Task XI.H: Accelerated Maneuver Stalls

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Lesson Overview

Objective

> The student should develop knowledge of the elements related to accelerated stalls and develop the ability to recognize such stalls immediately, with the capability to take prompt, effective recovery action.

Reference

- Aircraft Flight Manual / Pilot’s Operating Handbook
- Airplane Flying Handbook (FAA-H-8083-3B, page(s) 4-10)
- POH/AFM

Key Elements

1. Excessive Maneuvering Loads
2. Unusual Stall Attitudes
3. Normal Recovery

Elements

1. Aerodynamics
2. Possible Situations
3. The Maneuver

Equipment

1. White board and markers
2. References
3. iPad

Instructor Actions

1. Discuss lesson objectives
2. Present Lecture
3. Ask and Answer Questions
4. Assign homework

Student Actions

1. Participate in discussion
2. Take notes
3. Ask and respond to questions

Schedule

1. Discuss Objectives
2. Review material
3. Development
4. Conclusion

Completion Standards

The student understands situations in which an accelerated stall is possible and has the ability to recognize and effectively recover from the stall.

Instructor Notes

Introduction

Attention

Stalling during a steep turn, or in a level, possibly even nose ow attitude? Didn't think that could happen?

Overview

- Review Objectives and Elements/Key ideas

What

Stalls entered from flight situations that impose excessive maneuvering loads on the airplane. Situations such as steeps turns, pull-ups, or other abrupt changes in flightpath.

Why

Stalls which result from abrupt maneuvers tend to be more rapid, or severe, than the

unaccelerated stalls, and because they occur at higher than normal airspeeds, and/or may occur at lower than anticipated pitch attitudes, they may be unexpected.

Lesson Details

A stall occurs when the smooth airflow over the wing is disrupted and lift decreases rapidly. This is caused by the wing exceeding its critical angle of attack. The stall is strictly related to AOA, which means it can occur at any pitch angle, with any power setting.

More specifically, when the AOA is increased to approximately 15° to 20° (usually 18°), the air can't follow the upper curvature of the wing. This is known as the critical angle of attack. As the critical AOA is approached the air begins separating from the rear of the upper wing surface. As the AOA is increased the air is forced to flow straight back and a swirling/burbling of the air begins to flow over the upper surface. When the critical AOA is reached that turbulent flow spreads over the entire wing surface. This results in a sudden increase in pressure on the upper surface and a loss of lift. Due to the loss of lift the form drag is such that the remaining lift can't hold the aircraft aloft.

Most wings are designed to stall in a predictable and controlled manner. They stall from the root outward to the tip. This is achieved by various mechanisms, one of which is building the wing with washout (a slight twisting of the wing along the chord so the AOA is slightly different from root to tip). This leaves the ailerons somewhat effective up to the point where the wing is fully stalled.

In an accelerated stall, due to the maneuvering loads placed on the aircraft, the stall will occur at a higher airspeed. The AOA may exceed the critical angle while recovering from a steep descent if done too sharply because the relative wind may b aligned with the descent angle causing an almost level pitch attitude stall. In general these stalls tend to be more rapid and severe, and occur at higher airspeeds and lower than normal pitch angles.

The airplane will stall during a coordinated steep turn exactly as it does from straight and level flight. The one difference is that the pitching and rolling actions tend to be more sudden. If slipping, the aircraft tends to roll rapidly toward the outside of the turn. If skidding, the aircraft tends to roll rapidly toward the inside of the turn.

Possible Situations

There are a number of situations where accelerated stalls may occur. These are generally associated with abrupt changes in the aircraft direction. This can happen during steep turns, stall and spin recoveries, steep pull ups, or any other abrupt change in the aircraft's flight path.

Performing the Accelerated Stall Maneuver

Before Starting

Perform the pre-maneuver checklist

a. Fuel Pump - ON

b. Mixture - RICH

c. Gauges - GREEN
    1. Ensure that the area is clear of traffic
    2. Select a starting altitude
d. The aircraft must be recovered above 1,500 feet AGL
    1. Select whether the stall will be provoked from a steep turn or descent

Executing the Accelerated Stall Maneuver

1. Establish the desired flight attitude
    a. If stalling from a steep turn, roll into about a 45° bank at or below Va. Then smoothly, firmly and progressively increase the AOA until a stall occurs. This will increase wing loading, decrease airspeed, and the centrifugal force will push the pilot into the seat.
2. Watch for and identify the stall
    a. This will be characterized by a high sink rate, nose down pitching, extremely negative load factor, and loss of control effectiveness. The pre-stall buffet or stall warning horn will indicate the impending stall. The normal nose high attitude and reduction in noise as the aircraft slows is not present in an accelerated stall.

Stall Recovery

1. Release elevator pressure, and increase power
    a. If uncoordinated a wing may drop suddenly. If that occurs recover by releasing back pressure, adding power, and using coordinated control pressures.

Common Errors

- Failure to establish selected configuration prior to entry
- Improper or inadequate demonstration of the recognition and recovery
- Failure to present simulated student instruction that adequately emphasizes the hazards of poor procedure in recovering from an accelerated stall

Conclusion

It is important that the pilot be able to determine the stall characteristics of the airplane being flown and develop the ability to instinctively recover at the onset of a stall at other than normal stall speeds or flight attitudes.

ACS Requirements

CFI PTS Standards

To determine that the applicant

1. Exhibits instructional knowledge of the elements of accelerated maneuver stalls by describing:
   a. Aerodynamics of accelerated maneuver stalls.
   b. Flight situations where accelerated maneuver stalls may occur.
   c. Hazards of accelerated stalls during stall or spin recovery.
   d. Entry procedure and minimum entry altitude.
   e. Recognition of the accelerated stall.
   f. Recovery procedure and minimum recovery altitude.
2. Demonstrates and simultaneously explains accelerated maneuver stall from an instructional standpoint.
3. Exhibits instructional knowledge of common errors related to accelerated maneuver stalls by describing:
   a. Failure to establish proper configuration prior to entry.
   b. Improper or inadequate demonstration of the recognition of and recovery from an accelerated maneuver stall.
   c. Failure to present simulated student instruction that adequately emphasizes the hazards of poor procedures in recovering from an accelerated stall.
4. Analyzes and corrects simulated common errors related to accelerated stalls.

Commercial Pilot ACS Skills Standards

1. Clear the area.
2. Select an entry altitude that will allow the Task to be completed no lower than 3,000 feet AGL.
3. Establish the configuration as specified by the evaluator.
4. Set power appropriate for the configuration, such that the airspeed does not exceed the maneuvering speed (VA), flap extension speed (VFE), landing gear extended speed (VLE), and any other POH/AFM limitation.
5. Establish and maintain a coordinated turn in a 45° bank, increasing elevator back pressure smoothly and firmly until an impending stall is reached.
6. Acknowledge the cues and recover promptly at the first indication of an impending stall (e.g., aircraft buffet, stall horn, etc.).
7. Execute a stall recovery in accordance with procedures set forth in the POH/AFM.
8. Configure the airplane as required after a positive rate of climb has been established.

9. Accelerate to VX or VY speed before the final flap retraction; return to the altitude, heading, and airspeed specified by the evaluator.