* Notice to Airmen (NOTAMs) [AIM 5.1.3, FIH]
  + Time-critical aeronautical information which is either of a temporary nature or not sufficiently known in advanced to permit publication on aeronautical charts or in other operational publications
  + NOTAM information is that aeronautical information that could affect a pilot’s decision to make a flight. It includes information essential to planned en route, terminal, or landing operations.
  + Classified into four (4) categories:
    - NOTAM (D)
      * Information includes such data as taxiway closures, personnel and equipment near or crossing runways, and airport lighting aids that do not affect instrument approach criteria, such as VASI
    - Flight Data Center (FDC) NOTAMs
      * Used to disseminate information which is regulatory in nature
      * Contain such things as amendments to published IAPs and other current aeronautical charts, TFRs caused by things such as natural disasters or large-scale public events.
    - Pointer NOTAMs
      * NOTAMs issued by a FSS to highlight or point out another NOTAM
      * Assists in cross-referencing important information that may be found under an airport or NAVAID identifier
    - Military NOTAMs
      * Pertaining to USAF, USA, USMC, & USN navigational aids & airports
  + The Notice to Airmen Publication (NTAP) is published every four (4) weeks.
* IAF Procedures [FTI 409.4]
  + A low altitude IAF is any fix that is labeled as an IAF or any PT/HILO PT fix.
  + Before reaching the IAF, recheck the weather, review/brief the IAP, obtain clearance for the approach, and complete the Approach Checklist (ABCC: ATIS, Brief, Checklist, Clearance)
  + Normally cross the IAF at 150 KIAS and maintain for the initial and intermediate segments of the approach, although 170 KIAS or other airspeeds may be flown for extended arcs/segments at pilot’s discretion or as directed by ATC.
  + At the initial approach fix execute the 6 T’s:
    - **Time.** As Required
    - **Turn.** Turn to intercept course
    - **Time.** As Required
    - **Transition.** Reduce power to initiate descent
    - **Twist.** Set the inbound, teardrop, or front course
    - **Talk.** Refer to NATOPS callouts.
  + Upon reaching the IAF, you have two choices, whether it is a PT or procedure track:
    - If your heading is within 90° of the procedural course, use normal lead points to intercept the course.
    - If your heading is NOT within 90° of the procedural course, overfly the IAF and turn in the shortest direction to intercept the procedural corse
    - **NOTE:** Do not ask for “maneuvering airspace” as this term is not found in the AIM and maneuvering for better alignment is not necessary. **PRIMARY LIED TO YOU!**
  + Assuming you are cleared for the approach, do not descend until outbound/abeam and on a parallel or intercept heading the PT course.
    - Do not confuse abeam the PT course with abeam the NAVAID or IAF, this may not necessarily be needle through the wing tip.
* CRM Callouts & Techniques [See NATOPS Ch. 27]
  + Reference NATOPS
* GPS Approach Types [FTI 414.9]
  + Stand-Alone
    - Constructed specifically for use by GPS and do not have a traditional underlying procedure. They are identified by the absence of other NAVAIDs in the title, ie. “RNAV (GPS) RWY 35”
    - There are varying types of stand-alone GPS approaches, to include:
      * Basic ‘T’
      * HILO PT
      * RADVEC
      * TAA
  + Overlay [Primary Instruments FTI 710.3]
    - Consists of GPS waypoints overlaid on conventional non-precision approaches.
    - GPS overlay approaches that contain final approach step-down fixes may not have corresponding waypoints in the associated GPS approach. It is the pilots responsibility to identify these points relative to charted GPS waypoints.
* GPS Configuration Point [FTI 410.4]
  + RNAV (GPS) procedures are non-precision approaches, and configuration should be made 3 NM prior to the FAF
* Receiver Autonomous Integrity Monitoring (RAIM) [AIM 1.1.19.3, FTI 414.1]
  + GPS navigation receiver using RAIM provides GPS signal integrity monitoring, it’s also referred to as fault detection. Without RAIM capability, the pilot has no assurance of the accuracy of the GPS position.
  + RAIM is necessary since delays of up to two hours can occur before an erroneous satellite transmission can be detected and corrected.
  + Another capability, fault exclusion, refers to the ability of the receiver to exclude a failed satellite from the position solution and is provided by GPS receivers.
  + To detect an integrity anomaly, RAIM needs a minimum of 5 satellites in view, or four satellites and a barometric altimeter.
* Approach Modes [FTI 414.4]
  + Enroute Mode
    - Prior to execution of the instrument approach, the display sensitivity is a full-scale deflection of 5 NM either side of centerline
  + Terminal Mode
    - Operations conducted within 30 NM of the origin or destination airport.
