I F R m i s s e d a p p r o a c h e s

The best way to study this material is having several IFR charts available to help find an actual situation in your area for analysis. Do three charts per session.

VFR-on-top (OTP)
Filing and getting a clearance makes you IFR. OTP is a mix of IFR/VFR that reduces separation standards. Compliance with VFR visibility and cloud clearance is required along with IFR minimum altitudes. (FAR 91.177) Under IFR to IFR standards terminal areas require 3 miles lateral and 5 miles in centre airspace. *IN OTP the pilot must fly cleared routes but can request direct and get it off airways with radar while maintaining VFR altitudes and clearances.*

OTP does not require clouds to be flown. Without radar you will not be allowed to fly below MEA or higher. *An OTP aircraft can avoid the climbs and vectors required for IFR separation.* OTP can be filed for and obtained after completing the DP requirements. Under OTP you can climb to any altitude below 18,000' that is above the instrument minimums so long as you make required reports to ATC regarding the changes.

- Adhere to VFR cloud separation
- Climb and descend at will
- No need to fly assigned route

Procedures

- You must know where the DME is located when flying an ILS. *Don't leave a navaid during an approach that has DME if it can be avoided.*
- Threshold crossing height (TCH) should be added to the threshold elevation for altimeter reading. Do not use TDZE (Touchdown zone elevation)
- **Over 90% of missed approach accidents occur on the second missed.**
- ATC cannot give a visual approach when visibility is less than three miles. In Class D airspace the ceiling must be better than a thousand feet.
- *To get a contact approach the aircraft must be on an IFR flight plan.* A contact requires one-mile ground visibility and an instrument approach to the airport. A contact approach is the IFR equivalent of a SVFR approach.
- When you are unable to interpret a clearance, come up with an alternative suggestion to ATC.
- *Avoid procedure turns where you can.*
- A non-radar approach must begin at a charted initial approach fix. (IAF)
- *The last chance you have to check your altimeter is when crossing the non-precision FAF.*
- If your glide slope indicator needle is acting funny, it is best to consider it unreliable and change to non-precision minimums IF you have not already descended lower. If lower, a missed is your only option.
- For the PTS an aircraft must be able to perform at least two of the non-precision approaches and one precision approach. An ADF is not required. *Marker beacons are required but can be 'called' by RADAR.*.
- Light IFR aircraft should have standby vacuum system or pump.
- There is no evidence that engine problems are more likely to happen at night or that night weather is any worse than day weather.
- **Only a small percentage of total IFR flying occurs at night yet over half of the IFR accidents occur at night.**
- Variations of transitions, segments and fixes make approaches.
- The simplest approach on an airport will have only a final segment, MDA and missed approach. No timing, no intermediate segment, intermediate fix or final fix. Visual descent point (VDP) may exist. There is no glide slope information. --Final approach may have several step down fixes.
- *At a minimum descent altitude (MDA) level flight continues, usually by time, to the missed approach point.*
- ATC cannot vector you to intercept the ILS above glide slope. **But they do and have to me.**
- Vectoring altitude is 1000' AGL in flat terrain and 1500/2000' AGL where mountainous.
- *The "Maltese Cross" on approach plates is the final approach fix for non-precision approaches only.*
- The final approach fix for precision approaches is glide slope interception.
- If the ILS becomes a localizer approach then the time over the Maltese Cross must be noted.
- Ground speed can be determined electronically by DME, LORAN or GPS more commonly by using the wind direction and velocity from whatever source.
- Use of the airport wind is very uncertain since wind speeds vary greatly with altitude. *The variability of the approach ground speed along with other instrument factors are what makes most approaches non-precision.*

Getting Vectors to the FAF

- *One initial approach procedure can be the use of radar as a substitute for any other published approach.*
- The controller flies you a modified base entry and then gives you an intercept heading of 20 or 30 to the 'approach gate'.
- The approach gate is defined as a point at least one mile outside the fix and five miles from the runway.
- The radar intercept altitude must allow you to descend within the limits of the approach procedure.
- The normal intercept of a radar vector is within the intermediate segments.
- *Only on an on-airport VOR or NDB can the radar vector intercept the final approach.*
- The usual length of the intermediate segment is five miles except for shallow interceptions of an ILS.
- *The ILS final approach fix is where the charted intermediate altitude intercepts the glide slope.*
- Most ILS vectors must be at a higher altitude than would be a localizer approach for this reason.
- Once you descend below the last assigned altitude, you must be inside the one and one-half mile charted approach airspace of the procedure.

