Autopilot/Rudder Demonstrations

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The problem

Inexperienced pilots often climb with insufficient right rudder. When the autopilot is engaged to hold a heading or course, this results in a continuous right bank (climbing in a slight slip). When the autopilot is climbing the plane in GA (wings level) mode, the result is a left yawing tendency that can lead to an undesired heading change.

The Solution

Pilots need to have a practical understanding of the factors related to single-engine airplane turning tendencies and the effects of high-power, high-pitch climbs. Pilots also need to understand what all lateral and vertical modes of the flight director do.

Below are two exercises to help pilots learn and understand proper rudder management during climbs and go-arounds while using a flight director/autopilot. These demonstrations are designed for G1000 airplanes with the GFC700 and Garmin Perspective systems, but can be altered to work with other systems as well.

These demonstrations should be performed in VFR day conditions with good visual references in multiple directions. The objective is for the learner to see the physical effects of improper rudder/yaw management.

Demonstration 1: Insufficient right rudder causes right bank during climbs

1. Complete pre-maneuver checks.
2. Initiate a cruise climb at max continuous power with the autopilot in HDG mode.
3. Release all rudder inputs and allow the plane to stabilize
4. Note the amount of bank on the attitude indicator.
5. Note the amount of bank by referencing the location of each wing above/below the horizon.
6. Set the climb speed to Vy and allow the plane to stabilize.
7. Note the amount of bank on the attitude indicator.
8. Note the amount of bank by referencing the location of each wing above/below the horizon.
9. Set the climb speed to Vx and allow the plane to stabilize.
10. Note the amount of bank on the attitude indicator.
11. Note the amount of bank by referencing the location of each wing above/below the horizon.

Demonstration 2: Insufficient right rudder causes left turn in GA mode

1. Complete pre-maneuver checks.
2. Initiate a cruise climb at max continuous power with the autopilot in HDG mode.
3. Press the TO/GA button and re-engage the autopilot (if needed).
4. Change the pitch mode to FLC (set at Vy), release all rudder inputs, and allow the plane to stabilize (the FD lateral mode should still be GA).
5. Note the amount of yaw (heading change) on the heading indicator.
6. Note the amount of yaw (heading change) by referencing the movement of outside heading references.
7. Set the climb speed to Vx and allow the plane to stabilize.
8. Note the amount of yaw (heading change) on the heading indicator.
9. Note the amount of yaw (heading change) by referencing the movement of outside heading references.

Lessons to Learn

1. The ball/brick needs to be kept centered to maintain coordinated flight.
2. Different planes need different amounts of rudder pressure. Fly what you see, not what you feel.
3. There are multiple cues for uncoordinated flight. Pay attention to bank and yaw, as well as the ball/brick.
4. Pilots need to understand that the go-around (GA) lateral mode commands wings level (it does not hold a heading or course).

This document is available for download at:
https://flywithjim.com/resources/rudder