

new nose gear leg fairings. It was difficult trying measure the effect of these small changes. Many times improvement was imperceptible. I'm sure they've helped cumulatively.

To date we've each gained around 15 mph, measured at full power at 2500' msl and 8000' msl. We both consistently attain true airspeeds around 205 mph. While pleased with the increases, we know there is a bit more to be had and we're going after it. On the other hand we realize that we are reaching the end of the envelope on 160 hp.

RV Aileron Pulsing

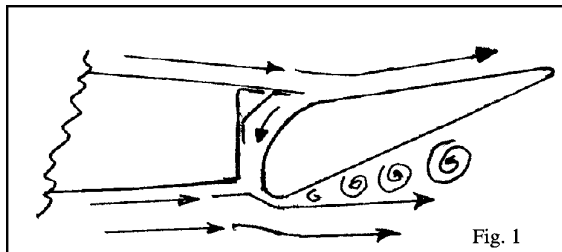
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by Van

Those who read Ed Kalano's "Flying Qualities Report" in the 3/99 issue of Sport Aviation probably noticed the comment about the stick pulsing experienced at full aileron deflection. Few pilots have mentioned it to us, probably because they dismissed it as a minor annoyance rather than a real problem. We have been aware of this for a long time. It has only been recently, within the past year or so that I surmised what the cause might be.

My guess is that there is a separated flow over the bottom of the Up deflected aileron. (fig. 1) At or near the 32° travel limit specified for Up aileron, the relatively sharp edge of the aileron nose causes an intermittent flow separation which is manifested to the pilot through varying aileron feedback pressure, or "pulsing."

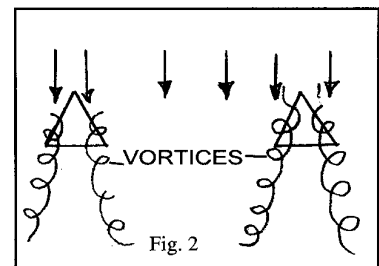
My first thoughts were to increase the nose radii to enhance the Coanda effect and thus retain attached flow. Reshaping the leading edge with clay and taped on aluminum strips seemed to show promise. We built a new set of ailerons for the RV-8A with a 0.75" leading edge radius rather than the 0.43" radius of the stock ailerons. Flight testing revealed no improvement. Back to the drawing board. Some time later that I decided that instead of trying to reshape the aileron to achieve boundary layer control, maybe the vortex generator approach would work.



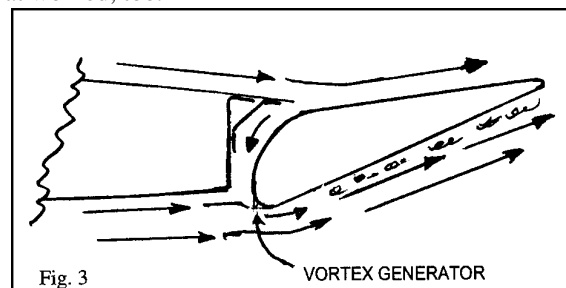
Vortex generators is that they aren't a panacea, but rather a sacrificial solution to some problems. VGs always cause drag but can enhance flow attachment, sometimes increasing lift or improving control surface authority.

Our suspected flow problem seemed a natural application for VGs. Unlike VGs used almost anywhere else, those on the very leading edge of the aileron would be essentially retracted when the aileron was not deflected. When the aileron leading edge is deflected downward, the VGs enter the airstream and begin doing their thing, creating vortices which energize the boundary layer and prevent flow separation. There was even a side benefit. When the aileron deflects and the leading edge is into the airflow, it creates drag. That's usually bad, but in this case it's good, because the drag helps reduce adverse yaw.

Cleverly I designed VGs shaped as in fig. 2 which should create opposing vortices as indicated. I found that 1 1/4" #40 PVC pipe had an ID similar to the aileron leading edge



radii. After a bit of practice, these little VGs could be created quickly and inexpensively. I used carpet tape to adhere them to the leading edge of the aileron, (a 2" spacing should provide good vortex coverage of the bottom of the aileron). They worked. The aileron pulsing was eliminated, though a mild trembling remained. I tried another installation using half as many VGs; 4" spacing. That worked equally well. I figured I might as well try something even more simple, expecting that it wouldn't work. This consisted of a 1/8 x 1/4" strip of wood. Son-of-a-gun, that worked, too.



If I'd stopped with the wedge shaped VGs, I could have claimed semi-genius status, but this overgrown toothpick destroyed my happy scenario. Obviously, there is more to learn here, so I will continue to experiment. We don't recommend making any modifications to your ailerons until we have more concrete conclusions.