



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

Instrument Airplane study guide

Planning an IFR Flight

Preflight Planning Required by FARs §91.103:

- Weather reports and forecasts
- Known traffic delays as advised by ATC
- Runway lengths of intended use
- Alternatives if flight cannot be completed as planned
- Fuel requirements
- Takeoff and landing distance data in the approved aircraft flight manual

Planning Steps

1. Check enroute chart
2. review approach plates
3. ETE
4. alternate requirements
5. File with fss
6. Obtain Weather
7. Check for SID and DP's- Ensure you look for Terrible T's and A's and A N/A's
8. Plan Route - Consider: Take off mins, enroute weather, obstacle clearances, navigational aids
9. Enroute Consideration: - Obstructions clearance, Navigation aids, Freezing levels
10. Approaches - Consider: Weather mins, , is an alternate required (1-2-3 rule), other ways to get into field, check foot notes on approach plates
11. IFR – 1000ft 3 miles visibility

IFR Flight Plans:

- *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 should be filed at least 30 min in advance. ATC will generally delete it 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.

Filing an Alternate Airport:

- if 1 hour before and 1 hour after time of intended landing at primary airport the weather is predicted to be below 2000' ceiling and 3 SM visibility. (1-2-3 rule ,Filing an alternate airport is required).
- Or if the primary airport does not have a published instrument approach. You always have to file an alternate airport regardless of the weather
- The exception to filing an alternate without an instrument approach is if a descent can be made from the MEA and land at the airport visually (VFR)

Alternate requirements

- When an alternate is required, check the approach plate to see if the airport can legally be filed as an alternate. Look for (A NA) It needs to have approved weather reporting.



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

- Alternate airport weather requirements at ETA : precision approach must have 600' AGL ceiling and 2 miles visibility. non-precision approach must have 800' ceiling and 2 miles visibility if no alternate weather minimums are published.

Pre-Flight Considerations and Review

- IFR Fuel Requirements: fuel to reach primary airport, shoot an approach, fly to alternate airport, and then 45-min thereafter at normal cruise power.
- Use personal minimums such as 1- 1 ½ hours of fuel instead.

Fuel Minimums

VFR – Destination plus 30 minutes

IFR – Destination with approach, plus alternate plus 45 minutes

Night VFR – 45 Minutes

Documents

Required Documents: ARROW

- Airworthiness Certificate
- Registration
- Radio License (International flight only)
- Operation Limitations (POH)
- Weight and Balance (Aircraft specific)

Flight review, Inspections & currency

• Biennial Flight Review	24 Calendar Months
• Medical Certificate	24 Calendar Months
• Transponder	24 Calendar Months
• Altimeter/Pitot/Static ¹	24 Calendar Months
• Annual	12 Calendar Months
• ELT ²	12 Calendar Months
• 100-Hour	100 hours-If for hire
• IFR Currency ³	6 Calendar Months
• VFR Currency ⁴	90 Days (same category and class)
• VOR Test ⁵	30 Days

1. *The Transponder/Mode C and the Altimeter/Pitot/Static test are usually performed concurrently and recorded under a single logbook endorsement.*
2. *ELT*
 - *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*
3. *VFR w/passengers*
 - *3 Take-offs and landings for day currency*
 - *3 Take-offs and landings to a full stop for night currency*
4. *IFR Currency*
 - *All VFR requirements*
 - *6 approaches in the past 6 months with holding, intercepting and tracking courses. Simulator or hood is acceptable.*



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

- There is a 6-month grace period if approaches are not completed within the previous 6 months; If not completed in next 6 months an instrument proficiency check by at least a CFII is required.
5. VOR Test Note date, place, bearing error, and signature
- Over airborne checkpoint: +/- 6°
 - Over ground checkpoint: +/- 4°
 - Against two VOR's: 4° maximum difference.
 - VOT test signal: +/- 4° -with 180° TO indication (182)360° from

I'd rather be down here wishing I was up there, than up there wishing I was down here.

A great pilot uses his skill to increase his safety margin not to flirt with it.

Instruments §91.205

Required Instruments

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		

Instrument cockpit check (Before Take-off)

Airspeed	Reads "0" on ground and is active on T/O
Attitude Indicator	+/- 5° within 5 minutes, banks no more than 5° 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° 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 nav aids if possible
Checklists	Complete all checklist including T/O checklists

Compass Errors and timed turns

Standard rate turns

360° 2 mi

270° 90 sec



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

- 180° 60 sec
- 90° 30 sec
- 30° 10 sec
- 10° 3.333 sec
- 3° 1sec
- 1° .333 sec

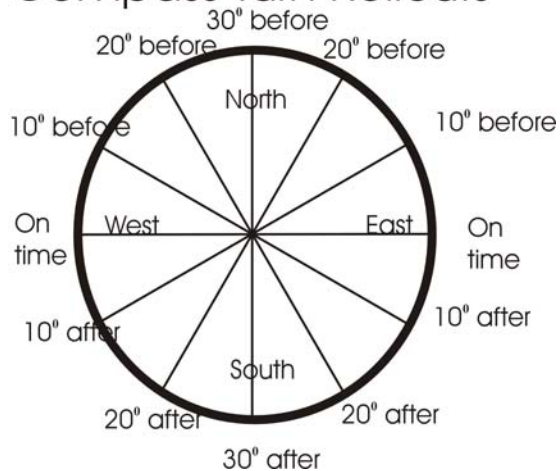
Compass errors

compass deviation- caused by metals and electrical accessories in aircraft

variation- Difference between true north and magnetic north

Magnetic dip- magnetic north is below horizon due to curvature of the earth.

Rollout before north after south Compass Turn Rollouts



Magnetic Dip Compass Errors “the old fashioned way”

- ANDS - When on an East or West heading, an acceleration of the aircraft shows turn toward North. Deceleration shows a turn towards the South
- When on a North heading, turning West initially indicates East turn. And an East Turn initially indicates a West heading
- UNOS- Undershoot (rollout Before) Northerly headings, [undershoot 060°/300° headings-10°- undershoot 030°/330° headings-20° undershoot northerly headings 30°]Overshoot Southerly headings. [overshoot 120°/240° headings-10°- overshoot 150°/210° headings-20° overshoot (Rollout After) southerly headings 30°]
- When using compass, banking more than 18° will cause compass to drag on the side of the case and give inaccurate readings

Attitude Indicator Errors- Vacuum Driven

- 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

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)



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

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

VOR Checks

VOT Transmits 360 deg radial 180/TO	4 degrees
Ground Check Point	4 degrees
Airborne Check	6 degrees
Airway Check	6 degrees
Dual Nav Check (air/Grd)	4 degrees between
Bench Check	

VOR signal I.D. every 15 seconds

DME signal I.D. every 30 seconds

VOR Types and Ranges

VOR (T)	25nm	1000-12,000 feet
VOR (L)	40nm	1000-18,000feet
VOR (H)	40nm	1000-14,500 feet
	100nm	14,500-18,000 feet
	130nm	18,000-45,000 feet
	100nm	45,000-60,000 feet

Navigational formulas

Diameter of a standard rate turn = airspeed x .0106

TC (-L + R) WCA = TH (-E +W) VAR = MH (+-) DEV = CH

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



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

Right Triangles Let the right angle be labelled C and the hypotenuse c . Let A and B denote the other two angles, and a and b the sides opposite them, respectively.

- 1 Pythagorean theorem: $a^2 + b^2 = c^2$.
- 2 Sines: $\sin A = a/c$, $\sin B = b/c$.
- 3 Cosines: $\cos A = b/c$, $\cos B = a/c$.
- 4 Tangents: $\tan A = a/b$, $\tan B = b/a$.

Basic trigonometry review

Opposite / Sine angle B = Hypotenuse (1/1 sin = 57.2986885)

(Opposite/adjacent) x inv tangent = angle B

Tangent B = Opposite / Adjacent

Trigonometric Method

Time off course / degrees off course (sine) = Time to station
minutes off course x TAS/60min /degrees off course (sine) = Distance to station

FAA method:

(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

Tenths to min/sec table

- .1 hours / min = 6 min/sec
- .2 hours / min = 12 min/sec
- .3 hours / min = 18 min/sec
- .4 hours / min = 24 min/sec
- .5 hours / min = 30 min/sec
- .6 hours / min = 36 min/sec
- .7 hours / min = 42 min/sec
- .8 hours / min = 48 min/sec
- .9 hours / min = 54 min/sec

NDB Types and Ranges

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

ADF Automatic Direction Finding

MH+RB=MB



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

MB-MH=RB

NOTAMS

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

Weather Minimums

- Take Off- None required except if a specific DP exists for part 91. Part 121 and 135 must comply with published take off minimums in the front of the Approach plate book
- Two engines or less 1 mile visibility (part 121/135) no ceiling requirement
- Three engines or more ½ mile visibility (part 121/135) no ceiling requirement
- 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.

Are you required to file an Alternate (use 1-2-3 rule)?

1. Forecast 1 Hour before thru after 1 hour after ETA
2. 2000 foot ceiling minimum
3. 3 miles visibility
4. or if no IAP at airport

What is required of the alternate airport?

- Approved to be filed as an alternate (see foot notes on approach plates)
- 800/2 for non-precision at ETA
- 600/2 for precision approaches at ETA
- If no Instrument approach, able to descend from MEA and land under VFR conditions

Why are some approaches not authorized for alternates?

1. Has no weather reporting capability
 2. Unmanned facility accuracy can not be guaranteed
- Look for the “A” in the (for the NA or not authorized for use as an alternate

How do we get established on an Approach?

- Radar Vectors to Final
- Fly to IAP
- Fly from a feeder route

Circling Approach Distant Mins.

- 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

Weather Information

HIWAS – Airmet, Sigmet, Convective Sigmet, CWA, UUA, AWW
TWEB – Transcribed weather enroute briefing
ASOS – Automated surface observation system



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

AWOS - Automated surface observation system
ATIS – Automated Terminal Information System
FSS – Flight Service station
EFAS/Flight Watch – Enroute Flight Advisory Service

- Airmet - Of significance to light aircraft, moderate turbulence, icing and winds, IFR 50% of the are, Mt. Obscurment
- Sigmet- Of significance to all aircraft, severe turbulence, icing and winds, Visibility below 3 miles, Volcanic ash, duststorms, sandstorms
- Convective Sigmet-Severe condition, LLWS, tornadoes, Line of Thunderstorms, embedded thunderstorms, hail better than $\frac{3}{4}$ " and winds better than 50 knots

Definitions

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 airspace.

