CP08/4

Static Test Wing

Our static load test wing is completed and will undergo proof-load tests soon. After proof load testing the wing will be given to another organization for fatigue testing. The glass layups on this wing were done by an aviation writer who had no previous fiberglass experience. He was curious if he could do the work and we wanted a first-hand look at how well a beginner followed our wing plans. His work looked fine to us and he was pleased with the ease of construction.

CP08/4

VARIEZE PLANS

We really don't like to call them plans - a better description would be manufacturing manual. They include a 30-page educational section that gives you a very complete introduction to the materials and detailed methods used to build the VariEze. The plans themselves are not just engineering drawings, but a very complete step-by-step manual showing each operation required. If you're curious about the format, find one of your wife's Simplicity dress patterns and look at the instruction sheet that comes with the pattern. We have found that this format of words, photos, and sketches, to supplement the normal drawings, is a very effective approach. Each major job is detailed and in each step you are told how many man-hours should be required.

The basic plans will consist of about 150, 11"x17" sheets, plus some larger full-size drawings. The plans will be offered in several sections:

CP08/4

Section I

Composite structures education, construction manual and drawings on entire aircraft except engine installation and optional electric/avionics systems.

CP08/5

Very Low Temperatures

Several people have asked how the structure withstands the low ambient temperatures common to the North. I think this concern stems from thermal stress failures that have occurred on another homebuilt that has a relatively weak surface skin and a highly insulated main spar. The VariEze structure bears no resemblance to that structure - spar caps and skin being at the surface minimizes thermal stress. The glass/epoxy matrix actually has improved physical properties at low temperatures. These same materials are used in structural areas of military aircraft whose high altitude envelopes requires them to be qualified to below minus 70 deg. F.

CP08/6

Closure Inspections

When does FAA inspect the structure? The glass is applied over a solid foam core - thus there is nothing to inspect before skinning. All joints and all structure is inspectable from the outside, and must be done after the structure is built but before it is painted. You will be given specific inspection criteria in the plans. In addition, since not every FAA inspector is familiar with composite structures, we plan to supply recommended inspection criteria to all FAA regional offices and to the foreign agencies.

CP09/04

VARIEZE STRUCTURE - To certify an aircraft for production, FAA requires the manufacturer to load the flying surfaces to 150% of design limit load. After that loading, it is acceptable for the surface to be damaged beyond repair, but it must be in a condition to allow a safe landing. To demonstrate the structural adequacy of the VariEze's wing and attachment, we had someone, who had no previous fiberglass construction experience, build a wing from our plans. We mounted that wing in a test fixture and loaded it over 200% of design limit load. The wing had absolutely no damage, not even the transverse matrix cracking that occurs with composites at about 2/3 ultimate load! Just for kicks, we rounded up eight people and had them all stand on the wing - that was as many as could crowd onto the wing, but resulted in much less load than the formal test done with lead shot bags.

Structurally, the Eze has some very important advantages over conventional metal or wood: greater redundancy, less susceptible to catastrophic failure due to fatigue, less susceptible to corrosion or deterioration, higher safety factors, easier to inspect and repair and less susceptible to surface damage. With proper ultra violet protection (as shown in VariEze section V), the composite structure should outlast metal or wood in any type environment.

CP10/4

WORKMANSHIP AND QUALITY CONTROL

In section I we gave you detailed information on specific defects that you may find in your work and how to repair them if necessary. We went into detail there and don't need to repeat them here, but it does seem appropriate to make a few comments of a more general nature on workmanship. There is no substitute for good workmanship, and no excuse for poor workmanship. We've made an effort at making the materials and techniques as easy as possible for the beginner to do well, but nothing as complex as an airplane will ever be completely idiot-proof. All of you will make some minor mistakes in the process of building your airplane and this is perfectly normal. There are also, unfortunately, a few of you who will make serious mistakes and lots of them. All of you must remember that you are your only quality control and nobody else can do it for you. If you have questionable parts you are burdened with the decision to scrap them or use them. If you are lucky enough to have another builder nearby let him look your project over and respect his opinion of your workmanship. If you find that another builder in your area is doing poor work, please have the courage to tell him so. If we help police each other our safety record will improve and we'll be able to preserve our lenient rules. Sometimes it is hard for us to admit to ourselves that an expensive part is really junk and a second opinion may help us to decide.

Remember, a wrinkle, depression, or bump in the layup which is greater than 1/16 inch high (or low) and which is more than 20% of the chord length or 20% of the spar chord is not acceptable and requires repair. A depression can generally be repaired by filling with flox to level and laying over the entire depression the amount of glass that is underneath, lapping outside the depression a distance equal to one inch per ply. Be sure you don't layup a depression or bump in the thick main spar caps. The transition of the spar caps into the wing fittings must be smooth and without joggles. The above applies only to the flying surfaces. The fuselage and fuel tanks can have relatively large depressions or bumps without affecting structural safety.

CP10/4

VARIEZE PLANS CORRECTIONS/CLARIFICATIONS

We've got a lot of corrections this issue, because there are already several people who have built most of the airplane from original--edition plans, all since the last newsletter. Most of you already have most of these changes since they were sent back with license agreements and included with shipments of materials from the distributors. Several of you will also be working with original--edition plans for the last half of the project between now and January when the next newsletter is due. So, keep your eyes open for errors/omissions in the plans and keep us informed if you find them. Those of you who are working on the second-half (chapter 15 on) between now and January should send us a self-addressed stamped envelope. If we find important changes before January we will make copies, stuff your envelopes and send them out immediately. Be sure to mark "PLANS CHANGES" on the outside of your S.A.S.E. Do not send the envelope unless you are actually working past chapter 15.

Now - grab a pencil and make the following corrections in your plans.

CP10/5

1 - 1, 1st paragraph

Some early sets of plans omitted page count. Add 153 and 9.

CP10/6

We have been advised by FAA that our registration numbers must be horizontal, not vertical as they have been. The numbers will have to get smaller to stay on the winglet but I guess that's ok. Strike the reference to vertical format on page 1 - 5 of section I.

CP10/14

AMATEUR-BUILT VARIEZE INSPECTION CRITERIA

CP10/14

1.0 Scope

This document has been prepared to assist inspection personnel by providing recommended acceptance criteria and acceptable repair practices for the VariEze amateur-built composite sandwich structure.

CP10/14

2.0 Background Information

CP10/14

2.1 Design Criteria

The materials, methods, and practices employed by the amateur builder in the construction of the VariEze type are new to light aircraft construction and may be unfamiliar to the inspection personnel involved with the licensing of amateur-built aircraft. Structural design criteria for the VariEze exceed F.A.R. part 23 requirements. In-house component testing of the primary flight structure has been conducted to 200% of design limits. Detail documentation of test data is on file at Rutan Aircraft Factory. The aircraft is considered to be a utility category aircraft. VariEze builders are being supplied with a complete Owner's Manual which specifies all placards, operating limitations, normal & emergency operations, flying qualities, maintenance specifications, inspection procedures, & initial flight test procedures.

CP10/14

2.2 Structural Approach

The basic structure throughout the design is a composite sandwich of load bearing fiberglass skins separated by a light-weight foam core. While the materials and processes are tailored to the amateur builder, the structural layout is very similar to the honeycomb composite structures utilized in military and transport type aircraft and fiberglass sailplanes. Loads are carried by Epoxy/"E"-type fiberglass lamina. Foams of various types and densities are employed as a form (upon which the load bearing material is shaped) and as local buckling support. In no instance are foams used to transmit primary loads, as is the case in some other amateur-built designs.

CP10/14

2.3 Inspection Techniques

The transparent nature of the fiberglass/epoxy material allows for visual inspection of primary structure from the outside prior to finishing. Defects in the structure, as described in paragraph 3.0, are readily visible even in the deepest laminate.

CP10/14

2.4 Inspection Sequencing

The external visual inspection capability provided by the materials allow inspection of all primary structures at any point before finishing. All primary structures are at the surface, eliminating the requirement for â€œpre-cover" or "closure" inspections. Opaque filler materials are used throughout the airplane in finishing. and inspection must take place before any areas are obscured. Some areas may have opaque materials applied to one surface where the structure is inspectable from the opposite side (wing trailing edge for example).

CP10/14

3.0 Defects

3.1 Voids

Interlaminar voids in a new layup may be due to small air bubbles trapped between plies during the layup. These void areas look white and are distinctly visible even deep in a cured layup. Interlaminary voids up to 1 inch in diameter do not require repair, as long as they do not consist of more than 5% of the surface area. Interlaminar voids (air bubbles) up to 2 inches in diameter are acceptable when repaired as follows: A small hole is drilled into the void and epoxy is injected into the void area. Small voids such as this may occupy up to 5% of the laminate surface area. Voids greater than 2 inches in diameter should be repaired as shown in paragraph 4.

CP10/14

3.2 Lean Areas

Areas where the epoxy/glass matrix is incomplete because of inadequate wetting of the cloth with epoxy (lean areas) are speckled whitish in appearance. The fully wetted laminate will have a consistent transparent greenish appearance. Epoxy lean areas are acceptable, as long as the white speckled area is less than 10% of the surface area. White-to-green ratios greater than 10% require rejection or repair as shown in paragraph 4.

CP10/14

3.3 Rich Areas

Resin richness primarily adds weight to the laminate. While some degradation of physical properties does occur, a overly wet (rich) layup is not grounds for rejection.

CP10/14

3.4 Inclusions

Bristle paint brushes are used throughout the layup process. As a brush begins to deteriorate it will shed some bristles into the laminate. The bristle inclusions, up to 20 bristles per square foot, are not cause for rejection. Occasional inclusion of small wood chips or other small foreign objects is not grounds for rejection.

CP10/14

3.5 Fiber disruption

In all instances, it is good practice to have the glass fibers lying flat and without wrinkles. Major wrinkles or bumps along more than 2 inches of chord are cause for rejection in the wings, canard, and winglets, particularly on the upper surfaces (compression side). Disruptions greater than 2 inches require repairs per paragraph 4.

\*\*SKETCHES OMITTED\*\*

CP10/14

3.6 Finishing Damage

Damage to the external structure by sanding in preparation for surface fill and paint can occur. Occasional sanding through the weave of the first skin ply is not grounds for rejection. Sanding through areas greater than 2 inches in diameter completely through the first ply or any damage to interior plies must be repaired in accordance with paragraph 4. A damp rag passed over the sanded surface will make the plies show up to determine how many plies have been sanded away.

CP10/14

3.7 Service Damage

Damage to the glass structure will be evidenced by cracked paint, or "brooming" of glass fibers. Both of these indicators are clearly visible. If either type of indication is present the paint and filler should be sanded away, bare laminate inspected, and repairs made per paragraph 4 as required. Where surface damage has occurred it is also likely that local foam crushing has been inflicted.

CP10/14

3.8 Delaminations

Delamination of glass/epoxy lap joints is evidenced by physical separation of plies. These defects are easily visible and easily repaired. The leading and trailing edges of flying surfaces (wing, canard, winglets) should be free of delaminations.

CP10/14

3.9 Multiple Defects

Where multiple types of small defects occur in a laminate (voids, fiber dislocations, and lean areas for example). They should not exceed a total of 10% of the surface area of the laminate, or 20% of the wing chord at any one spanwise position.

CP10/14

4.0 Repairs

There are seldom single defects so massive that a major component must be scrapped. The repair procedures described here may be applied throughout the VariEze and VariViggen SP composite sandwich structures.

CP10/14

4.1 Small Void Repairs

Voids up to 2 inches in diameter may be repaired by drilling a small hole into the void and injecting the void full of epoxy. A vent hole opposite the injection point is required to allow air to escape.

CP10/14

4.2 Large Defects

Excessively large voids, lean areas, finishing damage, fiber disruptions, major fiber wrinkles, or service damage may be repaired using this procedure. Remove the rejected or damaged area by sanding or grinding and taper the glass laminate on a slope of approximately 2 1/2 cm per ply in all directions. The plies are visible as the sanding is done. The tapered glass edges and surrounding two inches of glass surface must be sanded completely dull. Damaged underlying foam should be removed and the void filled with a dry microsphere/epoxy mixture or a replacement foam piece. The damaged area is then laminated over using the same type and orientation of glass plies removed, each ply lapping onto the undamaged glass at least one inch. The whole repair area is covered with an additional bidirectional glass ply. \*\*SKETCHES OMITTED\*\*

CP10/14

6.0 Applicability

These acceptance criteria are different from and, in some cases, much looser than for similar structures found in sailplanes and other contemporary composite structures. These criteria apply only to the VariEze and VariViggen structures. Design safety factors in excess of three enable somewhat relaxed acceptability criteria compared to other similar structures.

