VIII.B. Precision Instrument Approach

References: 14 CFR part 91; FAA-H-8083-9; FAA-H-8083-15; AIM

Objectives	The student should develop knowledge of the elements related to precision approaches.
Key Elements	1. Ensure you have the correct chart 2. 5 T's at every waypoint: Turn, Time, Twist, Throttle, Talk 3. Brief the Approach
Elements	1. Appropriate Instrument Approach Procedure Chart 2. Pertinent Info on the Approach Chart 3. Radio Com with ATC and Compliance with Clearances, Instructions, and Procedures 4. Aircraft Configuration, Airspeed, and Checklist Items 5. Tuning, Identifying, and Determination of Status of Ground/Aircraft Nav Equipment 6. Aircraft Approach Category 7. Maintenance of Altitude, Airspeed, and Track 8. Appropriate Rate of Descent 9. Determination of a Straight-in-Approach, Circling Approach, Missed Approach
Schedule	1. Discuss Objectives 2. Review material 3. Development 4. Conclusion
Equipment	1. White board and markers 2. References
IP's Actions	1. Discuss lesson objectives 2. Present Lecture 3. Ask and Answer Questions 4. Assign homework
SP's Actions	1. Participate in discussion 2. Take notes 3. Ask and respond to questions
Completion Standards	The student has the ability to set up for, brief, and execute precision approaches without the assistance of the instructor.

Instructors Notes:

Introduction:

Attention

Interesting fact or attention grabbing story

Overview

Review Objectives and Elements/Key ideas

What

A precision approach provides lateral and vertical guidance to a runway (ILS). Because of the addition of vertical guidance (the glide slope), the precision approach has the ability to get an aircraft closer to the ground than a non precision would allow. The ILS is an expensive system, so although it makes it easier to get into an airport in poor weather or visibility, they are most often located at the larger, busier airports.

Why

The ILS system is important to understand since it is used throughout the US, and has the ability to get you within 200' AGL before starting your missed approach. The ILS, if available, is the default approach assigned by ATC.

How:

1. **Appropriate Instrument Approach Procedure Chart**
   - A. Often ATIS will provide pilots with the approaches that are in use
     - i. If more than one is in use, an educated guess may be necessary until ATC assigns an approach
       - a. This is based on weather, direction of arrival, any NOTAMS, and previous experience
   - B. ATC can inform you of the approach that can be expected
     - i. Pilots may request specific approaches to meet the individual needs of their equipment or regulatory restrictions at any time and ATC will most likely accommodate the request
   - C. If operating into an airport without a control tower, the crew occasionally will be allowed to choose
   - D. Double check the approach plate you are using/briefing coincides with the assigned appraoch
2. **Pertinent Info on the Approach Chart**
   - A. FFIIMMMMS
     - i. **F**ixes
     - ii. **F**requencies
     - iii. **I**nbound Course
     - iv. **I**dentify
     - v. **M**arker Beacons
     - vi. **M**inimums
     - vii. **M**inutes
     - viii. **M**issed Approach
     - ix. **S**ecurity
3. **Radio Com with ATC and Compliance with Clearances, Instructions, and Procedures**
   - A. Comply with ATC clearances and instructions given
     - i. Repeat back important information regarding clearances to ensure positive transfer
   - B. If unable to comply with an instruction advise ATC "unable"
     - i. ATC can make mistakes

C. If you do not understand an instruction from ATC request “say again” or clarification

4. Aircraft Configuration, Airspeed, and Checklist Items

A. Configuration
   i. Procedure Turn (inbound/Outbound), Localizer Intercept
      a. Airspeed: 100 KIAS
      b. Power: 18-20” Hg, 2300 RPM
   ii. ½ Dot Above Glide Slope
      a. Airspeed: Decelerating to 90 KIAS
      b. Power: 18-20” Hg 2300 RPM
      c. Flaps: Takeoff Flaps
   iii. Glide Slope Intercept (FAF)
      a. Airspeed: 90 KIAS
      b. Power: 13-14” MP 2300 RPM
      c. Pitch: 5^{o} Nose Down

B. Checklist Items
   i. Pre-Landing Checklist
      a. LBBGUMPS
   ii. Arriving at any Fix (5 T’s)
      a. Turn
      b. Time
      c. Twist
      d. Throttle
      e. Talk
   iii. Inside Outer Marker/FAF
      a. Reds, Blues, Greens, Whites, Power: 11-13” Hg

5. Tuning, Identifying, and Determination of Status of Ground/Aircraft Nav Equipment

A. Tune the desired navaid frequency

B. To identify/verify there are two options in the G1000
   i. The G1000 will put the navaids ID next to the frequency, this indicates it is tuned and identified
   ii. Listen to the Nav for the Morse code identifier
      a. In the case that the Morse code identifier is not heard, the navaid is out of service

