

VI.D. Constant Airspeed Climbs and Descents

References: [Instrument Flying Handbook](#) (FAA-H-8083-15)

Objectives	The student should develop knowledge of the elements related to constant airspeed climbs and descents in both straight flight and turning flight.
Key Elements	<ol style="list-style-type: none">1. Establish, Trim, Crosscheck, Adjust2. 10% Rule3. Scan, Scan, Scan
Elements	<ol style="list-style-type: none">1. Primary and Supporting Method2. Constant Airspeed Straight Climbs3. Constant Airspeed Climbing Turns4. Constant Airspeed Straight Descents5. Constant Airspeed Turning Descents
Schedule	<ol style="list-style-type: none">1. Discuss Objectives2. Review material3. Development4. Conclusion
Equipment	<ol style="list-style-type: none">1. White board and markers2. References
IP's Actions	<ol style="list-style-type: none">1. Discuss lesson objectives2. Present Lecture3. Ask and Answer Questions4. Assign homework
SP's Actions	<ol style="list-style-type: none">1. Participate in discussion2. Take notes3. Ask and respond to questions
Completion Standards	The student understands the concepts behind constant airspeed climbs and is competent in performing them.

Instructors Notes:

Introduction:

Attention

Interesting fact or attention-grabbing story

Overview

Review Objectives and Elements/Key ideas

What

This lesson will discuss the ability to climb and descend at a constant airspeed and maintain that airspeed throughout the climb and in a turn.

Why

Aircraft specific speeds are published for performance as well as safety reasons. In order to obtain this performance and remain safe, a consistent speed must be able to be maintained.

How:

1. Primary and Supporting Method

- A. Direct extension of the control and performance method (discussed in VI.A-E Basic Attitude Instrument Flight – Control and Performance)
 - i. Establish, Trim, Crosscheck, Adjust
 - ii. Focuses more on the instruments that depict the most accurate indication for the desired attitude
- B. Attitude is established with the attitude indicator / power instruments, but each maneuver has specific primary and supporting instruments
 - i. Primary: the instrument that gives the most pertinent information for a specific parameter
 - ii. Supporting: Show trend away from the desired parameter, but don't provide a direct indication
 - a. Forewarn of an impending deviation
 - b. An efficient crosscheck catches and corrects these potential deviations early

2. Constant Airspeed Straight Climbs

- A. The objective is to maintain a specific airspeed at a specific power setting during a climb
- B. General
 - i. Establish power and pitch for the desired airspeed and accept the resulting rate of climb
 - a. Raise the mini aircraft to the approximate nose high indication for the desired climb speed
 - b. Power may be advanced to the climb power setting simultaneously with the pitch change, or after the pitch is established and the airspeed approaches the climb speed
 - ii. During the pitch transition, the attitude indicator is the primary pitch instrument
 - iii. Once established in the climb, the airspeed indicator is the primary pitch instrument
 - a. This is because the airspeed indications dictate whether pitch adjustments are necessary
 - iv. Once established, trim the aircraft and continue the crosscheck adjusting as necessary (more below)
 - v. Airspeed Corrections
 - a. Pitch adjusts the airspeed during a constant power climb
 - If the airspeed is too slow, lower the pitch attitude to regain the desired airspeed
 - If the airspeed is too high, increase the pitch attitude
 - b. Use small, controlled pitch movements to correct to / maintain the desired airspeed
 - ½ to 1 bar movements



Figure 7-25. Climb entry for constant airspeed climb.

C. Stabilized Climb

- i. At a constant airspeed / attitude, the Airspeed Indicator is primary for pitch and the Heading Indicator is primary for bank
 - a. Monitor the tachometer / Manifold Pressure to ensure power is as desired
- ii. If the pitch attitude is correct for the power setting, airspeed will stabilize at the appropriate speed
 - a. If the airspeed is high or low, make the appropriate small pitch correction



Figure 7-26. Stabilized climb at constant airspeed.

D. Level Off

- i. Start the level off prior to reaching the desired altitude
 - a. Lead the altitude by 10% of the vertical speed
- ii. Apply smooth and steady forward elevator toward the level flight pitch attitude
 - a. As pitch decreases, the VSI will approach 0, and the altimeter's rate of movement will decrease
 - b. Airspeed will begin to increase
- iii. As airspeed increases toward cruise speed, continue to gently reduce pitch to maintain altitude
- iv. Approaching cruise speed, reduce power to the cruise setting and trim for level flight

E. Partial Panel

- i. Loss of gyro / AHRS instruments (attitude indicator and heading indicator)
 - a. Remaining instruments: Altimeter, Airspeed Indicator, Turn Coordinator, VSI, Magnetic Compass



Figure 7-64. Constant airspeed climb from established airspeed.

