


## Recovery From Unusual Flight Attitudes (Instrument)

<b>Objective</b>	
<p>To ensure the applicant learns the purpose of and can exhibit a clear understanding of the recovery from unusual attitudes basic instrument maneuver and how to perform the maneuver properly.</p>	
<b>Purpose</b> <p>No pilot wants to ever find themselves in an unusual attitude, however an inadvertent encounter with instrument conditions, or momentary disorientation or distraction can quickly lead to one. Learning to recover from unusual attitudes is a crucial life-saving skill that pilots can use to escape from these situations.</p>	
<b>Schedule</b>	<b>Equipment</b>
<ul style="list-style-type: none"> <li>● <b>Ground Lesson:</b> 15 minutes</li> <li>● Initial <ul style="list-style-type: none"> <li>■ <b>Flight 1:</b> 10 minutes - <i>Introduction to Maneuver</i></li> <li>■ <b>Flight 2:</b> 15 minutes - <i>Improve Proficiency (Dual)</i></li> </ul> </li> <li>● Pre-Checkride <ul style="list-style-type: none"> <li>■ <b>Flight 3:</b> 10 minutes - <i>Demonstrate Proficiency</i></li> </ul> </li> <li>● <b>Debrief:</b> 10 minutes (<i>per flight</i>)</li> </ul>	<ul style="list-style-type: none"> <li>● Whiteboard / Markers (optional)</li> <li>● Foggles / Hood</li> </ul>
<b>Student Actions</b>	<b>Instructor Actions</b>
<ul style="list-style-type: none"> <li>● Ask any questions, receive study material for the next lesson.</li> <li>● Watch linked video.</li> <li>● Review listed references.</li> </ul>	<ul style="list-style-type: none"> <li>● Deliver the ground lesson (below).</li> <li>● Demonstrate the maneuver in flight.</li> <li>● Debrief after each flight.</li> </ul>
<b>Completion Standards</b>	
<ul style="list-style-type: none"> <li>● <b>Ground:</b> Student explains the purpose of the recovery from unusual attitudes instrument maneuver and how the various instruments are used to detect which type of unusual attitude has occurred, and explains the proper recovery procedure.</li> <li>● <b>Flight:</b> Student can perform the maneuver to the applicable ACS standards. <ul style="list-style-type: none"> <li>● When instructed by the examiner, pilot detects the type of unusual attitude and applies the appropriate recovery procedure solely by reference to instruments.</li> <li>● Pilot maintains smooth, coordinated airplane control throughout the maneuver and returns the airplane to straight and level flight.</li> </ul> </li> </ul>	

## References

- ERAUSpecialVFR - “Recovery from Unusual Attitudes”
  - YouTube - <https://www.youtube.com/watch?v=ns2Oiqs2sc8>
- FAA-H-8083-3B (Airplane Flying Handbook) - Chapter 3, Page 5-6 [Integrated Flight Instruction], Chapter 3, Page 6-9 [Straight and Level Flight], Chapter 4, Page 5-6 [Stalls/Stall Recognition/Stall Recovery]
- FAA-H-8083-25B (Pilot’s Handbook of Aeronautical Knowledge) - Chapter 8, Page 3-4 [Altimeter], Chapter 8, Page 8-9 [Airspeed Indicator], Chapter 8, Page 17-18 [Turn Coordinator], Chapter 8, Page 18-19 [Attitude Indicator]
- FAA-H-8083-15B (Instrument Flying Handbook) - Chapter 3, Page 2-5 [Sensory Systems for Orientation], Chapter 3, Page 5-7 [Illusions Leading to Spatial Disorientation], Chapter 5, Page 19-21 [Gyroscopic Instruments], Chapter 6, Page 4-8 [Attitude Instrument Flying/Primary and Supporting], Chapter 6, Page 10-13 [Instrument Cross-Check/Interpretation], Chapter 7, Page 26-28 [Unusual Attitudes and Recoveries]
- FAA-S-ACS-6B (Private Pilot ACS) - Area VIII Task E
- FAA-S-8081-6D (CFI PTS) - Area XII Task E