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 preceded 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.

Non-Precision Approach is a standard instrument approach procedure in which no electronic glide slope is provided; for example NDB, VOR, TACAN, ASR, LDA, or SDF

Precision Approach is an IAP in which an electronic glideslope is provided such as a ILS, MLS, or PAR approaches.

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 overflying 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



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

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 30⁰ 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

Clearances

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

- **Clearance Limit Destination
- **Route A/F or Route, Normally "as filed"
- **Altitude Maybe an EFC
- Frequency Departure
- Transponder 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



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

- 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.
 - 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

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.

ATC- Pilot Navigation – Formerly SIDs

ATC- Radar Vectors - Formerly SIDs

Obstacle Clearance (front or TRPPS) note terrible "T"s (

Standard take off min = 1 mile Vis for 2 eng or less ½ mile Vis for more than 1 eng.

Climb rate = Ground speed/60 x feet/nm = climb rate

ENROUTE and ATC

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:



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

- 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

Non Radar

C= Change in ETA \pm 5 minutes

F= Final Approach inbound

Lost Communications? (IFH 11-5) FAR § 91.185

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 operating in VFR conditions at the time of the failure, the pilot should continue the flight under VFR and land as soon as practicable. If the failure occurs in IFR conditions, or if VFR conditions cannot be maintained, the pilot must continue the flight as follows:

Altitude for route segment (highest of)

M= Minimum IFR for route filed

E= Expected altitude to be assigned

A= Assigned Altitude

Route

A= Assigned Route

V= Vectors “direct to fix, route, or airway specified in vector clearance”



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

E= Expected, proceed as expected in absence of other clearance

F= Filed "route filed in flight plan"

Approach and descent at clearance limit:

1. If the clearance limit is an initial approach fix: commence descent or descent and approach at the expect-further-clearance time if one has been received;
 - a. if no "expect-further-clearance time", commence descent or descent and approach at the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route.
2. If the clearance limit is not a fix from which an approach begins, leave the clearance limit at the expect-further-clearance time if one has been received; or if none has been received, upon arrival over the clearance limit, and proceed to a fix from which an approach begins and commence descent or descent and approach as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route. While following these procedures, set the transponder to code 7600 and use all means possible to re-establish two-way radio communication with ATC. This includes monitoring navigational aids (NAVAIDs), attempting radio contact with other aircraft, and attempting contact with a nearby automated flight service station (AFSS).

Holding

Procedures

ATC instructions will always include:

1. Direction of holding from the fix in terms of the eight cardinal compass points (i.e., N, NE, E, SE, etc.).
2. Holding fix (the fix may be omitted if included at the beginning of the transmission as the clearance limit).
3. Radial, course, bearing, airway, or route on which the aircraft is to hold.
4. Leg length in miles if DME or area navigation (RNAV) is to be used (leg length will be specified in minutes on pilot request or if the controller considers it necessary).
5. Direction of turn if left turns are to be made, the pilot requests or the controller considers it necessary.
6. Time to **expect-further-clearance (EFC)** and any pertinent additional delay information.

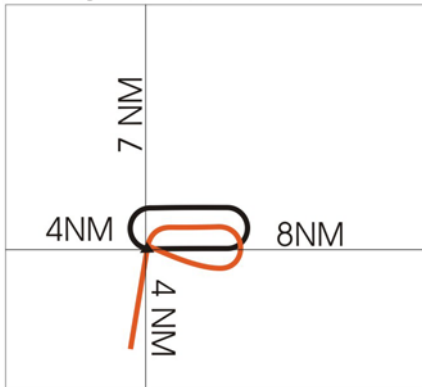
"Bonanza 8136R Hold northwest of the little rock VOR on the 045 radial; expect further clearance at 40 past the hour; time now 10 past the hour"

- 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, 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 180⁰ 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 to ATC when entering and leaving the hold
- The ATC instruction "Hold southwest of the fix" best describes the out bound leg heading
- 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



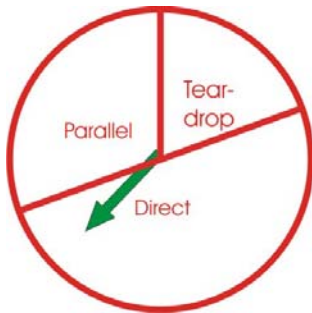
Geoff Hatcher MEI, CFII, ATP,
Westwind Type Rating
 1915 Biscayne Little Rock, AR 72227
 (501) 680-7283

Protected Hold Area is:
 Holding area protected space



Entering a Holding pattern

- 3 Types of entries into a hold are suggested depending on the holding patterns out bound heading relative to the present aircraft heading: Teardrop, Parallel, or Direct
- These types or entries are not required, just recommended.
- To determine the entry needed for standard holding patterns (right turns), mentally overlay the following over your Directional gyro or hsi.



if the outbound course(green arrow) is ahead and to the left, make a parallel entry(left turn always), ahead and to your right make a teardrop (turn to outbound heading- 30°), if it is behind make a direct entry (right turn always).

- 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).

Approaches

Types of Approaches

- **Visual Approach-** 3000 foot ceiling and 3 mile visibility, Field in sight or follow another A/C / must be VFR. ATC can assign
- **Contact Approach-** Pilot must request, Must have 1 mile visibility and COC. Must be able to safely 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-
- **Visual Decent Point-** Point at which you must level off until you acquire visual sight of the airport before continuing a decent.
- **VASI-** obstacle clearance 10 deg of centerline for 4 NM
 normal angle= 3.00 deg. red over white



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

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**

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.

Non-Precision Approaches

- 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 and ADF
- NDB/DME
- NDB (A)
- Arcing Approaches
- SDF – Simplified Directional Facility, No shading on the feather, Course width, 6_ or 12_, never have 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

Parallel Approaches

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

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 permitted if more than one MAP exists AIM 5-4-9



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

- Must have a control tower

Approach Plate Notes

- PV statue miles in quarters
- RVV in Statue miles ??
- RVR feet??

Standard if not published is 400 feet before beginning turns

Required to Land (hold at MDA)

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

Threshold

1. Threshold
2. Threshold Marks
3. Threshold Lights

Approaching Runway

1. REIL
2. VASI or equivalent
3. Touchdown Zone
4. Touchdown Zone Marks
5. Touchdown Zone Lights

Runway

1. Runway
2. Runway Marks
3. Runway Lights

Approach Speeds are Based on $V_{so} \times 1.3$

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

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

- **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.



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

- **Missed Approach** airspeed in V_x until clear of obstacles and then V_y .
- **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.

Airports

- Visual Runway
- **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

PROCEDURES

Proper Scan

Primary and secondary instruments

Timed Turns

- $\frac{1}{2}$ SRT 1.5_ per sec, 4 minutes for 360_
- SRT 3_ per sec, 2 minutes for 360_
- Compass Errors -



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

- Acceleration Error – ANDS: Accelerate North, decelerate South
- Turning Errors – UNOS: Undershoot North, Overshoot South

Partial Panel

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

DMC Arcing

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

When do I begin my Descent?

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

Airspace Review

Classes of Airspace

A	FL180 to FL 600 na
B	30 nm, 10,000 AGL, shaped to fit 3 mi, COC
C	10 nm, 4000 AGL 3 mi, 2 1/5
D	4 nm, 2500 AGL 3 mi, 2 1/5
E	700AGL or 1200 AGL to the underlying airspace 3 mi, 2 1/5, above 10K 5 1 1/1
G	SFC to 700 AGL or 1200 AGL above 10K 5 1 1/1 Day 1200-10K – 1, 2 1/5 Night 1200-10K – 3 2 1/5 Day Below 1200 – 1, COC Night Below 1200 – 3 2 1/5

Special Use Airspace (7 Types)

- Prohibited Area
- Restricted Area
- Alert Area
- Warning Area
- MOA
- PJA
- NSA
- (also TRSA)

Other Airspace (5 Types)

- MTR
- Airport Alert Areas
- TFR
- Parachute Jump Areas
- PVFR Routes

Weather Review



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

Review

Thunderstorm formation

Fog formation

Frontal Activity

Cloud Formations and types

Weather charts

Weather Forecasts

Weather Sources

Winds

KEY to AERODROME FORECAST (TAF) and AVIATION ROUTINE WEATHER REPORT (METAR)		
<p>TAF KPIT 091730Z 091818 15005KT 5SM HZ FEW020 WS010/31022KT FM1930 30015G25KT 3SM SHRA OVC015 TEMPO 2022 1/2SM +TSRA OVC008CB FM0100 27008KT 5SM SHRA BKN020 0VC040 PROB40 0407 1SM -RA BR FM1015 18005KT 6SM -SHRA OVC020 BECMG 1315 P6SM NSW SKC</p> <p>METAR KPIT 091955Z COR 22015G25KT 3/4SM R28L/2600FT TSRA OVC010CB 18/16 A2992 RMK SLP045 T01820159</p>		
Forecast	Explanation	Report
TAF	Message type: TAF -routine or TAF AMD -amended forecast, METAR -hourly, SPECI -special or TESTM -non-commissioned ASOS report	METAR
KPIT	ICAO location indicator	KPIT
091730Z	Issuance time: ALL times in UTC "Z", 2-digit date, 4-digit time	091955Z
091818	Valid period: 2-digit date, 2-digit beginning, 2-digit ending times	
	In U.S. METAR : COR rected ob; or AUTO ated ob for automated report with no human intervention; omitted when observer logs on	COR
15005KT	Wind: 3 digit true-north direction, nearest 10 degrees (or Var iable); next 2-3 digits for speed and unit, KT (KMH or MPS); as needed, G ust and maximum speed; 00000KT for calm; for METAR , if direction varies 60 degrees or more, V ariability appended, e.g. 180 V 260	22015G25K T
5SM	Prevailing visibility: in U.S., S tatute M iles & fractions; above 6 miles in TAF Plus6SM . (Or, 4-digit minimum visibility in meters and as required, lowest value with direction)	3/4SM
	Runway Visual Range: R ; 2-digit runway	R28L/2600