    - CDI defection during these operations is ±1 NM, and must be in this mode prior to descending on an approach
  + Approach Mode
    - At a distance of 2 NM inbound to the FAWP, the display sensitivity being to transition to a full-scale deflection of 0.3 NM either side of centerline.
      * In the TC-12B, the green Approach Light will illuminate, [CRM Callout: “Approach Mode Active”]
  + Missed Approach Mode
    - When navigation to the missed approach holding point is activated, the CDI display sensitivity transitions back to the terminal area sensitivity of ± 1 NM
* Required Navigation Performance (RNP) [FTI 414.4, AIM 5.4.5]
  + Intended to provide a single performance standard for aircraft manufacturers, airspace designers, pilots, controllers and international authorities.
  + Some aircrafts have RNP approval without a GPS sensor. The lowest level of sensors that the FAA will support for RNP service is DME/DME, however necessary DME service may not be available at the airport of intended operations. “DME/DME RNP-0.3 NA” such as on the RNAV (GPS) RWY 17 at KCRP, means that DME/DME dependant aircraft are not authorized for this approach.
* Visual Descent Points (VDPs) [AIM 5.4.5, FTI 410.5]
  + A defined point on the final approach course of a non-precision straight-in approach procedure from which normal descent from the MDA to the runway touchdown point may be commenced, provided visual reference is established.
  + Will be normally identified by DME on VOR and LOC procedures and by along-track distance to the next waypoint for RNAV procedures
  + It is identified on the profile view of the approach chart by the symbol: **V**
  + The pilot should not descend below the MDA prior to reaching the VDP and acquiring the necessary visual reference
* Vertical Descent Angle (VDA) [AIM 5.4.5, FTI 410.5]
  + Designed by the FAA to reduce instances of Controlled Flight Into Terrain (CFIT).
  + Published on all non-precision approaches, along with the threshold crossing height (TCH) used to calculate the angle. The optimum descent angle is 3.00°; and whenever possible the approach will be designed using this angle
  + Published VDAs are strictly advisory in nature and does not offer obstacle clearance below MDA.
  + A chart note will indicate if the VDP or Visual Glide Slope Indicator (VGSI) are not coincident with the VDA
  + VDA can be translated into descent speeds using the inside back cover of the approach plate, or by halving your ground speed and adding a zero.
* Landing Transition [FTI 410.5]
  + Know the approach lighting and be able to determine aircraft position relative to the runway, but do not rely on the instrument approach lighting for vertical guidance
  + Continuously crosscheck the Glide Slope Indicator and VSI & ADI
  + CRM is extremely important in the landing transition. Stay focused on flying the instrument approach, when the field is in sight, the PM will let you know.
* Holding [FTI 407]
  + Normal holding airspeed for the TC-12B is 150 KIAS. Start speed reduction when 3 minutes or less from the holding fix and cross at or below holding speed.
  + Max holding airspeeds change with MSL altitudes:
    - MHA – 6000’ : 200 KIAS
    - 6001’ – 14000’ : 230 KIAS
    - 14001’ and above : 265 KIAS
    - Exceptions:
      * Where depicted restrictions exists
      * USAF Fields: 310 KIAS
      * USN Fields: 230 KIAS
  + Holding Pattern Entry
    - Crossing the holding fix execute the 6 T’s:
      * **Time.** Note the time of entry and compare to EFC
      * **Turn.** Turn outbound using Direct, Parallel or Teardrop entry. Apply wind correction if winds are known.
      * **Time.** Begin timing when outbound and abeam the fix, which ever occurs last.
      * **Transition.** 150 KIAS & assigned altitude
      * **Twist.** Twist CDI to inbound holding course
      * **Talk.** Report established (if required).
    - Parallel Entry
      * Turn to a heading to parallel the holding course outbound on the non-holding side for one minute, turn in the direction of the holding pattern for more than 180° and return to the holding fix or intercept the holding course inbound
      * Caution: Winds may put the aircraft on the holding course or cause the aircraft to cross the holding course.
    - Teardrop
      * Fly to the fix, turn outbound to a heading for a 30° teardrop entry within the pattern (holding side) for 1 minute, then turn to intercept course inbound.
    - Direct
      * Fly to the fix and turn to follow the holding pattern
  + Timing
    - SFC-14,000 ft : 1 minute legs
    - 14,001 ft and above: 1.5 minute legs
    - If receiving a clearance specifying the time to depart a holding pattern, adjust the pattern within the limits of the established holding procedure to depart at the time specified.
  + Drift Corrections
    - Wind corrections should be applied on the entry orbit as winds are generally known
    - Outbound drift corrected headings are to be held for 1 minute, whether utilizing timing or DME. Once the initial 1 minute is up, turn back to parallel the inbound course.
