

Task XII.E: Recovery from Unusual Flight Attitudes

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Lesson Overview

Objective

The student should develop knowledge of the elements related to attitude flight and have the ability to smoothly and steadily control the aircraft without the use of outside references. The student will be able to perform this as required in the ACS/PTS.

Reference

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

Key Elements

1. Crosscheck
2. Recovery
3. Coordination

Elements

1. General
2. Unusual Attitude Situations and Conditions
3. Recognizing Unusual Attitudes
4. Recovery Basics
5. Nose High (Climbing Turn) Recovery

6. Nose Low (Diving Spiral) Recovery
7. Coordination During Recovery

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 will understand the reasons unusual flight attitudes may occur and the proper recovery procedure for a nose low or nose high unusual flight attitude.

Instructor Notes

Introduction

Attention

On July 16, 1999, JFK Jr. was killed along with his wife and sister-in-law, when the aircraft he was piloting crashed into the Atlantic Ocean. Kennedy had 310 hours of flight experience, including 55 hours of night flying and 36 hours in the high-performance Piper Saratoga. He had completed about half of an instrument training course. The NTSB investigation found no evidence of mechanical malfunction and determined that the probable cause was "the pilot's failure to maintain control of the airplane during a descent over water at night, which was a result of spatial disorientation (or, not recovering properly from an unusual attitude). Factors in the accident were haze, and the dark night."

Overview

- Review Objectives and Elements/Key ideas

What

An unusual attitude is an airplane attitude not normally required for instrument flight.

Why

An uncorrected unusual attitude can result in a dangerous situation if not recovered properly and quickly.

Lesson Details

Since unusual attitudes are not intentional maneuvers during normal flight, they are often unexpected. Without training the reaction will be instinctive rather than intelligent and deliberate, which can lead the aircraft into danger. Individuals often react with abrupt muscular efforts which are purposeless and can even be hazardous in turbulent conditions, at excessive speeds, or at low altitudes. When an unusual attitude is detected on the crosscheck the immediate problem is not how it got there, but what is the aircraft doing and how to get it back to straight and level flight as quickly as possible.

Without adequate visual references a pilot may unintentionally allow the aircraft to enter an unusual attitude. This condition may result from a number of different root causes.

- Turbulence
- Confusion
- Disorientation
- Instrument Failure
- Preoccupation with cockpit duties
- Carelessness in crosschecking
- Errors in instrument interpretation
- Lack of proficiency in aircraft control

Recognizing Unusual Attitudes

The first general rule is if you note an instrument rate of movement or indication other than those you associate with the basic instrument flight maneuvers already learned, assume an unusual attitude and increase the speed of crosscheck to confirm the attitude, or instrument error, or instrument malfunction. To avoid aggravating the unusual attitude with incorrect controls the initial instrument reading must be accurate.

Nose High Attitude (Climbing Turn)

This is generally indicated by the rate/direction of movement of the altimeter, VSI, and airspeed indicator as well as the attitude indicator. The instruments will show a rapidly decreasing airspeed, rapidly increasing altitude (or at least increasing faster than desired), and the turn coordinator will show a bank.

Nose Low Attitude (Diving Spiral)

This is shown by the exact same instruments, but with the instruments showing opposite indications. The instruments will show a rapidly increasing airspeed, rapidly decreasing altitude (or decreasing faster than desired), and the turn coordinator showing a bank.

Failure to recognize an unusual flight attitude can be due to a poor instrument crosscheck, or poor interpretation. Once detected the primary concern is how to correct, not how it was entered.

Recovery

In moderate unusual attitudes the pilot can normally reorient with the attitude indicator, but this should not be done. Why? The attitude indicator is "spillable" and it is possible that its upset limits have been exceeded. It may have become inoperable due to a mechanical failure. Even if it isn't spillable and is operating properly errors of up to 5° pitch and bank may result, and indications are difficult to interpret at extreme attitudes.

Recovery, instead, is initiated by reference to the airspeed indicator, altimeter, VSI, and turn coordinator. The consequences of not using these instruments, or trying to recover by "feel", are hazardous. You must believe and correctly interpret the flight instruments since spatial disorientation is normal when in an unusual attitude.

