CANARD PUSHER

OCTOBER 2002 RUTAN AIRCRAFT FACTORY VOL 28 ISSUE 3 NO. 109

IMPORTANT STRUCTURAL NOTICE

VARIEZE WING SPAR & WING ATTACH STRUCTURE

VariEze Spar Cap Failure reported

A VariEze wing center-section spar cap has failed. This compression cap totally failed just inboard of the right wing attach fitting. The failure appears to be caused by high flight loads; however, the failure was discovered on the ground and did not result in an accident. This is the first known failure of a VariEze fiberglass primary structural component.

Tests conducted at RAF have shown that the compression cap was joggled on installation and samples from the other wing show serious weakness. It is possible that other VariEzes also have weak spar caps and, thus, RAF is recommending that all VariEzes immediately be subjected to significant flight restrictions.

RAF is in the process of attempting to develop an acceptable spar cap repair procedure in order to allow VariEzes to operate safely. Due to the way the VariEze wing attach aluminum parts are jigged and installed during the wing fabrication process, it is not feasible to merely replace affected components. It may be necessary to modify the wing structure in a way that will not allow wing removal.

CONTINUED ON PAGE 5

VariEze Mandatory Ground

Before next flight:
- ☐ Inspect for corrosion
- ☐ limit flight operations.

Long-EZ and Defiant Mandatory Ground

Per this newsletter before next flight:
- ☐ Inspect for corrosion

Pitch Trim Changes and Your Canard

We have recently received a number of inquires relative to the use of the two different canard airfoils that are used on the Long-EZ aircraft. The original VariEze and Long-EZ used a University of Glasgow GU25 airfoil section known for its high lift at the low Reynolds number (500,000) seen by the canard. This section, while having excellent lift, tended to be affected by the transition as the airfoil went from laminar flow to turbulent flow. While we found excellent characteristics on all of our prototype aircraft, beginning in 1979, builders reported that their aircraft would change its trim position when they flew into and out of a rain shower. This trim change was, in general, a minor annoyance where the pilot had to change trim position when wet and then again as the airplane dried out after the rain encounter.

Later, in the early 80's, we began to get reports that some Long-EZs had relatively strong nose down trim change, even beyond the trim capability of the aircraft, such that the pilot had to trim aft and then still apply some aft stick force as the airplane flew through the rain shower.

RAF did extensive testing to investigate this phenomena and with the help of airfoil guru John Roncz, developed a new canard design that essentially eliminated the rain trim change. This new canard, made no change on some airplanes, was to be found desirable on others, and in a few cases, highly desirable and mandatory since the trim change was objectionable.

CONTINUED ON PAGE 3

RAF announces retirement of Canard Pusher Newsletter

Time has caught up with the Canard Pusher. It has been 28 years since the first issue introduced the VariViggen to builders, and now the quarterly newsletter is ready to retire.

The Canard Pusher's 28-year history will end with CP#110, which will be delivered in the next few months.

RAF is NOT closing at this time. Mike and Burt will continue to field questions and RAF will continue to offer, for a limited period of time, some merchandise, including back issues of the Canard Pusher. Important safety issues, such as those addressed in this issue, will be sent to the Central States Newsletter. Editor Terry Schubert has done an outstanding job reporting safety information and articles in his excellent newsletter. We highly recommend that you subscribe to the Central States Newsletter.

Information, safety issues and merchandise will be also be available on the website at www.rutanaircraft.com

Canard Pushers are prepaid subscriptions. If your subscription to the Canard Pusher was paid beyond CP #110, RAF will mail you a refund.

Subscriptions to the newsletter began to fall after RAF stopped selling plans in 1985. In its heyday, Burt and Mike mailed over 7000 newsletters to readers every quarter. Today the Canard Pusher has a loyal contingent of 200 fans, who have helped keep RAF alive since 1985. All of us at RAF thank our loyal readers for their support over the years.

For a subscription to the Central States Newsletter, mail $25 (US and Canada) $30 (all other countries) to Terry Schubert, 9283 Lindbergh Blvd, Olmsted Falls, OH 44138-2407. (Checks MUST be made payable to Terry Schubert. DO NOT make checks payable to Central States or CSA).

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RAF is no longer accepting multi-year subscriptions. Please renew only after your current subscription has expired.

If you are building a RAF design, you must have the following newsletters:

VariViggen (1st Ed)
CP 1 to current
VariViggen (2nd Ed)
CP 18 to current
VariEze (1st Ed)
CP 10 to current
VariEze (2nd Ed)
CP 16 to current
Long-EZ
CP 24 to current
Solitaire
CP 37 to current
Defiant
CP 41 to current

A current subscription of the Canard Pusher is mandatory for builders, as it is the only formal means to distribute mandatory changes.

PITCH TRIM CHANGES and YOUR CANARD continued

While extensive tests were done with many airfoils and dozens of airplanes were measured, RAF was never able to determine by visual inspection which airplanes should have the trim change and which would not. These measurements always provided conflicting data. Thus, the only way to determine whether a previously-built airplane should be upgraded to the Roncz 1145MS canard was through flight test.

After the Roncz 1145MS canard plans became available it was recommended for all new construction on Long-EZs and recommended as a replacement on those aircraft that exhibited a strong nose down trim change.

For those of you out there that don't spend nearly every waking hour cruising through your Canard Pusher newsletters, Tonya did a search on the CD-ROM for "trim changes" and came up with the following archival information dating back to 1979 in order to give you a complete picture of the trim-change-related support that RAF has provided builders and flyers: CP 22 pg 3-4; CP 30 pg 4; CP 38 pg 4; CP 39 pg2; CP 43 pg1-2; CP 46 pg 3; CP 48 pg 3; CP 50 pg 1; CP 66 pg 11; CP 67 pg 5-6

Excerpts from the CPs are printed below:

CP 22 Oct 1979 page 3-4

Moisture on a wing from rain will effect its lift. This effect is small on a conventional aircraft; i.e. the Grumman Tiger descends 500 fpm if untrimmed entering a rain shower, but is easily trimmed out. A canard aircraft generally has a much larger trim change in rain because its high lifting wings are located far apart. We do not fully understand the reasons for this, but the following characteristics exist for most VariEzes: if a trimmed EZ enters light moisture or light rain it will climb, requiring about 1/2 lb to 1 lb push to maintain level flight. In heavy rain, most EZs trim nose down, requiring a mild aft stick pressure to fly level. The trim change varies with speed, being barely perceptible at 70 knots and higher as speed is increased. One EZ flyer reported a heavy aft force required (15 – 20 lbs) when making a 150-knot (172 mph) descent through a heavy rain shower.

CP 30 Oct 1981 page 4

Trimming the Aerodynamics of your EZ — (with graphs) — Like any other aircraft, the trim and stability of a Varieze or Long-EZ depends on correct cg position and proper contour and incidences of all flying surfaces. There is an easy way to verify that your aircraft is rigged properly with the incidences correct. This involves flying at several airspeeds while monitoring the elevator position, then comparing your data with the design information. Measuring elevator position in flight is simple since the pilot can easily see an indicator attached directly on the elevator surface. If your EZ does not handle, perform and stall exactly as described in the Owner's manual it could be due to an improper incidence or contour of the wing, canard or elevator, and you should conduct the test below to see if your elevator is at the correct position. If the elevator position is not correct, your airplane may also have a large rim change when flying into rain.

(Fabrication explanation and graphs follow above text)

CP 38 Oct 1983 page 4

While most VariEzes and Long-EZs have a rather mild pitch trim change in rain, some are less mild than others are. Try this: scuff sand your canard using 500 wet or dry (wet). Sand only in a chord wise direction, until you have a uniform full look. Ken Cluis did this to his with surprisingly good results.