## Ground Lesson Outline

- Unusual Attitudes
  - Definition
  - Situations That Lead to Unusual Attitudes
    - VFR into IMC
    - Inattention or Distraction
    - Spatial Disorientation
    - Wake Turbulence
- Your Senses Cannot Be Trusted
  - Sensory Illusions
    - Somatogravic Illusion
    - Somatogyric Illusion
  - Rely on the Flight Instruments
- Recognizing an Unusual Attitude
  - Primary Instruments to Scan
- Two Types of Unusual Attitudes
  - Nose High - Primary danger is stall, increase power, decrease pitch, roll level
  - Nose Low - Primary danger is overstress, decrease power, roll level, increase pitch
- Importance of Smooth, Coordinated Control
- Maneuver Description - step-by-step
  - Altitude, airspeed, etc.

## Common Errors

- 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.

## Ground Lesson Content

- **Unusual Attitudes** - Unusual attitudes refer to flight attitudes that are not experienced during normal maneuvering. In particular, instrument flying maneuvers are generally quite docile compared to visual maneuvers, and any large pitch or bank angles are generally dangerous. These attitudes are almost always accidental or unintentional and are sometimes called an “*upset*”.
  - The FAA defines unusual attitudes as:
    - Pitch attitude greater than 25°, nose up.
    - Pitch attitude greater than 10°, nose down.
    - Bank angle greater than 45°.
    - Within the above parameters, but flying at airspeeds inappropriate for the conditions.

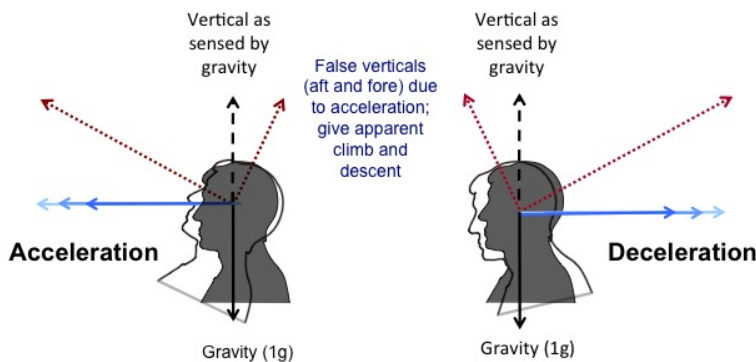
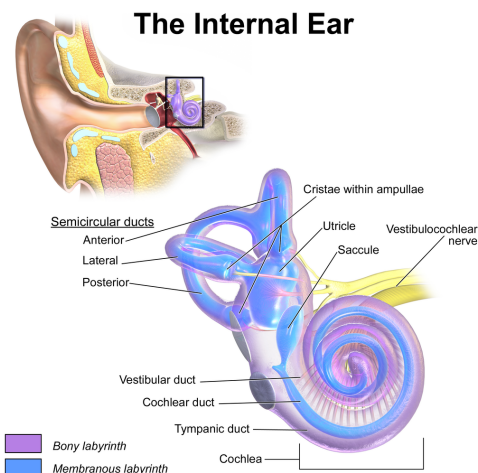


- **Situations That Can Lead to Unusual Attitudes** -
  - **VFR into IMC** - Although a Private Pilot certificate does not allow new pilots to fly in instrument conditions, situations might occur when pilots unexpectedly find themselves in these conditions: an inadvertent encounter with an unseen or misjudged cloud, deteriorating weather conditions, etc. **Pilots who are inexperienced with flight solely by reference to instruments often do not scan the instruments appropriately and can rapidly find themselves in an unusual attitude.**