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

	designator Left, Center, or Right as needed; "/"; Minus or Plus in U.S, 4-digit value, Feet in U.S. (usually meters elsewhere); 4-digit value Variability 4-digit value (and tendency Down, Up or No change)	FT
HZ	Significant present, forecast and recent weather: see table (below)	TSRA
FEW020	Cloud amount, height and type: SKY Clear 0/8, FEW >0/8-2/8, SCaTtered 3/8-4/8, BroKeN 5/8-7/8, OVerCast 8/8; 3-digit height in hundreds of ft; Towering CUmulus or CumulonimBus in METAR ; in TAF , only CB . Vertical Visibility for obscured sky and height "VV004". More than 1 layer may be reported or forecast. In automated METAR reports only, CLear for "clear below 12,000 feet"	OVC010CB
	Temperature: degrees Celsius; first 2 digits, temperature "/" last 2 digits, dew-point temperature; Minus for below zero, e.g., M06	18/16
	Altimeter setting: indicator and 4 digits; in U.S., A -inches and hundredths; (Q -hectoPascals, e.g. Q1013)	A2992
WS010/31022 KT	In U.S. TAF , non-convective low-level (<=2,000 ft) Wind Shear ; 3-digit height (hundreds of ft); "/", 3-digit wind direction and 2-3 digit wind speed above the indicated height, and unit, KT	
	In METAR , ReMarK indicator & remarks. For example: Sea-Level Pressure in hectoPascals & tenths, as shown: 1004.5 hPa; Temp/dew-point in tenths °C, as shown: temp 18.2°C, dew-point 15.9°C	RMK SLP045 T01820159
FM1930	From and 2-digit hour and 2-digit minute beginning time: indicates significant change. Each FM starts on a new line, indented 5 spaces.	
TEMPO 2022	TEMPORary : changes expected for < 1 hour and in total, < half of 2-digit hour beginning and 2-digit hour ending time period	
PROB40 0407	PROBability and 2-digit percent (30 or 40): probable condition during 2-digit hour beginning and 2-digit hour ending time period	



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

BECMG 1315	BECOMING: change expected during 2-digit hour beginning and 2-digit hour ending time period	
-------------------	--	--

Table of Significant Present, Forecast and Recent Weather - Grouped in categories and used in the order listed below; or as needed in TAF, No Significant Weather.

QUALIFIER

Intensity or Proximity

- Light "no sign" Moderate + Heavy
 VC Vicinity: but not at aerodrome;
 in U.S. **METAR**, between 5 and 10SM of the point(s) of observation;
 in U.S. **TAF**, 5 to 10SM from center of runway complex (elsewhere within 8000m)

Descriptor

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

WEATHER PHENOMENA

Precipitation

DZ Drizzle grains	RA Rain	SN Snow	SG Snow
IC Ice crystals hail/snow pellets	PL Ice pellets	GR Hail	GS Small

UP Unknown precipitation in automated observations

Obscuration

BR Mist (>= 5/8SM)	FG Fog (< 5/8SM)	FU Smoke	VA Volcanic
SA Sand dust	HZ Haze	PY Spray	DU Widespread

Other

SQ Squall developed	SS Sandstorm	DS Duststorm	PO Well
FC Funnel cloud whirls	+FC tornado/waterspout		dust/sand

Explanations in parentheses "(")" indicate different worldwide practices.
Ceiling is not specified; defined as the lowest broken or overcast layer, or the vertical visibility.
NWS TAFs exclude turbulence, icing & temperature forecasts; NWS METARs exclude trend fcsts
Although not used in US, Ceiling And Visibility OK replaces visibility, weather and clouds if: visibility >=10km; no cloud below 5000 ft (1500m) or below the highest minimum sector altitude, whichever is greater and no CB; and no precipitation, TS, DS, SS, MIFG, DRDU, DRSA, or DRSN.

FAR's

- Airspeeds Class C and D airspace below 2500 and W/I 4-NM from primary airport reduce to below 200 knots.
- Airspeed is 250 in Class B and 200 below class B.
- CFII may log actual while instructing under actual conditions
- Recency for Instruments: in last 6 months



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

- 6 approaches aircraft or simulated or actual conditions
- Holds
- Intercept and track a radial
- ON re-currency, log (**location, type of approach, name of safety pilot**)
- If beyond 6 months may take a safety pilot to get currency
- If beyond 12 months must complete a proficiency check outlined in PTS, and a CFII or examiner can perform it.
- If not current can not take passengers beyond 50 NM or at night

Pre-Flight Requirements

- Weather, current and forecasts, enroute and destination
 - Fuel requirements
 - Traffic delays
 - Runway lengths and lighting available at destination airports
 - Take off distance information and weights and balances
-
- 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.
 - Instrument clearance required above FL 180
 - DME required above FL 240

Oxygen Requirements

- Above 15,000 feet
- 14,000 to 15,000 feet
- 12,500 to 14,000 feet -
- below 12,500 feet – none required

Questions

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.*

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: 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.*

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 (IMI) probably has the VOR-B approach.*

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 only. You may land at any airport when it is above or equal to minimums.*



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

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: 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.*

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.*

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.*

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: In IMC, can a pilot fly to the FAF and drop immediately to the MDA without regard to decent gradient?

A: *No, to ensure safe obstacle clearance you must not exceed an 8⁰ 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.*

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

A: A displaced threshold.

A/F D Review

Know the 11 Sections without looking and have a general understanding of why they are there.

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



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

10. Chart Bulletins
11. Airport Diagrams

Read an entire page and be able to decipher it without using the legend.

Amarillo
Sanantonio
Little Rock
Abilene
Albuquerque
Alexandria LA
Altus AFB OK
Austin Bergstrom
Batroun Metropolitan
Beaumont-Port Arthur
New Orleans -Lakefront
Vicksburg

Know the chart symbols on all of the diagrams

Mnemonics

Required Inspections “AVIATES”

- A**= Annual inspection
- V**= VOR (w/I 30 day for IFR flight)
- I**= 100 hour inspection
- A**= Altimeter (2 yrs)
- T**= Transponder (2 yrs)
- E**= ELT (1 yr or 1/2 useful life of battery)
- S**= Static & Pitot System (2 yrs)

VFR Equipment Required (part 91) “Tomato Flames”

- T**= Tachometer
- O**= Oil Pressure Gauge
- M**= magnetic Compass
- A**= Airspeed Indicator
- T**= Temperature Indicator for Liquid cooled engines
- O**= Oil Temperature for Air Cooled engines
- E**= ELT

- F**= Fuel Quantity Indicator
- L**= Landing gear Position Indicator
- A**= Altimeter
- M**= Manifold pressure Gauge for altitude engine
- E**= Equipment for floatation if flying out of glide to land
- S**= Seat Belts

Required Additional Instruments for Instrument IFR Flight “GRAB CARD”

- G**= Generator
- R**= Radios



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

A= Altimeter

B= Ball of Turn Coordinator

C= Clock

A= Attitude Indicator

R= Rate of Turn Indicator (Turn Coordinator)

D= Directional Gyro

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

Station Passage 5 T's

T= Time

T= Turn

T= Twist

T= Throttle

T= Talk

Wave fronts

Occluded fronts

Temperature inversions

Dry adiabatic lapse rate

Ice pellets indicate that a warm front is about to pass

WFO weather forecast office

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

Tafs are issued 4 times a day valid for 24 hours

Aviation Weather Service (AWS) prepares FAs (Aviation Area Forecast) 3 times a day

They must be wise enough, educated enough to understand the risks involved, and most importantly willing to participate

Maintaining Instrument Proficiency

- To meet Recency of experience requirement for instruments flight, you must have intercepted and tracked courses through the use of navigation systems, performed holding procedures, and flown at least six instrument approaches within the preceding six calendar months.
- If you do not meet the instrument currency requirements within six calendar months or within six calendar months after that, you must pass an instrument proficiency check.



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

ADVANCED HUMAN FACTORS CONCEPTS

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.

Pilot-In-Command Responsibility

- You are the final authority in the airplane you are flying. Pilots responsibilities must be defined before the flight.

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.

Communication

- 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.

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.
-

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.



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

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

- **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

Flight Instrument Systems (Chapter 2)

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.

Turn Coordinator (Vacuum driven)

- Provides an indication of the aircraft's rate of movement about the yaw and roll axes.
- 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.

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.



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

- During acceleration, the horizon bar moves down, indicating a climb, and during deceleration, the instrument may indicate a slight descent.

Heading Indicator (Electric)

- Must be periodically realigned with the magnetic compass.
- Is your primary source of heading information.

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.

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

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.**

Types of Altitude

- 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.

ATTITUDE INSTRUMENT FLYING

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.



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

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

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.

Unusual Attitude Recovery

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.

INSTRUMENT NAVIGATION (CHAPTER 2)

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.



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

- Horizontal Situation Indicator (HSI); Radio Magnetic Indicator (RMI)
- 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.

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.

VOR Checks

- Every 30 day; VOR checkpoints or VOT (test facilities)
- ± 4 ; and ± 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.
- **[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)

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 and settles at or near the 180 degree position.

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.

Flight Environment (Chapter 3)

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)



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

- 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 from the threshold.
- Pulsating visual approach slope indicator (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.

Weather Minimums for controlled and uncontrolled airspace.

- No person may operate an aircraft beneath the ceiling under VFR within the lateral boundaries of controlled airspace designated to the surface for an airport when the ceiling is less than 1,000 ft. and ground visibility at that airport is at least 3 statute miles.

Special VFR Weather Minimums; operations may only be conducted—

- With an ATC Clearance; Clear or clouds; flight visibility is at least 1sm; between sunrise & sunset
- Unless; pilot and aircraft is IFR

Special Use Airspace:

- Prohibited Areas; Restricted Areas; Warning Areas; Military Operations Areas; Alert Areas; Controlled Firing Areas

Other Airspace Areas;

- Airport Advisory/Information; Military Training Routes; Temporary Flight Restrictions; Parachute Jump Aircraft Operations; Published VFR Routes; Terminal Radar Service Area; National Security Areas.
- Military Training Routes; 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.