CP 39 Jan 1984 page 2

Since January 1982, RAF has been working on a new canard airfoil for the Long-EZ. The design goal was higher performance, lower takeoff speed, lower landing speed, and no rain trim change. Quite an order. John Roncz, (designer of the Solitaire airfoils) said he could do it, so we asked him to have a shot at it.

The canard was built and tests flown in early 1982, and even flown in the CAFE 400. It had some problems and needed more refinement. We have been working on it and flying it on and off, since then, with mixed results. Some aspects are excellent, others are not good. We are actively pursuing this test and if we get it to where it meets our requirements, we will publish the results and put out plans for the canard as an optional performance change.

Please do not call us for information on this canard. We cannot release any data on it until it meets the standards we require. The only reason we are reporting on it at this time is that so many builders have seen it on the Long-EZ here at RAF, that rumors are flying around. RAF's policy is that we will not put out any information on any design modifications until we are completely satisfied with the results of flight testing. At this point we are not satisfied but are continuing with flight tests. Stay tuned.

CP 43 Jan 1985 page 1-2

The standard Lon-EZ canard if built according to the plans, is identical to the VariEze plans-built canard. On the Long-EZ however, there has been a history of what has become known as the "rain trim change." This trim change is usually a nose-down trim change when flying into rain requiring a small aft force on the stick to maintain altitude, which is easily trimmed out, using the bungee trim system. According to feedback we have received from builder/flyers,

CONTINUED on page 4

this is what most pilots notice. For the average Long-EZ pilot, this is of course no problem, rather more of a minor annoyance and once you have experienced it a few times you simply trim for the condition and press on. A few builder/flyers however, report that their Long-EZs exhibit a more pronounced nose down trim change, requiring most of the available bungee trim force to fly "hands off" and in a couple of cases, pilots report not having enough trim authority to trim "hands off." During the last two years we have spent a lot of time and effort to try to understand what causes this trim change.

Thanks to John Roncz (airfoil designer par excellence) we now do understand it and have the analytical tools to predict and to overcome this phenomenon. We have built and tested five completely different canards with different airfoils. Many flight hours have been flown and a considerable database has been generated. Also, a video camera was used to document tuft behavior on each airfoil. The lift and hinge moments with and without rain were documented. A method to simulate the rain effect was developed. Surprisingly one airfoil had no rain trim change at approach or cruise speed but had a considerable reduction in max lift, resulting in a nose drop if rain were encountered in the flare. The result of this extensive testing was the data John needed to model the rain trim change in his computer program. Soon he was able to duplicate the flight test results on the computer and from there was able to produce a brand new airfoil, the Roncz 1145MS, which we have recently tested on the prototype Long-EZ, N79RA.

This completely new and never-flown-before airfoil is by far the best we have seen. It has a negligible rain trim and the rain only adds 2 knots to stall speed. Of course some more flight testing remains to be done, however, we are confident that we do indeed have what we have been looking for. The R1145MS produces considerably more lift than the original GU-5 (11)8 airfoil and in fact more than any we have tested so far. This enables us to reduce the span, reducing whetted area, and thus drag. Its trailing edge shape provides the correct stick forces without external devices.

At this time, the span from the outboard tip of the left elevator to the outboard tip of the right elevator is 130-inches. This compares to 140-inches on the original GU-Canard. We have incorporated the John Roncz designed, curled-up wing tips first seen on Mike and Sally's N26MS. These tips are specifically optimized to enhance the vortex coming off the tip of the canard and position this vortex in the "sweet spot" over each main wing. The remaining test and preparation/printing of the plans should be completed by April 1.

The new Roncz 1145MS canard will NOT be recommended for the VariEze. The airfoil used on the VariEze main wing is working very hard to maintain attached flow even with the GU canard. This new canard may ruin the stall characteristics of a VariEze. Feed back from VariEze flyers indicates that while most VariEzes do have a small rain trim change, it is just that — a small trim change that in most cases is not significant enough to warrant the flight test program that would be required to qualify a new canard for the VariEze.

CP 46 OCT 1985 page 3

Vortilons on the main wings are MANDATORY when using the Roncz 1145MS canard. Do not neglect to install the vortilons on your main wings. They are optional when using the original GU section. We have had reports varying from no change to "really makes a big difference" with the original canard.

CP 50 Oct 1986 page 1

A poll was taken at the Bull Sessions of rain trim changes in VariEzes, Long-EZs and Defiants. The VariEzes had 9 examples that trimmed nose up and 12 that trimmed nose down in rain. The Long-EZ contingent had 16 that trimmed nose down and 1 with no trim change, all standard canards. Three examples of the Roncz canard were there and all 3 had no trim change. All 3 Defiants reported no trim change. The trim change in the EZs range from very slight to slight (90%), moderate (5%), heavy (5%). It was very difficult to see or feel any difference between these canards.

CP 66 Jan 1991 page 11

Vortex Generators on canards — Since Magna Liset of Oakey, Australia reported on his epoch trip across Australia, we have had numerous requests for information on his modification (vortex generators).

Magna has been good enough to send us a sketch of what he did. Essentially, he glued tiny vortex generators (aluminum angles) to the top skin, forward of the elevators, approximately 40 of them on each side, at specific angles and positions. This reportedly completely eliminated the annoying pitch trim changes he used to experience every time he flew into, or out of, rain or visible moisture. This was also done on the Voyager prior to world flight for the same reason. ●

Spar Cap Failure Continued

Following the discovery of this failed spar cap and during the disassembly the builder discovered very serious corrosion in the aluminum parts of the top right wing fitting. The corrosion would also have resulted in wing failure if it had not been discovered.

The corrosion problem and inspection requirements have been covered in directives in the Canard Pusher newsletter on six previous occasions: CP 53 Oct '87; CP 55 Apr '88; CP 66 Jan '91; CP 86 Oct '96; CP 87 Jan '97; and CP 107 Jan '02. (These notices are printed later in this bulletin).

In spite of past notices we continue to see occasional examples of severe corrosion, the extent of which is likely to cause wing failure.

Based on the data we have seen to date there is a high likelihood that an EZ will lose a wing resulting in a fatal accident unless builders ground their aircraft and carefully inspect them. Builders of experimental aircraft are, in general, careful to do inspections and check all newsletter notices. Those who operate, but did not build their aircraft are generally at a much greater risk since they often ignore notices or are not experienced at inspection and repair. If you have built an experimental but are no longer operating it, do take the responsibility to notify and assist the new owner so he can fly safely.

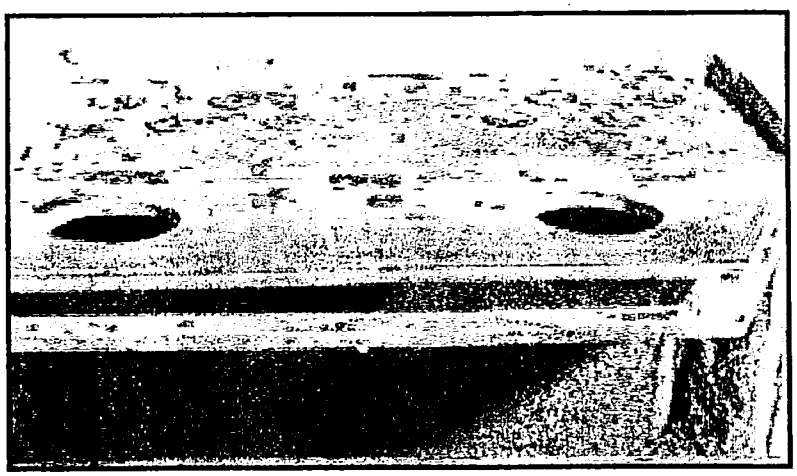
Inspect for CORROSION

After discovery of the failed spar cap (a "loose feeling" when moving the wingtip) the aircraft was grounded.