CP11/2

NEWSLETTER BACK ISSUES

For those of your who are new readers of the "Canard Pusher" and wonder what has transpired in the past, there are now a grand total of eleven issues in print. The first six are concerned with the VariViggen exclusively. Issues seven through eleven contain VariEze and VariViggen information. If you are going to build a VariViggen you will need all eleven issues to update your plans. If you are a VariEze builder you need this issue (#11) and the October 1976 issue (#10) for plans update. If you have very recently purchased plans (after February 1, 1977) a yellow sheet of changes may be bound into your manufacturing manual. If you have the yellow change sheet included, you only need newsletter #11 and on, to keep your plans current. If you sell your plans to someone else, please pass this information along with the plans.

CP11/3

The structural quality control criteria in section I, section V, and newsletter 10 are maximum allowable defects. Anything worse and the part must be repaired or rejected. Your structural parts in general should be much better than these criteria.

CP11/3

Do not assume that the plans do all your thinking for you. Check all sections, photos, drawings, etc., on each step. Be sure you have no bumps, depressions, or joggles on the surfaces in a spanwise direction on all structural parts.

CP12/1

The VariEze homebuilt program has started on a more positive note with four homebuilt airplanes now flying, and many more soon to fly. However, the VariEze record so far has not been good. One ended up being run through a snowbank removing all three gear and damaging the propeller when it veered off the runway on its first lift-off. Factors contributing to this included a gusty crosswind, one brake being stronger than the other due to a modification, and incorrect rigging of stops in the elevon control system. That airplane has been repaired and is now flying successfully. We are concerned about the safety of many of you who will be conducting your flight tests, since we have observed an almost appalling lack of good judgment of many who have and are doing test work. Some have had a complete disregard of the limitations and procedures in the Owner's Manual and have overlooked important things like weight and balance, rigging of controls, etc. It seems unbelievable that anyone can spend so much work building an airplane, then be so sloppy when it comes to flying it. We have also noted that many builders are not familiar with many of the changes and additions in previous Newsletters. Be sure you copy all info from Newsletter #10, #11, and #12 completely into your plans and Owner's Manual. A lot of this information is very important to you! A large portion of this newsletter is devoted to preaching and emphasizing the importance of quality control, careful conduct of your test program, and of following known limitations.

\*\*PHOTO OF WICK'S ORGAN COMPANY'S 101MW OMITTED\*\*

CP12/5

The inspection criteria published in Newsletter #10 were not frivolous standards established to make life hard for the builder. These standards were set up to keep the structure safe and strong. An example of this can be shown in the wrinkle or bump criteria. A bump in the skin tends to trigger a premature buckling failure, and a natural tendency to peel away from the foam core. \*\*SKETCH OMITTED\*\*

The same type of premature skin buckling failure is the result of a dip or impression into the foam. \*\*SKETCH OMITTED\*\*

CP13/2

VARIEZE AILERONS As you know, the VariEze underwent a major control-system design change shortly before newsletter 12. At that time we had made only a few flights with ailerons but were already convinced that they were a very important addition to the airplane. Aileron plans were first available on the first of May and we hope that all serious builders have received them and updated their plans and airplanes to this configuration. If you have plans and do not have the aileron addendum send RAF a 9"x12" envelope with 57 cents postage ($1.50 overseas) and with your address written on the front. Include your aircraft serial number. RAF will stuff your 9 x 12 envelope with the 19-page aileron addendum, thus updating your plans. There is no charge for these.

RAF has gone to considerable expense in developing the aileron system, including (1) a full flight test program revalidating the airplane's performance, flying qualities at all cg's, absence of flutter above the dive speed, absence of spin susceptibility and crosswind capability, (2) preparation of drawings and assuring the availability of parts thru distributors, (3) absorbing some of the loss due to obsoleted items (spoiler parts and VECS 5/6).

Of course, the big question is why, why we waited until this late to remove the roll function from the canard and add ailerons for roll?

The reason we did not originally use conventional ailerons is that we were obsessed with the simplicity and low cost of the elevon control system. We knew that it did not provide optimum flying qualities in that the roll rate was sluggish unless rudder were used, and that large aileron deflections resulted in the elevon being deflected far enough to cause a partial stall on the down-going surface. This produced a mildly objectionable pitchdown when large aileron inputs were used at low speeds, particularly at forward cg. Installation of the small spoilers on the cowl offset this somewhat, but did not cure the cause. We had assumed that these objections were minor enough to accept and that keeping the simple control system was justified. The fact that the airplane required rudder to maneuver well at low speeds was documented in the Owner's Manual, including the requirement for good rudder proficiency for the pilot before being qualified to fly the airplane.

We did not consider the sluggish roll rate to be a flight safety consideration, merely a minor objection that the pilot easily gets used to as he builds his proficiency. Well, to be blunt, the initial homebuilder's experience showed that we were wrong. We found that far too often people just don't do what you tell them to. They don't determine roll trim in a ground-effect flight as the Owner's Manual instructs. They fly without roll trim or with a crooked airplane or without the appropriate pilot proficiency. Worse yet, we have found that even small differences in the wing airfoils, winglet angles, or wing twist caused enough out-of-trim that three out of the first six homebuilt VariEzes to fly with elevons found that they had to use rudder just to keep things upright. This being the case, we are forced to make installation of the rear wing ailerons mandatory for everyone.

Now, for the good news. The aileron-equipped VariEze adds some important capabilities to the airplane in addition to its stronger roll authority required to offset an out-of-trim airplane. Returning the strongest roll control to the stick, rather than the rudder pedals made it quite practical to add a rear stick to allow a rear seat passenger to fly home and land in the event of pilot incapacitation. The rear seat stick is included in the aileron plans. The canard control surfaces are now used only for pitch control and thus their effectiveness is not compromised to allow large deflections for roll. As a result, they are much more effective in their role of giving the canard its high lift required at forward cg. Whereas the VariEze used to be limited to pilot weights below 210 lb., the forward limit cg is now extended and pilots weighing up to 255 lb. can be accommodated. The forward cg limit is now based on structural considerations on the nose gear strut; even at forward limit cg of sta 95 the VariEze has more than enough elevator power to rotate the nose before lift-off speed and to flare in-ground-effect.

The aileron-equipped VariEze can now do good conventional sideslips, a maneuver that was very limited with elevons. Sideslips aid forward visibility during steep climbs and greatly increases the airplane's capability to make a good landing in a gusty crosswind.

Most important, the airplane now flies more "conventional", in that roll authority is stronger on the stick rather than the rudder pedals. This should greatly shorten the time required for a pilot to transition to the point where he feels comfortable. We were also concerned that the sluggish roll rate would reflect on the canard configuration in general. A reputation it does not deserve.

Another thing we found through the homebuilders experience was that the spoiler system was unacceptably susceptible to errors in workmanship in installation and rigging. Within the first ten airplanes we inspected we found three who had the spoilers rigged improperly or were rubbing on the cowl! Thus, we were quite pleased to put the entire spoiler system in the trash can where it will never get out of rig or jam on the cowl.

One of the early reasons we were reluctant to incorporate ailerons was our fear of a rear wing flutter mode that may be divergent. This is why we designed the ailerons in the configuration of a full-span mass balance. Flight tests have shown the airplane to be free from flutter. The highest flutter test point was at 240 mph indicated at 10,000 feet, which is a true speed of 280 mph. All controls had deadbeat damping at this speed, thus demonstrating adequate margin over red line speed.

We had previously preached that the "clean wing" of the VariEze (no control surfaces) provided a performance advantage. We were wrong. We have been unable to detect any speed loss due to the installation of the ailerons. In fact, we see a slight increase in corrected performance data, a drag reduction we cannot explain.

In summary, the current configuration (canard elevators for pitch, conventional rear wing ailerons and no spoilers) gives the airplane overall flying qualities we can all be proud of. Roll rate is more rapid than the average light plane, adverse yaw is much less, and flight safety for first-flights/pilot transitions is improved. Those of you who had already fabricated the spoilers and the old configuration stick assembly will have a mild setback in $ and work, but the result is well worth the additional effort. We feel concerned enough about the problems some homebuilders encountered with elevons that we are recommending that inspectors do not approve a VariEze for an airworthiness certificate unless ailerons are installed. The out-of-trim condition on first flight has not yet caused an accident and we want to insure that it never does.

CP13/3

Stan Sigle sent in an improved wiring diagram for the warning system in section III. This system uses the same switches, just rewired. This prevents the gear horn from honking during nose down parking with the master on. It also warns you to not prop the engine if the throttle is open. Normal function of canopy-open warning and gear-up warning is not changed. Thanks, Stan. \*\*SKETCH OMITTED\*\*

CP13/4

A recent article stating that one drop of fiberglass resin catalyst in the eye will destroy the eye tissue and result in permanent blindness. The material they were discussing is MEKP, which is a catalyst used in polyester resins, none of which are used on the VariEze. The hardener used in our epoxy resins should be used with appropriate precautions, but does not have the tissue destroying characteristics of the highly toxic MEKP.

CP14/11

VARIEZE AND VARIVIGGEN RETENTION OF CANOPY

As we have mentioned several times before canopy retention is very important. An inflight canopy opening has resulted in the destruction of Tony Ebel's VariEze and a horrifying pattern flight by Peter Krauss. Peter took off without the canopy locked. It opened wide open at 100 mph during the initial climb. He grabbed it, pulled it closed on his fingers and held it while he returned for a good landing. Tony had a canopy latch that was adjusted so loose that it allowed the canopy to rise and fall noticeably during flight. Tony was flying at 6000-ft altitude and 185 mph true (165 indicated) when the canopy opened. He doesn't remember if he had bumped the latch. When it opened the airplane immediately departed from controlled flight, yawed, pitched down past vertical, did a 1/4 turn spin, then pitched up. Tony grabbed the canopy, it was pulled from his hand and the airplane repeated the above maneuvers. This happened about six times until he finally got the canopy closed with fingers outside (Tony did not have the knob installed on the inside). Once recovered to level flight (only 800-ft altitude) he noticed that his prop was stopped and thus he had to make a forced landing.\* Due to a combination of almost passing out and fear of the canopy opening, he did not flare. He shoved the stick forward near impact. His own words follow: "When the canopy opened, it was as if someone threw a hand grenade.\*\* It really startled me. I knew I was in trouble. The plane shuddered and shook. Then started a left turn. It slowed down very fast.

After the first few wild gyrations, spins to the left, recovering straight down, etc., I got it to stall, nose high, and tried to close the canopy. As it fell, the canopy pulled open. This went on for the 5000 ft I fell. I wish I had tried a steep right side slip, or a full power stall, while trying to close the canopy. I was in (a) tense situation, real busy, jump or close it. I did not register any other event. As soon as the canopy came shut, and I noticed that the engine was dead, I had a thought that the sky was getting overcast. I had trouble thinking, finding a field and getting in position. I put the gear down. Then just as I landed, I thought..why did the sun go down? So I shoved forward on the stick, but the bean field was real dark, I heard the nose wheel breaking. Nothing more till after the wreck. So I was out, before I hit anything. Probably lack of oxygen, as maybe I was not breathing much on the way down.... I knew the fence was just ahead. I had tried a 90 degrees turn at about 70 ft., had to level it just before I landed, got 45 degrees of the turn.

Next day I walked the field. It was smooth and solid. So the gear probably would have stayed on, but I would have hit the fence.

I know now..don't try to knock the gear off by pushing on the stick. If I would have been really alert and not passing out, I could have landed in a circle and gotten away from the fence.

