency frequency, 121.5. Additional frequencies are shown above navaid boxes.
- **HIWAS** is indicated by a small square in the communications box on NOS charts.
- Look for ARTCC discrete frequencies in boxes with the name of the controlling center. A **Remote Communications Outlet (RCO)** for an FSS will have the name of the FSS and the frequency in a communication box.

Minimum Enroute Altitude (MEA) Is usually the lowest published altitude between radio fixes that guarantees adequate navigation signal reception and obstruction clearance (2000' mountainous within 4NM, 1000' elsewhere) Adequate communication can be expected but not guaranteed. There may be gaps up to 65 miles as indicated by "MEA GAP."

Minimum Obstruction Clearance Altitude (MOCA) guarantees obstacle clearance (2000' mountainous within 4NM, 1000' elsewhere), but only guarantees navigation signal coverage for 22 NM from the navigation facility. It is proceeded by a * on NOS charts and a "T" on Jeppesen charts

Minimum Crossing Altitude is the lowest altitude at certain fixes at which an aircraft must cross when proceeding in the direction of a higher minimum enroute IFR altitude

Minimum Reception Altitude is the lowest altitude at which an intersection can be determined.

Off-Route Obstruction Clearance Altitude (OROCA) gives 2000' obstruction clearance in mountainous areas and 1000' elsewhere within a latitude and longitude grid area.

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

Required Reports: At all times;

- Leaving on assigned flight altitude for another
- VFR-on-top change in altitude
- Leaving any assigned holding fix or point
- Missed approach
- Unable to climb or descend at least 500 ft per minute
- TAS variation from filed speed of 5% or 10 knots, whichever is greater.
  - Time and altitude upon reaching a holding fix or clearance limit
  - Loss of nav/comm capability (91.187)
  - Unforecast weather conditions or other information relating to the safety of flight (91.183)

  Non-Radar Reports;
  - Leaving FAF or OM inbound on final approach
  - Revised ETA of more than three minutes
  - Position reporting at compulsory reporting points (91.183)

Position Reports in Non-Radar Environment:

- If ETA to a fix is more than +/- 3 minutes
- Inbound from the final approach fix or outer marker
- Time and altitude at compulsory reporting points -Solid black triangle
- Whenever requested

Position Reporting:

- Position
- Time
- Altitude
- ETA over next reporting point
- Name of reporting point following next point

NOTE: Position reports are typically made in non-radar environment. Practically they are not requested. You may even ask ATC if they need to be made.

Required Reports

Radar Environment

T= TAS unable to maintain w/I 10 knots of 5% of airspeed
U= Unforecasted weather
U= Unable to climb or descend at 500 FPM
L= Loss of Facility signal
S= Safety of flight (Instruments / gauges inop)
A= Altitude Changes

H= Hold- Arriving or leaving Hold
A= Altitude change on VFR on Top
M= Mandatory or Compulsory Reports
M= Missed Approach Executing

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

Non Radar
C= Change in ETA ± 5 minutes
F= Final Approach inbound

- navigation publications

- communication facilities;
- selects and identifies the navigation aids
- Checklist items relative to the phase of flight.
- Two-way communications with the proper controlling agency, using proper phraseology.
- Complies with all ATC instructions and airspace restrictions. communication failure procedures.
- Intercepts all courses, radials, and bearings appropriate to the procedure, route, or clearance.
- tolerances
  - airspeed +/-10 knots
  - headings within +/-10°
  - altitude within +/-100 feet
  - course, radial or bearing within ¾ scale deflection of the CDI.

ARRIVAL

Standard Terminal Arrival Routes (STARs)

- Provide a standard method for leaving the enroute structure and entering a busy terminal area. STARs are established to simplify clearance delivery procedures.
- Are located in the front of NOS charts.
- STARs usually terminate with an instrument or visual approach procedure.

STARs in Clearances:

- If you accept a STAR, you must have at least a textual description of the procedure in your possession. A graphic description is preferable.
- Writing **"No STAR"** in the remarks section of your flight play will alert ATC that you do not wish to use these procedures during your flight. You also may refuse a clearance containing a STAR, but avoid this practice if possible.

STAR Charts:

- STARs use Symbology that is similar to that on SIDs. Altitudes are given in reference to mean sea level, and distances are in nautical miles.
- A STAR begins at a navaid or intersection where all arrival transitions join.
- A **Transition** is one of several routes that bring traffic from different directions into one STAR.
- STARs are named according to the point where a procedure begins. They are revised in numerical sequence.
- Arrival route headings on an NOS STAR are depicted by large numerals within a heavyweight line.
- Frequencies on which to contact the proper approach controller are found in the corner of an NOS chart.
- Vertical navigation planning information is given for pilots of turboprop and jet traffic, to aid them in making efficient descent from the enroute structure to approach fixes.

ARRIVAL PROCEDURES (SECTION B)

- ATC will issue a STAR when they deem one appropriate, unless you request **"No STAR"** in your flight plan. It is up to you whether to accept or refuse the procedure.
- Altitudes and airspeeds published on the STAR when they are used 75% or more of the time. They are not considered

restrictions until verbally given by ATC as part of a clearance

  - MEAs printed on STARs are not valid unless stated within an ATC clearance or in cases of lost communication.

- After receiving a arrival clearance, certain tasks can be completed before starting your approach, including gathering weather information and accomplishing the descent and approach checklists.

- A **descend via clearance** instructs you to follow the altitudes published on the STAR, with descent at your discretion.
- ATC may issue a descent clearance which includes a crossing altitude. Comply by estimation the distance and rate of descent required.
- ATC expects you to maintain the specified airspeed within ±10 knots.
- Keep in mind that the maximum speeds specified in **FAR 91.117** still apply during speed adjustments. ATC has the authority to request or approve higher then those in FAR 91.117.

HOLDING PROCEDURES

  - holding airspeed /altitude /aircraft when 3 minutes or less from, but prior to arriving at, the holding fix.

HOLDING PROCEDURES

Purpose of Holding: time delay by ATC to help maintain separation; or requested to wait out the weather.

Flying a Holding Pattern:

- Pattern size depends on the speed; doubling your speed doubles the size of the pattern
- Turns are the right in standard holding pattern, and left in non-standard
- Each circuit of the outbound leg of either a standard or nonstandard holding pattern should begin abeam the holding fix. If the abeam position cannot be identified, start timing the outbound leg at the completion of the turn outbound.
- Adjust the timing of your outbound leg to make your inbound leg one minute long.
- To correct crosswind drift, triple your inbound wind correction angle on the outbound leg.

Holding Speed:

- Up to 6,000ft MSL = 200 KIAS
- 6,001ft MSL to 14,000ft MSL = 230 KIAS
- 14,001 MSL and above = 265 KIAS

Holding Clearance:

- Should always contain the holding direction, the holding fix, and an expect further clearance patterns (EFC).

  - entry procedure that ensureing containment within the holding pattern airspace
  - standard, nonstandard, published, or nonpublished holding patterns.
  - Recognizes holding fix & enters the holding pattern.
  - Complies with ATC reporting requirements.
  - timing criteria, where applicable, as required by altitude or ATC instructions.

Timed Approaches:

- Are generally conducted at airports where the radar system for traffic sequencing is out of service or is not available and numerous aircraft are waiting for approach clearance. This can only be conducted at airports which have operating control towers.
- **If more than one missed approach procedure is available**, a timed approach from a holding fix may be conducted if none require a course reversal. **If only one missed approach procedure is available**, a timed approach from a holding fix may be conducted if the reported ceiling and visibility minimums are equal to or greater than the highest prescribed circling minimums for the IAP.