During the teardown to find out what had happened, considerable corrosion was found in the top WA-2 aluminum plate. The owner of this aircraft promptly contacted RAF, and offered to send the corroded and failed pieces to us for our evaluation. He later also sent additional pieces of his center section spar box so we could conduct some structural tests.

We have carefully examined all of these materials and parts, and have also conducted compression tests on the unidirectional E-glass spar caps from both the left and right sides of this center section spar. The corrosion found in the WA-2, WA-2-2 plates and the WA-5 spacer from the top right side wing attach fitting, is inter-granular corrosion in the WA-2 plate particularly, and thus cause for concern for anyone operating a Varieze.

For now at least, we feel that this incident is comprised of two separate and different problems. The severe corrosion of the aluminum wing attach plates is one and the failure of the glass spar cap is the other, and there does not appear to be any connection between the two.



Such severe corrosion in this wing attach fitting, in a Varieze that has been flying for 20 years means that it is possible that many other VariEzes out there could also be affected.

This particular Varieze was built in North Andover, Maine, and was based at and flown from the Lawrence, MA (KLWM) airport. It was purchased by Andreas Christou in June of 1992, and moved to the Waterbury/Oxford (KOXC) airport. It was subsequently moved to the Sky Acres (44N) airport in 1997. All of these locations are on or near the North East coast. It has been parked outside on the ramp in a marine environment all of its life except when brought home for the winter for maintenance.

This Varieze was built before the recommendation came out to Alodine all aluminum parts. For some reason not understood, only the right upper wing fitting was affected by this corrosion. The lower right, and both upper and lower left wing attach fittings on the center section spar are essentially corrosion free. In this case the owner had installed cover plates over the normally visible, wing attach aluminum plates. These consisted of thin aluminum covers that were fitted over the wing fittings, and held in place using silicone as an adhesive. This made it impossible to inspect the actual WA-2 wing attach plates during a normal pre-flight walk around. Had it been possible to easily look at the top surface of the WA-2 plates, there were indeed indications of corrosion at the inboard edges of this WA-2 plate that should have been noted during a pre-flight inspection.

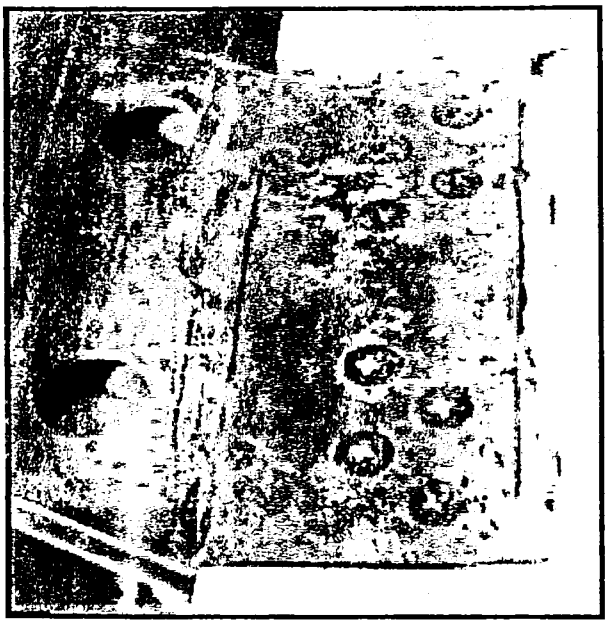
Continued on page 6

Spar Cap Failure Continued

If you own a Varieze which has had any kind of cover installed such that you can not closely inspect the normally visible WA-2 wing attach plates, remove them before next flight, and do not re-install them. It is possible that these covers actually allowed moisture to become trapped in the void under this cover, and exacerbated the corrosion problem.

Before next flight, remove both wings and carefully inspect the top of each wing attach fitting, the WA-2 aluminum plates on the center section spar box. Carefully check both left and right and top and bottom plates. Look for little gray lines indicating possible corrosion, extending from under the composite lay-up/micro fairing inboard of these fittings. Examine with special care between the plates and look closely at the visible face of the WA-5 spacer. See page 6-17 in Section 1 of the Varieze plans to be sure you completely understand this important paragraph.

In the case of the Varieze involved in this incident, the corrosion was obvious using the described inspection above. If you see any signs of corrosion, you must ground your aircraft, and conduct a much more thorough examination, which will include actually cutting into structure, and removing the WA-2 plates.



In the subject Varieze, the top right WA-2 plate was so severely corroded that the corrosion had worked its way completely through this 1/8" thick plate, reducing the physical qualities of this plate to the point that this alone would have caused a wing attach failure. The WA-2-2 plate and the WA-5 spacer also are heavily corroded, particularly in the area of the void between the "ears" or tabs of the WA-3 tongue, which is part of the wing fitting on the wing itself. See the top view on page 6-17, the WA-3 tongue and the WA-5 spacer, are outlined using a dashed line. Please report any findings of corrosion to raf@antelecom.net, or by snail mail to RAF, 1654 Flightline, Mojave, CA 93501.

For now at least, we feel that this incident is comprised of two separate and different problems. The severe corrosion of the aluminum wing attach plates is one and the failure of the glass spar cap is the other, and there does not appear to be any connection between the two.

Center section glass spar cap failure

The failure of the actual unidirectional glass top spar cap, just inboard of the right WA-2 wing attach plate was likely caused by an in-flight overload, and occurred right at this location due in part to glass fibers that were not straight, and also what appears to be a rather poor quality laminate. We have carefully removed a section of the glass spar cap inboard from this fracture point, and upon close examination, have found what looks like a rather dry, resin-starved lay-up. We made up 8 test coupons, cutting up the spar cap inboard of this dry-looking local area, and we have failed each of these in compression using an Instron Lab testing machine. The average compression failures occurred at only 68% of the expected stress.

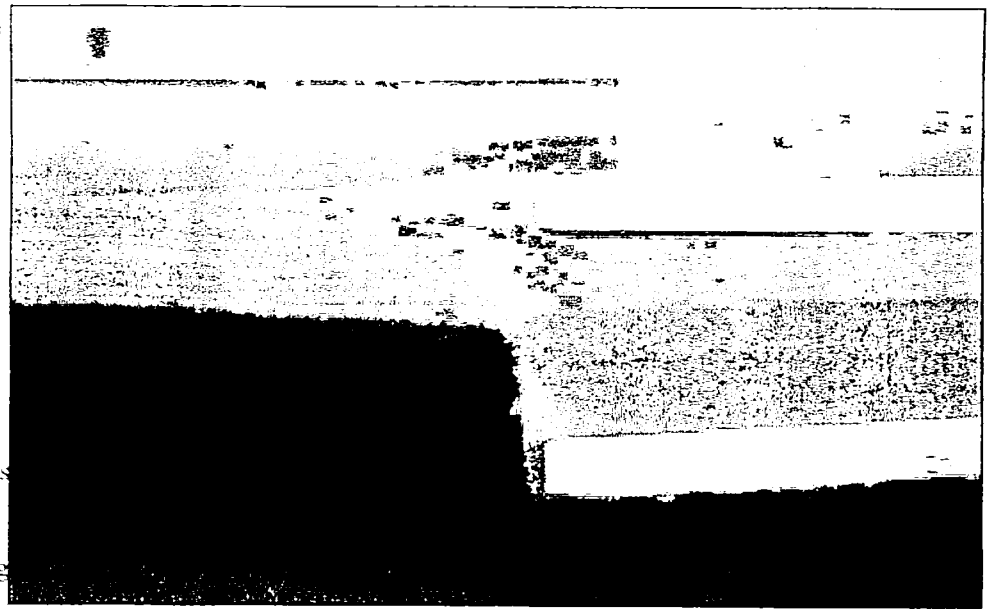
In addition to this test we also conducted a compression test of the left upper wing attach/spar cap. The left compression spar did not fail in flight, and on close inspection, there did not appear to be any damage to the spar cap. It is of course possible that there may have been some compression damage that was not detectable. There was no corrosion visible in the aluminum wing attach plates in this area nor in the bottom fittings of both wings. The section of spar cap immediately adjacent to the WA-2 aluminum plate, failed in this compression test, at a stress level of only 25% of the predicted maximum stress. This indicates a serious weakness, however the test method may have induced some side-loading of the cap.