    - When outbound, triple the wind correction used on the inbound leg during the first minute only.
  + DME/GPS Holding
    - The controller or IAP will specify the length of holding legs as indicated by DME or the Along-Track Distance (ATD) indicated by the GPS
    - Not all GPS holding is based on ATD. If the IAP specifies timing, use timing.
  + Descending in Holding
    - If cleared for an approach while established in holding, the pilot may descend to the minimum holding altitude, unless ATC instructs otherwise
    - Where there is no minimum holding altitude, upon clearance for the approach, the pilot must maintain the last assigned altitude until leaving the holding pattern and established inbound.
    - If established in holding on a published HILO-PT pattern and then cleared for the approach, no additional turns in holding are necessary nor expected by ATC. If additional turns are required/wanted, notify ATC
  + If arriving at your IAF without clearance for the approach, hold as published and update EFC. If no holding pattern depicted, hold on the PT side of approach course.
* GCA Approach [FTI 411.1]
  + Although not flying an approach with a diagram depicted on an approach plate, have an approach to the same runway up and not only brief the approach minimums, but all other applicable field information
  + Airport Surveillance Radar (ASR) is a non-precision approach offering course guidance only, without glide-slope.
    - Configure on dogleg or base
    - Upon contacting the final approach controller, request recommended altitudes on final. Upon instruction begin descent to MDA. Controller will issue course guidance when required and give range information each mile while on final approach.
    - The controller will inform you when reaching the MAP.
  + Precision Approach Radar (PAR) is a precision GCA that provides both course and glide-slope guidance.
    - Descent begins when the controller says “On Glide Path”, upon which the pilot should establish the predetermined rate of descent.
    - Avoid excessive power, pitch or bank changes. Normally pitch changes of 1° should be sufficient to correct back to glide path.
    - Make heading changes immediately, using shallow angles of bank not to exceed ½ SRT.
    - Decision Altitude (DA) is the MSL altitude and Decision Height (DH) is the AGL altitude at which a decision must be made on a precision approach. The controller will advise when DH has been reached. In the cockpit, DA is determined by the barometric altimeter or controller, which is reached first.
    - Two NATOPS qualified aviators must be at the controls to utilize minimums lower than 200 feet.
* PAR/ILS/ASR Configuration Point [FTI 410.4]
  + **PAR** Base or Dog-leg to final
  + **ASR** Base or Dog-leg to final
  + **ILS** 1 ½ dots above glide-slope at glide-slope intercept altitude or 3 NM prior to FAF
* PAR vs. ASR Descent Point [FTI 411.1]
  + PAR : When the aircraft reaches the point where final descent is to start, the controller will state, “Approaching glide-path, begin descent”. Wait to descend until he controller says “On glide-path”.
  + ASR : When the aircraft reaches the descent point, the controller will advise you to “begin descent to minimum descent altitude.” If a descent restriction exists, the controller will specify the prescribed restriction altitude.
* ASR Recommended Altitudes
  + Typically based on 3° glide slope
  + Don’t forget to ask the final approach controller
* NAVAID Characteristics (ILS/LOC) [AIM 1.1.9]
  + The ILS is designed to provide an approach path for exact alignment and descent of an aircraft on final to a runway.
  + The ground equipment consists of two highly directional transmitting systems and, along the approach, three (or fewer) marker beacons. The directional transmitters are known as the localizer and glide slope transmitters.
  + The system can be divided into 3 parts
    - Guidance information, provided by localizer and glide slope
    - Range information, provided by marker beacons and DME
    - Visual information, provided by approach lights, touchdown & centerline lights, runway lights
  + Localizer
    - Transmitters operate on one of 40 ILS channels within the frequency range of 108.1 to 111.95 MHz. Signals provide the pilot with course guidance to the runway centerline.
    - Approach course for the localizer is called the front course and is transmitted at the far end of the runway; adjusted for a course width of 700 feet at the runway threshold (ergo, 350 feet at full deflection).
    - The course line along extended centerline in the opposite direction is called the back course.
    - Identifier consists of three letters preceded by the letter *I* (••)
    - Provides course guidance up to 4,500 feet and out to 18 NM broken down as follows:
      * 10° full deflection out to 18 NM
      * 35° full deflection out to 10 NM
  + Glide Slope/ Glide Path
    - The UHF glide slope transmitter, operating on one of the 40 ILS channels within the frequency range 329.15 to 335.00 MHz, radiates its signals in the direction of the localizer front course.
    - Located between 750-1,250 feet from the approach end of the runway and offset 250-650 feet from centerline to transmit a glide path beam 1.4° wide (vertically).