Spread the news that I have a good canard, good canopy frame and a repairable left wing for sale, damaged fin and tip, good fitting.â€ Tony's airplane dug a large hole, cartwheeled once, tore off the right wing and ended up inverted. Tony dug himself out and found that his injuries were minor - cuts and bruises. The airplane was extensively damaged. Since this was the first major overload failure condition on an Eze structure, I was quite interested in inspecting the modes of failure. I flew over the next day and observed the following: wing failure occurred in the spar caps, 3 to 6 inches from the wing fitting - there was no damage in the fittings, winglets failed either in the wing or at the winglet 1/2 span. The joint did not fail. The canard, itself, was not damaged. All seat belt fittings were intact. The canopy plexiglass was broken in front but the canopy frame was not damaged. The forward fuselage back to instrument panel was totally destroyed. The rear seat area, fuel tanks, c/s spar, fuselage tank, etc., were undamaged. The engine, mount, firewall and everything in engine area were intact and not damaged. Nosegear strut and all its fittings were undamaged. The maingear tabs failed. The gear strut failed at 1/2 span.

\* While the prop will windmill down to 60 kt, once stopped you must go above 120 kt to restart. Tony's engine failed due to negative "g" at a speed below 60 kt during gyrations.

\*\* At that high speed it is surprising that the canopy was not torn off. The gyrations at that speed (above maneuvering speed) also should have resulted in airframe failure, but none occurred.

I am confident that inadvertent canopy opening cannot occur if the canopy is built and adjusted properly and locked before takeoff. The handle should be rigged so it must be forced hard forward to engage the latch. The latch and handle should be rigged for preload toward each other. Thus it is impossible to open it by bumping the handle. It should take two hands to open. Be sure the latches engage fully in the positions shown on the plans. Do install the warning horn that sounds if takeoff is attempted without canopy fully locked. Do use your checklist. Do not omit the canopy inside knob.

CP15/5

COMPOSITE STRUCTURE - It is evident from looking at some of the parts we've seen, that a few of you, including some inspectors, do not adequately understand the inspection criteria. We have even seen some parts that need repair to meet the criteria, yet they were passed by FAA. DO NOT assume that just because FAA signs it off, it is okay. DO assure yourself that you can judge a part to the criteria in "Section I," "Section V," and newsletter 10. Also, be familiar with the clarifications in the other newsletters. Some more follow:

Bump/Joggle/Dip Criteria - The best way to check this is to lay a 12-inch straight edge on the part spanwise. Move it all over the surface in the critical areas. If you can see 1/16" gap in any area, the part must be repaired. It is best to repair or beef up lumpy areas even if they meet this criteria. Better yet, do a good job in core preparation and use your squeegee well in the lay up to avoid the lumps in the first place.

Dryness Criteria - Pick any 6"x6" square in the lay up in the critical area. Assess carefully if any evidence of air in the lay up is present (white flecks, bubbles, air at the foam face). If the dryness evidence is more than 10% of the area, the part MUST be rejected. Reject or repair any evidence of dryness or voids in the trailing edge or leading edge overlaps. Better yet, do an adequate inspection with good light before cure when it's easy to fix. If in doubt on overlaps be sure to stipple in enough epoxy.

CP15/5

The following is a listing of the "critical areas" - the portions of the VariEze that must meet all the inspection criteria:

1. Center section spar - entire outside skin and spar caps.

2. All portions of the fuselage within 10" of the engine mounts and canard lift tab attachments.

3. All control surfaces.

4. All flying surfaces in the shaded areas shown plus all overlaps at L.E. & T.E.

CP16/9

VARIEZE EXHAUST FAILURES - Bad news - The exhaust systems on VariEzes continue to be a problem. Recently, even the short system has failed, both with stainless and mild steel material. Data available to us on the entire history of EZ exhaust systems is shown below.

Number of

System Airplanes History of Durability

1 1(N4EZ) Cracked at "A" in 20 hr, glass pack degraded at 15 hr.

2 1(N4EZ) Cracked at "A" & "B" in 50 hr

3 approx 15 Original in N4EZ failed at "A" in 80 hr. Many homebuilders had cracks in less than 50 hr. One stainless system cracked in 12 hr.

4 approx 10 No failures in N4EZ at 100 hr when removed for muffler installation. Homebuilders have had cracks and complete failures at flange in 80hr, 20 hr & 6 hr. One is operating at 130 hr without failure.

5 approx 15 No known failures, however, system may be too short for adequate heat protection of engine valves.

6 1(N4EZ) High-quality Flight Research Inc muffler-system being developed for Cessna for 150 retrofit. No signs of failure at about 90 hr. Extensive history of durability on Cessna 150.

The most important thing we can tell you about the exhaust system is in the next five sentences. Read and follow them carefully. If a piece of failed exhaust system should drop from the cowl and strike the prop it can fail the prop, cause excessive vibration, and possibly destroy the aircraft. If you are using system #4 or 5 you should immediately (before next flight) install a safety attachment to each tube to retain it in the event it fails at the flange. This can be a small welded tab with several loops of .041 stainless safety wire strung to a bolt or tube on the engine, or a small hole with a loop of 1/6" stainless cable looped over an engine component. This is a definite safety of flight item. Do no risk loss of your aircraft or life due to exhaust tube failure.

We are presently working with Brock to develop a system that we feel has a good chance of solving this problem. It is similar to systems that have good durability in other applications. We will be flying it soon and will keep you posted on the results (see system 7).

Now for the good news. The muffler system built by Flight Research Inc (reported on in "CP" 13, 14, and 15) has recently undergone some internal modifications to reduce its noise level over that listed in "CP" 15. It is now 6 db quieter than their previous muffler (a reduction of 6 db is a 50% reduction of noise level). Flight Research Inc manufactures the muffler system for the Cessna 152, which had to meet the rigorous, new noise requirement. They are now producing a quiet system for Cessna for replacement on the 0-200-powered Cessna 150s. This is the same system now on N4EZ. It is available now from Flight Research Inc, Airport Hangar 61, Mojave, Calif 93501. This system is complete with muff for carb heat and cabin heat. It is a bolt-on installation on the 0-200, but requires a modification to the cowl, adding "blisters" (see "CP" 14). We built our own blisters by glassing 4 ply BID over a foam bump. We are planning to get tooling prepared so the blisters will be available from Jiran. Thus, the homebuilder cuts holes in his cowl and installs the blisters. All indications are that the Flight Research mufflers will not be susceptible to failures and certainly cannot get to the prop should they do fail. \*\*SKETCHES OMITTED\*\*

CP16/10

Section I &

all â€œCP"

Wicks Aircraft Supply address should be 410 Pine St, Highland, Il. 62249 (618) 654-7447

CP16/10

SHOPPING - Continental A-75's OSMOH $1900. Kal Nelson Aviation Inc, 9801 Glenoaks Blvd, Sun Valley, Ca 91352 (213) 875-0388.

CP17/4

One EZ owner stuffed baggage into the compartment behind the seat in such a way to pinch off the fuel lines and restrict fuel flow - be careful about this.

CP18/5

UFO Reports - Three of the EZs had been reported as UFOs in separate incidents.

CP18/6

ACCIDENTS There have been two fatal VariEze accidents since August. We presently have very little information on these, as FAA has yet to release its findings. The following information is listed here not to infer that we know the causes, but in the hopes that knowledge of the circumstances may in some way prevent reoccurrence. The first was one of the airplanes that was at Oshkosh. It had a total of about 60 hours flying time. It was sold to two people. One of the new owners had no problem flying it and made several flights without incident. The other partner had considerable difficulty flying the aircraft but landed safely. On his second flight he was observed to be flying erratically on takeoff and during climb. He apparently approached much too slow, as the airplane was observed in wing rock at about 50 ft. height (+ 45 degrees bank angle). The aircraft fell at a high sink rate from about ten feet height, possibly damaging a wing tip or rudder at initial impact. At initial impact, power was applied, presumably for a go-around. The aircraft bounced nose high and abruptly turned left, then rolled left, striking the ground in an inverted attitude.

The second accident occurred on the third flight of a new airplane. The pilot had noted on the first flights an inability to trim the airplane, having to push on the stick to hold it level. The owner had neglected to trim the canard length, even though the airplane was tail heavy. He had not installed the wide chord elevator and did not correct the elevator shape even though it was similar to the "dangerous" one shown on "Page 11 of CP 17. On his third flight he was observed to be lowering the nose gear on final about 400 feet altitude when the airplane pitched up abruptly and rolled until striking trees in a near vertical attitude.

CP18/13

ANGLE OF ATTACK VANE AND SWITCHING GEAR. The pivot is made up of a 1 1/4" length of 5/8" - .062 aluminum tube, with an MRC R 3ZZ bearing (or equivalent) pressed into each end. The spindle is a .187 dia. stainless steel rod, 1 3/4 long. This is pressed into both bearings as per drawing. If it or the bearings are loose, use Loctite to be sure the spindle and bearings are firmly located, but free to spin. An aluminum vane is attached per drawings to the outboard end of the spindle. This vane can be carved from solid aluminum, or fabricated. An aluminum arm is cut from 3/16 stock with a balance weight as shown. Install the vane and balance arm on the spindle and balance them by grinding the balance weight down. The brass brushes are cut from .005" brass shim stock. These are split back from the contact end to the mounting area, as shown in the enlarged detail (no scale). The switching board is a piece of copper clad circuit board, obtainable from Radio Shack. Lay it out as shown. The detail is full size, and may be scaled. Remove all the copper cladding except in the areas shown. Drill three small holes where indicated, and push #22 wires through from the back side and solder to each copper area. These wires go to the light bulbs in the three light A.O.A. indicator, mounted on top of the glare shield or high in the panel. The circuit board is epoxied to a piece of 3/8" thick phenolic. A 5/8" hole is drilled through the circuit board and phenolic block. A #10-32 set screw is installed as shown to lock the circuit board and phenolic block to the 5/8" spindle housing, and to serve as a ground wire attach point. A similar phenolic block is epoxied to the inside of the nose cone. A 5/8" hole is drilled through the phenolic and the nose cone skin. A #10-32 set screw is installed in this block, is used to fine tune the A.O.A. vane.

When flying the A.O.A. indicator, only the green light should be on when the airplane is "on speed" on the approach. If you increase the airspeed by about three knots indicated, you will have the green and yellow (lower) lights on. Further increasing the airspeed by three knots will leave only the yellow light on. Slowing the airplane down three knots (increasing angle of attack) from a green light (on speed) will switch green and red (top) lights on. Reducing speed three more knots leaves only the red light on, indicating too high of an angle of attack (too slow). This is a simple yet very effective way to achieve consistently good landings. The A.O.A. indicator is wired through the gear down and locked, and therefore is an excellent gear up warning.

CP19/2

DID YOU KNOW that a 100 hp. VariEze can climb over 25000 ft. without turbocharging? Dick Rutan flew N4EZ to 25,300 ft on November 30, 1978. At 25,000 ft it trued out at 125 mph at 2100 rpm and 11-in manifold pressure. At 20,000 ft, maximum speed was 148 mph. Temperature of the cockpit remained 40 degrees above outside, despite the absence of a cockpit heat system. Takeoff gross weight was 890 lb. including 12 gallons fuel and 15 cu.ft. of oxygen. The structure remained below minus 30 degrees C temperature for half-hour. There were no indications of structural deterioration.

CP19/3

ACCIDENTS. VariEze takes on Cessna 172 at the Cable Airshow, 9 January 1979 - - both lost. Gerald Gardner's VariEze was on take off roll and at rotation speed a Cessna 172 pulled out for take off right in front of him. The VariEze rotated abruptly to try to fly over him and almost made it. The EZs left lower winglet struck the 172's right wing in the flap area, followed by the left main gear hitting the right wing tip of the 172.

The EZ struck the ground beyond the 172 in a right turn. The canard tip and nose gear hit first, folding the nose gear back.

The canard came off the airplane removing part of F22 bulkhead. The canard and elevators including lift tabs were undamaged. The left lower winglet was damaged. The wing attach fittings were not damaged. The main gear folded back, failing three glass tabs and pulling one aluminum extrusion from the fuselage. The main gear strut was not failed. The right wing trailing edge split open from the aileron to the trim tab. The right winglet failed at midspan. The Cessna's right wing was totaled. There were no injuries. Gerald had 118 hours on his EZ at the time of accident. He said he loves his galactic wonder and will rebuild it.