This is extremely serious, because it seems likely that since this has occurred in this one example of a Varieze, that there may be other Variezes out there in the field that have similar weaknesses. There is no way, short of a load test to failure, to determine that any particular Varieze has a similar problem. Such a test would of course render the aircraft un-flyable, and even if tested to a lower "G" value, there is a good chance that

Continued on page 7

Spar Cap Failure Continued

undetectable damage would occur during such a test, making the subject aircraft unsafe to fly.



During the testing described above, all of the samples failed without the normal "cracking" sound we have come to expect. They simply failed in what seemed to be a "soft", soundless failure. Certainly not what we normally see when conducting compression tests on composite laminates.

We are worried that there may be more of these weaknesses out there. There is no easy way to determine if your particular Varieze has the same problem, and there is no simple fix for this problem. For these reasons RAF believes that all Variezes must be grounded upon receipt of this information, and a carefully conducted examination of the wing attach fittings must be completed before next flight. In addition, no Varieze should be flown to a load factor above 2.5 "G"s. Also, you must avoid flying in greater than light turbulence, and of course, do not fly over the 1110-lb gross weight limit.

RAF will be attempting to contact all known Varieze builders/fliers, through the RAF web site, Sport Aviation, the Canard Pusher, the Central States Newsletter, and all other sources available to us. We would also ask you as a Varieze owner, to pass this information on to any one you know of who is flying a Varieze.

DETAILED CORROSION INSPECTION

Before next flight, all Variezes must under-go the following:

If your Varieze has any kind of cover installed such that you can not closely inspect the normally visible WA-2 wing attach plates, remove them and do not re-install them. It is possible that these covers can actually allow moisture to become trapped in the void under this cover, and actually cause a corrosion problem.

Open your Section 1 of the Varieze plans, and turn to page 6-17. Study the drawing of the Brock manufactured wing attach assembly, and keep this page handy so that you will clearly understand the following instructions.

Using a flashlight, closely inspect the visible part of each WA-2 aluminum plate on the top of the aircraft, and each of the WA-2-5 aluminum plates visible on the underside of the plane. Pay particular attention to the inboard edge of these aluminum plates. Look for little gray corroded lines extending from under the composite lay-up/micro fairing inboard of these fittings. Also look for any gap that may be building between the composite structure and these aluminum plates.

Now remove both wings, and place them on padded sawhorses such that you can easily inspect all areas of the aluminum wing attach fittings, on the wings as well as on the ends of the center section spar. Remove each aileron from the wings, and set them aside.

On the center section, use your flashlight to examine between the aluminum plates where the WA-3 tongue normally fits. Look for any signs of corrosion on the inner surfaces of these plates, as well as on the visible face of the WA-5 spacer.

On the wings conduct the same careful examination, paying particular attention to the inside edges of the "ears" of the WA-3 tongues, but look at every surface, on top and underneath the wings. You are looking for little "wiggly" gray lines of corrosion, or any pitting on any surface indicating corrosion.

Any indication of corrosion in any of these areas is cause to ground your Varieze, and to conduct a much more in depth examination. This may include actually cutting into

Continued on page 8

Spar Cap Failure Continued

structure to get a better look. Report any discovery of corrosion to RAF. raf@antelecom.net is the email address, or via snail mail, RAF, 1654 Flightline, Mojave, CA 93501

If you find absolutely no indication at all of any corrosion in your wing attach fittings, you may return your Varieze to flight status with the following limitation: Never exceed 2.5 "g" positive, or 1.5 "G" negative in flight. Install a placard in plain sight on the instrument panel, with these words clearly shown. Also change all reference to flight at more than 2.5 "G" in your owner's manual, to read 2.5 "G" maximum allowable in-flight loads.

Also, if you believe your EZ has **EVER** been overloaded (due to maneuvering, aerobatics or turbulence) beyond published design limits (5 G at 1050-lb weight or 4 G at 1110-lb you should **NOT** fly it.

Varieze Ailerons Corrosion Inspection

There has been a report of corrosion of the A1 aluminum tube, in the inboard end of the ailerons on an older Varieze, necessitating replacement of this tube. Therefore you must check yours at this time.

Before re-installing your ailerons, carefully examine the hinge areas of both ailerons. Look for any paint cracking around the hinges, or any signs of swelling around the aluminum tube A1 that is floxed into the foam core under the A2 aluminum bracket. The inboard hinge is mounted to the A1 tube and A2 bracket and the outboard hinge is attached to the aileron using Avex or Cherry rivets. See page 13-4 of Section 1 (Second edition) for detailed cross section drawings. Remove some glass, inspect and repair the glass per plans repair procedures.

Long-EZ and Defiant Ailerons Corrosion Inspection

There has been a report of severe corrosion of the A10 aluminum tube floxed into the inboard end of the foam core of the Long-EZ ailerons. The hinges are mounted to the aileron using Avex or Cherry pop rivets. These rivets pass through the hinge, through the glass skin of the aileron, and through the A2 (or A5) brackets. See page 19-14 for detailed cross section drawings of these areas. If moisture is able to find its way into the A10 tube it is possible that this tube and perhaps even the A2 and A5 brackets could become corroded. The fix is to cut the bad sections out of the aileron, and replace them with new parts, using the standard repair criteria of lapping 1" per ply onto well sanded existing known to be good structure. Be certain to treat all aluminum parts with Alodine just prior to installing them. This surface preparation will prevent any re-occurrence of corrosion.

Since the Defiant aileron is essentially identical to the Long-EZ, please follow all of the above instructions.

The following summarizes previous corrosion-related issues that were published in teh CP Newsletter

October 1987 CP 53 Page 4
VARIEZE PLANS CHANGES — MAN-GND
Next 10 hours — carefully inspect wing attach fitting for inter-granular corrosion.

October 1987 CP 53 Page 7
CAUTION: CORROSION IN VARIEZE WING ATTACH FITTINGS

A VariEze which had spent most of its life outdoors in the eastern US, but significantly, not on the coast, was found to have severe intergranular corrosion in the top plates of the wing attach fittings as well as in the two aluminum tubes between the top and bottom plates. Very little evidence of this was visible upon casual inspection. However, when the UND wrap on each end of the centersection spar was lifted, the corrosion was rampant and this EZ builder said he would not have flown this airplane knowing how bad the corrosion was.

