

HOW TO DIAGNOSE AND FIX A HEAVY WING!

If there is one question that requires a lot of time answering at Van's it is the "I just did my first flight and a wing is heavy, what do I do?" question. It usually is followed by the corollary "which aileron am I supposed to squash?"

There turns out to be a bit of reasoning involved in the answer. It is simple and yet it is not obvious to the pilot who has just spent 2-4 years of all of his spare time and energy to complete and fly his brand new airplane. He thinks he built it PERFECT and is dismayed that something is wrong.

First and foremost, DON'T DO ANYTHING for the first few hours of flight. If the aircraft is flyable, then fly it. There are factors that may not have been thought about quite yet on the first hour of flight. For the wings to be neutral (no wing heaviness) the fuel quantities must be equal in both tanks and for side by side aircraft where the pilot sits on the left side a weight would need to be in the right seat. All gear leg fairings, intersection fairings and wheel pants must be in place.

Now, after the plane has been flown a while (10+ hours) and the pilot has determined that a wing heaviness exists, then it is time to try and see what is wrong. The first step to fix the problem is to quantify it. It is easy and is worth the effort. Fill both fuel tanks, then takeoff using the HEAVY wing tank and climb to a cruise altitude of 8-9000 feet. Use a power setting of at least 75% or wide open, whichever comes first, and fly on that tank fill the wing no longer feels heavy. At this point, the weight differential of the two tanks equals the heaviness. Land and fill the tank, multiply the gallons by 6 lbs/gal and you have a starting number. If the heaviness is less than 18 lbs, then it is a minor condition. You would bum off that much fuel on a long climb to altitude for a trip and it may not warrant fixing.

Listed below is a sequence that may solve problems of heavier situations:

1. Check the rigging of the entire airframe.

Set longerons in the flying level condition.

Recheck the angle of incidence of the wings.

Recheck the vertical stabilizer. Is it up the middle of the airframe? Is it twisted somehow?

Use the wing template to cross check the aileron and flap alignment.

If any of the above are wrong, FIX 'EM.

2. Is the "BALL" out in level cruise flight (75% power)? It is the first thing to fix!

If so, fit a trim tab to the rudder. Start with a big one and trim it down until the ball is centered at cruise speeds.

3. Now back to the ailerons! Of all of the wing heavy problems the commonest one that can easily be identified and fixed is poor aileron symmetry. In flight, the aileron surfaces are exposed to some fairly high speed airflow. If during the installation of the ailerons, one aileron is installed with its spar in a different vertical location with respect to the rear spar of the wing than the other aileron, then you will have a problem. Since the ailerons are interconnected by the push tubes and control column, they must reach equilibrium during flight. If the deflection forces produced by the airflow are not identical then the ailerons will automatically move to a position where these forces are equalized.

Obviously if the equilibrium position produces an aileron deflection, then the plane will want to roll. The more the deflection, the heavier the wing roll tendency. The fix for a problem of this nature is easy.

Recheck the centerline of the tooling holes of the main wing ribs and the aileron ribs to be sure they are above the bearing pivot holes in the aileron attach brackets (per plans). This displacement should be checked on both inboard and outboard ends of the ailerons for both wings while the ailerons are set in trail with the wing template. The absolute dimension is not as critical as is the fact that both ends of each aileron and both ailerons be the same. If they are off by as little as 1/8" anywhere relative to each other, then it must be fixed. The fix is to simply purchase new A-406 BLANK or A-407 BLANK aileron attach brackets and drill displaced attaching holes in them to correct the asymmetry. (RV-9/9A and RV-10 builders will find the parts oversize but useable with trimming). Slotting the attach holes in the original attach brackets for test purposes is fine but the final hole position should be transferred to new brackets for permanent installation.

Now go fly it again.

Several slight adjustments may be needed so have patience.

For all planes except RV-9/9A and RV-10 there is an additional correction that can be done: If there remains a wing heavy condition in excess of the 3 gallon (18 lb) one mentioned above, then the next step is to adjust the trailing edge radius of one of the ailerons. **Reduce the trailing edge radius of the LIGHT wing.** This procedure should be approached carefully as it can have a significant impact. Squeeze it a little and then go fly it. DON'T try to fix it all at once.

The final solution for all models, if all else fails, is to simply add a trim tab. All of the construction manuals for the aircraft detail a wedge type trim tab that does not affect appearances too much.