- When timed approaches are in progress, you will be given advance notice of the time you should leave the holding fix. When making a timed approach from a holding pattern at the outer marker, adjust the holding pattern so you will leave the outer marker inbound at the assigned time.

Timed Approaches

- Timed from the faf inbound
- Ceiling and vis. must be greater than the highest circ. Min for the IAP
- Course reversals are not permited if more than one MAP exists AIM 5-4-9
- Must have a control tower

- For **Timed Approaches**, use conversion tables to provide various elapsed times to the MAP based on the aircrafts groundspeed.

- pattern leg lengths when a DME distance is specified.
- wind correction procedures to maintain the desired pattern and to arrive over the fix as close as possible to a specified time.
- Tolerances
  - airspeed within +/-10 knots
  - altitude within +/-100 feet
  - headings within +/-10°
  - tracks a selected course, radial or bearing within ¾ scale deflection of the CDI.

Entering a Holding pattern

- 3 Types of entries can be made into a hold depending on which direction you approach the hold: Teardrop, Parallel, or Direct
- These types or entries are not required, just recommended.
- To determine the entry needed for standard holding patterns (right turns), overlay the following over your D.G. Now, picture your plane at the fix in the original direction of flight, if the holding course is ahead and to the left, make a parallel entry, ahead and to your right make a teardrop, if it is behind make a direct entry.
- For memory sake- Think of the positions in which you sit while flying as viewed from above the plane. The student sits in the left seat (the Pupil = Parallel), teacher in the right (Teacher = Teardrop) and the dummy in the backseat (Dummy = Direct).

Procedures

- Holding patterns are a racetrack pattern flown by the aircraft to help maintain separation and provide a smooth flow of traffic
- They begin and end at a holding fix in which you hold TO.
- Standard holding patterns are turns to the right. Non-standard are to the left.
- Below 14,000' MSL holding patterns are usually two standard-rate 180^0 turns separated by one minute straight segments. With no wind, a whole pattern takes 4 min
- Above 14,000' MSL straight legs are 1 ½ minutes or 10 miles, whichever is less.
- Before entering the hold, you are expected to slow down 3 minutes before arriving
- The pilot is expected to report a hold when entering and leaving the hold

- To diagram a hold, place point in direction from fix, "Hold southwest of the fix", means place your point SW of fix and draw inbound leg. Continue the hold with either standard or non-standard turns.
- the parallel and teardrop positions.
- When should you start timing on a VOR hold? Ans. TO/FROM switch on reciprocal course
- When should you start timing on a NDB hold? Ans. When the needle is abeam the station
- Wind correction rule of thumb: Half wind speed in degrees. (20 kts of CW = 10 degrees of correction. Or triple the outbound correction)
    - Holding Speed Limits
    - Above 14,000 Feet 265 knots
    - 6,000 to 14,000 Feet 230 knots
    - Below 6,000 Feet 200 knots

Protected Hold Area is:

- 8nm direction of turn
- 7nm to barbed side
- 4nm on opposite side of FAF away from procedure turn
- 4nm to the station

Diameter of a standard rate turn = Airspeed x .0106

FLIGHT BY REFERENCE TO INSTRUMENTS

BASIC INSTRUMENT FLIGHT MANEUVERS

- attitude instrument flying during straight-and-level, climbs, turns, and descents while conducting various instrument flight procedures.
    - altitude +/- 100 feet
    - headings +/- 10°,
    - airspeed +/- 10 knots, and
    - bank angles +/- 5°
- instrument crosscheck and interpretation, and apply the appropriate pitch, bank, power, and trim corrections when applicable.

Proper Scan

Primary and secondary instruments

Fundamental Skills

- **Instrument Cross-Check**; **Instrument Interpretation**; and **Aircraft Control**
- Scan requires logical and systematic observation of the instrument panel.
- Most common errors: **Fixation**; **Omission**; and **Emphasis**.

Primary and Supporting Instruments

- **Primary**—provides the most pertinent pitch, bank and power information for a given flight condition

  Heading Indicator—to maintain heading
  Altimeter—to maintain altitude.
  Attitude Indicator—during any change in pitch and bank
  Turn Coordinator—any time your objective is to maintain a specific rate of turn.

Airspeed Indicator—any time your objective is to maintain a constant airspeed. Also primary for power control.
Vertical Speed Indicator—any time your objective is to maintain a specific rate of climb or descent.
Manifold or Tachometer—during changes in power

- **Supporting**—provides additional pitch, bank, and power as back up.

Straight-And-Level Flight

- Three conditions which determine pitch attitude required to maintain level flight are Airspeed, Air Density, and Aircraft Weight.
- You should make altitude corrections of less than 100 ft using a half-bar width correction on the attitude indication
- During level flight you normally adjust pitch to maintain altitude and power to get the desired airspeed.

Turns

- Standard-rate turn is 3 degrees per second.
- You can estimate angle of bank required for a standard-rate turn by dividing the true airspeed in knots by 10 and adding 5 to the result.
- At steeper banks, the rate of turn increases and the radius decreases. Lowering the airspeed also increases the rate and decreases the radius of turn for a given angle of bank.
- When airspeed is increased during a level turn, additional vertical lift is generated. To avoid climbing, you must increase the angle of bank and/or decrease the angle of attack.

Climbs and Descents

Constant Airspeed Climb & Descents
Constant Rate Climb & Descents

RECOVERY FROM UNUSUAL FLIGHT ATTITUDES

- recovery from unusual flight attitudes (both nose-high and nose-low).

Nose-High

- Your objective is to avert a stall
  - **Add Power**; **Lower the nose**; **Level the wings**; and return to the original attitude.

Nose-Low

- Your objective is to avoid overstressing the airplane structure.
- **Reduce Power**; **Level the wings**; **Raise the nose** to a level attitude.
- pitch, bank, and power corrections in the correct sequence to return the aircraft to a stabilized level flight attitude

NAVIGATION SYSTEMS

INTERCEPTING AND TRACKING NAVIGATIONAL SYSTEMS AND DME ARCS

- intercepting and tracking nav aides and DME arcs.

DMC Arcing

½ mile prior begin turn, turn 10° in bound, twist VOR 10 degrees, once VOR aligns, repeat

DME Arcs

1. Turn approximately 90 degrees from your inbound or outbound course.
2. For groundspeed of 150 kts or less, a lead of about 1/2 mile is usually sufficient.

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

- Tunes and identifies the nav aides.
- Sets and correctly orients the course to be intercepted into the course selector or correctly identifies the course on the RMI.
- Intercepts the specified course at a predetermined angle, inbound or outbound from a navigational facility.
- airspeed +/-10 knots,
- altitude +/-100 feet
- selected headings within +/-5°.
- course, no more than three-quarter-scale deflection of the CDI or within +/-10° (RMI).
- Determines the aircraft position relative to the nav aide/ waypoint in the case of GPS.
- Intercepts and maintain DME arc within +/-1 nautical mile.
- Recognizes navigational failure, and when required, reports the failure to ATC.