ATC Vector Strictures:

- 2 miles outside the 'gate' unless a visual approach.
- Unless ceiling 500' above MVA/MIA and 3 mile visibility or closer vector requested by pilot.
- ILS vector cannot be above the glide slope or below the fix altitude.
- Vector must allow published descent.
- ATC has cushion of additional 300' obstacle clearance for each mile over three beyond the FAF.
- *ATC must give your position relative to a fix before clearing you for approach.*

Pilot Vector Strictures

- Do not turn to intercept **UNLESS** given ATC clearance.
- You must maintain or be given an altitude before being cleared for the approach. 91.175(I)
- Strong winds can cause problems. Don't rely on ATC for wind correction
- Centre vectors come from distant antenna and are unreliable. Same with BRITE in many towers.
- You can intercept final closer than 3 miles on request.
- Even though a course change follows the FAF your intermediate vector is considered to be a vector to final.
- A clearance to an approach fix is not equivalent to a radar vector to final.
- *Pilot should reject a clearance and vector that gives you a straight in where a course reversal is part of the procedure*.
- Where a VASI or PAPI serves as a glide path assistant some degree of obstacle clearance is assured as long as you don't go below the indicated centre of the path.

Timing

Timing, whether you use a traditional or electronic timer makes no difference. Time is the second T of the 5/7 Ts. for every segment of the instrument approach. You may not use it every time but it should remain as part of the sequence. *The time required for an approach depends on ground speed*. The timing of an approach involves more than just noting the time off the chart. Since the time is based on ground speed we must factor into it the effect of the wind, our proficiency at holding an airspeed during established flight and transitions. The result of your timing efforts will only be as accurate as your data input.

The "Maltese Cross" on approach plates is the final approach fix for non-precision approaches only. An ILS should be timed passing the non-precision FAF (Maltese cross). This guarantees awareness if the glide slope fails and you need to continue with a localizer-only approach. The FAF for an ILS is the point you intercept the glide slope at the designated altitude on the chart. The localizer FAF may be inside or outside marker, begin descent at interception (See Livermore chart) *The final approach fix for precision approaches is glide slope interception.*

The greatest hazard associated with non-precision approaches is the descent from MDA to the runway. In relatively poor conditions the pilot must change from IFR to VFR flight. Your localizer is only good within three degrees of centerline. An LDA's precision is even less. *It is not unusual to miss the runway by 1/2 mile at the MDA of a NDB approach.*

Select a heading

Reference Heading is the heading that will keep the needle centred. Because of wind you must bracket this heading through referral to the Heading Indicator. One system uses 1/2 angle corrections of ever decreasing amounts. (see instructor)

Initial changes to find the reference heading should be 5 degrees. (10 degrees only if 1/2 deflection.) All turns by reference to heading indicator. *Stabilize your heading and airspeed based on the wind. Use only rudder for heading changes of three degrees or less.*

Cleared for the Approach
If a pilot who is "Cleared for the Approach" does not understand his responsibility to adhere to the charted altitudes of that approach, he could be preparing for an accident. The phrase is one of the most misunderstood and ambiguous terms used by ATC. **Controllers expect pilots to know what they are supposed to know**. Pilots who don't know what they don't know will fail to follow the expectations of the controller. FAR 91.175 (i) states--"when a pilot is cleared for an IFR approach, he shall maintain the last assigned altitude until established on a published route for which a lower minimum altitude is published." *One definition of 'established' is when you are within ½ of the total possible needle deflection.*

Any route leading to an IAP (instrument approach procedure) becomes part of that procedure when the approach clearance is given. If you don't get an approach clearance you can't descend. The approach clearance should relieve you from all altitude restrictions. Just report leaving your present altitude

The pilot who has a malfunction of equipment or systems on an IFR flight is required to report the problem to ATC (FAR 91.187). The pilot should know that being cleared for the approach requires him to fly the altitudes and routes as charted*. You can remain at higher than charted altitudes but never at lower than charted.* If ATC provides vectors then altitude restrictions must be included. If ATC fails to provide the required instructions or information then the pilot needs to know enough to pick up the error. **Most of all, the pilot must know enough of his situation to say "NO" to ATC when it is justified.**

The term "radar contact" does not mean that ATC will provide obstruction avoidance. ATC will not provide advisories as to traffic and terrain below the minimum vectoring altitude unless specifically requested. The informed pilot understands the performance rules of ATC radar.