    - It provides descent information for navigation down to the lowest authorized decision height (DH) specified in the approved ILS approach procedure, and my not be suitable for navigation below this altitude. Glide paths with no published DH are useable to runway threshold.
    - If glide-slope information is lost on an ILS approach and are above localizer minimums, consider yourself transitioned to a localizer approach and proceed accordingly.
    - Glide path projection is normally adjusted to 3° so that it intersects the OM at 1,400 feet above runway elevation.
  + In the US, the glide-slope, the localizer, and the Outer Marker (OM) are required components for an ILS.
* Localizer Approach [FTI 411.2]
  + Localizer approaches are non-precision approaches that use the localizer from the ILS for azimuth guidance, without using the ILS glide-slope.
  + The localizer signal typically has a useable range of at least 18 miles within 10° of the course centerline unless otherwise stated on the IAP. Clearance by ATC to intercept the localizer beyond this distance is only acceptable when your aircraft is in radar contact and ATC is sharing responsibility for course guidance.
  + The localizer sensitivity increases the closer you are the antennae. Try to keep corrections to ±5°.
* Localizer Back Course Approach [FTI 411.2]
  + In order to fly a localizer back course approach, set the published front course in the CDI.
  + Due to the location of the localizer antenna, when flying the LOC BC the CDI will be much more sensitive than when flying a normal localizer approach.
  + Disregard all Glide-slope indications when executing a BC approach unless a glide-slope is specified on the IAP
* NAVAID Characteristics (LOC/LOC-BC)
  + Localizer
    - Transmitters operate on one of 40 ILS channels within the frequency range of 108.1 to 111.95 MHz. Signals provide the pilot with course guidance to the runway centerline.
    - Approach course for the localizer is called the front course and is transmitted at the far end of the runway; adjusted for a course width of 700 feet at the runway threshold (ergo, 350 feet at full deflection).
    - The course line along extended centerline in the opposite direction is called the back course.
    - Identifier consists of three letters preceded by the letter *I* (••)
    - Provides course guidance up to 4,500 feet and out to 18 NM broken down as follows:
    - 10° reception range out to 18 NM
    - 35° reception range out to 10 NM
  + Localizer Type Directional Aid (LDA)
    - Comparable use and accuracy to a localizer but is not part of a complete ILS.
    - The LDA is not aligned with the runway. Straight-in minimums may be published where alignment does not exceed 30° between the course and runway. Circling minimums only are published where this alignment exceeds 30°.
* Reverse Sensing [FTI 411.2]
  + Because the localizer gives no bearing information the CDI displays only directional deflection from centerline, regardless of course selected in the course select window. For this reason, if you twist in the final approach course when flying a LOC BC, the CDI will appear to be commanding you the wrong direction.
* LOC/LOC-BC Configuration Point [FTI 410.4]
  + 3 NM prior to FAF
* Use of VOR or NDB on ILS/LOC Approaches [FTI 411]
  + When flying a LOC, LOC BC, or ILS approach, it is always wise to tune up another NAVAID, if one is available, to help increase situational awareness. Where available, tune the VOR or NDB, select the paddles as appropriate on the RMI, and keep watch as the head of the needle “falls” to the CDI course; When it is within 10 bearings of the radial, expect the CDI to start moving. This will prevent missing the CDI course becoming “alive” and blowing through the final.
* Departure Procedures (DPs) [AIM 5.2.8]
  + Instrument departure procedures are preplanned IFR procedures which provide obstruction clearance from the terminal area to the appropriate en route structure.
  + If an obstacle penetrates what is called the 40:1 obstacle identification surface, then the procedure designer chooses how to establish obstacle clearance. Obstacles that are located within 1 NM of the DER and penetrate the 40:1 OCS are referred to as “low, close-in obstacles”.
  + DPs assume normal aircraft performance, and that all engines are operating. Development of contingency procedures, required to cover the case of an engine failure or other emergency in flight that may occur after liftoff, is the responsibility of the operator.
  + Unless specified otherwise, required obstacle clearance for all departures is based on the pilot crossing the departure end of the runway (DER) at least 35 feet above the DER elevation, climbing to 400 feet above the DER elevation before making the initial turn, and maintaining a minimum climb gradient of 200 feet per nautical mile.
  + There are two types of DPs
    - Obstacle Departure Procedures (ODP)
      * Printed either textually or graphically
      * Provide obstruction clearance via the least tasking route from the terminal area to the appropriate en route structure.
      * May be flown without ATC clearance unless an alternate departure procedure has been specifically assigned by ATC.
    - Standard Instrument Department (SID)
      * Always printed graphically
      * ATC procedures printed for pilot/controller use in graphic form to provide obstruction clearance and a transition from the terminal area to the appropriate en route structure.