C. Aircraft navigation equipment that is inoperable will show a flag indicating that it is not working

6. Aircraft Approach Category

A. Aircraft Approach Category - A grouping of aircraft based on reference landing speed, if specified, if it is not, 1.3 V_{SO} (stall speed/min steady flight in the landing config) at the max certificated landing weight
   i. Reference Landing Speed - The speed of the airplane, in a specified landing configuration. At the point where it descends through the 50’ height in determination of the landing distance

B. Categories
   i. A: Speed less than 91 knots
   ii. B: Speed 91 knots or more but less than 121 knots
   iii. C: Speed 121 knots or more but less than 141 knots
   iv. D: Speed 141 knots or more but less than 166 knots
   v. E: Speed 166 knots or more

C. An airplane is only certified in one approach category
   i. Pilots are responsible for determining if a higher approach category applies

a. If a faster approach speed is used that places the aircraft in a higher approach category, the minimums for the higher category must be used
b. Emergency returns at weights exceeding max, approaches w/inop flaps, and icing conditions are examples of situations that may require a higher approach category

ii. An airplane cannot be flown to the minimums of a slower approach category

D. Circling Approaches
i. Circling approaches at faster than normal approach speeds require consideration of the larger circling approach area
a. The published circling minimums provide obstacle clearance only within an appropriate area of protection, and is based on the approach category speed
ii. The size of the circling area varies with the approach category of the airplane
a. A min of 300' obstacle clearance is provided in the circling segment
iii. Remain at or above the circling altitude until the airplane is continuously in a position from which a descent to landing can be made at a normal rate of descent with normal maneuvers

7. Maintenance of Altitude, Airspeed, and Track

A. Establish, Trim, Crosscheck, Adjust
B. Keep the scan moving, include everything in your scan
i. Occasionally include the approach chart in the scan
C. Always ask, "What am I doing next?"
i. Stay ahead of altitudes, airspeed, track
ii. Use the 5 T's at every waypoint
a. Turn, Time, Twist, Throttle, Talk
- Will I need any of these?

D. Keep the localizer needle centered
i. Be proactive in maintaining the localizer course
a. Make adjustments for wind
- Use the heading bug to bug the heading that will maintain the desired course
- Make adjustments to the R/L of the heading bug to correct for course deviations

E. When the glide slope centers, pitch down approx 5^{o} and maintain a centered glide slope indication
i. Be proactive in maintain glide slope
a. If the ball starts to move up/down make small adjustments immediately to arrest the movement
b. As GS increases, rate of descent must increase as well
c. As GS decreases, rate of descent must decrease as well

8. Appropriate Rate of Descent

A. A descent rate of greater than 1,000 FPM is unacceptable during the final stages of an approach
i. This is due to human perceptual limitation independent of the type of airplane
B. A descent rate should be used that will ensure reaching the DA at a distance from the threshold that will allow landing in the touchdown zone
i. The glide slope will ensure you maintain the appropriate rate of descent, Follow it

9. Determination of a Straight-in-Approach, Circling Approach, Missed Approach

A. Straight-in-Approach
i. Should be used when available based on aircraft equipment, ground equipment, etc
B. Circling Approach
i. When necessary due to closed runways, weather (wind), or equipment dictating a circling approach be flown
C. Missed Approach

i. The primary reason for a missed approach is that the required flight visibility does not exist or the required visual references for the runway cannot be seen at the DA, DH, MAP
   a. Once a descent below DA, DH, or MDA is begun, a missed approach must be executed if the required visibility is lost or the runway environment is no longer visible
ii. In addition, the aircraft must be in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers
iii. Also required upon the execution of a rejected landing for any reason
   a. Men and equipment, or animals on the runway, not stabilized approach, etc.
iv. The missed approach course begins at the MAP and continues until the aircraft has reached the designated fix and a holding pattern has been entered
   a. Unless a holding pattern is not published
v. Non Precision Approaches and MAP
   a. On some, the MAP is given as a distance associated with a time from the FAF to the MAP based on GS
      - Pilots must determine the approx GS and time based on the approach speed and TAS and current winds
      - A clock/stopwatch should be started at the FAF
   b. Many use a specific fix as the MAP
      - These can be identified by a course (LOC or VOR) and DME, a cross radial from a VOR, or a RNAV (GPS) waypoint
   c. Obstacles in the missed approach segment may require steeper climb gradients
      - If so, a note will be published on the approach chart in the plan view

Common Errors

- Failure to have essential knowledge of the information on the instrument approach chart
- Incorrect communications procedures or noncompliance with ATC clearances or instructions
- Failure to accomplish checklist items
- Faulty basic instrument flying technique
- Inappropriate descent below MDA

Conclusion:

Brief review of the main points