A LOVAR DG MAN"
A= ATIS / Altimeter Set

L= Localizer
O= Outer Marker
V= VOR
A= ADF
R= Radios
D= DME
G= GPS
M= Missed Approach
A= Altitudes / Approach brief

N= Name of Outer Marker

<u>Station Passage 5 T's</u>
T= Time
T= Turn
T= Twist
T= Throttle
T= Talk

#of dots off course x DME/30=lateral distance off course

<u>FAA method:</u>
(dist. off /dist. flown x 60)+ (dist off / dist. remaining x 60) = heading correction

Time (minutes)off course x 60/ degrees off course= min to station (95 % accuracy)

Time (seconds) off course/degrees off course= min to station

Minutes to station x TAS /60 = dist to station

TAS x min flown (90 deg) /bearing change(deg)= distance

INSTRUMENT APPROACH PROCEDURES

Preparing for an Approach:

- After you have been advised as to which approach to expect, you should conduct a thorough approach chart review to familiarize yourself with the specific approach procedure.
- If ATC does not specify a particular approach but states **"Cleared for Approach,"** you may execute any one of the authorized IAPs for that airport.
- **Feeder routes** provide a transition from the enroute structure to the IAF or to a facility from which a course reversal is initiated.
    - **Reviewing The Approach:** should include radio frequencies, the inbound course, descent minimums, the missed approach point, and the missed approach procedure.
    - When completed the chart review, consider the descent and approach checklists, as appropriate to your aircraft. Check your fuel level, and make sure a prolonged hold or increased headwinds have not cut into your reserve.
- If you are landing at an airport with approach control services which has two or more published instrument approach procedures, you will receive advance notice of the instrument approaches in use.

Course Reversals:

- A course reversal may be depicted on a chart as a procedure turn, a racetrack pattern (holding pattern), or a teardrop procedure. **If a teardrop or holding pattern** is shown on an approach chart, you must execute the course reversal as depicted the maximum speed in a course reversal is 200 IAS.
- Course reversals must be **completed within the distance** specified on the chart which is typically 10 nautical miles from the primary navaid or fix indicated on the approach chart.
- When more than one circuit of a holding pattern is needed to lose altitude or become better established on course, the additional circuits can be made only if you advise ATC and ATC approves.
- **Touchdown (HAT)** listed after the visibility requirement
- When on the glide slope during a precision approach, the missed approach point is the decision height.

- Visibility is listed on approach charts in statute miles, usually as a prevailing visibility reported by a accredited observer such as tower or weather personnel, or in hundreds of feet determined through the use of runway visual range (RVR) equipment.
- If **Runway Visual Range (RVR)** minimums for landing are prescribed for an instrument approach procedure, but RVR is inoperative and cannot be reported for the intended runway at the time, RVR minimums should be converted and applied as ground visibility. For example, RVR 25 translates to 1/2 statue miles visibility.
- The minimum altitude to which you can descend during a non-precision approach is shown as a **Minimum Descent Altitude (MDA)**.

Overview:

- **Standard Instrument Approach Procedure (IAP)** - allows you to descend safely by reference to instruments from the enroute altitude to a point near the runway at your destination from which a landing may be made visually. An IAP may be divided into as may as four segments: Initial, Intermediate, Final, and Missed Approach.

- The procedure title indicates the type of approach system used and the equipment required to fly the approach.

Precision and Non-Precision Approaches:

- **Precision Approach**, such as an ILS or Precision Approach Radar (PAR) procedure provides vertical guidance through means of an electronic glide slop, as well as horizontal course guidance. A **Non-Precision Approach**, such as a VOR or NDB approach, provides horizontal course guidance with on glide slope information.
- If the glide slope becomes inoperative during an ILS procedure, it becomes a non-precision approach, and higher localizer minimums are used.
- The most common approaches are; ILS, localizer, VOR, RNAV (GPS), and NDB. Other approaches you may encounter include LDA, SDF, VOR DME RNAV, and MLS procedures.

Approach Segments:

- **Feeder routes**, also referred to as approach transitions or terminal routes, provide a link between the enroute and approach structures. Flyable routes are indicated with a heavy line arrow on NOS charts. Each flyable route lists the radial or bearing, the distance, and the minimum altitude. You may have several feeder routes, you generally use the one closest to your enroute arrival point.
- The letters **IAF** indicate the location of an **Initial Approach Fix**. The purpose of the initial approach segment which follows the IAF, is to provide a method for aligning your aircraft with the approach course. The **Intermediate Segment** primarily is designed to position your aircraft for the final descent to the airport.
- The **Final Approach Segment** allows you to navigate safely to a point at which, if the required visual references are available, you can continue the approach to a landing.
- The final approach segment for a precision approach begins where the glide slope is intercepted at the minimum glide slope intercept altitude shown on the approach chart. For a non-precision, the final approach segment begins either at a designated **final approach fix (FAF)** or at the point where you are aligned with the final approach course.
- If you know the glide slope angle (normally 3 degrees), and if you maintain an average groundspeed on the final approach segment, you can determine the rate of descent to initially establish the airplane on the glidepath for an ILS approach procedure.
- The **Missed Approach Segment** takes you from the **missed approach point (MAP)** to a point for another approach or to another airport.

Course Reversals:

- A **procedure turn** is a standard method of reversing your course. When a holding or teardrop pattern is shown instead of a procedure turn, it is the only approved method of course reversal. If a procedure turn, holding or teardrop pattern is not shown, a course reversal is not authorized.
- The procedure turn, as depicted on the profile view, must be completed within

Airport Information:

- The **airport diagram plan** view portrays an overhead view of the airport, including runways and lighting systems. The airport reference point, or ARP, is where the official latitude and longitude coordinates are derived.

Visual and Contact Approaches:

- If the ceiling is at least 1,000 ft AGL and visibility is at least 3sm, ATC may clear you for a visual approach in lieu of the published approach procedure.
- ATC can issue a clearance for a **contact approach** upon your request when the reported ground visibility at the airport is 1sm or greater. ATC cannot initiate a contact approach.
- **Charted Visual Flight Procedures (CVFPs)** may be established at some controlled airports for environmental or noise considerations, as well as when necessary for the safety and efficiency of the air traffic operations.

Altitude Information:

- Minimum altitudes on approach procedures provide clearance of terrain and obstruction along the depicted flight tracks.
- The **minimum safe altitude (MSA)** provides 1,000 feet of obstruction clearance within 25 nm of the indicated facility, unless some other distance is specified.
- The **touchdown zone elevation (TDZE) -** is the highest centerline altitude for the first 3,000 feet of the landing

runway. The TDZE is depicted on the airport sketch.

- The profile view shows the approach from the side and displays flight path, facilities, and minimum altitudes. **Height Above Touchdown (HAT)** is measured from the touchdown zone elevation of the runway. **Height Above Airport (HAA)** is measured above the **official airport elevation**, which is the highest point of an airport's usable runways.
- Distance between fixes along the approach path and the runway threshold are also shown on the profile view.
- The **Threshold Crossing Height (TCH) -** is the altitude at which you cross the runway threshold when established on the glide slope.

Stepdown Fixes:

- Many approaches incorporate one or more stepdown fixes, used along approach segments to allow you to descend to a lower altitude as you over fly various obstacles. Your ability to identify selected stepdown fixes may permit lower landing minimums in some cases. When you cannot identify a stepdown fix, you must use the minimum altitude given just prior to the fix.
- A **Visual Descent Point (VDP) -** represents the point from which you can make a normal descent to a landing assuming you have a runway in sight and you are starting from the minimum descent altitude.

Circling and Sidestep Maneuvers:

- An approach procedure to one runway with a landing on another is a **circling approach**, with circle-to-land minimums. Restrictions may apply to circle-to-land procedure. For example, a circle-to-land might not be authorized in a specific area.
- When executing a circling approach, if you operate at a higher speed than is designed for your aircraft **approach category**, you should use the minimums of the next higher category.
- During a **sidestep maneuver**, you are cleared for an approach to one runway with a clearance to land on a parallel runway. Minimums for this procedure usually are higher than the minimums for a straight-in landing runway, but lower than the circling minimums. Expected to begin the procedure as soon a possible after sighting the sidestep runway environment.