- Minimum IFR altitudes (MIA) is the minimum vectoring altitude for Centre radar.
- Minimum vectoring altitude (MVA) apples to terminal facilities.

Common Approach Elements
Preparation:

- Study the plate. **Highly essential**. Memorize what you can.
- Be ready to fly the full approach.
- Always assume you'll have to fly the missed.
- *If you need to look at the approach plate inside the outer marker you have not properly prepared.*
- Configure the aircraft for approach before reaching a critical point on the approach.
- Anticipate what will be required
- **Use a pre-approach checklist**
- Take your time. Slow the aircraft down. Try to determine the effect of wind. (Tailwind approach)
- Remain in a hold until YOU are ready for the clearance and approach.
- The inbound hold will probably be aligned with the approach course.
- Use what you have
- Use all available equipment and devices.

Approach Segments
The Five As
ATIS
Altimeter
Airspeed- Power/trim
Avionics- set
Approach-numbers
Headings, altitudes, time, distance, missed

--On interception--
The Ts

- Turn
- Time
- Twist
- Throttle
- Talk

Each part is defined as to:

- Beginning
- End
- Course
- Altitude

Transition

- Inbound to IAF--
- Beginning - the route to IAF
- End

Beginning of approach
-- the Initial Approach Fix --

- Course
- Altitude

Initial Segment
--Between IAF and end of procedure turn--

- Beginning - IAF
- End - to end of procedure turn
- Course
- Altitude

Intermediate Segment

- ***Established inbound to FAF--***
- Beginning - from procedure turn
- End - to final approach fix (FAF)
- Fan markers can be used as FAF but such use is rare.
- Course
- Altitude

Final Segment

- Between FAF and MAP--
- Beginning - FAF
- End - missed approach point (MAP)
- Course
- Altitude based on 40:1 climb gradient of 152’ per nautical mile.

Missed Approach Segment
This segment begins at the decision height (DH) or at a specific point in non-precision approaches. The chart will show an altitude, direction, and clearance limit. Figure minimum climb of 200’ per nautical mile. *Given a choice between a timed and DME MAP, take DME.*

Any departure course within 15 degrees is considered straight-out.

On an ILS do not make any heading changes until above 400’ AGL. On a non-precision missed, make your turn immediately. You can always climb before the MAP but never turn before the MAP.

There may be more than one missed approach procedure but only one will be charted.

The Missed
--Between MAP and holding fix--

- Beginning - MAP
- End - to holding fix
- Course
- Altitude

Any approach in actual conditions should be flown with the uppermost idea that the missed approach is an anticipated outcome. Be prepared to configure the aircraft. The landing gear is the least critical item of any re-configuration. The missed will arrive regardless of decision height, and time when there is no runway, no lights on ground. **You must act quickly, correctly with prior knowledge that you have charged your short-term memory with the missed-approach procedures**.

A good missed is easiest when made following a stabilized approach. Get full power smoothly, set the pitch on the AI for Vy and hold it. These two first and second together. Then climb configuration but don't hurry and only when everything else including heading are in order. Now is the time to refer to the missed checklist.

Step Down Approach
First of all, slow down. Know the pitch attitude, power setting, and configuration that will give the most rapid descent you can control at the 90 kts approach speed. Practice this descent and level off until it is not part of the problem. The step-down approach requires you to be able to control the maximum performance capabilities of your aircraft. Doing this gives you time to pick up the runway, configure the aircraft, and execute a normal landing.