All VariEze owners should make a very careful inspection of the aluminum wing attach fittings, especially under the glass that laps onto the aluminum plates, particularly if there is evidence that the glass has peeled or delaminated from the wing attach plates, both on the wings and the centersection spar.

For new construction, all aluminum parts, including wing attach fittings, should be cleaned in Alumiprep 33 or metal prep #79 and then soaked in Alodine 1201 which is a visible (golden brown) moisture barrier, greatly increasing resistance to corrosion. This also acts as an excellent surface to bond epoxy or paint.

Do not anodize wing attach fittings since this finish, if not done exactly right, can cause embrittlement in the highly stressed wing attach parts.

Alodine is a common aluminum preparation and can be obtained from RAF-approved suppliers such as Aircraft Spruce or Wicks Aircraft.

April 1988 CP 55 page 8
VARIEZE MAN GND

Check wing attach fittings for corrosion. Remove both wings, clean and inspect the wing attach fittings on the wings and on the centersection spar. See this CP for a more detailed description.

April 1988 CP 55 page 5

Since we first reported the corrosion problem in VariEze main wing attach plates in CP53, page 7, we have heard from only two or three builder/fliers who had found signs of corrosion. Just this week, we received a letter from a VariEze owner/pilot who found corrosion in the WA-2-2 plate. He has spent a considerable amount of time and energy removing this plate, in fact, he said

Continued on page 9

Corrosion-Related Issues continued

he almost resorted to using dynamite! He sent us the WA-2-2 plate, the lower plate of the top two plates mounted to the centersection spar. By far the toughest plate to remove and replace. This plate (see photo on page 11) has one of the worst cases of intergranular corrosion we have seen. It is absolutely not safe to fly and must be replaced. Unfortunately, this is probably going to be very difficult, and we honestly do not have any simple fix for this. Just removing the WA-2-2 plate could do serious damage to the centersection spar. The UND wrap around the end of the centersection spar may have to be cut and removed. The foam under the WA-2-2 plate must be dug out, the 8 AN525 (or AN509) screws must be removed (drilling them out may be the easiest method).

A replacement plate must be fabricated, duplicating exactly all of the holes in the plate. This is a difficult job and will require an expert machinist and a lot of patience. Brock will not be able to help you with this. Each case will have to e dealt with on an individual basis. The new piece should be alodined and then floxed and screwed back into place. If the UND wrap was damaged, it must be replaced, which requires cutting into the fuel tank (we did say it would be tough!).

This is major work, not anything that could not be done by a person who has built a VariEze, but very tedious, difficult work. And it must be done right. There is no short cut, no easy way. If you find more than simple white powder surface corrosion, stuff you can easily polish off with 320 grit sandpaper, you must ground your VariEze and replace the corroded parts.

A mandatory inspection is required before next flight for all VariEzes. Do not take this problem lightly, it could kill you and anyone who may be with you. Remove both wings. Clean all visible aluminum parts at the wing root and centersection spar. Look at the edges of all the WA plates on the centersection spar. Look for a thinner edge or a swollen appearance under the glass. Look in between these plates (where the WA-3 tongue slides in). A white powder appearance that can be completely removed and polished out with 320 grit is OK, but the plates should be very thoroughly cleaned and sprayed with zinc chromate. LPS or a good quality grease as used in marine applications should be generously applied everywhere before re-installing the wings. Check the WA-4 pins and the AN4 bolts and grease both thoroughly. Replace the AN4 bolts if they show any sign of corrosion.

New construction VariEzes, or anyone replacing wing attach fittings with new ones, should clean all aluminum parts with Alumiprep 33 or Metal Prep #79 then alodine them with Alodine 1201 which puts a tough, corrosion-resistant visible, golden finish on. We are reluctant to try alodining parts in place due to the acid etch (Alumiprep 33) possibly getting under the glass onto the aluminum.

When you inspect your VariEze, be very conscientious. Check very carefully, it is difficult to find, you may have to probe under the glass over the WA-2-2 plates. Look hard and long at it before you decide it is safe to fly.

The only good news about this is that where the epoxy was bonded to this WA-2-2 plate which we have, there is no corrosion. The surface of the metal is as new. Intergrandular corrosion is very common in airplanes that live near the ocean.

Sea planes are especially prone and require constant inspection and maintenance aimed at preventing just this problem. The salt in the air plus water from rain or condensation, plus heat and aluminum and presto!, you have a battery! Galvanic reaction and you have corrosion. Keep the aluminum parts clean, grease them often and you will have no problems. People who live far from the ocean may not see this problem but they must check for it just the same.

This problem is confined to the VariEze. The Long-EZ wing attachment is completely different and this same problem should not occur. Of course, all metal parts must be protected from corrosion — aluminum with alodine or zinc chromate, steel with zinc chromate (after cleaning in Metal Prep). Wing attach bolts and parts should be generously covered with a good grease in VariEzes and Long-EZs. Replace any rusty bolts and nuts.

January 1991 CP 66, page 3

ALERT! Possible Corrosion in Elevator Torque Tubes in EZs

We have one report from a VariEze builder/flyer who lives and hangars his EZ in Ohio. He noticed small bumps rising up on the top of each elevator along the aluminum torque tube. He could depress these bumps a little with his finger. He has removed each elevator and cut the glass and foam away along the top of each elevator, exposing the aluminum torque tubes. He reports that he has found "severe corrosion pits where each bump was located." He says that this corrosion occurs only under the foam and glass. There is no corrosion at all on the exposed ends of the elevator torque tubes.

Pitch control is absolutely critical to safe flight. For this reason, any report such as this must be taken seriously. ALL EZ, Defiant and Solitaire flyers should inspect the leading edges, the tops and bottoms of both elevators for bumps such as we have described here, before the next flight. If any evidence of bumps or corrosion is found, ground the airplane and remove foam and glass locally. Inspect the aluminum tubing under a bright light. Please report any problems found to RAF as soon as possible.

Any builders who have not yet built the elevators should treat the aluminum tubing with Alodine before starting on the foam and glass elevators. Do not omit this step! Remember, the corrosion, if it exists, is not visible on the exposed part of the tubing. It is under the foam and glass and cannot be seen without removing the foam and glass. Do not remove foam and glass without evidence of bumps or swellings that may or may not be soft. Do let RAF know of any evidence of corrosion.

Continued on page 10

Corrosion-Related Issues continued

The above report came of Ohio where it is hot and humid in summer and cold and damp in winter. Anyone who lives where there is much humidity and/or near the coast should be especially concerned and should check the area called out before each flight.

We have checked all of the EZs at Mojave with no sign of any problems but that probably was to be expected, this being a desert with only a few inches of rainfall in a good year.

October 1996 CP 86 page 4

Corrosion Found in Brackets A Long-EZ pilot has reported finding moderate to severe corrosion in the elevator hinge brackets on his GU canard. He did not build this airplane, and the history of this airplane is not known, but it currently is based on the East Coast in a salt water environment and the corrosion was significant enough to cause this pilot to dig out all of the hinge brackets and replace them.

We have not found anything like this on any of our aircraft, but keep in mind all of the EZ types here in Mojave live in hangars and in a dry desert environment. We will continue to investigate this problem, and will report in future CPs. Every EZ and Defiant owner should make frequent careful inspections of these hinge brackets. Keep in mind that there was little or no evidence visible outside the canard. The corrosion took place inside the canard, where the bracket was floxed into place in the high density foam insert. Probably moisture was "wicked" up into the flox/high density foam and was trapped in close proximity to the 2024-T3 aluminum brackets.