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

Air Traffic Control System

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.



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

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

- 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 statute 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***



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

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 plan 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 you 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 statute mile, and you must be able to remain clear of clouds with at least one statute 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 statute 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



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

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.

DEPARTURE (CHAPTER 4)

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.



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

- 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. 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.
- **Prevailing Visibility**—is the greatest distance a weather observer or tower personnel can see throughout one-half the horizon.
- **Runway Visibility Value (RVV)** - is the distance down the runway you can see unlighted objects or unfocused lights of moderate intensity; if is reported in statute 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 values to visibility in statute miles.
- 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.

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.



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

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.

ENROUTE (Chapter 5)

- 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

Airways:

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



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

- 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.

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.

ENROUTE PROCEDURE

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.

Required Reports: At all times;

- Leaving an 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)

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)

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.



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

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.

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).

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.



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

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.
 - **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.
- 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 than those in FAR 91.117.

APPROACH CHARTS (Chapter 7)

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 many 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 slope, as well as horizontal course guidance. A **Non-Precision Approach**, such as a VOR or NDB approach, provides horizontal course guidance with no 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.



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

- 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.

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:



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

- 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 as possible after sighting the sidestep runway environment.

Alternate Airport:

- If the forecast weather at your estimated time of arrival, plus or minus **1 hour**, indicates a ceiling of less than **2,000 feet** or a visibility of less than **3 miles**, you must list an alternate airport on your IFR flight plan.
- Standard alternate minimums when a **precision approach** is available are a **600-foot ceiling** and **2 statute miles** visibility. When only **non-precision approaches** are available, an **800-foot ceiling** and **2 statute miles** apply.

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 Touchdown (HAT)** listed after the visibility requirement
- When on the glide slope during a precision approach, the missed approach point is the decision height.
- **Aircraft Approach Categories** used to determine landing minimums are based on approach speed. This speed is 130% of the aircraft's power-off stall speed in the landing configuration at the maximum certificated landing weight (**1.3 V_{so}**). 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).

APPROACH CHARTS (Chapter 7)

- 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 statute miles visibility.
- **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.
- The minimum altitude to which you can descend during a non-precision approach is shown as a **Minimum Descent Altitude (MDA)**.
- For **Timed Approaches**, use conversion tables to provide various elapsed times to the MAP based on the aircraft's groundspeed.

APPROACH PROCEDURES (SECTION B)

Preparing for an Approach:



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

- 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.

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.

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.

APPROACH PROCEDURES (Chapter 7)

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.

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.



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

- **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 ***
 - VASI**
 - Touchdown Zone, Markings, Lights**
 - Threshold, markings, lights**
 - Runway End Identifier 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.
- **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 from 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.

Missed Approaches:

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

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.
- **Chartered 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.

INSTRUMENT APPROACHES (Chapter 8)

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 nav aids, 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.



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

- 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.

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.

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 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 marker, 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 two 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.



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

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 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.

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.

GPS and RNAV Approaches (Chapter 8)

GPS and RNAV APPROACHES (SECTION C)

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)



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

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 you 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.

Meteorology (Chapter 9)

Atmosphere: 78% nitrogen 21% oxygen 1% other

Circulation—refers to the movement of air relative to the earth's 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 known 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 earth's surface slows 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.



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

- 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.

- 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)

Weather Hazards (Chapter 9)

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.

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.



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

- 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. ; lightning 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 Mixture of the two. Frost

Weather Reports & Forecast (Chapter 9)

METAR (Aviation Routine Weather Report): METAR taken every hour & **(SPECI)** unscheduled.

- Winds reported are referenced to true north. **0000KT** = Calm; if the wind direction varies 60 degrees or more and speed is above six knots direction is separated by a **V**, if less than 6 knots **“VRB”**
- Peak gust are denoted by a number following a **“G”** after the wind direction and base speed.
- Visibility is reported in statute 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.

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

PRINTED WEATHER FORECAST

TAF (Terminal Aerodrome Forecast); your best sources for an estimate of what the weather will be in the future.

- Usually valid for a 24-hour period and are scheduled four times a day (0000Z, 0600Z, 1200Z, 1800Z)
- **“BECMG”** = a gradual change in the weather
- **“FM”** = a rapid 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.
- Cumulonimbus clouds are the only cloud type included. **“CB”**
- **“WS”** = low-level wind shear not associated with convective activity; WS015/30045kt = wind shear is expected at 1,500 ft with wind from 300 at 45 kts.

FA (Aviation Area Forecast): conditions over a wide region (several states) and is a good source of information for enroute weather. FA's are issued three times a day.



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

- **“OTLK”** = the outlook for a specific period of time.
- **“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.
- The **HAZARDS** section lists hazards to aviation, such as turbulence and icing, for selected areas.

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.

SEVERE WEATHER REPORTS AND FORECAST

AIRMETS (Airmen’s Meteorological Information): issued every 6 hours w/ amendments as necessary.

Moderate icing, turbulence, sustained winds of 30 kts or more at the surface, ceilings less than 1,000 ft and/or visibility less than 3 miles affecting over 50 percent of an area at any one time, and 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): issued for hazardous weather (other than convective activity) to all aircraft.

- Sever icing, sever or extreme turbulence, duststorms, sandstorms, volcanic eruption and volcanic ash lowering visibility to less than three miles.
- Use alphanumeric designators November through Yankee

Convective SIGMET (WSTs): always imply sever or greater turbulence, sever icing, and low-level wind shear.

- Tornadoes, lines of thunderstorms, thunderstorms over a wide area, embedded thunderstorms, hail greater than or equal to 3/4 inch in diameter, and/or wind gust to 50 knots or greater.
- 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 and valid for 2 hours from the time of issuance or until it is superseded by the next hourly issuance.

Weather Reports & Forecast (Chapter 9)

GRAPHIC REPORTS

Surface Analysis Chart: shows weather conditions as of the valid time shown on the chart

- You can get a picture of 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.

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.

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.

GRAPHIC FORECASTS



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

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.

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

Forecast Winds and Temperatures Aloft Chart:

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

PREFLIGHT WEATHER SOURCES

- Flight Service Station (FSS), National Weather Service (NWS), DUATS, and internet.

Flight Service Stations (FSS):

- Weather briefings; Standard, Abbreviated, Outlook, and Inflight
- 122.2; Airport Advisory/Information (Local Airport Advisory LLA) 123.6;

In-Flight Weather Sources:

- **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.
- **Transcribed Weather Broadcast (TWEB):** including winds aloft and route forecast for a cross-country flight.
- **Hazardous In-Flight Weather Advisory Service (HIWAS):** such as AIRMETs, SIGMETs, Convective SIGMETs, and urgent PIREP. When a HIWAS is updated, ARTCC and terminal facilities will broadcast an alert on all but emergency frequencies.
- **Automated Weather Observing System (AWOS):** 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.
- **Automated Surface Observation System (ASOS):** 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.

IFR Emergencies (Chapter 10)

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



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

- **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.

IFR Decision Making Section B (Chapter 10)

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.

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:



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

- 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.

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.

IFR Flight Planning (Section C)

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 obtained from the FSS.

Navigation:

- For IFR flight, you are required to have working navigation equipment appropriate to the ground facilities to be used.
- It is your responsibility as pilot in command to make sure that the **VOR check** has been accomplished within the past 30 days, and the transponder has been checked within the past 24 calendar months. Transponder checks must be entered in aircraft logbooks. There also must be a written record of the VOR test, which includes the date, place, bearing error, and the signature of the person performing the test.

Flying and Flying Your Flight Plan:

- 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.
- If you actually proceed to the selected alternate, then the landing minimums used at that airport should be the minimums specified for the approach procedure selected.

Federal Aviation Regulations (Chapter 11)

When an Instrument Rating is Required:

- In weather conditions less than the minimum for VFR flight, or in Class A airspace. An instrument rating is for any flight on 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.

Instrument Currency:



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

- Within **six months**, perform at least six instrument approaches, holding procedures, and intercepting and tracking courses through the use of navigation systems. These procedures must be performed and logged under actual or simulated instrument conditions, either in flight in the appropriate category of aircraft for the instrument privileges sought or in a flight simulator or flight training device that is representative of the aircraft category of the instrument privileges sought.
- You have an **additional six months** in which to gain the necessary instrument experience, with the help of a safety pilot or CFII, or using a simulator. After that time, you must pass an instrument proficiency check before you can again act as PIC under IFR.
- An **instrument proficiency check** must be given by an approved FAA examiner, instrument instructor, or FAA inspector. After successfully completing an instrument proficiency check, you remain current for 6 months even if no further IFR flights are made.

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.

General Operating and Flight Rules (Section B)

Preflight Planning:

- PIC **before beginning a flight**, become familiar with all available information concerning that flight. For a **flight not in the vicinity** of an airport, this information must specifically include weather reports and forecast, fuel requirements, alternatives available if the planned flight cannot be completed, and any known traffic delays of which the pilot in command has been advised by ATC. For **any flight**, determine the runway lengths at airports of intended use, and takeoff and landing distance information for the aircraft.
- An **alternate airport** must be listed in an IFR flight plan when the forecast ceiling and visibility is less than 2,000 feet and 3 statute miles (SM), from 1 hour before to 1 hour after the ETA.
- An alternate with a **non-precision approach**, the forecast at the ETA must be at least an 800 foot ceiling and 2 SM. A **precision approach**, the forecast at the ETA must be at least an 600 foot ceiling and 2 SM. **No approach**, the forecast must allow descent from the MEA, approach, and landing under basic VFR.
- If you need to file an alternate, carry enough **fuel** to arrive at the first airport of intended landing, fly from that airport to the alternate airport, and fly thereafter for 45 minutes at normal cruising speed.
- 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.

Federal Aviation Regulations (Chapter 11)

IFR Clearance Required:

- You may not enter controlled airspace under IFR unless you file a flight plan and receive a clearance prior to entering controlled airspace.
- For flight in Class A airspace.
- A pilot on an IFR flight plan is responsible for avoiding other aircraft whenever conditions permit.