Stabilized Approach

- Determine primary heading
- Established outside FAF
- + 5 degrees to MAP

IFR Stabilized Approach Defined

- 1000 feet above airport elevation when IFR (500 feet VFR)
- Aircraft on correct flight path and requiring only small corrections
- Speed no more than 20kts above Vref nor less than Vref
- Aircraft in landing configuration
- Sink rate below 1000 fpm.
- **ILS needles within one dot of center**
- Wings level 300 feet above airport elevation when circling
- Sterile cockpit inside IAF

Full approach
The FULL Approach always includes the procedure turn. Anything else is considered a straight-in approach via: (Within 30 degrees of runway alignment)

- Vectors
- NoPT Transition from a holding pattern
- DME arc

Holding Pattern Approach
If a holding pattern is part of the approach the pattern manoeuvre is completed when the aircraft is established on the inbound course after executing the appropriate entry. (AIM 5-48) ATC expects you to proceed straight-in when crossing the fix. ATC does not expect/require a holding turn from any entry that allows you to arrive at the holding fix within 30-degrees and at altitude. AIM 5-48(a)(4) The holding pattern manoeuvre is considered complete when the aircraft executes an entry that establishes it on the inbound course. A radio report is required. *If you wish to do the complete pattern one or more times, for practice or to become better established, advise ATC.*

Coupled Approach
The use of autopilot may not be allowed due to roughness (wavering) of signals. The faster the aircraft the more likely the problem. If you have this equipment be moderate in its use and your reliance on it. *Use the autopilot only enough to maintain currency in its use.* Fly basic instruments on raw data and partial panel as opportunities arise. Allowing the autopilot to become the dominant factor over personal proficiency is a mistake.

Missed Approach
Considerations--

- Stress can affect your decision making
- *Good option choices become more limited*
- Self discipline is needed to choose the missed
- Check destination early…
- Expect to miss

Uncontrolled Airport Practice Missed Approaches
Begin the missed-approach soon enough to remain above the traffic pattern altitude by 1000'.

Missed Approach Altitude
Not the DH or MDA but

Missed-Approach Surface
Slopes from MAP at 150 feet per nautical mile (225 fpm at 90kts) up to 1000' below the Missed Approach Altitude. *No obstacle can intrude into this plane*. Primary area of the Missed Approach Surface begins at the missed approach point (MAP) and spreads to eight miles wide (four to either side of straight line) at 15 miles out.

Early missed Approach
A*ircraft must fly to MAP before making any turns.* However aircraft may climb before reaching the MAP. One reason for timing an ILS approach is because this is the best way to know you have reached the DH when no descent is made.

The Real World Missed
It goes without saying that any accident that occurs during a missed approach is the direct result of a poorly performed procedure. The Missed has a 40:1, no buffer, 152 ft/nm required climb gradient. This is less than the 200 ft/nm for a departure. *Since there is no missed safety margin, you would be well advised to use the departure climb for obstacle clearance.* You will have the width of an airway in 15 nautical miles plus a two-mile-wide secondary area on each side.

The planning of the missed according to TERPS is that it must be simple, the altitude to climb to must be an en route or holding altitude that will avoid obstacles. The clearances and gradient of any missed that has less than a 15 degree turn is considered straight. Only airspace or terrain are allowed to void the simplicity of the straight missed procedure. Many procedures do not have FAFs so the MAP will always be the navigational facility regardless of location on or past the airport. *Make sure than your approach speed is appropriate for the category box on the approach plate.*

There are two basic kinds of missed approaches, the kind you are prepared for and the kind you are not prepared for nor expecting. This second kind of approach flies in the face of the training edict that you must expect a missed and not a landing from every approach. We become so used to always landing that the missed comes as a shock. We forget to add full power, clean up the aircraft, get a positive rate of climb, climb to the turn altitude, turn, contact approach. *The report of the missed being executed is mandatory.*

The expectation of landing is relatively high with experienced pilots. In practice approaches you know you are going to miss or land as planned. Making the missed when you are not expecting it requires a new sort of thinking. You probably have not prepared the missed as you should have. *You must confirm timing or DME, climb, clean-up, which way, how far, how high, what next?* When multiple approaches are followed by the missed, it is during the missed that the accidents usually occur.

Missed Basics:
1. Pitch for climb
2. Clean up per POH
3. Direction
4. Altitude

The worst case missed is when you are VFR until inside the FAF. The fudging of minimums appears to be more likely to occur in this approach situation. Beyond the MAP or below the minimums you must have the visuals or execute the missed. You ability to time and fly a speed related to that time is critical where a timing missed is part of the procedure. DME is better than timing where available. **Any delay in executing the missed means that you will begin below the designed climb gradient which has no margin for such an event.**

End of Approach 'Unexpecteds'
Training procedures include not only briefing the approach but the missed approach even though the vast majority of actual conditions approaches seldom end with the missed. Thus, the occasion of needing to make an unexpected missed approach usually catches the student pilot unprepared for the missed segment procedure.

