

# **Mandatory Ground**

## **ELEVATORS**

**If your elevators are not in compliance with the following report GROUND YOUR AIRCRAFT**

**Do not fly it again until you have fabricated new elevators with the correct shape, size and balance**

**A Southern California Varieze crashed near Palm Springs, killing both occupants. The NTSB accident investigation, while no where near complete yet, has determined that the canard came off the aircraft in flight. The aircraft crashed more than one mile from where the canard was found.**

**The physical damage to the canard itself suggests that the right elevator fluttered, resulting in the nearly complete destruction of the right side of the canard and elevator. The forces generated by divergent flutter tore the canard mounting hard points at the top of the F-22 bulkhead completely out of the fuselage. What remained of the canard then departed the aircraft. With no means of controlling pitch, the aircraft nosed over and crashed.**

**Conditions in the Banning Pass near Palm Springs at the time of the accident were reported as strong wind shears with lots of dust devils. The Banning pass is notorious for turbulence, and it is likely that these pilots encountered sharp edged gusts, which may have excited this extremely heavy, incorrectly balanced elevator causing it to flutter. In this case the flutter was severe and divergent destroying the right side of the canard and tearing the canard from the fuselage.**

**We have repeatedly cautioned builders/flyers of both the Varieze and the Long-EZ about how critically important the elevators are. The elevators on all the EZ's are the single most important parts on these aircraft. Your very best workmanship and attention to detail is required when working on your elevators and associated parts.**

**The weight of each elevator, including the lead mass balance weights, must not be more than 3.5 lbs on the left side, and 3.25 lbs on the right side. These weights are prior to applying paint. The lead blocks as supplied by Brock are all that should be necessary to balance these elevators to within the spec as called out in Section 1 of the plans. Re-check the balance after painting, and note that the absolute maximum allowable weights are 3.9 lbs, left and 3.6 lbs right, after painting and accepting them as ready to fly. The maximum permissible additional lead to balance the elevators is 0.3 lbs per elevator, and ALL of this additional lead must be added to the outboard mass balance. Do not add any additional lead to the inboard ends of the elevators.**

**The shape of each elevator is also very important. They should be flat on the underside, and slightly concave on the upper surface. The chord length should be 4.6 inches, with a maximum tolerance of plus or minus 0.2 inches. These features can affect pitch control forces and your ability to trim the airplane. Your elevators must closely match the full scale drawing in Section 1 of the plans.**

**If your elevators do not meet the above criterion, strip all of the foam and glass from the aluminum torque tubes, and start over. The importance of near perfect elevators cannot be overstressed. Poorly made elevators CAN KILL YOU!!**

**Reprinted from CP 21, July 1979**

It may seem that we harp on about elevator shape and balance, but the fact remains that the single most important parts of the airplane are the elevators. Recently, since CP 20, we have had yet another builder who experienced flutter. It occurred at 120 to 130 mph and produced such a violent shaking, that he was certain the airplane was going to come apart. It turned out that he had extended his elevator's trailing edge and found he had to add weight. Unfortunately he added considerable weight only to the inboard and none to the outboard mass balance. This is a NO NO! It is critical that any extra weight added to balance the elevators to 10° - 20° nose down (up to a maximum of 0.3 lbs) be equally divided between the inboard and outboard. Keep your elevators light! In his case these elevators weighed around 5 lbs apiece, which is totally unacceptable. If yours are over 3.9 lb left, or 3.6 lb right balanced, strip them to bare tubes and start over

**Reprinted from CP 57, October 1988**

MAN GND: Conduct an inspection or provide certification that the elevator quality regarding correctness of laminate schedule, orientation of plies, number of plies and workmanship relative to the weight of the layup and straightness of the primary surface is correct. This should include inspection or verification that additional filler materials have not been added to increase the elevators weight and thus change its natural frequency of oscillation. If you have purchased structure from someone else and cannot otherwise verify the structural quality and conformance, conduct a dissection of the elevator skins to assure the proper structure, or better yet, discard the elevators and build new ones you know are in conformance with the tested and approved configuration. Any variance in weight, stiffness or shape should be suspected of being dangerous and not allowing you to rely on the testing that was conducted to verify freedom from flutter.

The weight limits shown are absolute maximums. A properly fabricated, accurate foam core with a properly squeegee'd minimum resin laminate will result in weights well below the limits shown in CP 21, PG 5. (and in Section 1 of the plans) In order to provide more margin for variables in this extremely important area, we are now recommending that any elevators that require additional mass balancing beyond those weights shown for the basic configuration be discarded and new elevators be fabricated. If you are unable to build elevators that can be balanced by the basic balance weights, both inboard and outboard, you are possibly unable to produce adequately safe flying components. Do not compromise by using up your margin of safety by merely increasing balance weight. This increases the weight of the elevator and lowers the frequency of oscillation. Above all, be certain that your elevators meet the balance-hanging angle of 12 to 20 degrees nose down after painting. If there's any doubt that they are absolutely perfect, discard

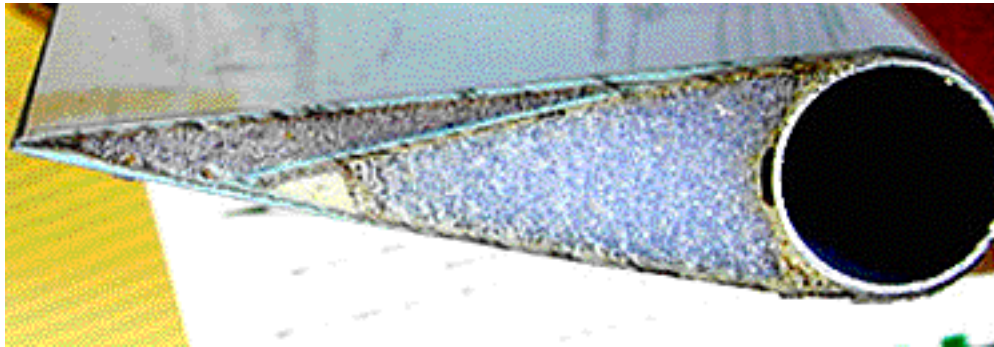
them and start over. It is possible, with proper tube orientation, to retain the aluminum tubing when building new elevators.

**The following inspection is required before next flight. While it is true that RAF cannot issue an AD, we are requesting, in the strongest possible way, that all owners of Varieze and Long-EZ aircraft comply with this inspection before you fly again.**

If you built your own elevators, and you are positive that you built them exactly to the plans and that they balanced within the tolerance using only the basic Brock supplied lead weights, you may disregard this inspection requirement.

**MAN GND:** If your elevators are not in compliance with the statements above--remove them and rebuild them to the correct specification before next flight.

If you own an older Varieze, built with the original short chord elevator that has been modified to the "new" longer chord, in other words, an elevator within an elevator, (see photo).



**Ground your aircraft; do not fly it again until you have fabricated new elevators with the correct shape, size and balance.**

If you have purchased an EZ, one you did not build yourself, you have no reliable way of knowing how the elevator was constructed. Before you fly this aircraft you should remove the elevators from the canard and weigh them individually, and check the balance per Section 1 of the plans. If they are out of the weight or balance limits, or if they required additional inboard lead weight to balance, you should discard them and build new elevators.

If there is another aircraft out there somewhere that is built like the one recently involved in an accident, it will probably kill someone. Please help us to locate it and save a life.