Transponder Required:

- In all controlled airspace at and above 10,000 feet MSL, within and above Class C airspace, and at any altitude within 4nm of the primary airport, Class B and the 30nm mode C veil, ADIZ.

Oxygen Requirements:



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

- Above 12,500ft = flight crew if beyond 30 minutes
- Above 14,000ft = supplemental oxygen for all crew members
- Above 15,000ft = for all passengers.

Other Regulations:

- Electronic devices is 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.

Building Professional Experience (Chapter 1) Questions

Answers: 1. A, 2. A, 3. C, 4. A, 5. B, 6. B, 7. C, 8. C, 9. B, 10. C, 11. C, 12. B

- 1. Without visual aid, a pilot often interprets centrifugal force as a sensation of**
 - A. rising or falling
 - B. Turning
 - C. Motion reversal

- 2. Abrupt head movement during a prolonged constant rate turn in IMC or simulated instrument conditions can cause**
 - A. Pilot disorientation
 - B. False horizon
 - C. Elevator illusion

- 3. A sloping cloud formation, an obscured horizon, and a dark scene spread with ground lights and stars can create an illusion known as**
 - A. elevator illusions
 - B. Autokinesis
 - C. False horizons

- 4. An abrupt change from climb to straight and level flight can create the illusion of**
 - A. tumbling backwards
 - B. A nose up attitude
 - C. A descent with the wings level

- 5. A rapid acceleration during takeoff can create the illusion of**



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

- A. spinning in the opposite direction
- B. Being in a nose up attitude
- C. Diving into the ground

6. Why is hypoxia particularly dangerous during flights with one pilot?

- A. Night vision may be so impaired that the pilot cannot see other aircraft
- B. Symptoms of hypoxia may be difficult to recognize before the pilots reaction are affected
- C. The pilot may not be able to control the aircraft even if using oxygen

7. the sensations which lead to spatial disorientation during instrument flight conditions

- A. are frequently encountered by beginning instrument pilots, but never by pilots with moderate instrument experience
- B. Occur, in most instances, during the initial period of transition from visual to instrument flight.
- C. Must be suppressed and complete reliance placed on the indications of the flight instruments.

8. How can an instrument pilot best overcome spatial disorientation?

- A. Rely on kinesthetic sense
- B. Use a very rapid cross-check
- C. Read and interpret the flight instruments, and act accordingly.

9. How can an instrument pilot best overcome spatial disorientation?

- A. Use a very rapid cross-check
- B. Properly interpret the flight instruments and act accordingly.
- C. Avoid banking in excess of 30 degrees

10. A pilot is more subject to spatial disorientation if

- A. kinesthetic senses are ignored
- B. Eyes are moved often in the process of cross-checking the flight instruments.
- C. Body signals are used to interpret flight attitude.

11. Which procedure is recommended to prevent or overcome spatial disorientation?

- A. Reduce head and eye movements to the extent possible
- B. Rely on the kinesthetic sense.
- C. Rely on the indications of the flight instruments.

12. What action should be taken if hyperventilation is suspected?

- A. Breathe at a slower rate by taking very deep breaths.
- B. Consciously breathe at a slower rate than normal.
- C. Consciously force yourself to take deep breaths and breathe at a faster rate than normal.

Instrument Flight (Chapter 2) Questions

1. An aircraft altimeter system test and inspection must be accomplished within

- A. 12 calendar months
- B. 18 calendar months
- C. 24 calendar months



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

- 2. An aircraft operated under part 91 IFR is required to have which of the following?**
 - A. Radar altimeter
 - B. Dual VOR system
 - C. Gyroscopic direction indicator.

- 3. Under what condition is pressure altitude density altitude the same value?**
 - A. At standard temperature
 - B. When the altimeter setting is 29.92" Hg.
 - C. When indicated, and pressure altitudes are the same value on the altimeter.

- 4. Which of the following defines the types of altitude used when maintaining FL 210?**
 - A. Indicated
 - B. Pressure
 - C. Calibrated

- 5. If both the ram air input and drain hole of the pitot system are blocked, what airspeed indication can be expected?**
 - A. No variation of indicated airspeed in level flight even if large power changes are made.
 - B. Decrease of indicated airspeed during a climb
 - C. Constant indicated airspeed during a descent

- 6. What indication should be observed on a turn coordinator during a left turn while taxiing?**
 - A. the miniature aircraft will show a turn to the left and the ball remains centered.
 - B. The miniature aircraft will show a turn to the left and the ball moves to the right
 - C. Both the miniature aircraft and the ball will remain centered

- 7. What does the miniature aircraft of the turn coordinator directly display?**
 - A. Rate of roll and rate of turn
 - B. Angle of bank and rate of turn
 - C. Angle of bank

- 8. What force causes an airplane to turn?**
 - A. Rudder pressure or force around the vertical axis
 - B. Vertical lift component
 - C. Horizontal lift component

- 9. What causes the northerly turning error in a magnetic compass?**
 - A. Coriolis force at the mid-latitudes
 - B. Centrifugal force acting on the compass card
 - C. The magnetic dip characteristic

- 10. if a standard rate turn is maintained, how long would it take to turn 180 degrees?**
 - A. 1 minute
 - B. 2 minutes
 - C. 3 minutes

- 11. During flight, if the pitot-tube becomes clogged with ice, which of the following instruments would be affected?**
 - A. The airspeed indicator only
 - B. The airspeed indicator and the altimeter
 - C. The airspeed indicator, altimeter, and Vertical Speed Indicator.



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

- 12. When an aircraft is accelerated, some attitude indicators will precess and incorrectly indicate a**
- A. Climb
 - B. Descent
 - C. Right turn
- 13. The rate of turn at any airspeed is dependent upon**
- A. the horizontal lift component
 - B. The vertical lift component
 - C. Centrifugal force
- 14. What is the initial primary bank instrument when establishing a level standard rate turn?**
- A. Turn coordinator
 - B. Heading indicator
 - C. Attitude indicator
- 15. Rate of turn can be increased and radius of turn decreased by**
- A. Decreasing airspeed and shallowing the bank
 - B. Decreasing airspeed and increasing the bank
 - C. Increasing airspeed and increasing the bank
- 16. For maintaining level flight at constant thrust, which instrument would be the least appropriate for determining the need for a pitch change?**
- A. Altimeter
 - B. VSI
 - C. Attitude indicator
- 17. When must an operational check on the aircraft VOR equipment be accomplished when used to operate IFR?**
- A. Within the preceding 10 days or 10 hrs of flight time
 - B. Within the preceding 30 day or 30 hrs of flight time
 - C. Within the preceding 30 days.
- 18. Which checks and inspections of flight instruments or instrument systems must be accomplished before an aircraft can be flown under IFR?**
- A. VOR within 30 days, altimeter systems within 24 calendar months, and transponder within 24 calendar months
 - B. ELT within 30 days, altimeter systems within 12 calendar months, and transponder within 24 calendar months
 - C. VOR within 24 calendar months, altimeter systems within 12 calendar months, and transponder within 24 calendar months
- 19. What minimum navigation equipment is required for IFR flight?**
- A. VOR/LOC receiver, transponder, and DME
 - B. VOR receiver and, if in ARTS 111 environment, a coded transponder equipped for altitude reporting.
 - C. Navigation equipment appropriate to the ground facilities to be used.
- 20. When using VOT to make a VOR receiver check, the CDI should be centered and the OBS should indicate that the aircraft is on the**
- A. 090 radial
 - B. 180 radial



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

C. 360 radial

21. When the CDI needle is centered during an airborne VOR check, the omnibearing selector and the TO/FROM indicator should read

- A. Within 4 of the selected radial
- B. Within 6 of the selected radial
- C. 0 TO, only if you are due south of the VOR

22. Where can the VOT frequency for a particular airport be found?

- A. On the IAP Chart and in the A/FD
- B. Only in the A/FD
- C. In the A/FD and the A/G Voice Communication Panel of the En Route Low Altitude Chart.

23. A particular VOR station is undergoing routine maintenance. This is evidenced by

- A. Removal of the navigational feature.
- B. Broadcasting a maintenance alert signal on the voice channel
- C. Removal of the identification feature

24. Which of the following is required equipment for operating an aircraft within Class B airspace?

- A. A 4096 code transponder with automatic pressure altitude reporting equipment.
- B. A VOR receiver with DME
- C. A 4096 code transponder

25. What angular deviation from a VOR course centerline is represented by a full-scale deflection of the CDI?

- A. 4 degrees
- B. 5 degrees
- C. 10 degrees

26. For IFR operations off of established airways below 18,000 ft, VOR navigational aids used to describe the “route of flight” should be no more than

- A. 80 NM apart
- B. 40 NM apart
- C. 70 NM apart
- D.

Answers: 1. C, 2. C, 3. A, 4. B, 5. A, 6. B, 7. A, 8. C, 9. C, 10. A, 11. A, 12. A, 13. A, 14. C, 15. B, 16. C, 17. C, 18. A, 19. C, 20. C, 21. B, 22. C, 23. C, 24. A, 25. C, 26. A

Flight Environment (Chapter 3) Questions

1. Where is DME required under IFR?

- A. At or above 24,000 ft MSL if VOR navigational equipment is required.



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

- B. In positive control airspace.
- C. Above 18,000 ft MSL.

2. What is the purpose of FDC NOTAM's?

- A. To provide the latest information on the status of navigation facilities to all FSS facilities for scheduled broadcasts.
- B. To issue notices for all airports and navigation facilities in the shortest possible time.
- C. To advise of changes in flight data which affect instrument approach procedure (IAP), aeronautical charts, and flight restrictions prior to normal publication.

3. When are ATIS broadcasts updated?

- A. Every 30 minutes if weather conditions are below basic VFR; otherwise, hourly.
- B. Upon receipt of any official weather, regardless of content change or reported values.
- C. Only when the ceiling and/or visibility changes by a reportable value.

