

XII.A-D. Basic Attitude Instrument Flight

About: control of an aircraft's spatial position by using instruments rather than outside visual references.

TSW: Become comfortable flying the airplane without outside, visual references in the event that they mistakenly fly into adverse weather.

How: This is shown by flying the airplane "under the hood" by reference to the flight instruments

Basic Elements:

1. Cross check (Radial): Based off the attitude indicator
 - a. Eyes never travel between flight instruments, begin with the attitude indicator, scan an instrument and return to the attitude indicator before moving to another
 - b. The attitude indicator is the hub and the primary reference for all maneuvers
2. Pitch control: measured in degrees or bar widths on the attitude indicator
 - a. Restrict the attitude indicator's pitch displacement to 1 bar or $\frac{1}{2}$ bar width up or down
 - b. Smooth, small adjustments lead to smooth, steady control
3. Bank Control: Standard rate turns or less as shown on the turn coordinator
 - a. Use a bank angle that approximates the degrees to turn, not to exceed Std rate or 30° whichever is less
 - b. Smooth, small adjustments lead to smooth, steady control
4. Power Control
5. Trim the plane for hands off level flight, many small adjustments may be necessary

Discussion Points:

6. The four step process works for any change in flight attitude - Establish, trim, crosscheck, adjust
 - a. Establish with the control instruments, trim the controls, monitor performance, adjust as required
 - b. Be aware of, and set, the approximate pitch and power settings for the desired performance
7. **Pitch Instruments:** Attitude indicator, Altimeter, Airspeed Indicator, VSI
8. **Bank Instruments:** Attitude Indicator, Heading Indicator, Turn Coordinator, Compass
9. **Power Instruments:** Tachometer, Airspeed Indicator



Maneuvers

All Maneuvers

10. Trim to relieve the control pressures
11. Crosscheck: Monitor for any performance deviations
12. Adjust: re-establish pitch/ power as needed, trim, crosscheck, repeat

Straight and Level

13. Use the attitude indicator to establish wings level with nose on the horizon; adjust power as needed for cruise.

Constant airspeed climbs

14. Raise the nose of the aircraft to the approximate pitch attitude for the desired climb speed, set the power to the climb setting (full).
15. Level off: Lead the altitude by 10% of the vertical speed

Constant airspeed descents

16. Reduce power to a predetermined setting for the descent and maintain straight and level flight as airspeed decreases, lower the nose with the attitude indicator to maintain a constant speed
17. Level off: Lead the altitude by 10% of the vertical speed

Turns to Headings

18. Determine direction the turn should be made and bank angle required
 - a. Use max 30° or std rate whichever is less
19. Apply coordinated aileron and rudder pressure to establish the desired bank angle on the attitude indicator and turn coordinator
20. Adjust pitch as necessary (increase back pressure) to maintain level flight
21. Roll Out: Apply coordinated rudder and aileron pressure to level the wings on the attitude indicator
 - a. Depending on the rate of turn, rollout $5-10^\circ$ before the desired heading

Common errors:

22. "Fixation," "Omission," and "Emphasis" errors during instrument cross-check
23. Improper instrument interpretation
24. Improper control applications
25. Failure to establish proper pitch, bank, or power adjustments during altitude, heading, or airspeed corrections
26. Improper entry or level-off procedure (specific to Constant Airspeed Climbs and Descents)
27. Improper entry or roll-out procedure (specific to Turns to Headings)
28. Faulty trim procedure

Evaluations/ Standards (Private ACS):

Straight-and-Level Flight

29. Maintain straight-and-level flight using proper instrument cross-check and interpretation, and coordinated control application.
30. Maintain **altitude ± 200 feet, heading $\pm 20^\circ$, and airspeed ± 10 knots.**

Constant Airspeed Climbs

31. Transition to the climb pitch attitude and power setting on an assigned heading using proper instrument cross-check and interpretation, and coordinated flight control application.
32. Demonstrate climbs solely by reference to instruments at a constant airspeed to specific altitudes in straight flight and turns.
33. Level off at the assigned altitude and maintain **altitude ± 200 feet, heading $\pm 20^\circ$ and airspeed ± 10 knots.**

Constant Airspeed Descents

34. Transition to the descent pitch attitude and power setting on an assigned heading using proper instrument cross-check and interpretation, and coordinated flight control application.
35. Demonstrate descents at a constant airspeed to specific altitudes in straight flight and turns.
36. Level off at the assigned altitude and maintain **altitude ± 200 feet, heading $\pm 20^\circ$ and airspeed ± 10 knots.**

Turns to Headings

37. Demonstrate turns to headings, maintain **altitude ± 200 feet** and maintain a standard rate turn and rolls out on the assigned **heading $\pm 10^\circ$** ; maintain **airspeed ± 10 knots.**