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SERVICE BULLETIN

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APPLIES TO: RV-7 and RV-7A aircraft.

Van's Aircraft has made a change to the RV-7/7A empennage kit. A new, larger rudder has been incorporated to improve the spin recovery qualities of the RV-7.

BACKGROUND

Early in the life of the RV-6 we recognized that its spin characteristics and recovery were not the same as the mild spin qualities of the RV-3 and RV-4 which preceded it. The spin was fully developed following the second turn, the rotation rate became rapid and recovery required around 1½ more turns. We recognized that most RV-6 pilots would probably not have an extensive aerobatic background, and could be challenged by recovering from fully developed spins. We chose to recommend that RV-6 pilots concentrate on learning spin recognition, immediate recovery, and spin avoidance rather than encouraging them to explore the limits of spin recoverability. We also recommended that the RV-6 not be used for recreational spins. Section 15 of the RV-6 Construction Manual details spin testing, spin recovery techniques, and spin limitation recommendations for pilots. Testing the RV-6 also revealed that stall characteristics were benign and spin resistance was good. In other words, a conscious effort was needed to cause intentional spins, so accidental spins were deemed improbable during normal flight operations, including sport aerobatics.* Of the 1400 plus RV-6 and RV-6A aircraft which have been completed and flown, we are not aware of accidental spins resulting from aerobatic flight, nor are we aware of spin recovery problems when operated within suggested limits

When planning the RV-7, which was to be a slightly enlarged RV-6, we anticipated that certain flying qualities, including spin recovery, might be affected by dimensional and configuration changes. In an effort to determine these qualities, we re-configured our RV-6A demonstrator to closely duplicate the planned RV-7 configuration. We added removable wing extensions and installed the longer span sheared wing tips like the ones now standard on the RV-7. We performed comparative spin tests in this aircraft with the original RV-6 wing configuration as well as the simulated RV-7 span and configuration. These tests were performed with both the original RV-6 vertical tail surfaces and with the larger RV-7 vertical tail surfaces.

Test results were sufficiently favorable that we proceeded confidently with RV-7 development. After completing routine testing of the RV-7, we contracted a professional test pilot to do spin testing. The results showed that the spin recovery qualities of the RV-7 were not quite on par with those of RV-6 and of the re-configured RV-6A we had tested. We are not, at this time, able to explain why the spin characteristics of the RV-7 prototype differ from those of the re-configured RV-6A test vehicle. We did find that the RV-7 spin recovery characteristics easily met FAA requirements* for normal category* aircraft, but not those of aerobatic category aircraft*. (*The AEROBATIC category requires that the aircraft be able to recover from a 6-turn spin within 1¼ rotations. A NORMAL category aircraft is required to recover from a 1-turn spin within 1 additional rotation.*)

The RV-7 spin recovery characteristics were also found to be adequate for operations within the recommended limits specified in Section 15 of the RV-7 Construction Manual. Service experience with the RV-6/6A fleet indicates that safe operation, including "Sport Aerobatics"*, is possible without meeting the exact spin recovery requirements of aerobatic category aircraft.

In an effort to improve RV-7 spin recovery, we choose to experiment with a larger rudder. Because of the intentional similarity of components on different models with the Van's Aircraft product line, the RV-9/9A rudder has a very similar leading edge and hinge bearings identical to the RV-7/7A. We installed an RV-9/9A rudder on our RV-7 demonstrator/test aircraft, and had the spin tests repeated.

Testing the RV-7 (N137RV) reconfigured with an RV-9/9A rudder showed improved spin recovery qualities. With this larger rudder, RV-7 spin recovery qualities are equal to or better than those of the standard RV-6/6A, which have been service proven through fleet experience.

* For further details, see DISCUSSION section below.

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CONCLUSION:

Flown within the recommended limitations of Section 15 of the Construction Manual, either the original or the enlarged RV-7 rudder will provide adequate authority for spin recovery.

The substitution of an RV-9 rudder on an RV-7 improved spin recovery. With the larger rudder, the RV-7 will have better spin recovery from whatever flight condition the pilot may encounter.

IN CONSIDERATION OF THIS, VAN'S AIRCRAFT IS TAKING THE FOLLOWING ACTION:

1. Van's Aircraft has altered the RV-7/7A Empennage Kit by replacing its rudder with a larger one, identical to the RV-9/9A rudder. All new kits shipped after 5-20-02 will include the new, larger rudder. The construction plans and manual included with the RV-7/7A Empennage kits have been altered to reflect the new rudder parts and assembly procedures. (The rudder details shown on the preview plans show the original rudder configuration and details, and therefore no longer pertain to the current kit specifications—remember that only the detail shown on the full size construction drawings supplied with the kit should be used for actual assembly)

Van's Aircraft is offering a no cost replacement rudder kit to all previous RV-7/7A Empennage kit purchasers.

Any owner of an RV-7 kit, may request a new enlarged rudder.

Because of reasonable limits of production capability, Van's Aircraft may not be able to supply rudder replacements immediately on request. Replacement rudder kits will be prioritized based on the need of the builder relative to the anticipated completion date of his aircraft.

Van's Aircraft is offering an instrument panel placard for all models which reads:

AEROBATIC LIMITATIONS: Refer to the Operating Limitations for aerobatic maneuvers permitted in this aircraft.

The purpose of this placard is to make the pilot aware that the Operating Limitations for a specific airplane may differ from other aircraft of the same model, and that these Operating Limitations are unique to that particular airplane and were established through its testing.

DISCUSSION:

To gain a Standard airworthiness certificate, an aircraft must demonstrate compliance with the standards of a given category. The most common categories are Normal, Utility, and Aerobatic.