4. Absence of the sky condition and visibility on an ATIS broadcast specifically implies that

- A. The ceiling is more than 5,000 feet and visibility is 5 miles or more.
- B. The sky condition and visibility is unrestricted.
- C. The ceiling is at least 3,000 ft and visibility is 5 miles or more.

5. The operation of an airport rotating beacon during daylight hours may indicate that

- A. The in-flight visibility is less than 3 miles and the ceiling is less than 1,500 ft within Class E airspace.
- B. The ground visibility is less than 3 miles and/or the ceiling is less than 1,000 ft in Class B, C, or D airspace.
- C. An IFR clearance is required to operate within the airport traffic area.

6. Class G airspace is that airspace where

- A. ATC does not control air traffic.
- B. ATC controls only IFR flights.
- C. The minimum visibility for VFR flight is 3 miles.

7. When should pilots state their position on the airport when calling the tower for takeoff?

- A. When visibility is less than 1 mile.
- B. When parallel runway are in use.
- C. When departing from a runway intersection.

8. What minimum aircraft equipment is required for operation within Class C airspace?

- A. Two-way communications and Mode C transponder.
- B. Two-way communications.
- C. Transponder and DME

9. Which runway marking indicates a displaced threshold on an instrument runway?

- A. Arrows leading to threshold mark.
- B. Centerline dashes starting at the threshold.
- C. Red chevron marks in the non-landing portion of the runway.

10. Which type of runway lighting consists of a pair of synchronized flashing lights, one on each side of the runway threshold?

- A. RAIL
- B. HIRL
- C. REIL



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

- 11. The 'runway hold position' sign denotes**
- A. intersecting runways.
 - B. An entrance to runway from a taxiway.
 - C. An area protected for an aircraft approaching a runway.
- 12. When should your transponder be on Mode C while on an IFR flight?**
- A. Only when ATC requests Mode C
 - B. At all times if the equipment has been calibrated, unless requested otherwise by ATC
 - C. When passing 12,500 ft MSL.
- 13. During a takeoff into IFR conditions with low ceilings, when should the pilot contact departure control?**
- A. Before penetrating the clouds.
 - B. When advised by the tower.
 - C. Upon completing the first turn after takeoff or upon establishing cruise climb on a straight-out departure.

Flight Environment (Chapter 3) Questions

- 14. When may a pilot file a composite flight plan?**
- A. When requested or advised by ATC.
 - B. Anytime a portion of the flight will be VFR.
 - C. Anytime a landing is planned at an intermediate airport.
- 15. When is an IFR Flight plan required?**
- A. When less than VFR conditions exist in either Class E or Class G airspace and in Class A airspace.
 - B. In all Class E airspace when conditions are below VFR, in Class A airspace, and in defense zone airspace.
 - C. In Class E airspace when IMC exists or in Class A airspace.
- 16. Where are VFR-on-Top operations prohibited?**
- A. In a Class A airspace.
 - B. During off-airways direct flights.
 - C. When flying through Class B airspace.
- 17. When on a VFR-on-Top clearance the cruising altitude is based on**
- A. True course
 - B. Magnetic course.
 - C. Magnetic heading.
- 18. A contact approach is an approach procedure that may be used**
- A. In lieu of conducting a SIAP
 - B. If assigned by ATC and will facilitate the approach.
 - C. In lieu of a visual approach.
- 19. When is radar service terminated during a visual approach?**
- A. Automatically when ATC instructs the pilot to contact the tower.
 - B. Immediately upon acceptance of the approach by the pilot.
 - C. When ATC advises, "Radar service terminated; resume own navigation."
- 20. When may you obtain a contact approach?**
- A. ATC may assign a contact approach if VFR conditions exist or you report the runway in sight and are clear of clouds.



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

- B. ATC may assign a contact approach if you are below the clouds and the visibility is at least 1 mile.
- C. ATC will assign a contact approach only upon request if the reported visibility is at least 1 mile.

21. What responsibility does the pilot in command of an IFR flight assume upon entering VFR conditions?

- A. Report VFR conditions to ARTCC so that an amended clearance may be issued.
- B. Use VFR operating procedures.
- C. To see and avoid other traffic.

22. In which airspace is VFR-On-Top operation prohibited?

- A. Class B airspace
- B. Class E airspace
- C. Class A airspace

Answers: 1. A, 2. C, 3. B, 4. A, 5. B, 6. A, 7. C, 8. A, 9. A, 10. C, 11. A, 12. B, 13. B, 14. B, 15. C, 16. A, 17. B, 18. A, 19. A, 20. C, 21. C, 22. C

Departure Procedures (Chapter 4) Questions

1. When ATC has not imposed any climb or descent restrictions and aircraft are within 1,000 ft of assigned altitude, pilots should attempt to both climb and descend at a rate of between

- A. 500 ft per minute and 1,000 ft per minute.
- B. 500 ft per minute and 1,500 ft per minute.
- C. 1,000 ft per minute and 2,000 ft per minute

2. What action is recommended if a pilot does not wish to use an instrument departure procedure?

- A. Advise clearance delivery or ground control before departure.
- B. Advise departure control upon initial contact.
- C. Enter "No DP" in the REMARKS section of the IFR flight plan.

3. A particular instrument departure procedure requires a minimum climb rate of 210 feet per NM to 8,000 feet. If you climb with a groundspeed of 140 knots, what is the rate of climb required in feet per minute?

- A. 210.
- B. 450.
- C. 490.

4. which procedure applies to instrument departure procedures?

- A. Instrument departure clearance will not be issued unless requested by the pilot.
- B. The pilot in command must accept an instrument departure procedure when issued by ATC
- C. If an instrument departure procedure is accepted, the pilot must possess at least a textual description.

5. What is meant when departure control instructs you to "resume own navigation" after you have been vectored to a Victor airway?

- A. You should maintain the airway by use of your navigation equipment.
- B. Radar service is terminated.
- C. You are still in radar contact, but must make position reports.

6. What does the ATC term "Radar Contact" signify?

- A. Your aircraft has been identified and you will receive separation from all aircraft while in contact with this radar facility.
- B. Your aircraft has been identified on the radar display and radar flight-following will be provided until radar identification is terminated.



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

- C. You will be given traffic advisories until advised the service has been terminated or that radar contact has been lost.

7. Upon intercepting the assigned radial, the controller advises you that you are on the airway and to “RESUME OWN NAVIGATION”. This phase means that

- A. You are still in radar contact, but must make position reports
B. Radar services are terminated and you will be responsible for position reports
C. You are to assume responsibility for your own navigation.

8. Which procedure is recommended while climbing to an assigned altitude on the airway?

- A. Climb on the centerline of the airway except when maneuvering to avoid other air traffic in VFR conditions.
B. Climb slightly on the right side of the airway when in VFR conditions.
C. Climb far enough to the right side of the airway to avoid climbing or descending traffic coming from the opposite direction if in VFR conditions.

9. What does the symbol T within a black triangle in the minimum section of the IAP for a particular airport indicate?

- A. Takeoff minimums are 1 mile for aircraft having two engines or less and 1/2 mile for those with more than two engines.
B. Instrument takeoffs are not authorized.
C. Takeoff minimums are not standard and/or departure procedures are published.

10. What is expected of you as pilot on an IFR flight plan if you are descending or climbing in VFR conditions?

- A. If on an airway, climb or descend to the right of the centerline.
B. Advise ATC you are in visual conditions and will remain a short distance to the right of the centerline while climbing.
C. Execute gentle banks, left and right, at a frequency which permits continuous visual scanning of the airspace about you.

11. Which is true regarding the use of an instrument departure procedure chart?

- A. To use an instrument departure procedure, the pilot must possess both the textual and graphic form of the approved departure.
B. To use an instrument departure procedure, the pilot must possess at least textual description of the approved standard departure.
C. The use of instrument departure procedure is mandatory.

Answers: 1. B, 2.C, 3. C, 4. C, 5. A, 6. B, 7. C, 8. A, 9. C, 10. C, 11. B

Enroute Procedures (Chapter 5) Questions

1. Which types of airspace are depicted on the Enroute Low Altitude Chart?

- A. Limits of controlled airspace, military training routes, and special use airspace.
B. Class A, Special use airspace, Class D, and Class E.
C. Special use airspace, Class E, Class D, Class A, Class B and Class C.

2. Unless otherwise prescribed, what is the rule regarding altitude and course to be maintained during an off airways IFR flight over non-mountainous terrain?

- A. 1,000 ft above the highest obstacle within 3 NM of course.
B. 2,000 ft above the highest obstacle within 5 SM of course.
C. 1,000 ft above the highest obstacle within 4 NM of course.



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

3. What is the definition of MEA?

- A. The lowest published altitude which meets obstacle clearance requirements and assures acceptable navigational signal coverage.
- B. The lowest published altitude which meets obstacle requirements, assures acceptable navigational signal coverage, two-way radio communications, and provides adequate radar coverage.
- C. An altitude which meets obstacle clearance requirements, assures acceptable navigation signal coverage, two-way radio communications, adequate radar coverage, and accurate DME mileage.

4. Reception of signals from an off-airway radio facility may be inadequate to identify the fix at the designated MEA. In this case, which altitude is designated for the fix?

- A. MRA
- B. MCA
- C. MOCA

5. In the case of operations over an area designated as a mountainous area where no other minimum altitude is prescribed, no person may operate an aircraft under IFR below an altitude of

- A. 500 feet above the highest obstacle.
- B. 1,000 feet above the highest obstacle.
- C. 2,000 feet above the highest obstacle.

6. Acceptable navigational signal coverage at the MOCA is assured for a distance from the VOR of only

- A. 12 NM
- B. 22 NM
- C. 25 NM

7. For which speed variation should you notify ATC?

- A. When the groundspeed changes more than 5 knots.
- B. When the average true airspeed changes 5 % or 10 knots, whichever is greater.
- C. Any time the groundspeed changes 10 MPH.

8. What reports are required of a flight operating on an IFR clearance specifying VFR on Top in a non-radar environment?

- A. The same reports that are required for any IFR flight
- B. All normal IFR reports except vacating altitudes.
- C. Only the reporting of any unforecast weather.