Q: You are going to shooting an approach into LIT ILS 22R and ATIS is reporting 1600 RVR. Can you shoot the approach? If so, can you land?
A: *Under Part 91 Regulations: you may shoot the approach even though the weather is below the minimums published for the approach. You may land if you have the **flight** visibility. So, legally, you could land even if ATIS is reporting slightly below minimums. For example: If you had a ragged cloud base that maybe prevented one pilot from landing, but allowed the next to land.*

Q: When an ILS exists on both sides of the runway, will both of them be working at the same time?
A: No.

Q: You are setting up an approach to an uncontrolled field, which is at its weather minimums, what do you need to do inside the plane to be able to see the runway?
A: If it has pilot controlled lighting, it needs to be activated. This is indicated by the negative symbology on the approach plate.

Approach Speeds are Based on Vso x 1.3

- **Aircraft Approach Categories** used to determine landing minimums are based on approach speed. This speed is 130% of the aircrafts power-off stall speed in the landing configuration at the maximum certificated landing weight **(1.3 Vso).** Landing minimums published on instrument approach charts consist of both minimum visibility and minimum altitude requirements for aircraft in various approach categories (A,B,C and D).

A= below 90 knots
B= 91 to 120 knots
C= 121-140 Knots
D= 141-165 knots
E= Greater than 165 knots

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

Approach Plate Notes

How do we get established on an Approach?

- Radar Vectors to Final
- Fly to IAP
- Fly from a feeder route to the IAP then to final

- PV statue miles in quarters
- RVV in Statue miles ??
- RVR feet??
- **TCH**- Threshold Crossing Height, height above end of runway on a given glide slope measured AGL.
- **TDZE**- Highest point in MSL above the runway in first 3000 feet.
- **Missed Approach** airspeed in Vx until clear of obstacles and then Vy.
- **Missed Approach** on a circling to land, fly toward the runway centerline and follow missed procedures.
- **Enroute Feeder Rings** show nav aids & intersections that are part of the low alt enroute structure used in the approach.
- **Feeder Facility Rings** show nav aid, fixes, intersections, directions and altitudes used by ATC to direct A/C between enroute structure and the IAF.

IAP's use three type of lines

- Thin lines = VOR radial used to identify fixes and include course information only. (non-flyable)
- Dark Thin Lines = Feeder routes includes altitudes, course and distance information.
- Dark Bold Lines = Are instrument procedure tracks, includes altitude, course and distance information.
- Circling Approaches have 300 foot obstacle clearance.
- MSA requires a VOR or NDB within 30 NM of an airport.

Procedure Turn (PT) is a maneuver prescribed when it is necessary to reverse direction in order to establish an aircraft on the intermediate approach segment or on the final approach course. A procedure turn begins by over-flying a facility or fix. The maximum speed for a PT is 200 KIAS

Final Approach Fix (FAF) is at the glideslope intercept (lighting bolt) on a precision approach. If ATC directs a glideslope intercept altitude which is lower than that published, the actual point of glideslope intercept becomes the FAF. The Maltese cross indicates the FAF on a non-precision approach.

Final Approach Point (FAP) applies only to non-precision with no designated FAF such as on-airport VOR or NDB. It is the point at which an aircraft has completed the procedure turn, is established inbound on the final approach course, and may start the final descent. The FAP serves at the FAF and identifies the beginning of the final approach segment.

Glideslope is a glide path that provides vertical guidance for an aircraft during approach and landing. Applying the glideslope angle and the ground speed to the rate of descent table gives a recommended vertical speed.

Height Above Touchdown (HAT) is the height above the highest point within the first 3000' of the runway. It is published in conjunction with straight-in approaches and appears next to the MDA or DH of the approach plate.

Height Above Airport (HAA) is the height above the highest point on any of the landing surfaces. It is published in conjunction with circling approaches and appears next to the MDA of the approach plate.

Threshold Crossing Height (TCH) is the height above the threshold of the runway for a given glideslope.

Touchdown Zone Elevation (TDZE) is the highest point within the first 3000' of runway

Field Elevation is the highest point on any of the landing surfaces. It is not the highest point on the field, *just the landing surface.*

Minimum Descent Altitude (MDA) is the altitude on a non-precision approach in which you must go missed or land visually and guarantees 300' obstacle clearance. Pilot can only go below MDA when within 30^0 of the runway. Field Elevation + HAA= MDA

Decision Height (DH) is the altitude on a precision approach while following a glideslope in which you must go missed or land visually. HAT + TDZE =DH

Minimum Safe Altitude (MSA) Is the safe altitude within 25NM of the airport or navaid and provides 1000' obstacle clearance *in both mountainous and non-mountainous terrain*. It is usually located within 30 miles of airport and is for emergency use only.

Minimum Vectoring Altitude (MVA) Is the minimum altitude in which ATC can vector an aircraft. This guarantees 1000' obstacle clearance in non-mountainous, 2000' in mountainous, and 300' within terminal airspace.

Q: What does a sideways "8" indicate on an approach plate airport diagram?
A: A displaced threshold.

Q: Is the 10-mile circle on an approach plate the radius or diameter? What does this circle represent?
A: It is the radius and represents that within that circle, everything is drawn to scale.

Q: On an approach chart, what does 5500 with a line above it, below it, or above and below at the same time mean?
A: Maximum Altitude, minimum altitude, or mandatory altitude.

Descending on the Approach:

- When you are **cleared for an approach** while being radar vectored, you must maintain your last assigned altitude until established on a segment of the published approach. If you are above the altitude designed for the course reversal, you may begin descent as soon as you cross the IAF.
- Normally, you should descent at a rate that allows you to reach the MDA prior to the MAP so that you are in a position to establish a normal rate of descent from the MDA to the runway, using normal maneuvers.

2 TYPES OF NONPRECISION APPROACHES (NPA)

With-

- One hand flown with a procedure turn without radar vectors or, a Terminal Arrival Area (TAA) RNAV approach procedure)
- 2 different types of nav aids. (NDB, VOR, LOC, LDA, GPS (must be demonstrated if installed), or RNAV)
- 1 Partial panel (flight instrument failure)

Non-Precision Approaches

Non-Precision Approach is a standard instrument approach procedure in which only horizontal guidance and no vertical guidance is provided; for example NDB, VOR, TACAN, ASR, LDA, or SDF

VOR and NDB Approaches:

- **Two categories**—those that use an **on-airport facility** and those with an **off-airport facility**. On approaches with on-airport navaids, the FAP often serves as the FAF.
- Obtain weather information, if possible, for the destination airport and analyze whether a successful approach is likely.
- Typically, you accomplish a course reversal by flying outbound for **two minutes**, turning to a charted heading 45 degree left or right of your inbound course and flying for one minute, then making a 180 opposite direction turn back to re-intercept the inbound course.
- When cleared for an approach, you should descend promptly to the minimum altitude published for your current route segment or approach transition, or other altitude assigned by ATC.
- Complete your before landing checklist prior to the FAF, or if there is no FAF, before intercepting the final approach course. If you have retractable landing gear, it is generally best to extend it when starting your descent inbound to the FAF.
- If you do not have the runway environment in sight when reaching the MDA, or if you lose sight of it at any time while circling, it is imperative that you immediately **execute the missed approach** procedure.
- Make sure you understand the missed approach procedure and are prepared to fly it.
- If you have the runway environment in sight with the required visibility, you may land. Do not descend below the MDA until you are in a position from which you can safely descend for landing.
- When executing a missed approach, notify ATC, and, depending on your circumstances, request a clearance to fly the approach again, or request a clearance to your alternate.
- **DME** is required on certain approaches that indicate DME in the procedure title. Even on those approaches that do not require DME, using DME to identify stepdown fixes may allow lower minimums.
- **VOR DME**—means the use of DME equipment is mandatory for the approach.
- **NDB** approach procedures are similar to VOR approaches. However, the precision with which you complete the approach is dependent on your skill in ADF tracking and on the **accuracy of your heading indicator**.
- Leave the volume turned up so that you can continue to listen to the identifier.
- Reverse sensing occurs inbound on the back course and outbound on the front course.