CP20/5

Gear and canopy warning - this system has a resetting defeat feature. The main advantage is the ability to silence the horn, while doing gear-up, slow flight or descents. The light stays on as long as the throttle is retarded. Each time you cycle the throttle the horn will sound and will have to be re-silenced. This eliminates the possibility of switching the warning system off during gear-up descents, and forgetting to rearm it for the landing approach.

CP20/7

There are three other documented cases of VariEze canopies opening in flight. All three were able to control the airplanes to a landing, even though they were holding it down with fingers outside the canopy frame (two inches open). With canopy open (2") in the safety latch, other than a moderate wind blast, VariEzes can be controlled and landed normally. The following is a first-hand account of such an incident by Les Faus.

CP20/7

â€œBurt asked me for few words about how it is to fly a VariEze with the canopy open. Mine opened at about 50 ft and 100 mph. I fortunately had a back seat passenger that I could rely on. Between the two of us we were able to close the canopy without too much trouble. With the canopy full open, the plane tends to pitch up and to the right. I put the stick into the left front corner and eased back and just held it straight until we could ascertain the damage. The back seat passenger held the canopy closed while we flew 15 miles to another larger airport for landing. The airplane flies well with the canopy being held with your hand around the frame. About 2" open. At that time there was no safety lock on mine. The only damage to the canopy was the center arrow stock broken by the back seat passenger trying to close the canopy. If this happens to any of you, don't panic. The airplane in controllable and can be saved. It sure gets the hair up the back of your neck at the time though!!"

CP20/8

We urgently request that the guide lines established in the operations of this aircraft be followed. Review them, be sure the warning systems are installed and operational. Follow the Owner's Manual to the letter.

CP20/8

To review an Air Force adage on how to handle any emergency.

1. Maintain Aircraft Control

2. Analyze the situation

3. Maintain Aircraft Control

4. Take proper action.

5. Maintain Aircraft Control

Many have crashed light aircraft due to doors coming open, even though the airplanes fly acceptably well with the open door.

CP20/8

We have seen several cases of EZs getting too slow on final, rounding out too high and landing hard. In one case this was attributed to an error of 30 mph in the airspeed indicator. This will not happen if you fly by attitude. If you cannot see the horizon over the canard you are getting far too slow - go around and try again. One good technique is to fly final at a speed that puts the canard three to five degrees below the horizon. You should always be able to see the runway over the nose, then start the flare and fly it down to the runway in a controlled rate of sink to touch down, without ever flaring the canard above the horizon. This will give the shortest distance, since an extended over-flare will use up a lot of runway.

CP21/4

MAN-GRD CP17-6 Canopy safety catch

CP21/5

The following is from Jim Davis' about his first flight experience: "On first flight, I experienced unusual roll on climb out and level flight. This occurred unexpectedly, both right and left at a random rate. First landing was exceedingly hard and resulted in damage to the main gear, wings, etc. I believe this was due entirely to pressing on the rudder bars inadvertently. I had flown back seat of another VariEze and experienced the unusual sensitivity of the controls. However, this didn't carry over well to the rudders which I had been tromping on for brakes during two hours of high speed taxiing. Rudder cable length was short, cut to insure solid brakes with toes down. Seat cushions, adjusted to other Rutan criteria definitely accentuated the problem. I didnâ€™t realize the unusual roll induced in swept wings by rudder action.

CP21/6

Another question is "why wear a parachute during flight test"? Will I hit the prop or the canopy or should I slow up and roll inverted - - - ? Remember your aircraft may not fly like N4EZ or a builder error could cause destructive flutter or a loose fuel line could cause a fire, or many other things. In any of these cases the parachute is the only means of survival. As for how to bail out - - - you open the canopy unfasten the belt and jump over the side. Don't worry about the prop, you will fall away from the aircraft long before you get blown back into the prop. You need 250+kt before prop contact should be a factor. Remember if you find yourself in a situation where staying with a stricken aircraft means death and the parachute is a chance to live, I think I would take that chance no matter what the odds were. It sure is comforting to have a chute on your back to get home with in the remote chance the aircraft came apart. As a two time member of the Caterpillar Club, I recommend parachutes enthusiastically. (Above comments by Dick Rutan)

CP21/6

ACCIDENT Fuel contamination: Steve Stuff had an engine failure just after take off and damaged his VariEze running off the end of the runway. The failure was due to debris in the carb float bowl blocking the main fuel jet. Therefore, we are changing Section IV to clean the screens and the float bowl after the engine/taxi runs but just prior to first flight. Note that Section IV already requires a 25 hour inspection and cleaning of the gascolator.

CP21/7

Caution Do not ever hand prop a VariEze (or any airplane) that does not have at least one functioning impulse mag. An impulse mag allows the plugs to fire at or slightly after top dead center, without an impulse mag it will fire up to 25 degrees before top dead center, which can lead to broken thumbs at the very least. If you only have one impulse mag, be sure you select only that one until the engine is running.

CP21/7

Safety Hint. This suggestion comes from Lee Herron. "It has been pointed out by the F.A.A. Eastern Region E.M.D.O. that the canopies of the bubble-type found on VariEze, Quickie, KR-2 etc., are impossible to break or open with the bear hands in an emergency and not all emergency personnel know to freeze the Lucite canopy with Carbon Dioxide before it will break. Therefore, an emergency canopy opening system is desirable.

An acceptable answer was found when using MS20001 type hinge, the hinge pin is replaced with 1/8" stainless music wire that has a one inch finger loop at the front end. A 1/8" hole is then drilled into the base side of the hinge and the wire loop end snaps into this hold and locks the pin in place until pulled to release the canopy in an emergency. To finish the job, use 3/8" red "stick-on" letters along the hinge "PULL EMERGENCY". Simple and safe. \*\*SKETCH OMITTED\*\*

CP21/9

WING AND CANARD AIRLOADS Canard Pusher No. 10 presented spanwise airloads data for the VariEze. These data are obsolete due to two changes: 1) shortened canard (142 inch) and 2) farther aft cg limit increases wing load. The data listed below is for the wing and canard at limit load factor of 5-g. Also the simultaneous 4000 in-lb winglet bending moment is applied at the wing tip. All data are for 1050 lb gross weight and worst-case cg positions. When doing any static load testing be sure to position the weights centered about the 1/4 chord position (chordwise distribution).

WING

Y IN LOAD/IN SHEAR LB MOMENT INLB BUTT LINE

95.95 8.489 37 4191 127.95

90.9 8.865 82 4608 122.9

85.85 9.304 129 5263 117.85

80.8 9.775 178 6167 112.8

75.75 10.261 230 7332 107.75

70.7 10.755 285 8772 102.7

65.65 11.253 341 10499 97.65

60.6 11.753 401 12525 92.6

55.55 12.254 463 14864 87.55

50.5 12.756 527 17529 82.5

45.45 13.258 594 20531 77.45

40.4 13.76 664 23885 72.4

35.35 14.261 736 27602 67.35

30.3 14.763 810 31696 62.3

25.25 15.265 887 36179 57.25

20.2 15.767 967 41064 52.2

15.15 16.269 1049 46364 47.15

10.1 16.771 1134 52091 42.1

5.05 17.273 1221 58259 37.05

0 17.775 1311 64881 32 Wingfitting

CANARD

BUTT-LINE

Y IN LOAD/IN SHEAR LB MOMENT INLB

63.65 11.978 40 134

60.3 11.978 80 403

56.95 11.978 120 806

53.6 11.978 160 1344

50.25 11.978 200 2016

46.9 11.978 240 2822

43.55 11.978 280 3763

40.2 11.978 321 4839

36.85 11.978 361 6048

33.5 11.978 401 7393

30.15 11.978 441 8871

26.8 11.978 481 10484

23.45 11.978 521 12232

20.1 11.978 561 14113

16.75 11.978 601 16130

13.4 11.978 642 18280

10.05 11.978 682 20566

6.7 11.978 722 22985 Lift Tabs

CP22/4

FLIGHT SAFETY BULLETIN

A VariEze experienced a forced landing due to engine failure caused by collapse of the induction hose. The owner had not safetied the wire and cord as per the instructions and drawing (Sect II A page 14 - 1st Edition, Section IIA page 17 2nd Edition, Section IIC page 13). If these are not safetied the cord can unwind, allowing the wire to twist and lie flat. Inspect your induction hoses. If they are not safetied, ground your aircraft until corrected. This bulletin was included in our fuel compatibility questionnaire.

CP22/6

Survival Kit

Ray and Nova Cullen (see CP 21 Page 2) 1116 6th Street, Tillamook, Or 97141, have developed an excellent accessory for the VariEze. It is a custom light weight survival kit designed to double as an additional thigh support for the rear seat. These are well done and we plan to install one in our airplanes. Contact them for price and availability.

CP22/7

VARIEZE LOSS-OF-CONTROL We have just completed another series of flight tests on N4EZ to test its departure (loss-of-control) resistance. What prompted this is reports from two VariEze pilots in Texas that they experienced a partial or full snap roll at about 80 knots. These occurred below pattern altitude and fortunately the pilots managed to recover in time to avoid an accident. The maneuver was described as follows: Full aileron and partial rudder steady sideslip, then full rudder was applied which caused the airplane to yaw excessively and abruptly roll, experiencing negative g. Recovery with neutral control was prompt, but several hundred feet of altitude was lost.

The most surprising thing about these incidents to us was that control was lost at such a high speed - 30 knots above stall. Reinspection of our stall/spin test data and the NASA tests indicated no susceptibility to departure. We then initiated a new test program to investigate this. Dick performed full rudder sideslip with N4EZ at all speeds and experienced no departures. Concentrating on the 80-knot speed range he then aggravated the yaw with abrupt rudder inputs while in a rolled attitude. On one of these he experienced a departure - a roll off in the direction of the slip. He then tried to repeat the maneuver and could not get a departure in over 20 attempts. We then adjusted the aileron and rudder rigging, moved the cg aft, and repeated the tests. Dick found that by learning a specific technique he could cause a departure nearly every time, if speed were above 75 knots and an excessive sideslip angle were generated. The departure generally consisted of an uncontrolled roll away from the rudder input direction. Recovery with neutral controls was prompt. However, on several of the maneuvers the yaw angle was extreme at departure causing a massive stall of the winglets and blanking of the upstream wing. The airplane then yawed past 45 degrees, abruptly rolled, and entered a 1 to 2 turn inverted incipient spin. The airplane always promptly recovered with neutral controls. If aileron or rudder were applied for recovery it could cause a further "snap" departure and delay recovery. Altitude loss on the worst of these maneuvers was as much as 1500 ft.

Why did we not find this departure when we did the original tests and the tests with cuffs in 1978 (CP #19)? The most probable reason is that most of those test were done at high angle of attack (full aft stick) which was thought to be the worst case. However, we have found that at lower angle-of-attack ie, 80 knots, the rudders can generate more sideslip than at high angle-of-attack, and thus can be powerful enough to stall the winglets in an accelerated yaw maneuver. We were then faced with a decision on what to do: (1) caution pilots that the airplane can be departed when using excessive yaw inputs or (2) fix the airplane to improve its departure resistance. Since we feel strongly that good departure resistance is an important asset and design goal for the VariEze, we set out to attack # (2).

We have always known that the EZ has more rudder power than needed for normal maneuvers - a full aileron steady sideslip at low speeds requires only 60% of the available rudder to hold heading. The available travel is 3 1/2 inches, measured at the top of the rudderâ€™s trailing edge. We then limited the rudders travel on N4EZ in various increments, 3", 2.6", 2.3" and 1.8". At each increment we flew tests to determine departure susceptibility and the necessary rudder authority for crosswind landings.

As expected, the departure susceptibility reduced as rudder travel was limited. After extensive testing and evaluation by three pilots we have N4EZs rudder now rigged for a two-inch full travel. With this rigging, the following characteristics exist: crosswind landings up to a component of 24 knots are possible without tire scrub. The aircraft is not susceptible to departure during any normal maneuver. Thus, we are now recommending a mandatory rigging change to limit the rudders to two-inches of travel.

It must be noted that this may not guarantee total departure resistance. This may vary from one airplane to another, due to expected tolerances in things like winglet leading edge finish and shape, fuselage shape etc. Also, even at 1.8 inch rudder travel, Dick was able to induce a departure by learning an unusual and aggressive combination of control inputs: full left aileron, full left rudder at 30 degrees bank, then at 100 degrees bank abrupt full right rudder. When this was done a departure was possible (not probable) even though the rudder was limited to 1.8 inches.

