

Task XI.E: Elevator Trim Stalls

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Lesson Overview

Objective

The student should develop knowledge of the elements related to elevator trim stalls and their application in executing a safe go-around. The student understands the inherent danger involved when positive control of the airplane is not maintained, especially close to the ground.

Reference

- Aircraft Flight Manual / Pilot's Operating Handbook
- Airplane Flying Handbook (FAA-H-8083-3B, page(s))

Key Elements

1. Maintain Positive Control
2. Anticipate Attitude Changes
3. Do Not Stall in a Go-Around

Elements

1. Aerodynamics
2. 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 has the ability to properly and safely perform a go-around procedure, correcting for any unintentional changes in airplane attitude, and without stalling the aircraft.

Instructor Notes

Introduction

Attention

Applying full power with too much nose up trim (as in an approach to land) can have dire results if we don't know how to deal with it.

Overview

- Review Objectives and Elements/Key ideas

What

The elevator trim stall maneuver shows what can happen when full power is applied for a go around and positive control of the airplane is not maintained.

Why

A situation like this could occur during a go-around procedure from a normal approach or immediately after takeoff. The objective is to show the importance of making smooth power applications, overcoming strong trim forces, maintaining positive control of the airplane to hold safe flight attitudes, and using proper and timely trim techniques. It is imperative that a stall not occur during an actual go-around.

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/bubbling 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 the event of a go-around, as maximum power is applied, the nose will rise and turn left. This is due to the combined forces of thrust, torque, and back elevator trim. If uncontrolled the excessive nose-up pitch will result in a stall.

Before Starting

1. Perform the pre-maneuver checklist
 - a. Fuel Pump - ON
 - b. Mixture - RICH
 - c. Gauges - GREEN
2. Ensure that the area is clear of traffic
3. Select a starting altitude
 - a. The aircraft must be recovered above 1,500 feet AGL
4. Select the desired configuration for the aircraft for the maneuver
 - a. Gear down, if retractable, and flaps up due to the possibility of exceeding the aircraft's limitations.

Executing the Elevator Trim Stall

1. Smoothly advance the power to maximum allowable as would be done in a go-around
 - a. Thrust, torque, and back elevator trim will make the nose rise sharply and turn to the left. If adequate control pressures are not maintained the pitch attitude will increase above the normal attitude resulting in exceeding the critical AOA.
 - b. To demonstrate what can occur, no immediate attempt to control these forces should be made.
2. Recognize the imminent stall
 - a. Stall warning (if available) should sound, and a rapid pitch-up with a rapid loss of airspeed should occur.

Stall Recovery

1. Forward pressure must be applied to return the airplane to normal climbing attitude
2. While holding forward pressure, re-trim the aircraft to relieve the pressures
3. Complete a normal go-around procedure.

Common Errors

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- Failure to present simulated student instruction that adequately emphasizes the hazards of poor correction for torque and up-elevator trim during go-around and other maneuvers
- Failure to establish selected configuration prior to entry
- Improper or inadequate demonstration of the recognition and recovery

Conclusion

It is very important that a pilot understands the elevator trim stall hazard associated with go-arounds. By understanding the risk involved if positive control of the airplane's attitude is not maintained future flights will be considerably safer.

ACS Requirements

CFI PTS Standards

To determine that the applicant

1. Exhibits instructional knowledge of the elements of elevator trim stalls, in selected landing gear and flap configurations by describing:
 - a. Aerodynamics of elevator trims stalls.
 - b. Hazards of inadequate control pressures to compensate for thrust, torque, and up-elevator trim during go-around and other related maneuvers.
 - c. Entry procedure and minimum entry altitude.
 - d. Recognition of elevator trims stalls.
 - e. Importance of recovering from an elevator trim stall immediately upon recognition.
2. Exhibits instructional knowledge of common errors related to elevator trim stalls, in selected landing gear and flap configurations by describing:
 - a. Failure to present simulated student instruction that adequately emphasizes the hazards of poor correction for torque and up-elevator trim during go-around and other maneuvers.
 - b. Failure to establish selected configuration prior to entry.
 - c. Improper or inadequate demonstration of the recognition of and the recovery from

an elevator trim stall.

3. Demonstrates and simultaneously explains elevator trim stalls, in selected landing gear and flap configurations, from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to elevator trim stalls in selected landing gear and flap configurations.