- LOC – Localizer, Glide Slope usually 3°, signal range 35° from center 10 NM, 10° from center to 18nm, Back course reverse sensing (more sensitive) HSI senses OK if set proper course
- VOR- Very High Frequency Omni Directional range, Requires a VOR receiver
- VOR/DME- Requires VOR Receive with DME capability
- VOR-A a inbound VOR course offset by 30 degrees or more from runway
- NDB- Non Directional Beacon, Required an ADF on board
- NDB/DME
- NDB (A)
- Arcing Approaches
- SDF – Simplified Directional Facility, No shading on the feather, Course width, 6° or 12°, never has glide slopes, Can be offset from runway
- LDA – Localizer Direction Aid, (e.g. I-LIT), offset from Runway, can have a glide slope, course width 3°-6°
- GPS Global Positioning System
  (RAIMS) Random Autonomous Integrity Monitoring mean must have enough satellites to ensure enough accuracy.
  IFR approved and certified to fly
  All GPS systems work differently so learn your
  GPS Overlays on VORs, etc)
  Uses basic T pattern on approaches on newer approaches. Newer approaches use the holding pattern, @ IAF / FAF.
  If RAIM fails or do not have green light must go missed approach
- LORAN - Authorized enroute only
- RNAV (Area Nav) Resets VOR and aligns them
- MLS – Microwave landing system, (eg. M-LIT)
- INS – Inertial Navigation System - Internal to Aircraft and calculates via airspeed directions, time etc.
- ASR - Approach Surveillance Radar

- **Visual Decent Point**- Point at which you must level off until you acquire visual sight of the airport before continuing a decent.

GPS and RNAV APPROACHES

Overview:

- You are not required to monitor or have conventional navigation equipment for stand alone GPS approaches to your destination airport.
- You must have conventional navigation equipment aboard your aircraft as a backup for enroute navigation, and to fly to an alternate airport if it becomes necessary. While you can conduct an approach to an alternate airport using GPS, you must have the capability of conducting the approach using conventional equipment.
- You can determine if a GPS is approved for IFR enroute and approach operations by referring to the supplements section of Airplane Flight Manual (AFM)

RAIM:

- The GPS continuously monitors the reliability of the GPS signal using a system known as receiver autonomous integrity monitoring (RAIM). If RAIM is not available when you set up a GPS approach, you should select another type of navigation and approach system.

Navigation Data:

- Your GPS receiver is required to have current data before it is used for IFR navigation

Navigation During the Approach:

- Flying from the MAP directly to the MAHWP may not provide sufficient obstacle clearance. You should always fly the full missed approach procedure as published on the approach chart.
- When you receive radar vectors to final you generally will have to manually sequence ahead and select the leg to which your are being vectored. You should avoid accepting or requesting radar vectors which will cause you to intercept the final approach course within 2nm of the FAWP.

Standards

- Tunes, identifies, monitors
- Recognizes instrumentation failure, and takes appropriate action.
- Establishes configuration/ airspeed for turbulence and wind shear, and completes the aircraft checklist items appropriate to the phase of the flight.
- Prior to the final approach segment
  - altitude within +/-100 feet,
  - heading within +/-10° and allows
  - less than ¾ scale deflection of the CDI or within +/-10° RMI, and maintains
  - airspeed within +/-10 knots.
- adjusts MDA and visibility for the aircraft approach category when required, such as—
  - NOTAMs.
  - inoperative aircraft and ground navigation equipment.

- **Landing minimums** usually increase when a required component or visual aid becomes inoperative. Regulations permit you to make substitutions for certain components when the component is inoperative or is not utilized during an approach.

  - inoperative visual aids associated with the landing environment.
  - NWS reporting factors and criteria.
- Arives at MDA prior to the MAP.

  Q: In IMC, can a pilot fly to the FAF and drop immediately to the MDA without reguard to decent gradient?
  A: *No, to ensure safe obstacle clearance you must not exceed an 8^0 glideslope. This means no more than 1' vertical decent for every 7' horizontally. For example: At 75kts, don't exceed 1055 FPM. At 105kts, don't exceed 1480 FPM. The decent table can be found in the back cover of the NOS charts.*
  75=1055 fpm
  90=1266 fpm
  120=1406 fpm

- continuously in a position to a land with normal rate using normal maneuvers.
- final approach segment,
  - no more than a three-quarter-scale deflection CDI / 10° RMI

  - airspeed within +/-10 knots of that desired.
  - Maintains MDA, within +100 feet, -0 feet to the MAP.
- missed approach procedure when visual references not visible at MAP.
- Executes a normal landing from a straight-in or circling approach when instructed by the examiner.

PRECISION APPROACH (PA) must be accomplished to DA/DH.

Precision Approach is an IAP in which vertical and horizontal guidance is provided such as a ILS, MLS, or PAR approaches.

- Accomplishes the appropriate precision instrument approaches as selected by the examiner.
- checklist items appropriate to the phase of flight or approach segment, including engine out approach and landing checklists, if appropriate.
- Prior to final approach segment,
- altitude +/-100 feet, the desired
- airspeed within +/-10 knots, the desired
- heading within +/-10°
- accurately tracks radials, courses, and bearings.
- Selects, tunes, identifies, and monitors the operational status Nav aide
- adjusts the published DA/DH and visibility criteria for the airplane approach category as required, such as—
  - NOTAMs
  - inoperative airplane and ground navigation equipment.
  - inoperative visual aids associated with the landing environment.
  - NWS reporting factors and criteria.
- Establishes a predetermined VSI at the point where the electronic glide slope begins, which approximates that required for the aircraft to follow the glide slope.
- stabilized final approach, from the Final Approach Fix to DA/DH
- no more than three-quarter scale
- glide slope or
- localizer indications and maintains the desired
- airspeed within +/-10 knots.
- missed approach or transition to a landing shall be initiated at Decision Height.
- Initiates immediately the missed approach when at the DA/DH, and the required visual references for the runway are not unmistakably visible and identifiable.
- Transitions to a normal landing approach using
- normal rate of descent and normal maneuvering.
- within three-quarter-scale deflection during the visual descent from DA/DH to a point over the runway where glide slope must be abandoned to accomplish a normal landing.

ILS APPROACH (SECTION B)

Overview:

- Is a precision approach navigational aid which provides highly accurate course, glide slope, and distance guidance to a given runway. ILS approaches are classified as Category I, II, or III.
- The ILS localizer transmitter emits a navigational signal from the far end of the runway to provide you with information regarding your alignment with the runway centerline.

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

Glide Slope:

- The glide slope signal provides vertical navigation information for descent to the lowest authorized decision height for the associated approach procedure. The glide slope may not be reliable below decision height.
- If the glide slope is inoperative or fails during your approach, the localizer (GS out) minimums apply. Continue the approach to the MDA.
- Prior to intercepting the ILS glide slope, you should concentrate on stabilizing airspeed and altitude while establishing a magnetic heading which will maintain the aircraft on the localizer centerline. Once your descent rate stabilizes, use power as needed to maintain a constant approach speed.
- Full-scale deviation of the glide slope needle is .07 degree above or below the center or the glide slope beam.