The unusual aspect of missed approaches is that unlike the similarity of all the other approach segments, the missed all vary one from the other. Early study of the missed approach procedure improves the chances that it will be correctly performed. *The importance of this planning procedure became even more important when the missed came as an unexpected event.*

However, if you fail in your missed planning and preparation, you should know that standard in all the varied procedures of the missed a standard of climb and turn always exists. *It is the height of the climb and the direction of the turn that varies.* You don't need to look to your chart, climb as best able on heading while reporting to ATC. Only when fully established in the climb should you consider looking at the plate and reading instructions. **The symbolic indicators of the latest charts are even better and quicker than the text.**

In the climb you now determine how high before turning, which way, and how far. This is one area where fiddling with the autopilot or GPS or other navigational aids should be minimized and emphasis placed upon proficient hand flying. *The end of every missed procedure ends in a fix with a holding procedure.* If the fix is an intersection getting there may be a problem. Get a vector or crank up your GPS. The overall pattern of the missed approach makes it possible for the unprepared pilot to line up the ducks and keep out of trouble.

Missed Approach Planning

- More than one alternate
- Keep getting Flight Watch updates
- No approaches where below minimums
- *Never more than two approaches to an airport*
- No 'duck under' procedure

A Better Missed Approach

- If IFR at FAF mindset should go to missed approach
- Plan your reconfiguration procedure
- Practice both precision and non-precision missed procedures
- Practice the most unusual charted missed you can find. (Marysville)
- Even when you do everything right..things can go wrong.

The best way to remove missed approach concerns is through standardization of your planning and execution. The missed approach is a standard and normal part of the approach procedure. You must always pre-plan the missed approach at the same time that you prepare for the approach. The missed is not a contingency. It is part of the approach that is planned and prepared for. If you need to look at the chart inside the outer marker, you have not properly prepared for the approach. Don't even think about descending below the DH.

Make a stick-up with critical missed DH/MDA information near the AI. *One very useful technique is to write the "missed' procedure on the window with a grease pencil.* The Missed Approach Point can be simplified for your post-it or window by using a standardized format such as:

How low _____
How long _____
Which way_____
How far to my secondary airport_____

The missed approach is always a viable alternative to landing. The pilot, in preparation for the approach, has become informed of the procedure and requirements. The "plan" is compared with the weather minimums, personal minimums and procedure options. If the safer option is inconvenient, take it. If you are going to make a creative missed (different than published) clear in with ATC first. *You can climb before reaching the missed approach point but you can't legally turn until reaching it.* Given the choice fly an ATC heading as assigned instead of the published procedure which is more likely to put you into a holding pattern.

Landing expectancy is a "mind set" at the subconscious level. The perception of the situation may not be accurate but rather a expected, hoped for, desired situation. The further the distance flown and the closer the landing the stronger the expectancy becomes. *The more insecure and uncertain the pilot is with the missed approach procedure the greater will be the drive toward landing expectancy.*

Setting up the missed approach on the #2 NAV during the approach should be an integral part of the cockpit resource management system of the pilot. The missed approach point on a non-precision approach occurs when the TIME runs out. It is much to late to look at the plate when the approach time runs out. You should know what to expect by the time you reach your VDP. **The risk-benefit ratio can get pretty lopsided if you see the runway just as you pass over it.** (This probably caused the Sun Valley Mall accident) Reaching DH/MDA and probing for the runway is the most hazardous part of an instrument approach in low weather.

Consider executing the missed approach in your approach configuration. It shouldn't affect performance that much and will reduce the workload. Clean up the plane once you are established toward the fix. *If equipped, use heading bug to set assigned headings.* It's always better to go around for another try. You now have first-hand knowledge of the situation.

Most judgment errors in non-precision approaches occur during the descent from MDA to the runway as the transition from IFR to VFR takes place. You cannot climb back to circling minimums once you have descended below them except for making the missed. *Some non-precision approaches have charted visual descent points (VDP) before the missed approach time runs out.* This is the point from which from the MDA a normal landing can be accomplished. Visual descent points are usually DME fixes. They provide normal descent to airport.

Just being able to see the airport does not mean that it is safe to get to the runway. It is far better to execute a missed than to force your way to the runway. *The purpose of a VDP, even of your own making, is to provide a 'normal' landing approach.* Be sure to write where your VDP exists on the plate and the time from the FAF.