The important thing to note is that, even though this design is not as susceptible to loss-of-control as a conventional aircraft it should not result in over-confidence on the part of the operator. Assume your aircraft is susceptible to departure until proven resistant during your stall tests with lots of altitude and a parachute. Refer to the plans-changes section of this newsletter for a caution note to be added to your owners manual and for instructions on rigging rudders to two inches.

CP22/7

FUEL/FIBERGLASS COMPATIBILITY - This year at Oshkosh, Nat Puffer had a partial power loss on take off and safely aborted. The cause was found to be a large amount of orange gummy residue in the carburetor. Our concern was that there might be fuel/epoxy incompatibility, possibly due to the high-aeromatic automotive fuel he was using. In August we prepared and sent to all known VariEze flyers a detailed inspection procedure and survey questionnaire, to determine any trends. Applied Plastics (APCO) also conducted an aggressive accelerated aging evaluation to determine if the aromatics used in high octane low lead fuel will deteriorate the epoxy. Results: APCO, RAES & RAEF showed a very slight amount of material extracted from the epoxy but well within acceptable limits. Under normal conditions such as the way VariEzes are used it would take years of exposure to extract even a trace. The new Safe-T-Poxy even under rigorous test conditions was essentially unaffected. Jim Tome ran some tests at a major midwest lab found that the aeromatics in automotive and some aviation fuel 100LL will craze and leach out the hardener in a hardener-rich Lambert lay up and this is probably what happened to Nat. Jim also found that the fuel additive "canned heat" and MEK can dissolve the new Safe-T-Poxy. The problems are with the aeromatics the oil companies are using more and more of. This is explained more in our fuel compatibility AD letter.

Out of the 64 returned survey questionnaires, 52 had no problem at all, 10 reported a trace of gummy substance on the float/mixture needle valve. Several mentioned this could cause the valve to stick, this is becoming a common problem with many other aluminum-tank airplanes using 100LL. One reported a gummy substance in the bowl like Natâ€™s. We will be analyzing this sample. Our conclusion is that the RAEFs and the Safe-T-Poxy when properly mixed should not deteriorate when exposed to aviation fuel. However, as a precaution we are recommending routine carb bowl inspection. If you are a VariEze flyer and did not receive our survey on the fuel contamination inspection/questionnaire, then we don't know you are flying. Write to us giving your N number, name, address, and date of first flight. We will send you the survey and add you to a confidential list. This list will be used only to mail you any urgent flight safety information.

CP22/11

VARIEZE SEAT BELTS RECALLED When Johnny Murphy called with information about the accident in Florida, he reported that the pilot's seat belt had come open on impact. The FAA investigator also checked some other VariEzes in the area and found that with a little amount of manipulation the buckles would pop open. We went out to check our airplane's and "GASP" much to our shock ours also "popped" open, so easily in fact that we grounded our aircraft and will not fly one more flight with that style buckle. The buckle is the series E 8000 made by EON Corp (see tag on nylon strap). This buckle is identified by its "cap-over" design in which the release is activated from either end by the cap. The cap extends over the sides and in the closed position its edges are flush with the bottom of the buckle. (see photo and sketch). The problem is that when the occupant is thrown forward, parts of his body, belt, clothing, objects in pockets etc, can be pressed against these edges of the cap and force them forward. This releases the belt. To demonstrate this to yourself grab the straps of the belt and pull the assembly firmly into your lap when your body is bent over the buckle. Our original thought was to install a "C"-channel under the buckle base that would provide a shield on the sides so the cap is not forced open in a crash. However, we are not seat belt designers and feel that a solution and replacement is the responsibility of the seat belt manufacturer. (EON). We set up a test demonstration of the problem and presented it to the president of EON Dr. Cross. Dr. Cross agrees that the buckles are defective and in fact, was already working with FAA on a recall due to inadequate tongue engagement. EON has agreed to replace all belts at no charge to the customer. We regret that this problem will result in your aircraft being grounded until replacement, but we must recommend that you immediately remove your seat belt assemblies both sides, (not the shoulder harness straps) and send them to EON for replacement. Do not send them to the VariEze distributor, send direct to

EON Corporation

2425 San Fernando Road,

Los Angeles, Ca 90065

Your replacement will be either a previous-design buckle without cap

edges or an improved cap-over buckle with side shields. \*\*PHOTO AND SKETCH OMITTED\*\*

CP23/6

VARIEZE SEAT BELT RECALL UPDATE Reference CP 22 page 11 EON 8000 seat belt buckle recall. We have learned that some of the recalled buckles are being replaced with an improved version of the same 'cap over' design. We found EON is doing this because they had nothing else to replace them with at this time. The improved design has the side edges of the cap trimmed up higher, rather than extending down to flush with the bottom and has the words "lift to open" on the cap. Our tests of the improved E-8000 show that it does not pop open as easily as the previous one. However, if it is placed on the side of the lap over the leg and the body is thrown forward, it can still release - particularly if it snags on your belt or is pressed against an object in a front pants pocket. It is more susceptible to release if it is loosely, rather than tightly, adjusted in your lap. Thus, in our opinion this buckle is not satisfactory.

We just had a meeting with EON and have concluded that the E8000 still requires further modification before it's airworthy. We are very encouraged that EON is willing to redesign and replace the buckle with one that acceptable. However, redesign, tooling, manufacture and delivery will take time. So an immediate solution to those of you that are grounded is not available right now from EON. Those who are waiting for a buckle replacement should consider an alternate until EON can supply you with an acceptable belt.

Our recommendation to those who have received the "improved" buckle is to conduct your own test - hook the belt to the back of a chair and throw the body forward.

Evaluate for yourself the effects if any protrusion in your lap area coming in contact with the belt side edges - including a pants belt buckle or keys in your pocket. If you agree that there is a problem, write a letter to EON and to FAA describing your concern.

EON Corp., FAA AWE-130

2425 San Fernando Rd. Attn: Fred Jenkins

Los Angeles, Ca 90065 15000 Aviation Blvd

Lawndale, Ca 90260

CP23/7

AEROBATICS We often get asked "is the VariEze aerobatic?" Answer "No". The VariEze was not designed for aerobatics and the flight manual states they are not permitted. Long range cruise efficiency was the design goal rather than any aerobatic capability. Those who want to do aerobatics should consider an airplane specifically designed for aerobatics. Recently Dick and Burt had an opportunity to fly Richard Grunsven's new RV-4 and thoroughly enjoyed it. The RV-4 is an excellent acro aircraft and would recommend it to those who want an aerobatic aircraft.

CP24/4

SAFETY MODIFICATIONS by Dick.

During my travels I am dismayed at the number of VariEzes flying that have not accomplished the safety modifications. Check CP #21, pg 4-5, CP #22 pg 8, CP #23 pg 7. Things like rudder travel, Continental O-200 starter bearing plug, 1/4" rod ends, canopy safety latch, EON-8000 seat belt buckle, etc, etc, are extremely important and should be accomplished immediately. Do not procrastinate with safety.

CP25/2

VARIEZE BOAT-TAILED EVALUATION

There has been a lot of interest in the "boat tail" since Steve Woods ran his in the VariEze race at the Sun-n-Fun. We obtained a boat tail shell from Ken Forrest and ran a very close evaluation to determine if there was any performance advantage to this modification. Our evaluation with and without the boat tail shows no perceptible difference in performance.

CP25/3

A FUNNY THING HAPPENED ON THE WAY TO EZ COMPLETION

By Jud Bock Serial #738.

While doing some finishing work in the back seat, I decided to close the canopy to check the rear head rest. It felt great, so I went to open the canopy and lo and behold the safety catch in the front cockpit was working perfectly! There I was, all 210 lb of me, locked in the back seat with no tools or anything to reach the 4" more, required to release the catch. My wife had just gone shopping and was not expected back for three quarters of an hour. Did I panic? Hell yes, because I was getting warm (hot actually!), and I decided to use my head and tried to use mind power to move the catch. After that failure, I started thinking some more and it finally dawned on my dulled brain that I had shoes on, which I promptly removed one of and was out in less than 5 minutes.

In another instance the builder has no shoes on. He removed his pants, rolled them into a stick and used it to reach the catch!

With consideration of this problem we designed the safety catch to be mounted at F.S.57 on the Long-EZ. VariEze new construction should follow suit.

CP26/4

FROM RAY RICHARDS, TOLEDO, OHIO - "After 150 flight hours (VariEze) I disassembled the carb heat muff and found the carbon steel door spring broken into a dozen pieces. To replace, I wound 0.40 stainless wire into a spring on a lathe mandrel. Works great... other than that all is fine and N48EZ behaved faithfully.â€

Has anyone else had carb heat spring deterioration? Do check for this, it may be possible to ingest a piece into the engine.

CP26/10

3) A Washington state VariEze crashed on approach while making a series of touch and go circuits. It was observed on a high final when the pilot initiated a sideslip. The airplane then rolled inverted and the pilot attempted to pull out in a reversing direction. Insufficient altitude was available for the pullout. The aircraft struck the ground in a near level attitude removing the landing gear and the bottom of the fuselage. The pilot's injuries were fatal. The departure that rolled this aircraft over appears to be the winglet stall discussed in CP #22 page 7 and 8. While the pilot appears to have disregarded the operational limitations recommended, this still should not have resulted in a departure. We intend to inspect the winglet contours of this aircraft to determine if any variances may have changed its susceptibility to winglet stall.

To prevent possible recurrence of this type of accident we urge all VariEze operators (does not apply to Long-EZ or VariViggen) to again review the information on page 7 and 8 of CP 22. Check your rudder rigging, wing cuffs, and winglet contours. In addition, to determine the actual departure susceptibility of your particular aircraft, conduct the following test at an altitude of 10,000 feet: full rudder sideslip, abruptly applied left and right at speeds of 100 kts, 90 kts, 80 kts, 70 kts, and full-aft stick. Your airplane should yaw, under control, with no tendency to stall or roll off. If your airplane has any undesirable characteristics, report these to RAF so we can analyze the causes and the extent of any variations.

CP26/10

5) A Nebraska VariEze equipped with the original 2-ply tires, was making a gross weight takeoff. The pilot began rotation at 85 or 90 mph, (above the normal lift off speed of 75 mph), when the right tire blew. He aborted the takeoff, using left brake all the way to stop to maintain directional control. He reported it was not hard to control even though the right brake bleed failed and the right wheel pant and brake rotor was destroyed. His gear strut was the original configuration, not reinforced. He placed the right wheel up on a dolly tilting the aircraft with most of the weight on the left wheel, then pushed it half mile to a hangar. On arriving, the left gear strut buckled a few inches above the axle, inside the tightly-sealed, non-vented wheel pant. The cause of the strut failure was heat. The long, continuous high speed braking resulted in a very hot brake. This heat, sealed in by the wheel pant, slowly permeated the fiberglass strut allowing it to soften and buckle under load. Lessons learned: Do not use the two-ply tires. Ventilate the top of your wheel pants. If unusually heavy braking is done, 'set' the gear to relieve load or jack the airplane to relieve stress while the strut cools. Glue a piece of your fiberfrax fire wall insulation material to the strut (use silicone rubber adhesive) adjacent to the brake disc. Your VariEze and Long-EZ should lift off and land at under 65 kts and 60 kts respectively, unless you have an airspeed instrument error or airspeed position error. Leaving the airplane on the ground above this speed increases tire stresses and reduces tire life.

CP27/6

Under the thigh support, in the front seat on the right side, there will be a gap under the right console, which could possibly allow a small object stored under the thigh support to slip under the console into the area near the pitch control belcrank. This "gap" should be closed off. 1 ply of BID will do it.

CP27/6

We have talked to several builders lately building from 2nd Edition of the plans who have not been reading Chapter 26 (plans updates). Do update your plans with Chapter 26 and all applicable newsletters before continuing construction.

CP28/7

Accident

Letter from Alden Andrew, 24531 Vanessa Dr., Mission Viejo, CA

Dear Burt,

This note is to alert VariEze owners of problems that made me an ex-owner! I had the Brock fuel caps as specified in the plans. As per original instructions, a vent hole was drilled in the cap for the auxiliary fuselage tank. I did not modify the auxiliary cap with the aluminum tube as per CP 25 page 4.