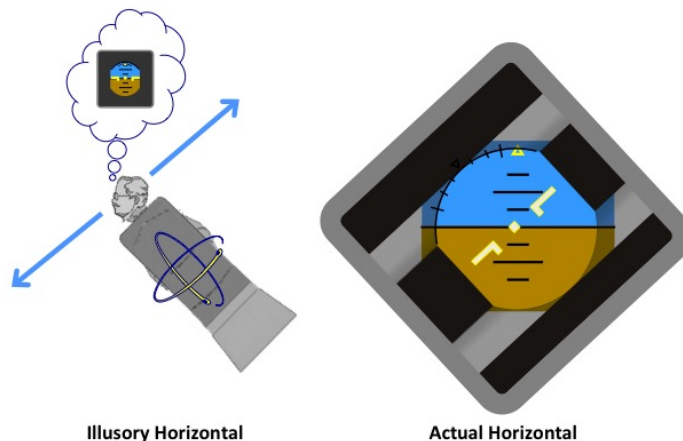
- **Inattention or Distraction** - Although the airplane may be in visual conditions, pilots may become distracted by other tasks and fail to monitor the airplane’s attitude.

- **Spatial Disorientation** - Spatial disorientation most commonly occurs during instrument conditions, however it can also affect pilots in visual conditions. **Night VFR conditions with limited starlight/moonlight or over unpopulated areas can result in optical illusions which confuse the pilots sense of orientation.**
  - **Wake Turbulence** - An encounter with wake turbulence may rapidly put the airplane into an unusual attitude.
  
- **Your Senses Cannot Be Trusted** - The most challenging aspect of transitioning to flying on instruments is that pilots are accustomed to recognizing the sensations their body is experiencing during flight. Something *feels* like a turn, or *feels* like a climb. However, pilots must realize that human perception of orientation and motion is extremely limited when outside visual references are not present! The human body senses motion using something called the *vestibular system*. The vestibular system primarily senses accelerations in one direction or another. It can generally sense rotation or movement, and with the aid of the other senses (primarily vision), the brain maintains a concept of the body's orientation and motion. However, **like a heading indicator which drifts over time, without continual reinforcement from outside visual references, the body's sense of "which way is up" or "which way am I going?" gradually drifts over time.**
  - **Sensory Illusions** - The vestibular system is susceptible to a number of common illusions:
    - **The Somatogravic Illusion** - The *somatogravic illusion* causes the brain to sense climbing or descending when subjected to acceleration or deceleration. **This can happen especially during takeoff or go-arounds in conditions with poor outside visibility.**



- **The Somatogyric Illusion** - The *somatogyric illusion* is often called "*the leans*", and happens when the brain 're-centers' its perception of which direction is up, and causes pilots to believe they are level when turning, or turning while level. **This can happen especially after prolonged, gentle turns when outside visibility is limited, such as at night.** This often leads to something called the *graveyard spiral*, where the pilot,

believing they are flying level or turning the opposite direction, increasingly banks in one direction, causing the airplane to enter a steepening, descending spiral.



Illusory Horizontal

Actual Horizontal

- **Rely on the Flight Instruments - The only solution to maintaining control in instrument conditions is to rely on the flight instruments.** The flight instruments are not subject to the same errors as the vestibular system and provide a much more reliable, accurate representation of the aircraft attitude.
- **Recognizing an Unusual Attitude** - The first thing that pilots must do is be able to recognize when an unusual attitude has occurred. Generally, when any of the flight instruments are moving faster, or in ways that are unexpected, it is safest to assume that the airplane is in an unusual attitude.
  - **Primary Instruments to Scan** - The most important instruments to consider are the **altimeter, turn coordinator, and airspeed indicator**. If the attitude indicator is displaying a recognizable attitude, it can also be used. (*A usable attitude indication may not be available in extreme unusual attitudes!*)