You can make your own VDP on any chart by taking 10% of the MDA and use that figure as the number of seconds to be subtracted from the approach time. This method automatically adjusts for altitude, speed and time. If you do not see the airport references at your calculated VDP you will be required to make a missed because you will be below circling minimums. *Remember, the missed climb can begin at any time but the turn part of the missed cannot begin until the time has run out.*

Your ability to land at reaching minimums will depend on your ability to make the IFR /visual transition, configure the aircraft, and acquire the required runway visual features. Flying the time out will usually make a landing at a mile long runway impossible. Run these figures as part of your preflight chart study.

You should pre-determine when you expect to break the reported ceiling. ***Your plan is that from 200' above down to the MDA you will flick your scan 'outside' every four instrument scans.*** Use a windshield spot as the scan point. That is where you expect to see the runway. This spot will be different for every aircraft and loading. On every approach except the ILS it will likely be off to one side. Plan where to look ahead of time. Every time you look outside at least two seconds is required to focus the eye on a 15-degree; field of view. At night you must force yourself to look slightly to the side of where you expect to see the airport.

It is very likely that you will be approaching a runway with the wind from one side or the other. Keep in mind the angle of correction you are holding on the HI. If you are holding a right correction you must look to the left of your windshield aiming spot. It will make a great difference where you can find the airport if you are in a constant descent or already at MDA and flying level. Fly both approaches to the same runway, descent and slope. Notice how the approach affects where you find the airport up until the VDP. At the VDP both approaches are at the same windshield spot.

The landing comes when you see the runway environment; the missed is everything else. Nobody likes to miss an instrument approach. The leading cause of IFR approach accidents is improper IFR procedures--especially recognizing when a missed approach is needed. *A rapidly evolving error chain in an approach is best indicated by any full deflection of the needles.* Start the missed approach as soon as there is uncertainty confirmed by instrument indications. **Execute the missed on any full-scale deflection of the localizer or glide slope.**

The missed must be flown precisely to maintain obstacle clearance. The missed approach procedure will be immediately executed if at any time the aircraft descends below MDA. You do not have to be at the missed approach point to initiate the climb to the missed approach point. You can execute the climb part of the missed approach at any time. However, you must continue the approach course, even while climbing, and initiate the missed approach procedures (turns) from that point in time. *Virtually all missed-approach procedures require an immediate climb and a turn at the MAP.*

If your approach goes bad, apply power and climb. You cannot execute a turn from a missed approach until you are at the time expiration for the DH on a precision or at the timed MAP on a non-precision. Obstacle clearances before the MAP or DH are quite different from those that apply after the turn. *Fly the published procedure unless VFR and cancelling.*

A minimum climb of 152' per mile is required. The area for the missed procedure is similar to that of the circle to land procedure. Accidents during missed approaches are caused by failure to initiate, delay in initiating, and improper procedure. *Reliance on ATC radar to resolve difficulties is becoming a common source of problems.*

Missed do's and don'ts

- Keep your eyes on the instruments
- Configure for the climb
- Don't turn until established in the climb.
- *Don't look for anything below during the missed.*
- Don't turn until climbing and stabilized.
- *Don't put your head down during the missed.*
- Execute the missed if needles are erratic.
- Set your own decision height above the published according to your proficiency.
- If you make and lose visual contact with the airport below decision height execute the missed immediately
- **Landings get three shots but approaches get only one. Leave while you're still alive.**
- Don't even try if the weather is below minimums.
- FAR 91.175 tells when you must execute the missed.
- *You will probably not be as near the runway threshold when you do the missed from the glide slope minimum as you will using the elapsed time of a non-precision.*
- A missed approach procedure only guarantees obstacle clearance when you begin the missed at the missed approach point.
- At an unfamiliar airport it is best to go elsewhere if you do not have the airport in sight at the minimum descent altitude.

On occasion you may decide that a missed approach other than that published will better fit your safety requirements. Be sure to coordinate this with ATC so that they can give you appropriate headings and altitudes to fly. An alternate missed procedure may not be possible.