ILS APPROACHES (Chapter 8)

Other Approach Facilities:

- **Localizer-type Directional Aid (LDA)** - is an approach system which uses a localizer course that is not aligned with the runway centerline. The LDA course width is between 3 and 6 degrees.
- **Simplified Directional Facility (SDF)** - 6 or 12 degrees wide. Most are aligned within 3 degrees of the runway bearing
- **Microwave Landing System (MLS)** - precision approach, to airports where interference from obstacles and/or high power FM stations make ILS difficult or impossible.

Other ILS Components:

- **Outer Marker (OM)** indicated by a blue colored light flashes and Morse code identification. **Middle Marker (MM)** indicated by a amber light flashes and Morse code identification. An **Inner Marker (IM)** is installed at locations where Category II and III ILS operations have been certified.
- When a compass locator is installed in conjunction with the outer maker, it is called an outer compass locator (LOM). When a compass locator is collocated with the middle marker, it is referred to as a middle compass locator (LMM). The LOM identifier is the first two letters of the localizer identifier. The LMM identifier is the last tow letters of the localizer identifier.
- A compass locator, precision radar, surveillance radar, or published DME, VOR, or NDB fixes may be substituted for the outer marker.
- The glide slope centerline normally intersects the middle marker approximately 200ft above the touchdown zone.
- Higher landing minimums may be required if some components of an ILS are inoperative. If more than one component is not available for use, you should adjust the minimums by applying only the greatest increase in altitude and/or visibility required by the failure of a single component.

Flying the Approach:

- The rate of descent you must maintain to stay on glide slope must decrease if your groundspeed decreases, and vice versa. If the glide slope and localizer are centered but your airspeed is too fast, your initial adjustment should be to reduce power.
- Since localizer and glide slope indications become more sensitive as you get closer to the runway, you should strive to fly an ILS approach so that you do not need heading corrections greater than 2 degrees after you have passed the outer marker.
- On an ILS approach, you must execute a missed approach if you have not established the required visual references at the DH.
- When advised to change to advisory frequency, you should broadcast your position and intentions on the CTAF.

ILS/DME:

- The procedure you use to fly an ILS/DME approach are essentially the same as any other ILS approach except for the requirement to identify approach fixes using DME.
- When DME is available through the localizer frequency, a DME/TACAN channel is shown in the facility box.

Parallel and Simultaneous Approaches:

- **Parallel** (dependent) ILS approach operations may be conducted on parallel runways with centerlines at least 2,500ft apart. **Simultaneous (independent) parallel** ILS approaches may be conducted to airports with parallel runway

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

centerlines separated by 4,300 to 9,000ft. When certain requirements are met, including the installation of a precision runway monitor, simultaneous close parallel ILS approach procedures may be established at airports with parallel runway centerlines less than 4,300ft. Apart.

- You will be informed by ATC or the ATIS broadcast if parallel approaches are in progress. A parallel ILS approach provides aircraft with a minimum of two miles separation between successive aircraft on the adjacent localizer course.
- When simultaneous approaches are in progress, each pilot may receive radar advisories on the tower frequency.

Precision Approaches

- ILS 3°-6° course, 3°Slope and Course, Markers OM 1400 ATDZE 4-6 miles, MM 200 ATDZE, (IM only on CAT II or III)
  - CAT I – 200 feet RVR 2400, unless you have RWCTL, RVR and TDZL reduces to 1800 RVR
  - CAT II – must be certified and authorized, 100' RVR 1200
  - CAT III (A)– No DH, RVR 700 min
  - CAT III (B)– No DH, RVR 150 min
  - CAT III (C)– No DH, RVR 0
- PAR- Radar Guided, told when to descend, when to turn and stop.

Parallel Approaches

- Dependant ILS systems must be staggered by 3 miles
- Simultaneous
- Simultaneous Close Parallel
- Simultaneous Converging
- Localizer

Substitutes for a Outer marker are:

1. LOM or Compass Locator
2. Radial off a VOR / NDB / DME
3. PAR / ASR

Substitutes for a MM are:

1. PAR
2. LOM

MISSED APPROACH

- Initiates the missed approach promptly by applying power climb attitude, and reducing drag

  When to Conduct a Miss Approach:

  During a precision approach, the height where you must make the decision to continue the approach or execute a missed approach is referred to in the FARs as the **Decision Height (DH).** NOS charts show the decision height as an MSL altitude with the **Height Above**
- Reports to ATC beginning the missed approach procedure.
- Complies with the published or alternate missed approach procedure.
- airspeed +/-10 knots;

Missed Approaches:

- The most common reason for a missed approach is low visibility conditions that do not permit you to establish required visual cues.

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

- If an **early missed approach** is initiated before reaching the MAP, you should proceed to the missed approach point at or above the MDA or DH before executing a turning maneuver.
- If you **lose visual reference** while circling to land from an instrument approach and ATC radar service is not available, you should initiate a missed approach by making a climbing turn toward landing runway and continue the turn until established on the missed approach course.
  - heading, course, or bearing +/-10°; and
  - altitude(s) +/-100 feet during the missed approach procedure.

CIRCLING APPROACH

- complies with the appropriate circling approach procedure

Confirms the direction of traffic and adheres to all restrictions and instructions issued by ATC and the examiner.

Q: If cleared for an approach that has only circling minimums, do you have to circle or may he land straight-in?
A: *He can land straight-in, but he should advise ATC if going to circle.*

Q: If LIT has a VOR-A and a VOR-C approach, why doesn't it have a VOR-B approach?
A: *An adjacent airport (1M1) probably has the VOR-B approach.*

- Does not exceed the visibility criteria or descend below the appropriate circling altitude until in a position from which a descent to a normal landing can be made.

  Circling Approach 300 ft obstacle clearance Distant from runway.
  - If more than 30 degrees off the runway centerline or landing on another runway

    A 1.3 miles
    B 1.5 miles
    C 1.7 miles
    D 2.3 miles
    E 4.5 miles

- Maneuvers the aircraft, after reaching the authorized MDA and maintains that altitude within +100 feet, -0 feet and a flight path that permits a normal landing on a runway.
- The runway selected must be such that it requires at least a 90° change of direction, from the final approach course, to align the aircraft for landing.

LANDING FROM A STRAIGHT-IN OR CIRCLING APPROACH

Descent below MDA DH

1. Visibility flight or ground (become VFR or identify filed of light to lower mins.)
2. Must be in a position to land
3. Approach lighting system in sight allows decent to 100' AGL
4. (FAR 91.175)Must have Runway Environment in sight (11 items) to descend for landing

<u>Threshold</u>

1. Threshold

2. Threshold Marks
3. Threshold Lights

Approaching Runway

4. REIL
5. VASI or equivalent
6. Touchdown Zone
7. Touchdown Zone Marks
8. Touchdown Zone Lights

Runway

9. Runway
10. Runway Marks
11. Runway Lights

- **To descent below the DH or MDA**, you must be able to identify specific visual references, as well as comply with visibility and operating requirements which are listed in FAR 91. 175

  Approach Light system * | **Threshold, markings, lights**
  VASI | **Runway End Identifier Lights**
  Touchdown Zone, Markings, Lights | **Runway, Markings, Lights**
- **VASI lights** can help you maintain the proper descent angle to the runway once you have established visual contact with the runway environment. If a glide slope malfunction occurs during an ILS approach and you have the VASI in sight, you may continue the approach using the VASI glide slope in place of the electronic Glideslope.

Straight-In Approach and Landing:

- May be initiated from a fix closely aligned with the final approach course, may commence from the completion of a DME arc, or you may receive vectors to the final approach course.
- A straight-in approach does not require nor authorize a procedure turn or course reversal.
- A **NoPT** arrival sector allows flights inbound on Victor airways within the sector or proceed straight in on the final approach course.
- The final approach course is positioned within 30 degrees of the runway.