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- b. Extremely important to use gentle pressure and wait for results on the primary instruments
- ii. Partial panel climb entries tend to be easier / more accurate if entered at the climb airspeed
 - a. Slow the airplane to the climb airspeed, then smoothly establish the climb power setting
 - b. Use the Altimeter, VSI, and Airspeed Indicator to make pitch changes
 - None of these instruments are direct indications of pitch, so it is very important to use smooth, small control inputs and allow time for the changes to take effect
- iii. Once established, the airspeed indicator is the primary instrument for pitch
 - a. The rate of movement of the altimeter can also provide indirect pitch information
 - b. Include the compass and turn coordinator in your crosscheck to maintain heading
- iv. Level Off
 - a. Like normal, lead the level off by 10% of the vertical speed
 - b. Apply smooth, steady forward pressure
 - Small control movements are especially necessary without the attitude indicator
 - c. Monitor the airspeed indicator, altimeter and VSI to return to level flight
 - d. Approaching cruise speed, reduce power to the cruise setting

3. Constant Airspeed Climbing Turns

- A. For climbing turns, combine the straight climbs with the turn techniques in lesson [VI.B. Turns](#)
- B. The rate of crosscheck and interpretation must be increased to keep up with changes in pitch and bank

4. Constant Airspeed Straight Descent

- A. Entry (same process as the above pictures, but in a descent)
 - i. Reduce power and maintain altitude to slow to descent speed
 - ii. Approaching descent speed, establish the pitch attitude for the descent (and power, if necessary)
 - a. Make small pitch adjustments as necessary to fine tune the airspeed
 - b. Trim to relieve the control pressures
 - c. Crosscheck correcting any deviations
- B. Stabilized Descent (same process as the above pictures, but in a descent)
 - i. The Airspeed Indicator is primary for pitch and the Heading Indicator is primary for bank
 - ii. Any deviation from the desired airspeed requires a pitch adjustment, power should remain constant
- C. Level Off
 - i. The level off must be started prior to reaching the desired altitude
 - ii. *To level off at cruise airspeed, set cruise power 100-150' prior to level off (varies based on aircraft)
 - iii. To level off at descent airspeed, lead the desired altitude by 10% of the vertical speed
 - a. Simultaneously adjust pitch to obtain level flight and power to maintain airspeed
 - iv. Trim the airplane for level flight
- D. Partial Panel
 - i. Loss of gyro / AHRS instruments (attitude indicator and heading indicator)
 - a. Remaining instruments: Altimeter, Airspeed Indicator, Turn Coordinator, VSI, Magnetic Compass
 - b. Extremely important to use gentle pressure and wait for results on the primary instruments
 - ii. Slow the airplane to the descent airspeed, then smoothly establish the descent pitch attitude
 - a. Use the Altimeter, VSI, and Airspeed Indicator to make pitch changes
 - None of these instruments are direct indications of pitch, so it is very important to use smooth, small control inputs and allow time for the changes to take effect
 - iii. Once established, the airspeed indicator is the primary instrument for pitch
 - a. Make small pitch changes to maintain the descent airspeed
 - b. Include the compass and turn coordinator in your crosscheck to maintain heading
 - iv. Level Off
 - a. Like normal, lead the level off by approximately 10% of the vertical speed
 - b. Apply smooth, steady back pressure

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- Small control movements are especially necessary without the attitude indicator
- c. Monitor the airspeed indicator, altimeter and VSI to return to level flight
- d. Simultaneously increase power to accelerate to cruise speed
 - Power can be increased simultaneously with pitch, or, to level off at a higher airspeed, increase power prior to the pitch change
- e. Trim the airplane for level flight

5. Constant Airspeed Turning Descents

- A. For descending turns, combine the straight descent with the turn techniques in lesson [VI.B. Turns](#)
- B. The rate of crosscheck and interpretation must be increased to keep up with changes in pitch and bank

Common Errors

- Failure to use a proper power setting and pitch attitude
- Improper correction of vertical rate, airspeed, heading, or rate-of-turn errors
- Uncoordinated use of controls
- Improper trim control

Conclusion:

Brief review of the main points

PTS Requirements:

To determine that the applicant:

1. Exhibits instructional knowledge of constant airspeed climbs and descents by describing-
 - A. procedure using full panel and partial panel for an entry into a straight climb or climbing turn, from either cruising or climbing airspeed.
 - B. a stabilized straight climb or climbing turn.
 - C. a level-off from a straight climb or climbing turn, at either cruising or climbing airspeed.
 - D. procedure using full panel and partial panel for an entry into a straight descent or descending turn from either cruising or descending airspeed.
 - E. a stabilized straight descent or descending turn.
 - F. a level-off from a straight descent or descending turn, at either cruising or descending airspeed.
2. Exhibits instructional knowledge of common errors related to constant airspeed climbs and descents by describing-
 - A. failure to use a proper power setting and pitch attitude.
 - B. improper correction of vertical rate, airspeed, heading, or rate-of-turn errors.
 - C. uncoordinated use of controls.
 - D. improper trim control.
3. Demonstrates and simultaneously explains a constant airspeed climb and a constant airspeed descent from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to constant airspeed climbs and descents.

ACS Skills Standards

1. Maintain altitude ± 100 feet during level flight, selected headings $\pm 10^\circ$, airspeed ± 10 knots, and bank angles $\pm 5^\circ$ during turns.
2. Use proper instrument cross-check and interpretation, and apply the appropriate pitch, bank, power, and trim corrections when applicable.