No Autopilot on Missed
An autopilot may fly the aircraft quite a while before a system failure becomes apparent to the pilot. A pilot who continually relies on the autopilot is going to lack proficiency in hand flying. The capable pilot scans all the instruments and is partial panel proficient only if he is capable of cross checking instrument against instrument so as to determine a failed instrument. *Any instrument which seems 'failed' must be compared and verified before being covered.*

The autopilot is disengaged on the missed so the pilot can hand fly the impending climb and turn. You have pre-set the heading bug, haven't you. The inability of the pilot to hand fly and fly partial panel is necessary to prevent spatial disorientation. **One-third of missed approach accidents are due to loss of aircraft control.** Approach accidents that result in accidents should have been missed in the first place. **Second approaches that go lower are preludes to a crash.**

Missed Mantra
Power up
Pitch up
Going up
Clean up

I.e. add power, raise the nose, confirm that you have positive rate of climb established, and then retract gear and flaps. No reason why the same mantra couldn't be used for a VFR go-around.

IFR Dead Reckoning
FAR 61.65(b)(2) required instrument pilots to be instructed in DR.

- DR is required for non-radar transitions to final approach
- DR is required in doing holding patterns
- DR is required in a non-precision approach when a navaid does not define to missed approach point.
- *DR can legally be used on an IFR flight that extends beyond the "service volume" (range) of a navaid.*
- Such flight can be initiated by either pilot or controller.
- Radar monitoring will be provided.
- DR provides situational awareness which should be augmented by a time and distance log record of the flight.

Have your plates marked so you don't have to look around for the times distances or altitudes. Memorize them if you can. Plan your descent so as to reach the MDA (minimum descent altitude) at least 1 mile before reaching the MAP (missed approach point).

Speed changes
Speed changes are used by ATC to more efficiently move traffic. Any non-compliance, errors or inability to make the changes are likely to affect your arrival. The only speed change that ATC cannot directly order is the 250 knots above 10,000 of 91.117.

ATC deals with indicated, true, and ground speed. True airspeed is used for flight planned enroute speeds. The pilot flies indicated speeds and ATC corrects his radar measured ground speed accordingly.

ATC wants to know if your speed changes + 10 knots or by 5%. When you file your flight plan the speed you use is the ATC reference speed from which changes are measured. If ATC assigns you a speed, that speed becomes a clearance. Clearances are not violated.

Remote Altimeter Setting Source (RASS)
All altimeter settings must come from a national Weather Service official observer or approved source such as AWOS or ASOS.

There are two different altimeter settings used in aviation. European pilots and glider pilots tend to use QEF. Americans use QNH for most operations. The selection to be used for the decision height of an approach makes a difference. Jeppeson provides both numbers. NOS only QNH.

- QEF is when the altimeter is set to read zero at the airport elevation.
- QNH is when the altimeter is set to read elevation from a datum plane which is at the oceans mean sea level (MSL).
- Remote altimeter setting source (RASS)

Most remote settings are close enough to the field's setting that you may be tempted to think the difference can be ignored. When a low exists in the area the difference can be critical. *The higher remote minimums must be applied to intermediate, final segments, to step-down and circling minimums.* The DH of precision approaches applies the difference but it is not applied to MSAs (Minimum safe altitudes , initial segments, airway segments or feeder routes.

Required Fuel
There is some question as to whether, when you reach into the 45-minutes required fuel reserve, it constitutes an emergency. **You are allowed to use this reserve to complete a flight to an alternate landing but should you land at such an alternate with less than the required 45-minute reserve you would be in violation of FAR 91.151**. Catch 22?

IFR fuel performance is relatively uncertain since your route will be different than planned as often as not. **Don't hesitate to advise ATC of a minimum fuel situation.** With minimum fuel don't hesitate to divert, maintain altitude until within engine out distance. Most no-fuel accidents occur within five miles of an airport.

By using altitude, climb/descent, distance, speed and wind a pilot can calculate the amount of fuel required for any flight. *The presumption is that you know your hourly consumption based on actual flights using your flight practices and leaning skills.* An additional presumption is that minimum reserve requirements of the FARs will be met for the flight type and conditions. The destination of an IFR flight must meet the 1, 2, 3 minimums forecast one hour before to one hour after ETA. *It is of interest that the NTSB found that should you land with below required fuel minimums the burden of proof for a violation rests with the FAA to show that the planned flight time was in error.*

Fuel to:

- Complete flight, thence
- Fly to alternate, thence (You can change your alternate so long as you can get there.)
- Fly 45-minutes at cruise
- **No alternate required if forecast of: 1. One hour before/after ETA a ceiling of 2000' and 3-mile visibility.**

IFR planes are required by FAR to have IFR reserves of fuel at all times during IFR flight. Once you are airborne you are not required to proceed to your selected alternate airport on the flight plan. You can legally go to any airport. **An IFR pilot has no right to be surprised by making a missed.** Both forecast weather and approach time weather at the airport should be within the expected parameters of a pilot's planning and expectations. Any diversion of a flight-planned route is best held to mind before the need actually exists.