      * Primarily designed for system enhancement and to reduce pilot/controller workload.
      * ATC clearance must be received prior to flying a SID
  + Diverse Departure
    - If an aircraft may turn in any direction from a runway within the limits of the assessment area and remain clear of obstacles, that runway passes what is called a diverse departure assessment and no ODP will be published.
  + Visual Climb Over the Airport (VCOA)
    - DPs established solely for obstacle avoidance that require a climb in visual conditions to cross the airport or an on-airport NAVAID in a specified direction, at or above a specified altitude.
  + Vectors
    - ATC may assume responsibility for obstacle clearance by vectoring the aircraft prior to reaching the minimum vectoring altitude by using a Diverse Vector Area (DVA).
    - ATC may also vector an aircraft off a previously assigned DP
    - In all cases, the 200 FPNM climb gradient is assumed and obstacle clearance is not provided by ATC until the controller begins to provide navigational guidance in the form of radar vectors.
* Needle/DME vs. Geographic Orientation
  + Head of the needle points to the NAVAID
  + Tail of the needle is the radial the aircraft is on
  + DME is distance along the radial of the aircraft
  + “I’m on the [tail] radial at [DME] miles, the NAVAID bears [head] degrees from the aircraft”
* Point-to-Point Navigation [FTI 406.4]
  + Tune and identify the station
  + Turn the aircraft in the shorter direction to place the head of the bearing pointer under the top index or upper lubber line
  + Center the CDI with a ‘TO’ indication (does not apply to NDB)
  + Maintain course to the station while correcting for winds and keeping the CDI centered.
  + If either compass or bearing pointer is inoperative, the HSI may be used to determine the bearing to the station by rotating the course set knob until the CDI centers with a TO indication. Until verified by radar or other navigation equipment, consider this bearing information unreliable.
  + If CDI or bearing pointer indicates a deviation from the desired course, return to course avoiding excessive intercept angles, then reevaluate drift correction required to maintain course.
* NAVAID Characteristics [AIM 1.1]
  + VHF Onmi-Directional Range (VOR)
    - Operate within the 108.0 to 117.95 MHz frequency band and have a power output necessary to provide coverage within their assigned operational service volume.
    - They are subject to Line Of Sight (LOS) restrictions and the range varies proportionally to the altitude of the receiving equipment
    - Most are equipped for voice transmissions on the VOR frequency. Those with out are indicated by the letter ‘W’ included in the designator.
    - Only positive identification is via Morse Code or voice transmission of the range identifier followed by “VOR”
    - Accuracy of course alignment is excellent and generally plus or minus one degree.
    - Certain propeller RPMs or helicopter rotor speeds can cause the VOR CDI to fluctuate as much as ±6°
  + Tactical Air Navigation (TACAN)
    - For reasons peculiar to military or naval operations the civil VOR/DME system of air navigation was considered unsuitable. A new navigational system was there fore developed by the military and naval forces.
    - TACAN is a pulse system and operates in the Ultrahigh Frequency band.
  + Non-directional Radio Beacon (NDB)
    - A low or medium frequency radio beacon that transmits non-directional signals whereby the pilot of an aircraft properly equipped can determine bearings and “home” on the station.
    - Operate in a frequency band of 190 to 1750 kHz
    - When used in conjunction with the ILS markers, it is called a compass locator
    - All NDBs, except Compass Locators, transmit a continuous three-letter identification in code except when during voice transmissions.
    - Subject to disturbances that may result in erroneous bearing information. At night, they are vulnerable to interference from distant stations.
    - Nearly all disturbances that affect ADF bearing also affect the facility’s identification. Noisy identification usually occurs when the ADF needle is erratic.
    - Since the ADF does not have a flag to warn the pilot when erroneous bearing information is being displayed, the pilot should continuously monitor the NDB’s identification.
* VOR/TACAN Approach Procedures
  + Tune and Identify the NAVAID
  + Select HSI source
  + Comply with IAP
  + Established inbound when CDI reaches half deflection.
* NDB Approach Procedures
  + CDI will be of no use for the actual approach
  + Approach is done using RMI
  + Established inbound when within 5 radials of final approach course
  + Monitor the NAVAID identifier continuously in case of disturbance.
* Circling Procedures [FTI 411]
  + Circling to land is a visual flight maneuver. When the instrument approach is completed, it is used to align the aircraft with the landing runway.
  + The TC-12B circles at 130 KIAS for normal and single engine situations, and 140 KIAS with a no-flap configuration.
  + The circling MDA and weather minima published on IAPs are those for the runway to which the instrument approach was flown, and apply to non-radar non-precision approaches.