9. Which report should be made to ATC without a specific request when not in radar contact?

- A. Entering instrument meteorological conditions.
- B. When leaving final approach fix inbound on final approach.
- C. Correcting an E.T.A. any time a previous E.T.A. is in error in excess of 2 minutes.

10. To ensure proper airspace protection while in a holding pattern, what is the maximum airspeed above 14,000 feet for civil turbojet aircraft?

- A. 200 knots
- B. 265 knots
- C. 230 knots

11. At what point should the timing begin for the first leg outbound in a non-standard holding pattern?

- A. Abeam the holding fix, or wing level, whichever occurs last.



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

- B. When the wings are level at the completion of the 180 degree turn outbound
- C. When over or abeam the holding fix, whichever occurs later.

Answers: 1. A, 2. C, 3. A, 4. A, 5. C, 6. B, 7. B, 8. A, 9. B, 10. B, 11. C

Arrival Procedures (Chapter 6) Questions

1. Which is true regarding STARs?

- A. STARs are used to separate IFR and VFR traffic.
- B. STARs are established to simplify clearance delivery procedures.
- C. STARs are used at certain airports to decrease traffic congestion.

2. How is ATC radar used for instrument approaches when the facility is approved for approach control service?

- A. Precision approaches, weather surveillance, and as a substitute for any inoperative component of a navigation aid used for approaches.
- B. ASR approaches, weather surveillance, and course guidance by approach control.
- C. Course guidance to the final approach course, ASR and PAR approaches, and the monitoring of non-radar approaches.

3. Under which condition does ATC issue a STAR?

- A. To all pilots wherever STAR's are available.
- B. Only if the pilot requests a STAR in the "Remarks" section of the flight plan.
- C. When ATC deems it appropriate, unless the pilot requests "No STAR"

Answers: 1. B, 2. C, 3. C

Approach Procedures (Chapter 7) Questions

1. What obstacle clearance and navigation signal coverage is a pilot assured with the Minimum Sector Altitudes depicted on the IAP charts?

- A. 1,000 ft and acceptable navigation signal coverage within a 25 NM radius of the navigation facility.
- B. 1,000 ft within a 25 NM radius of the navigation facility but not acceptable navigation signal coverage.
- C. 500 feet and acceptable navigation signal coverage within a 10 NM radius of the navigation facility.

2. What does the absence of the procedure turn barb on the planview on an approach chart indicate?

- A. A procedure turn is not authorized.
- B. Teardrop-type procedure turn is authorized.
- C. Racetrack-type procedure turn is authorized.



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

- 3. Which procedure should be followed by a pilot who is circling to land in a Category B airplane, but is maintaining a speed 5 knots faster than the maximum specified for that category?**
- A. Use the approach minimums appropriate for Category C.
 - B. Use Category B minimums.
 - C. Use Category D minimums since they apply to all circling approaches.
- 4. How can an IAF be identified on a Standard Instrument Approach Procedure (SIAP) Chart?**
- A. All fixes that are labeled IAF.
 - B. Any fix illustrated within the 10 mile ring other than the FAF or stepdown fix.
 - C. The procedure turn and the fixes on the feeder facility ring.
- 5. Aircraft approach categories are based on**
- A. Certificated approach speed at maximum gross weight.
 - B. 1.3 times the stall speed in landing configuration at maximum gross landing weight.
 - C. 1.3 times the stall speed at maximum gross weight.
- 6. If the RVR is not reported, what meteorological value should you substitute for 2,400 RVR?**
- A. A ground visibility of 1/2 NM
 - B. A slant range visibility of 2,400 ft for the final approach segment of the published approach procedure.
 - C. A ground visibility of 1/2 SM
- 7. When the approach procedure involves a procedure turn, the maximum speed should not be greater than**
- A. 180 knots IAS
 - B. 200 knots IAS
 - C. 250 knots IAS
- 8. While being radar vectored, an approach clearance is received. The last assigned altitude should be maintained until**
- A. Reaching the FAF
 - B. Advised to begin descent
 - C. Established on a segment of a published route or instrument approach procedure.
- 9. when simultaneous approaches are in progress, how does each pilot receive radar advisories?**
- A. On tower frequency
 - B. On approach control frequency
 - C. One pilot on tower frequency and the other on approach control frequency.
- 10. During an instrument precision approach, terrain and obstacle clearance depends on adherence to**
- A. Minimum altitude shown on the IAP
 - B. Terrain contour information
 - C. Natural and man-made reference point information.
- 11. What visual illusion creates the same effect as a narrower-than usual runway?**
- A. An upsloping runway.
 - B. A wider-than-usual runway.
 - C. A downsloping runway.
- 12. You arrive at your destination airport on an IFR flight plan. Which is a prerequisite condition for the performance of a contact approach?**
- A. A ground visibility of at least 2 SM.
 - B. A flight visibility of at least 1/2 NM.
 - C. Clear of clouds and at least 1 SM flight visibility.



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

Answers: 1. B, 2. A, 3. A, 4. A, 5. B, 6. C, 7. B, 8. C, 9. A, 10. A, 11. A, 12. C

Instrument Approaches (Chapter 8) Questions

1. When installed with the ILS and specified in the approach procedures, DME may be used.

- A. In lieu of the OM.
- B. In lieu of visibility requirements.
- C. To determine distance from TDZ.

2. How does a pilot determine if DME is available on an ILS/LOC?

- A. IAP indicate DME/TACAN channel in LOC frequency box.
- B. LOC/DME are indicated on en route low altitude frequency box.
- C. LOC/DME frequencies available in the Aeronautical Information Manual.

3. What is a difference between an SDF and an LDA facility?

- A. The SDF course width is either 6 or 12 degrees while the LDA course width is approximately 5 degrees.
- B. The SDF course has no glide slope guidance while the LDA does.
- C. The SDF has no marker beacons while the LDA has at least an OM.

4. Which range facility associated with the ILS is identified by the last two letters of the localizer identification group?

- A. Inner Marker.
- B. Outer Marker.
- C. Middle compass locator.

5. What facilities, if any, may be substituted for an inoperative middle marker during an ILS approach without affecting the straight-in minimums?

- A. ASR.
- B. Substitution not necessary, minimums do not change.
- C. Compass locator, PAR, and ASR.

6. Which of these facilities may be substituted for an MM during a complete ILS IAP?

- A. Surveillance and precision radar.
- B. Compass locator and precision radar.
- C. A VOR/DME fix.

7. The rate of descent required to stay on the ILS glide slope.

- A. Must be increased if the groundspeed is decreased.
- B. Will remain constant if the indicated airspeed remains constant.
- C. Must be decreased if the groundspeed is decreased.

8. The rate of descent on the glide slope is dependent upon

- A. True airspeed
- B. Calibrated airspeed.
- C. Groundspeed.

9. The glide slope and localizer are centered, but the airspeed is too fast. Which should be adjusted initially?

- A. Pitch and power.



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

- B. Power only.
- C. Pitch only.

10. During a precision radar or ILS approach, the rate of descent required to remain on the glide slope will

- A. Remain the same regardless of groundspeed.
- B. Increase as the groundspeed increases.
- C. Decreases as the groundspeed increases.

11. How can a pilot determine if a Global positioning system (GPS) installed in an aircraft is approved for IFR enroute and IFR approaches?

- A. Flight manual supplement.
- B. GPS operator's manual.
- C. Aircraft owner's handbook.

12. What is a waypoint when used for an IFR flight?

- A. A predetermined geographical position used an RNAV route or an RNAV instrument approach.
- B. A reporting point defined by the intersection of two VOR radials.
- C. A location on a victor airway which can only be identified by VOR and DME signals.

13. Hand-held GPS systems, and GPS systems certified for VFR operation, may be used during IFR operations as

- A. the principal reference to determine en route waypoints.
- B. An aid to situational awareness
- C. The primary source of navigation.

14. During IFR en route and terminal operations using an approved GPS system for navigation, ground based navigational facilities

- A. are only required during the approach portion of the flight
- B. Must be operational along the entire route.
- C. Must be operational only if RAIM predicts an outage.

Answers: 1. A, 2. A, 3. A, 4. C, 5. B, 6. B, 7. C, 8. C, 9. B, 10. B, 11. A, 12. A, 13. B, 14. B.

Meteorology (Chapter 9) Questions

1. A common type of ground or surface based temperature inversion is that which is produced by

- A. Warm air being lifted rapidly aloft in the vicinity of mountainous terrain.
- B. The movement of colder air over warm air, or the movement of warm air under cold air.
- C. Ground radiation on clear, cool nights when the wind is light.

2. The presence of ice pellets at the surface is evidence that

- A. There are thunderstorms in the area.
- B. A cold front has passed.
- C. There is freezing rain at a higher altitude

3. The amount of water vapor which air can hold largely depends on

- A. Relative humidity
- B. Air temperature
- C. Stability of air



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

- 4. Clouds, fog, or dew will always form when**
- A. Water vapor condenses.
 - B. Water vapor is present.
 - C. The temperature and dewpoint are equal.
- 5. What causes surface winds to flow across the isobars at an angle rather than parallel to the isobars?**
- A. Coriolis force
 - B. Surface friction
 - C. The greater density of the air at the surface.
- 6. Which is a characteristic of stable air?**
- A. Fair weather cumulus clouds.
 - B. Stratiform clouds.
 - C. Unlimited visibility.
- 7. What are the four families of clouds?**
- A. Stratus, cumulus, nimbus, and cirrus.
 - B. Clouds formed updrafts, fronts, cooling layers of air, and precipitation into warm air.
 - C. High, middle, low, and those with extensive vertical development.
- 8. a jet stream is defined as wind of**
- A. 30 knots or greater
 - B. 40 knots or greater
 - C. 50 knots or greater
- 9. An air mass is a body of air that**
- A. Has similar cloud formations associated with it.
 - B. Creates a wind shift as it moves across the Earth's surface.
 - C. Covers an extensive area and has fairly uniform properties of temperature and moisture.
- 10. Which weather phenomenon signals the beginning of the mature stage of a thunderstorm?**
- A. The start of rain at the surface.
 - B. Growth rate of cloud is maximum.
 - C. Strong turbulence in the cloud.
- 11. The presence of standing lenticular altocumulus clouds is a good indication of**
- A. A jet stream
 - B. Very strong turbulence
 - C. Heavy icing conditions.
- 12. Where does wind shear occur?**
- A. Exclusively in thunderstorms.
 - B. Wherever there is an abrupt decrease in pressure and/or temperature.
 - C. With either a wind shift or a windspeed gradient at any level in the atmosphere.
- 13. During the life cycle of a thunderstorm, which stage is characterized predominantly by downdrafts?**
- A. Cumulus
 - B. Dissipating
 - C. Mature



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

14. In which meteorological environment is aircraft structural icing most likely to have the highest rate of accumulation?