Recently I removed the left main fuel cap and went to the restroom while the attendant put in the fuel. Upon my return, the left cap was on and the attendant was fueling the right main. I replaced the right cap and went flying. Shortly after take-off I was notified over the Unicom that fuel was being dumped overboard. Sure enough, the attendant had set the left cap on but had not engaged the Dzus fastener and I had neglected to check or notice that it was not secure. I landed immediately and discovered that the cap had hit the prop and left a gash 1/2" wide and 5/8" deep about 4" from the tip. After this experience I considered putting a tether chain on the fuel caps but business matters soon consumed my full attention and the idea went by the wayside.

With a different prop, the plane was again serviceable. On February 6, over the telephone, I gave permission for a 3,000 hour pilot (with 10 hours in my VariEze) to use the plane the next day. Before his flight he attempted to obtain fuel but the fuel pit was temporarily out. Even so, they removed the left main cap as well as the auxiliary cap and attempted to obtain some fuel that might possibly be in the long hose of the fuel pit. After this unsuccessful attempt the caps were replaced (with the un-vented cap being put on the auxiliary tank) and it was decided that with about 1 3/4 gallons in the auxiliary tank that the pilot and his passenger could make Corona Airport from the present Chino location (about 5 minutes). They took off on the auxiliary tank and at about 100' at 105 knots they lost power. In the knowledge that there was fuel in the auxiliary tank the pilot did not try to select the mains which still had adequate fuel. An off airport landing (?) was made in a rough grassy field. The nose wheel was left retracted. (The aircraft was forced to the ground at high speed and high rate of sink because of a fence ahead.) The plane came to rest about 300 ft from the original touchdown point. The pilot escaped with scratches and bruised legs and toes but no broken bones. The passenger was not scratched or bruised at all. The plane did not fare so well; collapsed main gear, main center-section spar broken and ripped off with the left wing, canard ripped off, the total front end from the trailing edge of the canard was completely severed from the rest of the fuselage, as well as the top and bottom kevlar cowling was ruined. The prop was horizontal at the time of impact so the prop, spinner, hub extension and engine were undamaged as was most of the instruments. The canopy was unscratched.

To sum it up, I would recommend either a mandatory change to include a ram air vent leading to the auxiliary tank or the tethering of the fuel caps.

As my 86 delightful hours in the VariEze has spoiled me, I desire another canard pusher. I guess a Long-EZ is the next project. Does anyone want to but a good VariEze canopy and a 96 hour SMOH Continental O-200 complete with hub extension, prop and spinner?

Sincerely,

Alden Andrew.

RAF comment: The two VariEze plans changes in this newsletter are intended to prevent recurrence of Aldens accident. We have before considered tethering the fuel caps, but were concerned that major tank damage would be done by a cap flailing against the surface. Note that, as was explained in CP 13 page 5, loss of a wing cap on a VariEze will cause all fuel to be slowly drawn into one tank (and overboard if tanks are more than half full) and result in fuel starvation, requiring the selection of the fuselage tank to maintain engine operation. Loss of a cap on a Long-EZ does not affect engine operation due to its left/right isolation and pumped fuel system. Also, the Long-EZ's caps are outboard of the prop to eliminate prop damage should a cap not be secured.

CP29/2

Warning - Loss of Prop!

Dick recently had an experience with his Long-EZ that would raise the hair of the most experienced pilot. He lost the entire prop and spinner while cruising at 10,000 ft. over a solid cloud deck. After watching the prop cascade away he received radar vectors from center to allow a successful approach to an airport, under weather conditions of 1/4 mile visibility in fog. Investigation revealed that the all-important bolt tension (required to transmit torque through faceplate friction) had been lost when the prop dried out in desert conditions after exposure to the humid-wet Caribbean climate at his world-record arrival location. Note the added caution in the plans-change section of the newsletter. Also, do not, do not exceed the recommended interval on prop bolt torque check. (Owners Manual, Appendix III).

Homebuilt accident record statistics were reported for a three year period by The Aviation Consumer last year. They show an overall accident rate for VariEze of 2.59 (1.55 fatal) per 100 aircraft during the 3 years. Average for all homebuilt aircraft was 3.93 (1.07 fatal). We are not happy with this result, as we had expected the VariEze to be significantly better than the average homebuilt due to it's strong structure and good stall characteristics. Structurally the fiberglass VariEze has a perfect record - no inflight airframe failures in 100,000 flight hours. Also, there have been no fires either in operation or due to accident impact.

CP30/10

Forced Landings

The following information was supplied by Bruce Muirhead, from Colorado:

"Dear Burt,

I guess I should report a couple forced landings we experienced.

The first was on an early frosty morning flight from Pagosa, NE, over the Rockies to Boulder. I may tell the whole story in more detail another time but suffice to say here that it was a variation of the old "gas cap" story. The right cap didn't get secured, fell off on take off (damaging the prop some), but I didn't catch on until a temporary power loss got me to thinking over the Sangre de Christos. As Mary continued to report plenty of gas in the right tank but left running low, I was guided to make a sharp right turn and head for the plains. There we spotted the Air Force Academy chapel and turned north, still at 12,000. A minute or two later, flame-out. We did a 180 and glided 20 miles, straight into the Academy's north-south runway, unannounced, uneventful and followed by lots of red tape.

CP30/10

The second was on the way to Taos for the IVHC fly-in just 35 minutes from here. Just over the mountains and letting down 25 miles from Taos it quit. Fuel starvation on descent? Nose up - no luck. No reserve - faulty valve. A straight section of highway complete with a convenient turnoff made for another uneventful landing - at the New Mexico Port of Entry! Borrowed the officer's pickup, got five of regular, prop, run up ok, and took off on our "runway" for Taos. There most of the 19 VE pilots discussed my problem and the consensus was clogged vent line. That's what it was, though what I dug out of it was hardly enough to analyze. Even the little fuselage tank vent was plugged. Anyhow, you can bet those other 18 pilots at Taos will check their vent lines, and probably also,

Yours truly,

Bruce Muirhead.

RAF comment - we don't know why Bruce was unable to use the reserve tank to save the situation for both these cases - apparently the "faulty valve". You VariEze guys should always keep your reserve system in good operating order - its your redundancy to protect against vent clog, lost cap etc. Note: The Long-EZ while not having the reserve tank, has separate left and right pumped systems (which feed with a lost cap) and separate vents.

Investigators determined the cause of engine failure to be oil loss through a broken oil pressure sender line. The line was aluminum tubing, flared with an incorrect automotive flaring tool. It fractured at the fitting sleeve where it had been previously bent 45 degrees.

The purpose of us printing details of this kind of tragedy in this newsletter is to alert those flying other airplanes to conditions that might cause another accident so that recurrence can be prevented. If you are flying an airplane that may have an engine installation that has not been inspected by a qualified A.I., ground it until it is adequately inspected for aircraft-approved installation materials and workmanship. All plumbing of oil and fuel lines must be of components approved for a certified installation. If you have aluminum tubing installed, replace it with approved flex hose before flight.

CP31/2

SAFE-T-POXY - REACTIONS, ALLERGIES

It has come to our notice that quite a number of builders seem to be suffering from some form of reaction to the Safe-T-Poxy. We are very interested to know the present scope of this problem, since initial results in 1978 showed that reactions were very rare. If you have had any kind of reaction to the Safe-T-Poxy, please send us a report with a brief description of the reaction, and how long you had been working with the material before you noticed the reaction, whether or not you were using any form of protection, gloves, Ply 9, respirator etc. We will correlate this information and work closely with the manufacturer to see if a change has occurred or if improvement is indicated. We will report on our findings in a future C.P.

CP32/4

SAFE-T-POXY REACTIONS

In CP 31, we asked for reports from anyone who has experienced a reaction while using the SAFE-T-POXY. To date (April 4) we have received 47 letters, all of which have been sent onto Applied Plastics, the manufacturer.

It is still difficult for us to access the extent of the epoxy sensitization. Less than 3% of the builders sent reports of problems, but we must assume that many of you did not bother to write. Applied Plastics are presently reviewing your reports and investigating the problem. They recently sent in a random SAFE-T-POXY sample for testing and it again came back a zero on the SPI scale from zero through 10. For perspective, a common industrial epoxy. 815 has an SPI 6, while RAE epoxy has an SPI 3. SAFE-T-POXY is an SPI 0.

Applied Plastics is developing a very through pamphlet covering the use of SAFE-T-POXY and precautions to take to avoid the reaction in the first place. They also have suggestions to help you get around the problem. If you are having a slight reaction and are using SAFE-T-POXY, be absolutely certain that you do NOT have MEK or acetone or lacquer thinner in the shop at all. Just breathing the fumes of these solvents can render you vulnerable to the epoxy. Getting these solvents on your skin is asking for trouble. If you are using gloves (NEVER use Ply 9 and gloves together, it is either gloves or Ply 9) try using different types of gloves, even surgeons have allergic reactions to some gloves. Try using thin cotton liners under your gloves, this soaks up sweat, and will show you if you get a break or tear in the glove. While sweating you can sometimes be more vulnerable to allergies. A method that has worked well for some builders is to use only Ply 9, and to stop at least every two hours, wash your hands and arms thoroughly with a good borax soap (Lava) paying particular attention to scrubbing under finger nails and around your cuticles. Dry your hands, reapply Ply 9 and return to the layup. Do not exceed the two hour period. Wash up as often as necessary during a long layup. If your sensitivity to breathing the fumes is severe, full-face respirator can provide a solution. (W. W. Grainger #5X803 is an example).

To summarize, cleanliness is the 'biggy'. Do not allow epoxy, solvents or any industrial type materials, to come in contact with your skin, not ever. Wash thoroughly, often. Use a good respirator and/or ensure that you have adequate ventilation. If you still have problems you might consider switching to the RAE epoxy system. This may sound silly, (an SPI 0 to an SPI 3), but the fact is you may be reacting to a particular chemical in SAFE-T-POXY, that may not be in the RAE system. This has worked for several builders. The allergic reaction healed and they were not bothered again. Beware though, RAE is definitely more toxic. Take all possible precautions when using either of these systems. Finally, if you still have problems, let us know so that we can keep giving the manufacturer this data. Plastics (Practice?) good feed back.

CP32/5

CAUTION

Spinner/prop extension compatibility. This is a real gotcha! We installed a new prop extension on N79RA, which was not manufactured by Brock. We then installed a Brock spinner on this extension. The center hole in the spinner backplate was a close fit on the center locator on the prop extension. Unlike a Brock prop extension, this one had a rather large radius machined at the flange face, which did not allow the spinner backplate to slide all the way on, see sketch below. \*\*SKETCH OMITTED\*\*

This is a dangerous situation, and difficult to detect because the flow guide prevents a visual inspection. We installed the prop, torqued the bolts to the 18-20 ft/lbs. we normally use, and tracked the prop tips accurately. At this point, the prop bolts were tight, the prop ran true, but the prop was not being squeezed against the prop extension. Rather it was pressing only against the spinner back plate, in this case a very stiff 1/8" thick backplate, that was able to support the torque value of the bolts, without going back against the prop extension.

We flew the airplane for several hours, blissfully unaware of the problem. Last week Dick used N79RA to take a business associate to the Santa Monica Airport. On his was back he got to within 20 miles of Mojave when a strong vibration became apparent. It steadily worsened, to the point that he elected to turn back to the closest airport at Rosamond. The vibration became much worse and then abruptly went away. Dick thought he had thrown a rod, set himself up for an emergency, dead stick landing on the 2300 foot, Rosamond runway. Dick touched down on the numbers, made the turn off and rolled into an empty tie down. Not until he got out did he realize he had lost the prop and spinner.

Looking at the marks on the drive lugs it is plain to see what happened. The 1/8" aluminum back plate gradually gave way, allowing the bolt tension to relax. Without this friction between the crush plate and prop extension flange to drive the prop, it begins to be driven by the drive lugs and prop bolts in shear. This state of affairs can only continue for a very short space of time, before the bolts fatigue and then of course, the prop/spinner comes off.