Experimental Amateur-Built aircraft are not granted standard airworthiness certificates because they have not shown compliance with any certification standard. Therefore, there are no formal categories, such as Normal and Aerobatic, for Amateur Built aircraft. With an Experimental Amateur-Built airplane, the OPERATING LIMITATIONS for each individual airplane either includes or excludes aerobatic maneuvers. The manufacturer (builder) of each individual Experimental Amateur-Built airplane may request the inclusion of certain aerobatic maneuvers based solely on his statement of having demonstrated these maneuvers during the aircraft's flight test phase. A demonstration of compliance with any standard is not required.

Any statement of design or performance capability made for a certain aircraft design by its kit supplier has no direct bearing on any particular example of that design when built and licensed by an individual builder. Because no Experimental Amateur-Built airplane has been assembled to a uniform standard on a production line and under a quality control program, it cannot be assumed to be identical in performance, handling, and stability as the kit manufacturer's prototype.

A prudent builder of a Kit Amateur-Built aircraft should assume that his carefully built example of this aircraft design will be similar to, but not better than, the factory prototype. Each builder should test and fly his aircraft to determine its similarity to or differences from the factory specifications. Regarding spin recovery qualities, the prudent builder will not test his aircraft beyond those limits suggested by the kit manufacturer.

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Accidental spins and spin recovery have long been a troubling aspect of aircraft design, and after almost a century of flight, spins are still widely misunderstood. All spins are not alike. The stability of any airplane varies with its Center of Gravity position and other factors such as the amount of fuel in wing tanks. This is the reason why many aircraft have multiple C.G. limits; one for normal flying and another for Aerobatic flying. Minor differences in the aerodynamic profile of an aircraft can also have an effect on spin characteristics. One simple and commonly applied modification which is likely to impact spin recovery qualities is the use of wide gear leg fairings (wider than supplied by Van's Aircraft) on the nose gear leg, or the main gear legs of the tail wheel RV-7. Wider (than supplied by Van's Aircraft) gear leg fairings add to the overall side area of the airplane, and any side area which is forward of the center of pressure of the airplane has a directionally destabilizing effect and has been shown to degrade spin recovery characteristics.

In addition to the variable effects of an aircraft's weight and C.G., it is difficult to be totally objective in any discussion of spin and spin recovery characteristics because of the "Pilot skill" factor. Any discussion presupposes a certain level of pilot competence relative to recognition, response, and application of proper procedures and technique for spin recovery. Thus, not all spin entries and recoveries are identical.

Accidental spins, in any aircraft, are encountered at airspeeds at or near stall speed. Thus, the flight conditions in which accidental spins are most likely are take offs, departures, landing approaches, and certain aerobatic flight attitudes. Because of the unusual attitudes and rapid speed changes associated with aerobatic flying, this flight regime might be viewed as the most probable opportunity for encountering accidental spins. However, it is also true that while performing intentional aerobatics, pilots are usually conscious of and attentive to the opportunity for experiencing control loss. On the other hand, pilots flying departures and landing approaches are in "normal" attitudes and can easily become complacent and distracted from the importance of the need for speed control and control coordination so stall/spin accidents are unfortunately common in these non-aerobatic flight conditions. Accidental spins are certainly not found exclusively in aerobatic flight.

In addition, there is a greater opportunity to recover from accidental spins encountered at safe aerobatic altitudes than for accidental spins encountered at traffic pattern altitude or lower.

The RV-7, like all other RVs before it, exhibits good spin resistance. From our experience, you can expect stalls performed with coordinated rudder and aileron controls to be recoverable with little or no wing drop or roll. Moderately un-coordinated stalls will often result in a wing drop of 20-40 degrees as the nose is lowered for recovery. Stalls performed with full rudder input and sustained full up elevator will result in the initiation of a spin. If anti-spin control is applied soon after spin entry (within about 90 deg. rotation), recovery is almost immediate. Within the first full turn of spin rotation, recovery can be accomplished within a quarter turn after the application of anti-spin control; opposite rudder and neutral elevator. The first turn requires an elapse time of about 3 seconds. If you count "one thousand, two thousand, three thousand" at a natural speech rate, you will realize that this represents more than adequate time to stop the spin. If the spin is permitted to progress and develop, recovery requires more turns and more elapsed time.

The RV-7, like its predecessor the RV-6, are labeled as "Sport Aerobatic" airplanes. "Sport Aerobatic" is not a formal FAA or industry classification. It is a label Van's Aircraft, Inc. chose to help define the intended aerobatic use limits of these designs. Van's Aircraft has always been sensitive to the implication of the "fully aerobatic" label often used in general aviation circles. The generic "aerobatic" label applies to aircraft such as the Cessna 150 Aerobat trainer as well as the very dissimilar unlimited aerobatic airshow and competition aerobatic airplanes. Thus, we feel the need to define the intended limits of our kit aircraft. While the RV-6 and RV-7 kitplanes have been designed to meet FAA aerobatic strengths of +6Gs and -3Gs, they should not be assumed capable of all aerobatic maneuvers, and under any weight and C.G. condition. They were designed primarily as sport/cross country airplanes with sufficient performance and control authority to safely perform basic recreational aerobatic maneuvers such as loops and rolls. We do not consider aerobatic maneuvers such as high speed multiple snap rolls and tail slides, which can impose high airframe loads, to meet our definition of Sport Aerobatics. When establishing Operation Limitations for their aircraft, we suggest that RV builders list the maneuvers which, through his testing, will be permitted. They might also list maneuvers specifically prohibited, such as Snap Rolls, Tail Slides, Inverted Flight, Multiple Turn Spins, etc.). Other maneuvers such as inverted flight and hammerhead turns, may be included or excluded depending on whether the aircraft is equipped with an inverted fuel and oil system.