Radar Procedures:

- ATC radar approved for approach control service is used for course guidance to the final approach course, ASR and PAR approaches, and the monitoring of non-radar approaches.
- Radar vectors to the final approach course provide a method of intercepting and proceeding inbound on the published instrument approach procedure. During an instrument approach procedure, a published course reversal is not required when radar vectors are provided.
- If it becomes apparent the heading assigned by ATC will cause you to pass through the final approach course, you should maintain that heading and question the controller.
  - Exhibits adequate knowledge of the elements related to the pilot's responsibilities, and the environmental, operational, and meteorological factors, which affect a landing from a straight-in or a circling, approach.
  - Transitions at the DA/DH, MDA, or VDP to a visual flight condition, allowing for safe visual maneuvering and a normal landing.
  - Adheres to all ATC (or examiner) advisories, such as NOTAMs, wind shear, wake turbulence, runway surface, braking conditions, and other operational considerations.
  - Completes appropriate checklist items for the pre-landing and landing phase.
  - Maintains positive aircraft control throughout the complete landing maneuver.
    - **Visual Approach**- 3000 foot ceiling and 3 mile visibility, Field in sight or follow anther A/C / must be VFR. ATC can assign

- **Contact Approach**- Pilot must request, Must have 1 mile visibility and COC. Must be able to safety navigate to airport, Airport must have an instrument approach.
- **Circling Approach**- More than 30 degrees from inbound course. May also be know as a slash A, or slash B approach
- **TEC**- Tower Enroute Control-
- **VASI**- obstacle clearance 10 deg of centerline for 4 NM
  normal angle= 3.00 deg. red over white
  lower angle 2.8 deg (papi)
  - Papi 4R < 2.5 3R/1W 2.8, 2r /2w 3.0 3W/1R 3.2 4W 3.5

Airports

Runway Markings:

- Runway Number; Threshold Markings, Touchdown Zone Markings, Aiming Point Markings

Taxiway Marking:

- Mandatory Instruction Signs; Holding Position Markings, ILS hold line, Displaced Threshold, Blast Pad/Stopway

Runway Incursion Avoidance

- Any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in loss of separation with an aircraft taking off or intending to take off, landing, or intending to land.

Land and Hold Short Operations (LAHSO)

- If you have the slightest doubt that you can land and stop within the ALD, you should decline a LAHSO clearance
- You can find the ALD information in the A/FD
- Student pilots or pilots unfamiliar with LAHSO should not participate in the program.

Runway Lighting:

- Runway edge lights (HIRL), (MIRL), (LIRL) are white except on instrument runways where amber replaces white on the last 2,000 ft or half the runway length, whichever is less.
- Threshold Lights—mark the ends of each runway, Red and Green.
- Touchdown Zone Lighting (TDZL) - a series of white lights flush mounted in the runway,
- Runway Centerline Lights (RCLS) - flush mounted in the runway that are white and change to alternating red and white when 3,000 ft remain, and all red for the last 1,000 ft of the runway.
- VASI—assures you of safe obstruction clearance within + 10 degrees of the extended runway centerline and out to 4 nm form the threshold.
  - Pulsating visual approach slope indictor (PVASI), Precision approach path indicator (PAPI), Tri-color VASI,
  - Land and hold short lights—a row of five flush mounted flashing white lights at the hold short point.
  - Taxiway Lead-Off Light—flush mounted alternating green and yellow lights.
  - Pilot Controlled Lights—keying the microphone 7 time in 5 seconds. Turn off in 15 minutes.
    - Airport Beacon Light—operation during the day indicate the ground visibility is less than 3sm and/or the ceiling is less than 1,000 ft.

    - **Runway Markings**
    - **Non-Precision Runway** – 1000 feet mark

- **Precision Runways –** 500, 1000 (aiming point), 1500 to 3000 marks, touch down zone in 1st 3000 feet

- ILS Critical area below 800 feet and within 2 miles

Airport Lighting

- **RCLS**- Guidance and tells pilot how much runway remains. Space every 50ft, Last 3000 feet alternating red/white, last 1000 ft all red.
- **REIL**- Runway End Identifier Lights- Rapid identification of approach end of runway

Approach Lighting Systems

- ALSF1 – 2
- SSALR
- MALSR

Approach Glide Slope Lighting

- VASI
- P- VASI
- PAPI
- TRI-Color

EMERGENCY OPERATIONS

Distress and Urgency Conditions:

- **Pilots in Distress**—are threatened by serious and/or imminent danger and require immediate assistance.
- **Urgency Situation**—such as low fuel quantity, requires timely but not immediate assistance.
- In an emergency, you may deviate from any rule in FAR Part 91 to the extent necessary to meet the emergency. ATC may request a detailed report of an emergency when priority assistance has been given, even though no rules have been violated.

Communication Procedures:

- During a flight in IFR conditions, do not hesitate to declare an emergency and obtain an amended clearance when a distress condition is encountered.
- 121.5 for emergency
- **MAYDAY**—for emergency **PAN-PAN**—for urgency
- Transponder; **7700**—emergency **7600**—lost communications **7500**—air piracy
- FAR Part 91 requires you to report the malfunction of any navigational, approach, or communications equipment while operating in controlled airspace under IFR.

Minimum Fuel:

- If your remaining fuel quantity is such that you can accept little or no delay, you should alert ATC with a minimum fuel advisory. Declaring minimum fuel to ATC indicates an emergency situation is possible should any undue delay occur.
- If the remaining usable fuel supply suggest the need for traffic priority to ensure a safe landing, you should declare an emergency due to low fuel and report fuel remaining in minutes.

Instrument Failure:

- During an instrument failure your first priority is to fly the airplane, navigate accurately, and then communicate with ATC.
- Radar approach procedures may be available to assist you during an emergency situation requiring an instrument approach.

- A radar instrument approach that provides only azimuth navigational guidance is referred to as an **airport surveillance radar (ASR)** approach. A surveillance approach may be used at airports for which civil radar instrument approach minimums have been published.
- During a **precision approach (PAR)**, the controller provides you with highly accurate navigational guidance in azimuth and elevation as well as trend information to help you make a proper corrections while on the approach path.
- A **no-gyro approach** may be requested when you have experienced a gyroscopic instrument failure. Controllers provide course guidance by stating "turn right, stop turn", and "turn left" to align you with the approach path. Turns should be made at standard rate until you have been handed off to the final approach controller, at which point they should be made at one-half standard rate.

Communication Failure:

- You can use your transponder to alert ATC to a radio communication failure by squawking code 7600.
- During a communication failure in VFR conditions, remain in VFR conditions, land as soon as practicable, and call ATC.
- During IFR conditions:
  1. Highest of the assigned altitude
  2. MEA
  3. Altitude ATC has advised may be expected in a future clearance
- If an approach is available at your clearance limit, begin the approach at the expect further clearance (EFC) time.
- If an approach is not available at your clearance limit, proceed from the clearance limit at your EFC to the point at which an approach begins.

LOSS OF COMMUNICATIONS

- Recognizing loss of communication.
- Continuing to destination according to the flight plan.
- When to deviate from the flight plan.
- Timing for beginning an approach at destination.

What are you expected to do if Lost Comm?

- **Squawk 7600 and do the following…**

Altitude (highest of)

M= Minimum IFR for route filed
E= Expected altitude to be assigned
A= Assigned Altitude

Route
A= Assigned Route
V= Vectored to Point in absence of other
E= Expected, proceed direct in absence of other
F= Filed "As Filed"

Radio Failure (Squawk 7600)

- First actions:

- Check volume on headset, radio volume, correct frequency, comm selection, and circuit breakers
- Try last frequency
- Try to contact FSS
- If VFR conditions exist elsewhere, fly to it and land at suitable airport and then contact ATC If no luck, follow actions below and continue with IFR flight

NOTE: If you return to land at original airport, IT IS DECLARING AN EMERGENCY

NOTE: Carry portable transceiver, and/or cell phone. Use AFD phone numbers to contact center, approach, etc.