Nose High (Climbing Turn) Recovery

In a nose high unusual attitude the primary concern is to avoid a stall. If the airspeed is decreasing or is below that desired, execute the following steps.

1. Increase power to arrest the decreasing airspeed
2. Apply forward elevator pressure to lower the nose, thus reducing the AOA which assists in preventing a stall
3. Correct bank by applying coordinated aileron and rudder pressure by reference to the turn coordinator
 - a. Aileron pressure before reducing the AOA could result in a spin
 - b. **The steps above are listed in order, but should happen almost simultaneously**
4. After initial control has been applied continue with a fast crosscheck to ensure proper corrections
5. Level flight is indicated by a reversal and stabilization of the altimeter and airspeed indicator.
6. Straight and coordinated flight is indicated by a level miniature aircraft and a centered ball in the turn coordinator

Nose Low (Diving Spiral) Recovery

In a nose low unusual attitude the primary concern is to avoid over G-ing the aircraft. If the airspeed is increasing, or above what is desired, execute the following steps.

1. Decrease the power to idle

2. Correct the bank angle with coordinated aileron and rudder pressure by reference to the turn coordinator.
3. Raise the nose to level flight attitude by applying smooth back pressure on the elevator.
 - a. Increasing pitch attitude without decreasing bank will result in excessive Gs on the airplane. The instinctive reaction is to pull back, but removing bank decreases the amount of force required to return to level flight.
 - b. The pressures listed above should be made in the sequence given
4. Raise the nose smoothly to avoid overstressing the airplane
5. After initial control has been applied continue with a fast crosscheck to ensure proper corrections
6. Level flight is indicated by a reversal and stabilization of the altimeter and airspeed indicator.
7. When airspeed returns to normal set cruise power

Coordination During Recovery

The attitude indicator and turn coordinator should be checked to determine that the aircraft is in straight/coordinated flight (wings level, ball centered). Any slipping or skidding can cause sensations that might aggravate disorientation and slow recovery.

Common Errors

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- Failure to recognize an unusual flight attitude
- Consequences of attempting to recover from an unusual flight attitude by “feel” rather than by instrument indications
- Inappropriate control applications during recovery
- Failure to recognize from instrument indications when the airplane is passing through a level flight attitude

Conclusion

When recovering from an unusual attitude, it is essential to ignore the attitude indicator and use the airspeed indicator, altimeter, turn coordinator, heading indicator and VSI to determine the attitude of the aircraft. Recovery should be made promptly in the proper order to avoid damaging the airplane or inducing a stall. Once level flight has been attained, the airplane should be reconfigured for straight-and-level flight.

ACS Requirements

CFI PTS Standard

1. To determine that the applicant:

- a. Exhibits instructional knowledge of the elements of recovery from unusual flight attitudes by describing:
 - b. Conditions and situations that may result in unusual flight attitudes.
 - c. The two basic unusual flight attitudes - nose-high (climbing turn) and nose-low (diving spiral).
 - d. How unusual flight attitudes are recognized.
 - e. Control sequence for recovery from a nose-high attitude and the reasons for that sequence.
 - f. Control sequence for recovery from a nose-low attitude and the reasons for that sequence.
 - g. Reasons why the controls should be coordinated during unusual flight attitude recoveries.
2. Exhibits instructional knowledge of common errors related to recovery from unusual flight attitudes by describing:
 - a. Failure to recognize an unusual flight attitude.
 - b. Consequences of attempting to recover from an unusual flight attitude by “feel” rather than by instrument indications.
 - c. Inappropriate control applications during recovery.
 - d. Failure to recognize from instrument indications when the airplane is passing through a level flight attitude.
 3. Demonstrates and simultaneously explains recovery from a nose-high and a nose-low unusual flight attitude from an instructional standpoint.
 4. Analyzes and corrects simulated common errors related to recovery from unusual flight attitudes.

Private Pilot ACS Skills Standards

1. Recognize unusual flight attitudes solely by reference to instruments; perform the correct, coordinated, and smooth flight control application to resolve unusual pitch and bank attitudes while staying within the airplane’s limitations and flight parameters.