What can be done to prevent such an occurrence? The best thing to do for these brackets, and all other aluminum parts, is to treat the bare aluminum with Alodine 1201, after pre-cleaning with Alumiprep 33, *prior* to installation. They should then be sealed in pure epoxy prior to bonding them into the canard.

We would appreciate hearing from anyone who may find corrosion in this or any other area. Feedback from builder/flyers is extremely important and is our main source of information relating to safety.

January 1997 CP 87, page 9

Don Yoakam, Ft. Myers, Fla.—In the last newsletter you asked if anyone has much trouble with corrosion of the metal parts of their EZes. Just move to Florida and you will soon find out about such things. My VariEze sat under a flat metal shade with no walls. It is about seven miles form the Gulf. The hinge brackets started to corrode and I tried several things to stop it, but none worked. In the end I dug them out and replaced them with ones made of stainless steel.

I now have a Long EZ and made its brackets out of stainless. However the canopy hinges on it started to corrode and I had to cut up the hinges to get the canopy off. I have just a little nylon rope for a canopy stop and the little metal bracket that the rope is tied to will corrode where the rope goes through it. I just replace the bracket every year. I keep after the rudder and aileron hinges with WD-Forty and have had no trouble with them. The aircraft now has 770 hours on it and first flew in 1984. That is all the trouble that I have had with the air frame. Of course a little trouble with the engine, but that is another story.

It is a fine airplane.

January 2002 CP 107 page 8

Jonas-strutt Audrey — My EZ (ser. no. 21930) wing attachments are disintegrating, that is the aluminum is separating, that is flaking off. Have you heard of this happening? If so what was done, or can anything be done to stop this condition? Can the attachments be replaced or must I part my old bird?

Burt Rutan — This is a real tough one. As described in an early newsletter the aluminum components need corrosion protection for all but our dry desert environments. They are not easily replaced, since the units are jigged as a unit during construction. I have seen others resort to building new wings and center section to deal with wing attach corrosion. There may be a way to avoid this but RAF has never worked out or approved a repair procedure.

Burt's Summary
The Spar Cap Failure, Corrosion Issue for the VariEze

The basic problem here is the difficulty in determining the quality of the spar caps without destroying them. I have no doubt that many (if not most) EZs are airworthy to the original limits. I have done what I think prudent, ie, asked the builders to do the same inspections I would do to my own aircraft. Also, my aircraft was built to the plans and thus probably has some kinking of the spar caps at the edge of the wing fittings.

We do not believe the aluminum corrosion is the cause of the weak caps, since there was no corrosion near the caps that we tested. I have to believe that many EZs have weak caps, even my own (which will be displayed in the Smithsonian's new Dulles museum next year). If mine were flying today, I would remain below 2.5-g, avoid forecast turbulence and slow down in unexpected turbulence. Also, if you believe your EZ has **EVER** been overloaded (due to maneuvering, aerobatics or turbulence) beyond published design limits (5 G at 1050-lb weight or 4 G at 1110-lb you should **NOT** fly it. None of us want a fatal accident.

If there were an easy fix, it would have been drawn up and shown in the CP. I am still looking for a way to strengthen the old aircraft without throwing out the capability to remove the wings. Burt

Defiant Owner's Manual Correction

Change needed for the Defiant Pilot's handbook, page 31. Ignore the deflections shown for aileron rigging, and use the below information from CP # 53, October 1987.

Clarification of Defiant aileron rigging — follow exactly the information in CP 53, October 1987. The aileron travel information is on page 2, left column, center paragraph.

It says "A number of Defiant builders have reported problems in rigging their ailerons correctly. The plans change DPC #26 in CP45, page 4, is incorrect and should be ignored completely. There is NO differential in the Defiant aileron control system. To rig the ailerons, follow this procedure, in order: Rig the C-7 belcranks at exactly neutral as shown on page D-48. Lock them in this position with two small "C" clamps. Both control sticks should now be firmly locked. Now, rig the C-27 welded crossover tube by adjusting the length of the cables from the stick assemblies to make the C-27 look exactly as it is shown on page D-26 (top left). Now, adjust the aileron pushrod tubes (rod end bearings) to the proper length to set both ailerons exactly at neutral. That is it! You will now have approximately ±19-degrees of aileron travel both up and down. (± 2.3-inches at the aileron inboard trailing edge). Variations of up to ± 0.3 at the trailing edge (i.e. 2-inches to 2.6-inches are okay.

Accident report

Accident occurred Sunday, April 14, 2002 at Gary, IN
Injuries: 1 Serious.

On April 14, 2002, at 2100 central daylight time, an amateur built Varieze, N97JW, operated by a private pilot, collided with a light pole during a forced landing following a loss of engine power. The accident occurred near the intersection of Ridge and Cleveland Roads in Gary, Indiana. The private pilot received serious injuries and the airplane was substantially damaged. The 14 CFR Part 91 flight was operating in visual meteorological conditions without a flight plan. The airplane departed Nashville, Tennessee (JWN), at 1650.

The pilot reported the airplane was last topped off with fuel in French Lick, Indiana. He reported the airplane held 31 gallons of fuel of which 30 gallons were usable. The airplane was then flown to Fall-of-Rough, Kentucky; Henderson, Kentucky; and JWN. The pilot reported he then departed JWN with the intention of landing at Griffith, Indiana (05C). He reported that during the takeoff run at JWN, the airplane veered to the right. He corrected the directional control and continued the takeoff. He reported that upon reaching 05C, he aborted because of the lack of directional control. He then decided to land at Gary, Indiana. The pilot reported that he ran out of fuel while en route to Gary. The pilot selected a street on which to make a forced landing. He reported that during the landing the airplane "Veered to the right, having spun clockwise relative to the forward vector. The plane struck a city light pole."

The pilot reported that he calculated his fuel consumption for the trip using 4.5 gallons per hour for a Continental C-85 engine. Using this fuel consumption rate, the pilot calculated that he would have used 20 gallons of fuel for the entire trip. However, the engine had been modified with a crankshaft, pistons, and rods for a O-200 engine. The pilot reported that after the accident, he estimated that he burned approximately 50 percent more fuel than he calculated.

The pilot also stated that after the accident the right brake rotor was bent and locked against the caliper. He was not sure how this happened, but speculated that he may have hit something during the takeoff roll from JWN.

Accident occurred Sunday, June 16, 2002 at Urbana, IL
Aircraft: Vari Viggen, registration N915D; Injuries: 1 Fatal.

On June 16, 2002, at 1030 central daylight time, VariViggen, N915D, piloted by a commercial pilot, was destroyed following impact with terrain on initial climb from runway 27 (4,000 feet by 57 feet, concrete), at the Frasca Field Airport (C16), Urbana, Illinois.

Visual meteorological conditions prevailed at the time of the accident. The 14 CFR Part 91 personal flight was not operating on a flight plan. The pilot was fatally injured. The flight was originating at the time of the accident and was en route to the Andy Barnhart Memorial Airport (3OH0), Carlisle, Ohio.

Accident occurred Saturday, August 03, 2002 at Martha Vineyard, MA
Aircraft:Crawford Widebody Long EZ, registration: N3R; Injuries: 1 Fatal.

On August 3, 2002, about 1230 eastern daylight time, a homebuilt Long EZ, N3R, was substantially damaged during collision with the Atlantic Ocean while maneuvering near Martha's Vineyard, Massachusetts. The certificated commercial pilot/owner suffered a medical emergency, and died prior to the accident. Visual meteorological conditions prevailed for the public use flight that originated at the Barnstable Municipal Airport (HYA), Hyannis, Massachusetts. A visual flight rules (VFR) flight plan was filed for the flight conducted under 14 CFR Part 91.