- If Lost Comm, contact FSS. Allow at least a minute.
- **OROCA** – Off Route Obstruction Clearance Altitude
- **MOCA** – Minimum Obstruction Clearance Alt
- **MAA** – Minimum Authorized Altitude
- **MEA** – Minimum Enroute Alt
- Normally Low Enroute charts are 1 inch = 12 miles but not always.
- Blue and Green airports mean has an instrument approach.
- Small "s" by the runway length means soft field.
- Low Charts go to FL 180, J charts start at FL180

APPROACH WITH LOSS OF PRIMARY FLIGHT INSTRUMENT INDICATORS

Note: This approach shall count as one of the required nonprecision approaches.

- recognizes primary flight instrument failure and advises ATC or the examiner.
- Demonstrates a nonprecision instrument approach without the use of the primary flight instrument.

Partial Panel

Simulated lost vacuum pump or suction. No gyro instruments (AI, DG)

Coping With Instrument Failure

- Immediately advise ATC
- When you suspect an instrument failure, look for corresponding indications.
- The Compass is primary for bank, keep wings level with the ball centered and use timed turns.

Timed Turns

- ½ SRT 1.5° per sec, 4 minutes for 360°
- SRT 3° per sec, 2 minutes for 360°
- Compass Errors -
  - Acceleration Error – ANDS: Accelerate North, decelerate South
  - Turning Errors – UNOS: Undershoot North, Overshoot South

POSTFLIGHT PROCEDURES

CHECKING INSTRUMENTS AND EQUIPMENT

- proper operation of instrument and navigation equipment.
- Notes and documents all flight equipment for proper operation.
- Notes all equipment and/or aircraft malfunctions and makes appropriate documentation of improper operation or failure of such equipment.

All approaches and Procedures:

- Establishes two-way communications with ATC using the
- Uses proper communications phraseology and techniques, as required for the phase of flight or approach segment.
- Complies, in a timely manner, with all clearances, instructions, and procedures.
- Establishes the appropriate airplane configuration and airspeed/V-speed considering turbulence, wind shear, microburst conditions, or other meteorological and operating conditions.
- Advises ATC or examiner anytime that the aircraft is unable to comply with a clearance, restriction, or climb gradient.
- Follows the recommended checklist items appropriate to the go-around procedure.
- Requests, if appropriate, ATC clearance to the alternate airport, clearance limit, or as directed by the examiner.
- considering turbulence and wind shear and considering the maneuvering capabilities of the aircraft.

ADVANCED HUMAN FACTORS CONCEPTS

Personal Minimums Checklist:

- You should take into account your currency and experience when deciding which conditions you feel comfortable flying in.
- Five hazardous attitudes affect your decisions.

Communication:

- Barriers to communication include preconceived notions of upcoming clearances, abbreviated clearances, and words that have more than one meaning.

Resource Use:

- Effective use of resources occurs when you understand and utilize all the people and equipment available to you during a flight.
- During a high workload situation, identify the most important tasks and make those a priority. Do not allow yourself to fixate on an extraneous issue.

Geoffrey Hatcher AGI, MEI, IGI, CFII
1915 Biscayne Little Rock, AR 72227
(501) 680-7283 www.geoffhatcher.com
hatcherpottery@comcast.net

Situational Awareness:

- Visualization techniques can be used to create a mental picture of the flight overall.
- Loss of situational awareness can occur when pilots are confused by clearances, misunderstand onboard equipment, or do not communicate properly with others in the cockpit.

Aeronautical Decision Making: is a systematic approach to the mental process used by aircraft pilots to consistently determine the best course of action in response to a given set of circumstances.

- 75% of all aviation accidents are attributed to human factors related causes.

Five hazardous attitudes

- Anti-Authority; Macho; Impulsivity; Invulnerability; Resignation.

Resources Use

- Cockpit resources increases as you fly more complex aircraft with advanced systems. If you are not thoroughly familiar with the equipment in your aircraft or you rely on it so much that you become complacent, flight safety is compromised.
- **Crew Resource Management** (CRM) programs is the effective use of all available resources; human resources, hardware, and information.

Workload Management

- Directly impacts safety by ensuring that you are prepared for the busiest segments of the flight through proper use of down time. Organizing charts in the order of use, setting radio frequencies, and writing down expected altitudes and route clearance will help you visualize and mentally prepare for what comes next.

Situational Awareness

- Controlled flight into terrain (CFIT) occurs when an aircraft is flown into terrain or water with no prior awareness on the part of the crew that the crash is imminent.
- **Visual illusions** are the product of various runway conditions, terrain feature, and atmospheric phenomena which can create the sensation of incorrect height above the runway or incorrect distance form the runway threshold. When landing on a narrower-than-usual runway, the aircraft will appear to be higher than actual, leading to a lower-than-normal approach. An upsloping runway creates the same illusion.

Aviation Physiology

Disorientation: is an incorrect mental image of your position, attitude, or movement in relation to what is actually happening to your aircraft.

- Input from three primary sources: **Vision**, **Vestibular**, and **Kinesthetic Sense**.

Spatial Disorientation: is a conflict between the information relayed by your central vision scanning the instruments, and your peripheral vision.

- Pilots are more subject to spatial disorientation if body signals are used to interpret flight attitude.
- The best way to overcome the effect is to rely on the aircraft instrument indications.

Motion Sickness

- Nausea, sweating, dizziness, and vomiting are some of the symptoms of motion sickness. To overcome motion sickness without outside visual references, you should focus on the instrument panel, since it is your only source of accurate position information.

Hypoxia: occurs when the tissues in the body do not receive enough oxygen.

- **Hypoxic Hypoxia**—inadequate supply of oxygen (going to high altitudes)
- **Hypemic Hypoxia**—inability of the blood to carry oxygen (Carbon Monoxide)
- **Stagnant Hypoxia**—inadequate circulation of oxygen (excessive G forces)
- **Histotoxic Hypoxia**—inability of the cells to effectively use oxygen (by alcohol or drugs)

Supplemental Oxygen: FAR requirements

1915 Biscayne Little Rock, AR 72227
(501) 680-7283 geoff@geoffhatcher.com www.geoffhatcher.com

- **12,500—14,000 ft MSL** = Flight crew must use O2 after 30 minutes
- **14,000—15,000 ft MSL** = Flight crew must use O2
  - **15,000—Above** = Flight crew must use O2 and all occupants must be provided with O2

Hyperventilation: occurs with excessive loss of carbon dioxide.
You need to slow the breathing rate, breathing into a bag or talking aloud.

Decompression Sickness

- Is a painful condition that can occur if flying too soon after diving. It is very important that you allow enough time for the body to rid itself of excess nitrogen absorbed during diving.
- Ascending to 8,000 ft MSL after a dive not requiring a controlled ascent = 12 hours
  - Above 8,000 ft MSL or any dive requiring a controlled ascent = 24 hours

Self Assessment: (I'm Safe, Checklist)

- **I**llness
- **M**edication
- **S**tress
  - **A**lcohol
  - **F**atigue
  - **E**ating

VFR REVIEW

Airport/Facility Directory

- Reissued every 56 days

Federal Aviation Regulation

- Part 61; 91; NTSB 830

Notices To Airmen

- NOTAM (D) distant; NOTAM (L) local; FDC NOTAM