- A. Cumulonimbus clouds
- B. High humidity and freezing temperature
- C. Freezing rain.

15. If you fly into sever turbulence, which flight condition should you attempt to maintain?

- A. Constant airspeed (V_a)
- B. Level flight attitude
- C. Constant altitude and constant airspeed.

16. Fog is usually prevalent in industrial areas because of

- A. atmospheric stabilization around cities.
- B. An abundance of condensation nuclei from combustion products.
- C. Increased temperature due to industrial heating.

Meteorology (Chapter 9) Questions

17. Maximum downdraft in a microburst encounter may be as strong as

- A. 8,000 feet per minute
- B. 7,000 feet per minute
- C. 6,000 feet per minute

18. What wind condition prolongs the hazards of wake turbulence on a landing runway for the longest period of time?

- A. Direct headwind.
- B. Direct tailwind.
- C. Light quartering tailwind.

19. The body of a Terminal Aerodrome Forecast (TAF) covers a geographical proximity within a

- A. 5 nautical mile radius of the center of an airport.
- B. 5 statue mile radius from the center of an airport runway complex.
- C. 5 to 10 statue mile radius from the center of an airport runway complex

20. What wind direction and speed is represented by the entry 9900+00 for 9,000 feet, on an Winds and Temperatures Aloft Forecast (FD)?

- A. Light and variable; less than 5 knots.
- B. Vortex winds exceeding 200 knots.
- C. Light and variable; less than 10 knots.

21. A “VRB” wind entry in a Terminal Aerodrome Forecast (TAF) will be indicated when the wind is

- A. 3 knots or less
- B. 6 knots or less
- C. 9 knots or less

22. When the visibility is greater than 6 SM on a TAF it is expressed as

- A. 6PSM
- B. P6SM
- C. 6SMP

23. Which values are used for winds aloft forecast?



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

- A. Magnetic direction and knots.
- B. Magnetic direction and MPH.
- C. True direction and knots.

24. A ceiling is defined as the height of the

- A. Highest layer of clouds or obscuring phenomena aloft that covers over 6/10 of the sky.
- B. Lowest layer of clouds that contributed to the overall overcast.
- C. Lowest layer of clouds or obscuring phenomena aloft that is reported as broken or overcast.

25. AIRMET's are issued on a scheduled basis every

- A. 15 minutes after the hour only.
- B. 15 minutes until the AIRMET is canceled
- C. Six hours.

26. What important information is provided by the Radar Summary Chart that is not shown on other weather charts?

- A. Lines and cells of hazardous thunderstorms
- B. Types of precipitation.
- C. Areas of cloud cover and icing levels within the clouds

27. A prognostic chart depicts the conditions

- A. Existing at the surface during the past 6 hours.
- B. Which presently exist from the 1,000-millibar through the 700-millibar level.
- C. Forecast to exist at a specific time in the future.

28. SIGMET'S are issued as a warning of weather conditions potentially hazardous

- A. Particularly to light aircraft.
- B. To all aircraft.
- C. Only to light aircraft operations.

29. On what frequency should you obtain En Route Flight Advisory Service below FL 180?

- A. 122.1 T/112.8R
- B. 123.6
- C. 122.0

Answers: 1. C, 2. C, 3. B, 4. A, 5. B, 6. B, 7. C, 8. C, 9. C, 10. A, 11. B, 12. C, 13. B, 14. C, 15. B, 16. B, 17. C, 18. C, 19. B, 20. A, 21. A, 22. B, 23. C, 24. C, 25. C, 26. A, 27. C, 28. B, 29. C

Flight Considerations (Chapter 10) Questions

1. What does declaring "minimum fuel" to ATC imply?

- A. Traffic priority is needed to the destination airport.
- B. Emergency handling is required to the nearest useable airport.
- C. Merely an advisory that indicates an emergency situation is possible should any undue delay occur.

2. During an IFR flight in IMC, a distress condition is encountered (fire, mechanical, or structural failure). The pilot should

- A. Not hesitate to declare an emergency and obtain an amended clearance.
- B. Wait until the situation is immediately perilous before declaring an emergency.
- C. Contact ATC and advise that an urgency condition exists and request priority consideration.



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

3. Where may you use a surveillance approach?

- A. At any airport that has an approach control.
- B. At any airport which has radar service.
- C. At airports for which civil radar instrument approach minimums have been published.

4. After being handed off to the final approach controller during a “no-gyro” surveillance or precision approach, the pilot should make all turns

- A. One-half standard rate.
- B. Based upon the groundspeed of the aircraft
- C. Standard rate.

5. Which statement is correct regarding the use of cockpit lighting for night flight?

- A. Reducing the lighting intensity to a minimum level will eliminate blind spots.
- B. The use of regular white light, such as a flashlight, will impair night adaptation.
- C. Coloration shown on maps is least affected by the use of direct red lighting.

6. Which use of cockpit lighting is correct for night flight?

- A. Reducing the interior lighting intensity to a minimum level.
- B. The use of regular white light, such as a flashlight, will not impair night adaptation.
- C. Coloration shown on maps is least affected by the use of direct red lighting.

7. Preferred IFR routes beginning with a fix indicate that departing aircraft will normally be routed to the fix by

- A. The established airway (s) between the departure airport and the fix.
- B. An instrument departure procedure (DP), or radar vectors.
- C. Direct route only.

8. The most current en route and destination flight information for planning an instrument flight should be obtained from

- A. The ATIS broadcast.
- B. The FSS.
- C. Notices to Airmen (Class II)

9. If a pilot elects to proceed to the selected alternate, the landing minimums used at that airport should be the

- A. Minimums specified for the approach procedure selected.
- B. Alternate minimums shown on the approach chart.
- C. Minimums shown for that airport in a separate listing of “IFR Alternate Minimums.”

10. When a pilot elects to proceed to the selected alternate airport, which minimums apply for landing at the alternate?

- A. 600-1 if the airport has an ILS
- B. Ceiling 200 feet above the published minimum; visibility 2 miles.
- C. The landing minimums for the approach to be used.

11. What are the alternate minimums that must be forecast at the ETA for an airport that has a precision approach procedure?

- A. 400-foot ceiling and 2 miles visibility.
- B. 600-foot ceiling and 2 miles visibility.



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

C. 800-foot ceiling and 2 miles visibility.

12. What point at the destination should be used to compute estimated time en route on an IFR flight plan?

- A. The final approach fix on the expected instrument approach.
- B. The initial approach fix on the expected instrument approach.
- C. The point of first intended landing.

Answers: 1. C, 2. A, 3. C, 4. A, 5. B, 6. A, 7. B, 8. B, 9. A, 10. C, 11. B, 12. C

Federal Aviation Regulations (Chapter 11) Questions

1. Which flight time may be logged as instrument time when on an instrument flight plan?

- A. All of the time the aircraft was not controlled by ground references.
- B. Only the time you controlled the aircraft solely by reference to flight instruments.
- C. Only the time you were flying in IFR weather conditions.

2. To meet the minimum instrument experience requirements, within the last 6 calendar months you need

- A. Six hours in the same category aircraft.
- B. Six hours in the same category aircraft, and at least 3 or the 6 hours in actual IFR conditions.
- C. Six instrument approaches, holding procedures, and intercepting and tracking course in the appropriate category of aircraft.

3. After your recent IFR experience lapse, how much time do you have before you must pass an instrument competency check to act as pilot in command under IFR?

- A. 6 months
- B. 90 days.
- C. 12 months.

4. A pilot's recent IFR experience expires on July 1 of this year. What is the latest date the pilot can meet the IFR experience requirement without having to take an instrument proficiency check?

- A. December 31, this year.
- B. June 30, next year.
- C. July 31, this year.

5. How long does a pilot meet the recency of experience requirements for IFR flight after successfully completing an instrument competency check if no further IFR flight are made?

- A. 90 days
- B. 6 calendar months
- C. 12 calendar months

6. A certificated commercial pilot who carries passengers for hire at night or in excess of 50 NM is required to have least

- A. An instrument rating in the same category and class aircraft.
- B. An associated type rating if the airplane is of the multiengine class
- C. A first-class medical certificate.

7. Under which condition must the pilot in command of a civil aircraft have at least an instrument rating?



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

- A. When operating in class E airspace.
- B. For any flight above an altitude of 1,200 feet AGL, when the visibility is less than 3 miles.
- C. For a flight in VFR conditions while on an IFR flight plan.

8. To carry passengers for hire in an airplane on cross-country flight for more than 50 NM from the departure airport, the pilot in command is required to hold at least

- A. A Category II pilot authorization
- B. A first-class medical certificate
- C. A commercial pilot certificate with an instrument rating

9. The use of certain portable electronic devices is prohibited on aircraft that are being operated under

- A. IFR
- B. VFR
- C. DVFR

10. When are you required to have an instrument rating for flight in VMC?

- A. Flight through an MOA.
- B. Flight into class A airspace.
- C. Flight into an ADIZ.

11. The pilot in command of a civil aircraft must have an instrument rating only when operating

- A. In weather conditions less than the minimum prescribed for VFR flight.
- B. Under IFR, in weather conditions less than the minimum for VFR flight, or in class A airspace.
- C. Under IFR in positive control airspace.

12. Aircraft being operated under IFR are required to have, in addition to the equipment required for VFR and night, at least

- A. A slip skid indicator
- B. Dual VOR receivers
- C. Distance measuring equipment

Answers: 1. B, 2. C, 3. A, 4. A, 5. B, 6. A, 7. C, 8. C, 9. A, 10. B, 11. B, 12. A