  + Controllers may issue specific guidance for the circling approach to include a direction on an eight-point compass (N, NE, E, SE…)
  + Circling obstruction clearance areas are determined by aircraft category and the aircraft should be maneuvered to remain within the circling area.
    - Category ‘C’ : 1.7 NM
    - Category ‘D’ : 2.3 NM
  + When requesting circling MDA from the controller for a circling ASR approach, state your aircraft category.
  + Circling minimums provide 300 feet of obstacle clearance within the clearance area for a specified category
  + Additional consideration should be given to high altitudes and high tailwinds, possibly increasing aircraft category.
  + After breaking out, maneuver the shortest path to the downwind or base leg, considering existing weather conditions. You may make turns in either direction to final, unless
    - Directed otherwise by the controlling agency
    - Required to by the IAP or IFR/VFR Supplement
    - Other aircraft in the pattern
  + If able, fly the circling maneuver at higher than circling minimums (up to pattern altitude) to allow for better site picture and visual cues. Do not descend below MDA or reduce airspeed below 130 KIAS until in a position to place a normal glide path to the runway.
* Circling Missed Approach [FTI 411, AIM 5.4.21]
  + If you lose visual reference while circling to land or there is any doubt whether the aircraft can be safely maneuvered to touchdown, execute a missed approach.
  + The missed approach instruction is designed to return the aircraft to an altitude providing en route obstruction clearance.
  + If visual reference is lost while circling to land from an instrument approach, the missed approach specified for that procedure must be followed.
  + To become established, begin an initial climbing turn toward the landing runway to ensure the aircraft remains within the circling obstruction clearance area, and continue until established on the climb-out instructions.
  + FAA vs. ICAO Procedures
    - ICAO has a wider radius for Circling
    - FAA is more lenient with maneuvering to land
* Procedure Track
  + Arc/Radial Combination [Primary Instrument FTI]
    - Arcing is defined as flying at a constant distance from a TACAN or VOR/DME station by reference to DME
    - In practice you do not actually fly a “perfect arc”, but by varying AOB and heading, a close approximation of an arc can be achieved.
    - When turning onto an arc from a radial, the amount of lead should be 0.5% of the aircrafts groundspeed.
      * At 150 KIAS, this is approximately 0.8 NM
    - Turn to place the TACAN or VOR needle on the 90° benchmark
      * If DME is less than the desired arc distance, maintain heading. If excessively inside the arc, turn away from the NAVAID to place the head of the needle just below the 90° benchmark
      * If the DME is more than the desired arc distance, turn toward the NAVAID to place the head of he needle just above the 90° benchmark.
    - Turn off an arc onto a radial: (60/DME) x (5% Groundspeed)
  + Teardrop
    - Per Advanced FTI:
      * The advantage of the teardrop is that pilots can proceed outbound using course guidance to achieve the proper offset from the PT course so that one continuous turn will establish you inbound
      * Rules of Thumb
        + 30° teardrop for 1 minute outbound
        + 20° teardrop for 2 minutes outbound
        + 10° teardrop for 3 minutes outbound
    - Per Primary FTI
      * IAF 6 Ts
        + **Time.** Note time
        + **Turn.** In the shortest distance to parallel the outbound course
        + **Time.** Start timing for three minutes outbound when wings level or abeam the station
        + **Transition.** Airspeed, Altitude, Configuration
        + **Twist.** Set the outbound course in the CDI and intercept
        + **Talk.** Brief next segment
      * After 2 ½ minutes twist inbound course into CDI
      * At the three minutes (or timing as appropriate to remain within specified distance) turn to the inbound course and set an intercept.
      * When established inbound (half deflection on the CDI for VOR/TACAN approaches, 5 radials for NDB approaches) and 3 NM from FAF, configure and slow to 130 and continue approach.
* High Altitude Approach/Penetration
  + A high altitude instrument approach enables an aircraft to transition from the high altitude structure to a position on, and aligned with, the inbound course to the FAF, level on the FAF altitude.
* Lost Communications (IFR – VMC vs. IMC)
  + FAA Procedures [FIH A]
    - When confronted with a situation not covered in the regulations, pilots are expected to exercise good judgment in whatever action they elect to take
    - Transponder, Squawk ‘7600’
    - Expect ATC to transmit of Guard and NAVAID frequencies where available
    - If able to maintain VMC continue flight under VFR and land as soon as practicable.
    - If IMC, and VMC is not encountered, continue flight according to the following
      * Route:
        + By the route **A**ssigned in the last ATC clearance received.