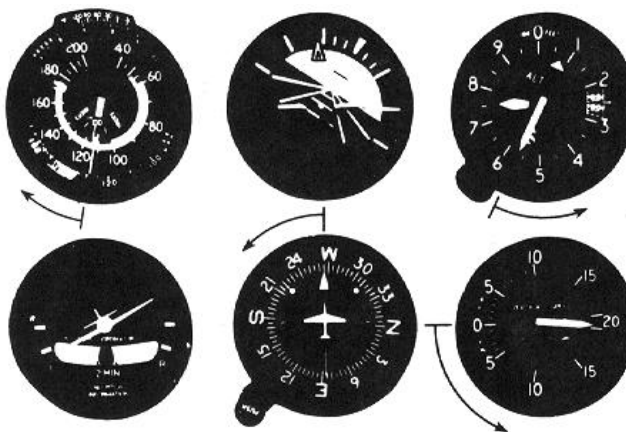


Figure 13-5 Unusual Attitude (Critical)

- **Two Types of Unusual Attitudes and Recovery** - The primary goal of unusual attitude recovery is returning to straight and level flight. **Returning to any specific altitude or heading is secondary to recovery to straight and level flight!** Unusual attitudes can put the airplane into a stall, or increase the load factor beyond structural limits, so they must be promptly recognized and recovered. There are generally two types of unusual attitudes that may be encountered:



- **Nose High** - The primary signs of a nose-high unusual attitude are decreasing airspeed and increasing altitude. Although the airplane may also be in a turn, **the primary risk is that of a stall, so the pitch attitude must be reduced first to reduce the angle of attack.**
  - **Recognition** - *Decreasing airspeed, increasing altitude.*



- **Recovery Procedure**
      - 1. *Apply full power.*
      - 2. *Reduce pitch to level.*
      - 3. *Level wings.*
- **Nose Low** - The primary signs of a nose-low unusual attitude are increasing airspeed and decreasing altitude. Unlike a nose-high unusual attitude, **the primary risk is the increasing airspeed and load factors on the airplane.** Because of this, the bank must first be corrected before attempting to raise the pitch. **Attempting to correct the pitch before correcting the bank will unnecessarily increase load factor** (*recall the increased load factor in steep turns*), and slow the pitch increase, as the nose will move at an angle towards the horizon.
  - **Recognition** - *Increasing airspeed, decreasing altitude.*



- **Recovery Procedure**
      - 1. *Reduce power.*
      - 2. *Level wings.*
      - 3. *Raise pitch to level attitude.*

- **Importance of Smooth, Coordinated Control** - Because unusual attitudes increase the risks of a stall or excess load factors, and involve potentially large control inputs, **it is crucial that pilots apply recovery inputs using *smooth, coordinated control***. Apply coordinating rudder input when correcting the bank angle, and be careful to not overstress the airplane when correcting pitch. Careless or abrupt application of control input can cause a stall or exceed the limit load factor and potentially damage the airplane.

## Maneuver Description

- **Preparation** - Instructor or examiner will take control of the plane while the pilot puts on the goggles or hood. The pilot will be asked to close their eyes and the instructor or examiner will begin maneuvering the airplane to create spatial disorientation.
- **Detect** - When instructed by the instructor or examiner, the pilot opens their eyes and begins the instrument scan/cross check to detect the type of unusual attitude that has been encountered.
- **Recover** - Apply the appropriate (nose-high or nose-low) recovery procedure to re-establish straight and level flight.
- **Altitude, Airspeed, Heading** - Return to the altitude, airspeed, and heading specified by the instructor or examiner.
- **Smoothness and Coordination - Proper coordination is essential.** A stall when in instrument conditions, particularly an uncoordinated stall, is unlikely to be recoverable. Additionally, during nose-low recoveries, the airplane may be at above maneuvering speed, so abrupt recoveries can overstress the airframe.
- **Never attempt this maneuver solo!** - The instructor or examiner will act as what is called a *safety pilot*, and will be responsible for all visual traffic scanning, collision avoidance, etc.