This is a very serious situation and anyone who has a Brock Spinner mounted on a prop extension that is made by someone other the Brock (obviously the Brock extension is completely compatible with a Brock spinner) should immediately ground their airplane and check this out. The problem can be cured by decreasing the radius in the prop extension, or increasing the diameter of the hole in the center of the spinner back plate.

CP33/6

ANOTHER PROP INCIDENT

Ray Johnson from the San Francisco Bay area, flew his VariEze to Las Vegas, where it was parked in the desert sun for 5 days. He then took off and headed south at 12,500 feet. About 20 miles north of Apple Valley airport, a horrendous vibration set in. Ray throttled back, pulled the mixture to idle cut off and pulled the nose up to slow down. When the engine stopped turning, the vibration went away. Ray glided in to a landing at Apple Valley. Other than the Cessna that pulled out in from of Ray on final, causing him to have to land off to one side of the runway, it was uneventful. Ray's prop was still on the airplane, 5 bolts had sheared, one was bent but still holding and the spinner retained the prop.

This is a classic case of flying from a moist ocean climate to a dry desert climate. The wood prop shrinks just a little bit, the bolts no longer have the correct torque, so the prop starts to move and in literally seconds, the bolt holes and drive lug holes become elongated, and the bolts break off at the drive lug due to fatigue.

Check your prop torque, it should be between 18 ft/lbs. (216 inch/lbs) and 20 ft/lbs. (240 inch/lbs). With a new prop, you should check the torque after one flight. Then again after 10 hours, then at 25 hours, and thereafter every 25 hours.

CP33/6

NOSE WHEEL SHIMMY/FAILURE

We have heard of three more nose wheel fork failures. This is a part of our airplanes we seldom see; it is retracted when parked and we are usually in the seat when the gear is extended. Do not neglect to check you nose wheel during your preflight. Pay particular attention to the friction damper. You should grab the tire as far aft as possible and swing the fork left and right. It should take 2 to 4 lbs. of force to do this. If you are not certain how much 2 to 4 lbs. is, use a spring scale to calibrate yourself. If you have less than 2 lbs., it is possible for the nose wheel to shimmy. This shimmy or flutter instantly goes divergent and in only a fraction of a second the fork will fail, due to side loads. The nose wheel/fork, can bounce back and go through the prop. The nose wheel fork is designed with more than enough integrity to take the maximum expected landing loads and has been tested to over 80% above the FAR Part #23 requirement without failure (see CP #18). This type of failure caused by shimmy generally occurs with very little load on the nose wheel, usually at the very moment of a nose wheel touch down, or even at the moment of nose wheel lift off during a take off. The new shimmy damper spring called out in CP 30, page 4 MUST be installed and correctly adjusted. Also check to see you have no ovalizing or bending of the NG17 steel tube and that the thick-wall (0.125+ wall) NG17 is installed.

CP34/4

AUTO FUEL IN COMPOSITE FUEL TANKS

RAF has recently received many requests to use auto fuel in VariEzes and Long-EZs. RAF cannot approve or disapprove the use of auto fuel. We can advise though, and we do not recommend using any auto fuel in a composite fuel tank. This is because of possible toluene content and its effect on the epoxy matrix. There is no way to be positive that the auto fuel you buy does not contain toluene (or possibly other potentially damaging aromatics). This is especially true of the unleaded or low lead auto fuels, which can leach the uncured epoxy residues out of the inside laminates of your fuel tanks, including the aft wall of the tank, which is your center section spar. The damage may be very insidious and may take years to become obvious. Safe-T-Poxy is much more resistant to aromatics than the previous RAE epoxy, but may still be affected in the long term.

CP34/5

Caution

Wes Gardner had a scary experience in his VariEze when the nose up trim spring on his pitch trim system (Long-EZ style) suddenly broke. It made a loud noise with the aircraft pitching nose down. Wes thought he had had a midair. He had trouble pulling out because the nose down spring was pulling the elevator into the nose down position. He got back to his home base ok, but was quite shaken. As if this was not enough, it has since happened to him twice. Should it ever happen to you - remember, FLY the airplane. Even with a broken trim system, it will still fly normally.

CP34/6

We recently checked what would happen to a Long-EZ, with full aft stick, both rudders all the way out, nose gear extended and engine at hard idle. The airplane developed a sink rate that varied between 950 fpm and 1250 fpm. This was also tried with the prop stopped. You cannot expect to walk away from this kind of impact. 1250 fpm is 21 feet per second or 14.5 mph. You must get the nose down and build enough airspeed to have sufficient energy to arrest your descent with a flare.

CP34/6

A VariEze pilot from Northern California flying from Stockton to Florida, heard a 'different' noise but before he could do anything, one exhaust stack (original style) cracked off and went through the prop removing about 17 inches of one blade. The vibration was so severe that it broke both mag wires and failed the mixture cable/spring assembly. He pulled the mixture and switched off both mags. When this did not work, he turned off the fuel valve and finally the engine stopped. He made an uneventful landing on a highway near Zuni, New Mexico. He found that the top engine mounts had failed and the engine was lying in the cowling. This pilot stayed very cool, flew the airplane and kept thinking all the way. Don't forget to fly the airplane.

CP34/8

CAUTION - Ray Cullen painted his exhaust system white using Krylon high temp paint, per the instructions. After about 3 hours of flight, the engine abruptly stopped on the take off roll and could not be restarted. Complete disassembly of the carburetor disclosed the problem. The carb induction tube and venturi area were full of white paint chips, which had flaked off the exhaust system. Apparently when carb heat was used, the paint chips were drawn into the induction. The air filter was clear. Ray blew the carb out with air and sand blasted the exhaust. The engine started immediately and he has since flown 60 hours with no problem. The moral: do nothing to your exhaust system that could possibly introduce foreign material into the carb heat system.

CP35/9

Prop Windmill and Forced Landings

An EZs prop will windmill at flight speeds above 65 to 70 knots. However, while practicing slow-flight or stalls at 60 knots or less, if your engine's idle is set too low, or you run out of fuel on one tank, the engine may not only quit running, but the prop may stop. Should this happen, and you do not have a starter, keep calm, switch tanks, verify mags on and mixture rich. Push the nose down and build up at least 135 knots (155 mph). The prop will begin to windmill at 125 to 135 knots and the engine should start. A windmill start uses less altitude if you initially dive steeply to rapidly attain the 135 knots. If you are faced with a forced landing for any reason, pick out a smooth spot and execute a NORMAL landing. Extend the nose gear and speed brake and land as if you were on your home field, DO NOT try anything fancy. Make a normal landing. If there are obstacles in the field, guide the fuselage/cockpit between them.

CP37/3

CAUTION: Testing experimental props may be a hazardous thing to do. A Long-EZ builder/flyer was testing a pretty fancy, thin bladed, flexible prop when both blades failed just outboard of the hub. Fortunately this particular prop had a ply of Kevlar wrapped over the prop full span. Only the Kevlar stopped the blades from departing the airplane, the pilot made a safe landing.

CP37/4

The following letter is from a builder who had an epoxy reaction.

â€œDear RAF,

I am writing this letter to express my appreciation to you and Applied Plastics for "saving" my composite homebuilt Long-EZ project! About two months ago, I called you to get your advice re: how to prevent any further or worsening of the dermatological (rash, burning, itching hands and arms) reaction I had experienced after a six hour session with Safe-T-Poxy and acetone.

I followed you advice and changed my shop routine as follows:

a) Started using Norton Butyl rubber gloves exclusively..

b) Stopped using acetone (I now discard brushes and just wipe down squeegees).

Since I was already using a charcoal filter respirator, no change required there. I did improve the ventilation in my shop.

I have had some lengthy lay ups since with no sign of a problem. While they are relatively expensive, I think you should strongly recommend the use of the Butyl gloves.

Thank you again for your professional, prompt and sincere response to a problem, which very easily could have "shot down" a project which is very important to me.

CP38/5

Prop Damage - VariEze and Long-EZ

Remember, flying a pusher airplane, anything that comes off the airplane might possibly go through the prop. This includes cowling screws, loose pieces of safety wire, nuts and washers left loose in the cowling, even wrenches inadvertently left in cowling! Be careful. Be conscientious about working on your airplane. You are the qualified mechanic doing maintenance on the airplane and it is absolutely your responsibility to do the best work you can. A cowling screw or a fuel cap going through the prop, can cause sufficient damage to the wooden prop, that you may have to land and wait for a replacement prop.

CP40/4

Canopy Opening In Flight In An EZ

Ralph Gaither, an experienced naval pilot with over 26 years of experience in airplanes and a VariEze pilot/owner called the other day to let us know of a canopy opening that he had. First of all his canopy warning system was out of order, a micro switch had failed. (Don't laugh, this can happen to you!) Secondly it was a hot day in Arizona. The canopy was kept open while taxiing out to the runway. The canopy was locked, then the wind shifted necessitating a long taxi to another runway. The canopy was opened for better ventilation (you can see it coming, right?) To make a long story short, he had to quickly fit in between traffic for take off, his safety catch had somehow gotten bent and did not catch, so the canopy opened fully at between 200/300 feet AGL during the climb out. Ralph, kept his cool, he flew the airplane, maintaining the climb, left the throttle full up, reached with his left hand and grabbed the canopy rail. He pulled the canopy down and closed it on his wrist (not fully closed). He climbed out in this configuration until at 1000 feet AGL. He trimmed the airplane as best he could, and throttled back to fly level at a reasonably slow speed (100 to 110 knots would be best). Then he took his right hand off he stick and calmly locked the canopy and continued on his way. Ralph's canopy does not have the throw over stay that was shown in CP 30, page 8. Rather he has a simple retaining cable. He expressed the concern to us that he felt that the over-center type throw stay may have made it much more difficult to close the canopy in flight. We have given this some thought and we agree. It would be more difficult to close the canopy, but certainly not impossible. Anyone who flies an EZ with this type of stay, will know that it takes both hands for about a second to flick it over center and close it.

It is food for thought and we wanted to give the builder and flyers the benefit of Ralph's experience. We believe the throw over stayâ€™s advantages out weigh its disadvantages. It is very light, it will hold your canopy open in a wind without allowing it to crash closed or open against the fuel tank. It does not impose the tremendous torsional loads through the canopy frame that the gas spring type canopy restrainers do.

Consider also that there has to be literally a triple failure before this would become a factor in flight.

1. The canopy warning system must have failed.

2. The safety catch has to fail.

3. The pilot must have a brain failure, or fails to comply with his or her checklist.

All three of the above have to occur before the throw over stay becomes a factor. We at RAF have elected to keep our throw over stays but we feel that each individual builder should make his or her own decision.

Incidentally, Ralph reported that the airplane was not at all difficult to fly, he easily maintained heading and continued his climb. The biggest thing to remember is to FLY THE AIRPLANE.

CP41/5

PROPELLER TALES!

There have been one or two EZ pilots recently who have had their hands or fingers hit by the prop. Hand propping an aircraft engine particularly on an EZ is not difficult, but there is not room for carelessness or lack of concentration. The prop should always be treated like a loaded gun. Be especially careful when "backing up" the prop, such as is commonly done to clear a flooded engine. This problem appears to be associated with the larger engines (0-320) more than with the standard 0-235 engines. However, it can happen and if it does it can cause painful cuts and abrasions and even broken bones and will also result in a broken prop. Be careful. Use good safety procedures and never move an aircraft propeller unless you are ready and in position for it to fire.

CP41/6

We talked with the pilot this morning and while driving his damaged airplane home, he had plenty of time to try to think of all that had happened and why it had happened. He came up with a theory that certainly could have been the cause. This airplane had the mag switches (two toggle switches) mounted on the left side of the roll over structure. The switches were not covered or protected inside the roll over structure. Two spiral bound note books were stored in the roll over structure. The pilot's theory is that possibly one or both books moved against the terminals of the mag switches and possibly shorted the mags to ground. This would certainly cause the engine to quit. This will be investigated further, but it certainly is something to think about. If you have your mag switches installed in your roll over structure, insulate the back of the switches or install a cover over them to prevent anything from coming in contact with the bare terminals.