        + If being radar **V**ectored, by the direct route from the point of radio failure to the fix, route, or airway specified in the vector clearance
        + In the absence of an assigned route, by the route that ATC has advised may be **E**xpected in a further clearance; or
        + In the absence of an assigned route or a route that ATC has advised may be expected in a further clearance, by the route **F**iled in the flight plan.
      * Altitude – At the highest of the following altitudes or flight levels for the route of segment being flown:
        + The altitude or flight level **A**ssigned in the last ATC clearance received;
        + The **M**inimum altitude for IFR operations; or
        + The altitude or flight level ATC has advised may be **E**xpected in a further clearance
    - Leave Clearance Limit
      * When the clearance limit is a fix from which an approach begins, commence descent or descent & approach as close as possible to the EFC time if one has been received, or if one has not been received, as close as possible to the ETA as calculated from the filed or amended (with ATC) estimated time en route.
      * If the clearane limit is not a fix from which an approach begins, leave the clearance limit at the EFC time if one has been received, or if none has been received, upon arrival over the clearance limit, proceed to a fix from which an approach begins and commence descent or descent and approach as close as possible to the ETA as calculated from the filed or amended (with ATC) estimated time en route.
    - Radar Approaches
      * Initiate lost communications procedures if no transmissions are received for approximately 1 minute while being vectored to final, 15 seconds while on the ASR final approach, or 5 seconds while on the PAR final approach.
        + Attempt contact on a secondary frequency, the previously assigned frequency, the tower frequency, or guard.
        + If unable to re-establish communications and unable to maintain VMC, proceed with a published instrument approach procedure or previously coordinated instructions. Change transponder to appropriate codes.
        + Maintain the last assigned altitude or the minimum safe/sector altitude, whichever is higher, until established on a segment of the published approach.
  + ICAO [FIH A]
  + Letter of Agreement (LOA) [Blue Brains]
    - If communications are lost with CRP Approach Control, attempt to contact NGP Tower on 340.2, proceed VFR and land. If unable:
      * Aircraft experiencing radio failure immediately after takeoff
        + Climb on last heading or route assigned by ATC, maintain 1,600 feet
        + If communications cannot be established with Corpus Christi Departure Control within three (3) minutes after departure, climb and maintain 2,600 feet.
        + After reaching 2,600 feet, proceed direct to an approach aid/fix serving NAS Corpus Christi and execute an approach.
      * If no transmission are received for 1 minute in the GCA pattern, proceed direct to an approach aid/fix serving NAS Corpus Christi and execute an approach
      * If no transmissions are received for 5 seconds (PAR) or 15 seconds (ASR), attempt to contact NGP Tower on 340.2 and proceed VFR and land. If unable, alter course to intercept an instrument approach course for the runway in use, if practical, and execute an approach; otherwise climb and maintain 1,600 feet, proceed direct to an approach aid/fix serving NAS Corpus Christi and execute an approach.
    - Surf, Sagebrush, and Rooke flight coded flight plans have specialized lost communication procedures; review letter of agreement prior to departing on Surf, Sagebrush, and Rooke flight plans.
* Windshear [NATOPS 15.3]
  + Any rapid change in wind direction or velocity. Severe windshear is defined as a rapid change in wind direction or velocity causing airspeed changes greater than 15 knots or vertical speed changes greater than 500 fpm. The best way to escape severe windshear is avoid it.
  + Potential windshear notification sources include
    - Hourly Sequence Reports
    - Pilot Reports (PIREPS)
    - Severe Weather Watch Reports
    - Convective Activity
    - Low Level Windshear Alert Systems (LLWAS)
  + Do not operate in areas of severe windshear
  + Windshear indications include:
    - ±15 KIAS
    - ±500 fpm of vertical speed
    - ±5° of pitch attitude
    - ±1 dot glide-slope displacement (approach only)
    - Unusual throttle position or a significant period of time (approach only)
  + A microburst is beyond the performance capability of transport category airplanes
  + Do not land or takeoff when tower broadcasts words such as “Microburst Alert”, “Microburst”, “Shear of 30 Knots” or greater.
  + Procedures:
    1. \*Power – Maximum. (PF)
    2. \*Propeller levers – Full forward. (PF)
    3. \*Autopilot – DISENGAGE. (PF)
    4. \*Pitch attitude/wings – Rotate toward 15°/gently roll wings level. (PF)
    5. Configuration – Do not change. (PF)

When clear of the windshear emergency event:

* + 1. Waveoff Procedure (normal) – Execute. (PF)
  + Do not stop or delay for analysis. Rotate smoothly at 3°/second until reaching 15° nose up. Stop rotation if stall warning sounds or stall buffet occurs.