During a telephone conversation, a research scientist with the National Oceanic and Atmospheric Administration

(NOAA), and the pilot's colleague, said the purpose of the flight was to gather data for a NOAA research project. The airplane was built, outfitted, and instrumented by the pilot to measure the exchange of heat, moisture, and momentum between the ocean and the atmosphere. The data was gathered and stored in a "lunchbox" personal computer mounted behind the pilot's station.

The pilot was to duplicate a flight he performed the previous day. On August 2, 2002, the pilot departed Barnstable Airport, and flew to a point in the open ocean (40:55:00 north latitude, 070:03:00 west longitude) where several research buoys were deployed. He then flew repeated low-level passes about 30 feet above the ocean surface over the research buoys. Some legs were north-south "saw-tooth" flight patterns over the same buoys. The saw-tooth patterns required several slow ascents and descents between 30 feet and 750 feet above the surface. The pilot then flew four east-west legs, and returned to Barnstable Airport. During the flight over the buoys, the pilot called his colleague over the radio every 10 to 15 minutes to "check in", and relay a status report. The flight was 2.9 hours in duration.

According to the Federal Aviation Administration (FAA), the airplane departed Barnstable Airport at 1159 on the morning of the accident; the pilot activated his VFR flight plan at 1202, and was due back at Barnstable at 1530. There were no further communications between FAA facilities and the pilot. According to his colleague, the only radio call from the pilot was immediately after takeoff when he said, "I'm heading out to the site."

Approximately 1500, the pilot of a passing airplane spotted the wreckage of N3R and the pilot afloat in the ocean. The wreckage was located at 41:19:28 north latitude, 070:34:26 west longitude.

The wreckage was recovered, and subsequently examined by an Aeronautical Inspector of the Aeronautics Commission for the Commonwealth of Massachusetts. The examination revealed no mechanical anomalies. According to the inspector, flight control continuity was established from the cockpit to the left aileron and rudder. Continuity could not be established to the right aileron and rudder, due to breaks in each cable. All cable breaks were "broomstrawed".

The rudder pedals were separated from the airplane, and were not recovered. The three wooden propeller blades were broken down to within 8 inches of the hub. All thee blades were splintered and "broomstrawed".

The Associate Chief Medical Examiner for the Commonwealth of Massachusetts, Pocasset, Massachusetts, performed an autopsy on the pilot. According to the medical examiner, his examination revealed the pilot suffered a "massive subarachnoid hemorrhage". He said a neurologist and forensic pathologist confirmed his diagnosis. The medical examiner said the hemorrhage was too large to determine its origin or its dimension. He added that the pilot's cause of death was "natural".

The weather reported at Martha's Vineyard Airport, 6 miles northwest of the crash site included clear skies with 10 miles of visibility. The wind was from 250 degrees at 8 knots.

Accident occurred Tuesday, July 02, 2002 at Covington, TN
Aircraft: Varieze, registration: N57EZ; Injuries: 1 Uninjured.

On July 2, 2002, about 1330 eastern daylight time, a Varieze amateur built airplane, N57EZ, registered to and operated by a private individual, as a Title 14 CFR Part 91 personal flight, made a forced landing near Covington, Tennessee. Visual meteorological conditions prevailed, and no flight plan was filed. The airplane incurred substantial damage, and the commercial-rated pilot received no injuries. The flight originated from Covington Municipal Airport, Covington, Tennessee, the same day, about 1320.

According to the pilot, he had just purchased the airplane from a friend, and had journeyed to Covington, Tennessee, to get the airplane and fly it back to his home in Pensacola, Florida. He said he only had about 0.2 flight hours of total experience in the airplane, and at the time of the accident flight he was evaluating the airplane following a condition inspection. He said that the airplane had not been operated in a while, and he said he had been told to get some flight hours in the airplane prior to attempting to fly it home. He said that during the first flight, the engine had surged, so he returned to the airport, and executed an uneventful landing. He further stated that after landing, he operated the airplane on the ground, trying to determine the cause of the engine surges, and was unable to duplicate the problems, so he decided to again fly the airplane to see if the surges would reoccur, or if he was experiencing "first flight paranoia."

He stated that during the second flight the taxi, takeoff a initial climb were uneventful, and when the airplane reache 2,700 feet, as he was about to reach back and to secure the magnetos and attempt to diagnose the reason for the earlier engine surges, he noted that he had left the electronic ignition off from the second startup on the ground, so he turned the switch back on. He said he then decided to wait until he reached 4,000 feet, and upon reaching 3,700 feet, and while in a left turn, "crossing the numbers for runway 01, the engine began to surge again. He said the engine rpms then dropped to 1,600, and that any attempts to control engine power were henceforth unsuccessful. He said he extended the downwind in order to dissipate altitude, but as he approached the airport to affect an forced landing he had descended below some wires which stretched across his flight path to the airport, so he changed his selected landing site to a road short of the runway. During the landing the pilot said the winglet caught some corn stalks at the side of the road and spun the airplane around. The airplane came to rest inverted in a corn field, incurring a severed right wing, a broken right main landing gear, a bent right canard and a damaged canopy.

An FAA inspector stated that he and an FAA designated Airworthiness representative examined the accident airplane, and no evidence of mechanical failure or malfunctions were

found with any of the airplane systems. The inspector also stated that the designated airworthiness representative told him that he had been present when the pilot was getting ready to take off, and that the fuel selector had been left on the 3-gallon capacity header tank position, and that after the accident, while assisting in extricating the pilot from the overturned airplane, the designated representative again noted that the fuel selector was still set to the header tank position.

Accident occurred Saturday, August 24, 2002 at RIO LINDA, CA
Aircraft: Varieze, registration: N42231;
Injuries: 1 Uninjured.

On August 24, 2002, at 2000 Pacific daylight time, an experimental Varieze airplane, N42231, lost engine power during the final approach turn and landed in trees, short of runway 35, at the Rio Linda Airport (Q94), Rio Linda, California. The airplane was operated by the pilot/owner under the provisions of 14 CFR Part 91, and sustained substantial damage. The pilot, the sole occupant, was not injured. Visual meteorological conditions prevailed for the local area flight and no flight plan had been filed. The flight departed Q94 about 1940, and was scheduled to terminate at Q94.

According to the pilot, he was number two to land behind a banner tow airplane. He had extended his base for spacing. During the turn to final the airplane lost engine power. The pilot reported that the airplane started to shake. He attempted to add power, but "didn't have any." The airplane went through trees and came to rest upright.

Accident occurred August 20, 2002 at Erie, Colorado
Aircraft: Defiant

On August 20, 2002, at 1045 mountain daylight time, a Defiant, N219DF, was substantially damaged when it collided with terrain during a rejected takeoff at Erie Airpark, Erie, Colorado. The private pilot and one passenger were not injured. Day visual meteorological conditions prevailed, and no flight plan had been filed for the personal flight being conducted under Title 14 CFR Part 91. The flight was originating at the time of the accident.

The following is based on a telephone interview with the pilot shortly after the accident, and the accident report he submitted. The pilot was taking off on runway 15. Power was applied to the rear engine, followed by power application to the forward engine. The airplane accelerated "slower than usual" and when the airplane was halfway down the runway, he elected to reject the takeoff. The pilot said he "couldn't rotate the airplane...it seemed to require more back pressure...it didn't seem right." He retarded power to both engines to idle and applied brakes. "The brakes seemed to grab at first, but then had no effect," he wrote. The pilot retarded the mixtures. The airplane went off the end of the runway and traveled 500 feet across rough terrain, collapsing the nose landing gear and bending the fairing. According to an FAA inspector who examined the airplane, the "Rhino" rudder and the engine cowling were crushed and the propeller was bent.

