Tech' Desk

Lateral Directional & Spiral Stability

At this stage of the Flight Test Program, stability tests approach an academic status, nevertheless, to continue to learn more about the aircraft and its tendencies in reacting to flight disturbances, (either by pilot input or by dynamic airflow disturbances), we will still explore directional stability as well as spiral stability tendencies for this RV-9A.

Static Directional Stability: is the tendency for the aircraft to return to its flight path after yaw forces have been applied by rudder.

We set up for this test with a forward C of G, an altitude of 5000 ft. AGL, a target airspeed of 120 mph, and trimmed the aircraft for straight and level flight. Once achieved, we applied left rudder, holding altitude with elevator and maintaining wings level with ailerons. When the rudder was released, the aircraft quickly returned to straight flight.

We repeated this test with right rudder and again observed the aircraft crisply returning to straight flight.

With the large rudder and vertical stabilizer on this aircraft, rudder authority is substantive, and the aircraft likes to fly straight without rudder input.

Lateral-Directional Stability:

This test is to determine if the aircraft will lift its lowered wing if the ailerons are released after being placed into a sideslip. It will also test the rudder's directional control effectiveness.

Since this test can impose high structural loads on the airframe, the tests will be done at or below maneuvering speed.

We started by establishing the flight parameters; forward C of G, 5000 ft. AGL, target airspeed at or below 100 mph, and trimmed for straight and level flight. We placed the aircraft in a sideslip, (left rudder, right aileron), and held our heading with rudder. (It is important to restrain the angle of bank to 10 degrees or less, or any bank angle that requires full rudder deflection.)

Control forces on the ailerons were light but rudder control forces became heavier with increase in bank angle. Upon release of the aileron control forces, the wing slowly returned to level flight, while directional control with the rudder remained positive throughout the maneuver.

We repeated this maneuver with right rudder and left aileron, and this time the wing did not return completely to its level flight. Again rudder response was positive throughout the maneuver.

We again noticed that the control forces were asymmetrical, with light forces required on ailerons and substantially heavier forces on the rudder.

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Lateral Directional & Spiral Stability, Cont'd

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Spiral Stability Test:

The final test in this series was to determine the aircraft's ability to raise the low wing after controls are released from a banked flight path.

Again, we set up our test with a forward C of G, an altitude of 5000 ft. AGL, and a normal cruise speed of 165 mph. We then placed the aircraft in a bank of 25 to 30 degrees, and once established, released the controls.

Our first bank was to the left, and upon release of the controls the aircraft slowly righted itself, showing a slight positive spiral stability.

When we banked to the right and released the controls however, the bank increased to about 45 degrees and then remained in this increased bank condition. We repeated this test, and again with the bank to the right, with the aircraft displaying a neutral to negative spiral stability.

The RV series of aircraft are very light on aileron control. This gives them a sporty feel. Neutral or negative spiral stability is not necessarily dangerous, but if the rate of divergence is great, added pilot attention is required, and IFR flight becomes more labour intensive. My RV-4 had a definite tendency for the left wing to drop and continue to do so until pilot control input would bring it back up to level flight. With these aircraft, it is not advisable to fall asleep on a long, boring cross-country flight, without a wing-leveler. (Tongue in cheek!)

These final tests complete the stability evaluations for the RV-9A. We have not, nor do we intend to explore spin recovery or flutter investigations, leaving these maneuvers to the test pilots employed by the kit manufacturer. Next month we will investigate altitude loss in a simulated 'dead-engine' 180 degree-turn 'back to the field'.

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Jack Dueck, EAA HAC, FA, TC

Historic day for aviation as Vulcan bomber returns to the skies after 14 years

Up, up and away: The Avro Vulcan XH558 takes to the skies, 14 years after its last flight and following a £6m refit

Speaking immediately after the flight, Squadron Leader McDicken said: "She was an absolute delight, every bit as good as I can remember. It was a tremendous privilege to fly it again. We were suitably aroused.

"What a statement for those people who made that aircraft all those years ago.

"It's 25 years almost to the day that I last flew one. It was just wonderful."

Daily Mail, October 19, 2007

It will cost an estimated £1.6 million a year to keep in the air & burns 40 tons of fuel an hour. Do you think we could handle a "Vulcan Bomber to Oshkosh"? (Ed)