  + If ground contact is imminent, rotate past the 15° target attitude and increase pitch to the lower limit of the stall warning threshold. Use intermittent stall warning as the upper limit for the pitch attitude until terrain clearance is ensured. The warning provides 4 to 12 knots of stall protection.
  + Do not change landing gear, flap or trim configuration until terrain clearance is ensured
  + PM call out continuous radio altitude and altitude trend (ie. “Climbing … 200 Feet … Descending … 150 Feet …”)
  + Advise ATC of any windshear encounter
* Partial Panel Approach [FTI 412.8]
  + Trouble shoot and transfer the controls to the co-pilot if the system failure affects only the pilots instrument panel.
  + Remain VMC and land as soon as practical if weather is not a problem and this is an option
  + Secure all electrical equipment (Big Four) that may influence the wet compass if the malfunction is a heading problem
  + If the heading indicator should fail, advise the radar controller and request a no-gyro radar approach.
  + Perform turns during the transition to final by establishing an AOB on the attitude indicator that will approximate a SRT, not to exceed 30° of bank.
  + If attitude information is also unavailable, a single needle width deflection of the pilot’s turn needle will indicate a SRT.
  + On final, do not use more than a ½ SRT.
  + Initiate turns immediately upon hearing the words “Turn Right” or “Turn Left”; likewise, stop turn on receipt of words “Stop Turn”. Acknowledge controller’s commands until advised not to.
  + Big Four:
    - Windshield heat
    - Windshield wipers
    - Air Conditioning
    - Forward Vent Blower
* Needle Only Approach Procedures [FTI 412.5]
  + If the CDI fails, or is found to be out of tolerance during an instrument check, the following procedures are available:
    - A VOR approach can be flown using the needles on the RMI, as in all normal NDB approaches.
    - TACAN approaches can be flown using just the bearing pointer on the HSI, you will have to mentally calculate the radial you are on as there is no needle in the aircraft.
      * When intercepting a course inbound, put the heading bug on the inbound course; the pointer will fall to the heading bug when on an intercept heading. The intercept is completed by turning to put the pointer under the upper lubber line.
      * When intercepting a course outbound, the heading bug is put on he reciprocal of the outbound course; again the pointer will fall to the heading bug when on an intercept heading. Complete the intercept by turning away from the pointer so it is on the lower lubber line mark.
* SSE Approach Procedures [FTI 412.1]
  + After engine failure, determine if an air-start should be attempted or the engine should be shutdown and then “pre-loaded” for a starter–assisted air-start. Do not restart (or preload) an engine if:
    - **M**echanical malfunction
    - **0**% N1
    - **V**ibrations
    - **E**xplosions
    - **O**verheating
    - **F**ire
    - **F**uel Fumes
  + Following an engine failure on climb-out:
    - Add power as required, clean up, and perform the Emergency Engine Shutdown Checklist.
    - Maintain VXSE/VYSE in the climb, or airspeed and power combinations that allows the aircraft to climb at the minimum climb gradient until desired altitude is attained.
    - Remain VMC if possible, declare an emergency, and state your intentions.
    - If IMC, request a suitable approach for existing weather, recommend a PAR or ILS due to the precision glide-slope.
    - Provide souls on board, fuel remaining (time), and the nature of the emergency, when time permits.
  + Engine failure en route:
    - Perform Emergency Engine Shutdown Checklist, declare an emergency, and land as soon as possible.
    - Be alert to increases in cabin altitude and MEA requrements.
    - Use charts and the IFR supplement to help determine suitable divert fields.
    - Use the ‘DRAFT’ technique to quickly give your intentions to ATC
      * **D**estination
      * **R**oute
      * **A**ltitude
      * **F**uel Remaining
      * **T**ime
  + When executing a single engine or SSE approach, maintain a clean configuration and 150 KIAS if possible, 140-150 KIAS allowable for the initial and intermediate segments of the approach until the normal configuration point. Any approach to a circle or sidestep will use non-precision approach configuration procedures.
    - If flying a single-engine or SSE ILS, PAR, or ASR with recommended altitudes:
      * Once established on final and approaching the configuration point, lower the flaps to approach, set the props full forward, and slow to 130 KIAS anytime after the normal configuration point; gear should be left in the ‘up’ position
      * Just before the configuration point lower the gear and complete the landing checklist.
      * If at any time you are unable to maintain glide-path or airspeed, you should retract the gear or clean up completely to eliminate drag. After reestablishing glide-path and airspeed, reconfigure and complete the landing checklist again.
    - SSE Configuration Procedures:
      * Precision : ½ dot below glide-slope at glide-slope intercept altitude.
      * Non-precision : In safe position to land
      * Radar Approach PAR : 10 second gear warning
      * Radar Approach ASR : 10 second gear warning/safe position to land.