The pilot said the fixed base operator's mechanic found a dowel from the left wheel pant about halfway down the runway. "I believe this may have contributed to my slower than usual takeoff roll. The calipers and linings on the brakes were fresh, I had just had them rebuilt/replaced," the pilot wrote.

From Our Builders

Ron Smith (IN) — Dennis Jacobs crashed and was killed in his VariViggen Sunday, June 16, while taking off from the Urbana, IL SAA Fly-In. We had three Viggens there and had a great time up to that point. I don't know if you ever got to meet him in person but he was a great guy and a fantastic friend. I flew all over with him during the last 8 years.

The accident is still under investigation but it appears he didn't develop full power on take off. He started a shallow turn and then suddenly rolled over and went straight down. Currently the FAA is suspecting Carb Ice for the power loss. It happened to Rutan in his Viggen once.

Fred Mahan — Scary Airplane — I saw something really scary today. I went by the shop of Robby Lueck, a local craftsman who helps owners rebuild composite aircraft. He showed me a pair of Long-EZ wings that a Florida builder had brought in for "repairs." Robby had condemned them.

The story he told me was that a friend of the owner/builder had flown the Long-EZ and had remarked to the owner/builder that the wings felt "loose." The owner/builder examined the wings, went flying himself, came back, and agreed that they felt "loose."

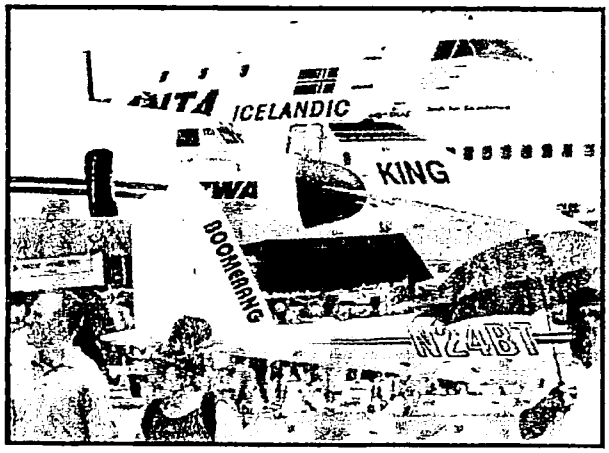
All four spar caps were cracked through (as in, *through*) at the corner of the "notch" for the stub spar. Then Robby pulled up the glass in one of the bolt access recesses so that I could see the foam. The wings were made from bead foam! Bead foam, as in beer cooler foam, made from little foam spheres pressed together!

This airplane had over 600 hours put on it during the last seven years!

Well, I felt weak-kneed. I don't know what anyone can do about stupidity of this magnitude. I'm just amazed. I don't know what else to say.

AirVenture 2002 Oshkosh

Marie Brock gets a heartfelt hug from Burt and Dick at the memorial for Ken at the Oshkosh Wall. Bruce and Bonnie Tifft were among our friends memorialized at the wall at AirVenture 2002.



Burt & crew flew the Boomerang nonstop from Mojave to Oshkosh in 6.5 hours.

It parked with the big boys on AeroShell Square.

Burt drives IT — aka Ginger, the revolutionary two-wheeled transportaion devise (its NOT a scooter!) developed by inventor extrodinaire Dean Kamen

Congratulations to EZ pilots in the 1000 mile "First Flight to World Flight"

The 2002 EAA AirVenture Cup Race was flown from the site of the first powered flight, Kitty Hawk, North Carolina, to the home of the Wright Brothers, Dayton, Ohio, to the current home of recreational aviation, EAA AirVenture Oshkosh. The 2002 AirVenture Cup Race replicates the excitement of the Bendix Trophy Races of the 1930s, by providing a well-organized race open to EAA Members.

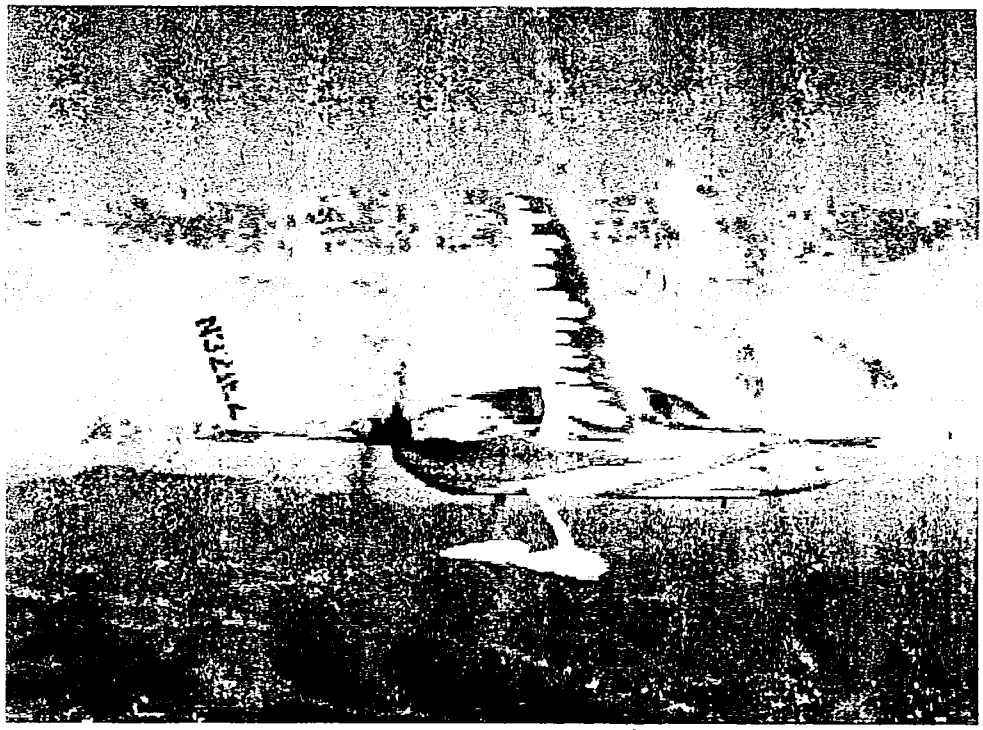
2002 Race Results
(for complete Race Results go to AirVenture Cup on the web – www.eaa.com)

Formula FX Class

Racer #	N Number	Aircraft	Pilot	Avg Speed
73	N73SH	Glasair I-TD	Steve Hammar	239.51
91	N91LH	Glasair I-TD	Bruce Hammar	232.40
85	N952W	Glasair IISFT	Don Saint	218.82
78	N78LC	Rutan Long-EZ	Jay Blum	216.13
28	N468JL	RV-8	Jeff Ludwig	205.72
56	N733JJ	Jordan RV-8	Scott Jordan	197.88
15	N215TW	Cozy Mark III	Tim Freeze	181.70
5	N642BG	RV-8	Robert Green	181.13
48	N7219D	RV-8	Dave Weisgerber	178.67
71	N44WS	Shannon RV-6A	Bill Shannon	177.00
72	N2QT	RV-4	Bobbi Boucher	163.2

Sprint Class

Racer #	N Number	Aircraft	Pilot	Avg Speed
66	N6LK	Vari EZ	Rob Martinson	192.49
22	N202SH	Quickie Q-200	Sam Hoskins	172.08
20	N500EZ	Vari EZ	Frank Pullano	164.35



David "Beagle" Orr's N321EZ

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