The pilot who has not done any diversion planning is now under considerable pressure. His initial option is to do another approach but second approaches are notorious for both their failure and accident rates. The second attempt tends to push personal minimums as well as THE minimums and fuel minimums..

Advance preparation is an insurance program to be used before the flight situation becomes critical. IFR training is unlikely put a student into an IFR situation where all the options are down to one. *The training that is needed is that which makes the trainee sensitive to the need for presumptive diversion planning*. If these events do not occur in training, then when they occur in later IFR life the lesson will be a real life experience. The right of Part 91 flights to try an approach, regardless of minimums greatly increases the probability that the end result will be a missed approach followed by a diversion flight.

Meanings of 'Established'
"Established" is a variable, it may mean "needle alive and moving toward centre", half-way, touching the doughnut or even centred. A centred needle provides the greatest obstacle clearance. One opinion is that when needle starts to move begin your turn to the Reference Heading. When needle stops --stop turning. *For descent to published altitude "established" means making the procedure turn or crossing the fix for the first time in a holding pattern.*

The major consideration for being 'established' is obstacle clearance. A centred needle gives the best clearance. *The standard procedure turn if taken to its ten-mile limits and to full needle deflection is at the edge of obstacle protection.* Errors of needle deflection may work either for or against obstacle clearance. The better you know the terrain and maintain your situational awareness the more 'established' can vary from the centred needle definition.

Choosing between a Circle, Downwind or Diversion

- It is important that the pilot pre-decide the limits that trigger each choice.
- *Using airline criteria is the safest choice.*
- Circles are not allowed at night, if you don't go visual at circling minimums, if the cloud base is ragged and not permitting a visual circle,
- Where a steep turn is needed to maintain visual obstacle clearance, if you become disoriented, and if you cannot align with the runway you must go for the missed.
- Doing the circle as published you will be nearly 8000 feet from the runway and 600' above it when approaching final.
- Only a perfectly executed circle has a prayer of being both legal and possible.
- *During the circle you cannot be looking where the aircraft is going.*
- It is necessary that the training program include actual circle to land situations both day and night.
- The removal of the hood while trying to maintain altitude, bank and visual contact unassisted is difficult to accomplish.
- Do an actual circle to land procedure only at your home field.

Alternative Choice

- How much tailwind can you handle for the last two thirds of runway?
- Know that a ten-knot tailwind component will double all distances required for landing.
- Know the possibles for your aircraft right now so you fly with a pre-decided minimum runway length
- Make practice short field landing in calm-wind conditions and then one normal landing.
- Double or tripling these figures you come up with some pre-decided options.
- Make Vref figures for your usual flying
- Get the ground speed and sink rate required for reaching the threshold or the touchdown markers.
- A 20-knot change in speed will give an 86% change of energy with a l0-knot headwind to a 10-knot tailwind. --At 60 knots a descent rate approaching into the headwind will require a descent of 500 fpm
- At 60 knots the tailwind will require 700+ fpm.

- The tailwind has speed illusions that cause pilot want to slow below Vs.
- With a tailwind you get a flatter approach that needs skilful power and trim use for a stable approach. –---------Knowing you have a tailwind helps you appreciate the problems.
- Runway contact will be faster with more braking.
- Wet more than doubles the required distance

The Missed Is Not a Go-Around

- A missed briefing must be a part of every pre-approach briefing.
- Most IFR approaches end in landings.
- Most practice IFR approaches end in missed approaches.
- Real world IFR training should do more landings than misses.
- To land from an IFR approach you must have the runway environment in sight before reaching DH or MDA.
- Most critical point (s) are transition (s) IFR to VFR to IFR to VFR to IFR
- Survival depends on your ability to ignore all influences and distractions by concentration on the gauges.
- All missed approaches begin with a wings level climb