CP42/3

LONG TERM MAINTENANCE ITEMS ON EZs

Summary

We have 3 Long-EZs and 1 VariEze here at Mojave, all of which are 4 years old or more. The total hours on these four EZs exceeds 3,300 hours. We have never had a problem related to the composite structure. We have not had a composite structural problem reported to us from the more than 600 EZs that are now flying world wide in all different climates and conditions. We are very pleased with the structural performance of these airplanes and we encourage all builders to continue to send in reports of any maintenance items that you may encounter so that we can look for any trend that may develop and report on it in the Newsletter to help all of the EZ builder/flyers out in the field.

CP44/3

LIGHTNING STRIKES ON FIBERGLASS AIRCRAFT

We recently received information from NASA and from Andy Plummer of Lightning Technologies Inc, a recognized expert in this field, regarding lightning strikes on fiberglass aircraft. At this point in time there is not one single documented case of a fiberglass sailplane being struck by lightning. This is surprising, especially in Europe, where sailplanes do fly in the clouds. There is no documented evidence of any EZ or composite type having been struck and damaged. There is however, one documented case of an all wood sailplane which was struck, with catastrophic results. There are many cases of radones, glass tail fins, etc. on airlines being struck with damage from insignificant to quite considerable.

The expert opinion from both NASA and Mr. Plummer, is that it could happen and if it did, it may be possible to suffer catastrophic damage. Mr. Plummer states, "I am firmly convinced that fiberglass aircraft are just as likely to receive a lightning strike as a metal aircraft of the same size". The consensus of opinion is to stay well away from thunderstorms or cloud formations that may generate lightning.

CP44/9

VARIVIGGEN AND VARIEZE PLANS CANCELLED

As of May 1, 1985 the VariViggen and VariEze plans will no longer be available. The sales for these two plans sets over the past few years have been very low and the current printings have been depleted. We do not feel that the sales justify the expense of reordering.

RAF will continue to provide builder support for those who are currently building either of these aircraft. The supplementary plans, such as engine installation, finishing and electrical system, etc., will continue to be available until we run out of stock.

CP47/2

ARE HOMEBUILTS SAFE?

FAA accident statistics show that per hour flown, a homebuilt is at least three times more dangerous than its general aviation store bought certificated counterpart. We have studied the accident records of these aircraft and have found some specific information that highlights the reasons for this large difference. The reasons are these general categories.

1. Low Flying/Buzzing/Aerobatics

This cause results in a relatively small percentage of accidents for the Cessna, Cherokees etc. We are astounded to see that the vast majority of serious homebuilt accidents fall into this category (3 out of 4 Long-EZ fatal accidents, 7 out of 11 total accidents/incidents). It seems that the homebuilts are such fun to fly that the pilots take risks that they generally do not take when flying their Cessna 172.

2. Engine/Prop Failure

Engine failures on homebuilts occur much more often than factory-builts, basically because many homebuilders do not apply adequate workmanship in the engine installation. A homebuilder who is not an A and P should get one to inspect his work and better yet, have an FAA designated IA approve the installation as would be required for a certified aircraft.

CP47/6

FIRE EXTINGUISHERS IN THE COCKPIT

There are now many small Halon fire extinguishers available at very reasonable prices. Halon is the only fire extinguisher that can be used in the case of a fire in the small confines of a cockpit. While electrical fires are not all that common, they do occasionally occur and if one ever happens to you, particularly in flight, without a means to extinguish the fire, you have little chance. A classic example of how a small fire extinguisher can save the day occurred to us here at RAF. We were taxi testing an airplane when a brake line failed and the brake fluid ignited. It was a small fire, but it quite rapidly began to burn the paint on the wheel pant and the paint on the gear leg. If we had not had one of these small fire extinguishers available, we would probably have had to sit by and watch it burn. We were over a mile from the nearest building at the other end of the airport!

Small, easy to mount Halon fire extinguishers are available from many aircraft supply companies including Sporty's Pilot Shop in Cincinnati, Ohio. Don't let it happen to you, order one now and mount it in your cockpit where you can easily reach for it anytime. It is very cheap insurance.

CP49/4

CAUTION

No cause for the engine quitting has been determined. The first thing that comes to mind, of course, is the engine idle speed. This may or may not have had anything to do with this accident, but we have seen airplanes set up with such low idle speeds that they do have a tendency to quit on short final. However, that is normally an occurrence in the flare where it is only an annoyance as far as taxiing after the landing. An excessively high idle RPM is not satisfactory in that it makes it tough to land an airplane with the L/D of a Long-EZ. In general, if your engine will idle OK on the ground, it will idle even easier at approach due to inflow assisting the propeller.

CP49/4

CAUTION

Never, ever, cowl an engine that has been worked on without a brief engine run to check for leaks. We, here at RAF, have more that once found fairly drastic leaks during the leak-check engine run.

CP49/5

FIREWALLS AND FIRE PROTECTION OF FLIGHT CONTROLS

The study of VariEze accident history has always shown considerably reduced incidents of fire as a result of an accident than the conventional metal aircraft with the engine on the front. The reasons for this are relatively obvious in that the sources of ignition of the fire are more remote to the major impact. Another feature that has been considered safer than the tractor aircraft is the airflow pattern through the engine area which pulls the fire away from the aircraft rather than impinging it toward the firewall. There have been no accidents or incidents in the VariEze or Long-EZ that have been caused by fire destroying aircraft structure or flight controls. There may be, however, a possibility of this occurring and this possibility is something that we feel obligated to address and, thus, are recommending specific modifications to the VariEze, Defiant and Long-EZ to reduce, as much as possible, the exposure to this risk.

Several years ago, we tested a product called Liquid Firewall and found it did not provide satisfactory fireproofing/insulation and, thus, did not recommend its use and, in fact, specifically cautioned those who would attempt substituting it for the recommended firewall. A couple of weeks ago, Wicks Aircraft sent us a new product (Ocean 1644 Intumescent) to evaluate. This material is intumescent which means it swells up to a very thick layer of high temperature insulation and provides surprising results in that it will protect an aluminum surface from fire damage for a considerable time period. We do not have the equipment to specifically qualify this material to FAR 23 regulations, however the torch tests we have conducted have convinced us that it can provide a considerable barrier to deterioration by fire to aluminum or composite structure. The other good news is that this material costs considerably less than the previous liquid protection product.

Because of our concern that it may be possible to suffer unacceptable structural damage or loss of flight controls, we are recommending mandatory changes in this newsletter to all our designs except the Solitaire. This is particularly important in the VariEze and Long-EZ where both yaw and roll systems pass through the engine compartment. Loss of roll control on a Defiant may allow recovery using rudder.

CP50/4

ACCIDENTS AND INCIDENTS

A Kansas based VariEze crashed, fatally injuring it's builder/pilot. The circumstances of this crash are the stuff nightmares are made of. The left wing separated from the fuselage in flight and the airplane fell out of control to the ground where the right wing also separated from the fuselage. Examination of the wreckage showed that the 16 screws (AN-509/AN-525) that must be used to fasten the wing-attach fittings to each wing spar were never installed! Surprisingly, the same 16 screws that are used to attach the wing-attach fitting to the center section spar were installed. As a result, only the epoxy bond held the wings to their fittings. Incredibly, this enabled the aircraft to fly for a number of hours before the top and bottom spar caps simply pulled out of the metal wing attach fitting.

This builder/pilot, by all reports, was a careful builder who built his VariEze closely to the plans, yet while he did install the wing attach screws into each of the center section spar, he somehow overlooked the installation of these critical screws into each wing. Why? We will probably never know, but we should all learn a lesson from this. Even though the plans are clear and concise, with full size drawings showing the location of these screws, it is apparently possible to overlook such a vitally important structural attachment. Every VariEze builder or flyer should check to be absolutely certain that all 64 screws are installed in the wing/center section attach fittings. If you have already covered these screws, such as in an already completed and finished airplane, you can easily check using a small magnet hanging on a string, or a stud finder such as carpenters use to locate vertical studs is a wall (it's also a magnet). Carefully mark the exact location of each screw head with a pencil. Compare your bolt pattern with the full scale drawing in the plans. Be sure that you have all 64 screws in the correct positions. This applies especially to those who have not done this work themselves and therefore would not know.

CP50/4

What can be learned from this type of accident? Complete engine failure, if not a mechanical failure such as a broken crankshaft or connecting rod(s), is generally fuel associated. With redundant magnetos, ignition is seldom cause for a complete and sudden engine stoppage. Catastrophic mechanical failures, while they do occur from time to time, are quite rare in aircraft engines. Sticky or stuck valves occur more often, but again, this seldom causes a complete power failure., Most of these types of failures will result in a partial loss of power which, while very nerve wracking, should still enable a pilot who stays cool to reach an airport or, at least, make a safe emergency landing.

CP50/4

Fuel related engine problems in homebuilts generally come under two headings: Simply running out of fuel (brain failure!), or a faulty fuel system that for one reason or another fails to allow fuel to reach the engine. This could be caused by many things. Deviating

from the plans is probably the most common reason. Clogged filters, substandard hoses or fittings, old, worn-out carburetors, sticking floats, wrong fuel pumps, disregarded inspection, - we could go on all day!

CP50/6

BUILDER HINTS

"Fire-Proofing" your firewall: by Arnie Ash (Reprinted from Central States Newsletter).

"The arrival of the latest Canard Pusher just two days before leaving for Oshkosh and also just prior to mounting my engine for the final time was indeed timely. The following is an account of a few thoughts regarding the purchase, application and protection of Ocean 1644 "fireproof coating".

To coat to the proper thickness your firewall and side "heat shields" you will need more than one quart of 1644 but less than two. Wicks prices this material at $25.00/quart or $60.00/gallon. It would seem that perhaps three EZs could be treated with one gallon so you may want to consider splitting the cost of a gallon with a couple of your buddies. You will also need the special thinner which sells for $15.00/half gallon. (You'll use less then a cup of this material though).

Application: Grab the oldest spray gun you can find - you don't need to break out the high priced equipment. Thoroughly mix the 1644 and draw off approximately 3/4 of a quart. Cut this by about 5 percent with the special thinner. Set your spray gun up in the suction mode with about 50 lbs. pressure at the gun. The material seems to flow on best at a range of only 5-7 inches from the part being sprayed. To get the required material thickness you'll have to spray 7 to 9 coats (depending on the thickness of each coat). Allow a few minutes between each coat for the material to "tack" and you'll avoid any runs. (If all goes well you'll have the firewall coated to the required thickness in less than 45 minutes. Wear a good mask and be sure to protect the rest of your airplane from any overspray). This material needs a couple of days to really give you the feeling it's dry.

Once dry you'll have a nice white firewall - - until the first time you touch it with dirty hands or spill a little oil on it. This material appears to be pretty porous and thus absorbent. I called the manufacturer, Ocean Chemical, Savanna, Georgia, inquiring as to the availability of a top coat to help keep the firewall looking nice.

Although they apparently have a product, their lab suggested an excellent top coat would be Imron 500-S Clear polyurethane enamel, sprayed to a thickness of about 3 mills. The problem: If you go to your local paint dealer and buy the smallest container if Imron 500-S and the 192-S activator required you will have as much invested as the Ocean 1644 and you'll only be using about six ounces!!

ONE SOLUTION: Ask the paint dealer who his biggest customer for Imron is and go tell this "end user" your tale of woe. In my case it was the local "Big Truck" body shop and enough Imron 500-S and 192-S cost me a case of Pepsi!

Mix the Imron at a ratio of 3 parts of 500-S to 1 part 192-S. The firewall will take about 4-5 ounces. Application is handy using one of those $3.00 aerosol "touch-up" bottles you can pick up from the guy who told you who his biggest "end user" was. (At least he sold you something!) Spray this material just as you would any "lacquer type" material. This stuff will run easily so best to spray a light coat and let it tack for 10-15 minutes then follow up with successive coats until you achieve the desired thickness.

One last thing: Even though you will only be spraying a few ounces do not under any circumstances attempt to spray this material without a very good mask. I used a good mask and pumped fresh air from a bottle into the mask to create a positive internal air pressure, and I still got a mild headache. This is nasty, nasty stuff. Be careful. . . . Arnie

P.S. At normal room temps. the Imron will take at least two days to cure to the point where you can work on the firewall. Total cure, they tell me, takes about two weeks."

CP50/8

FIRE EXTINGUISHERS IN THE COCKPIT

With our recent experience of a brake fire while taxiing the Defiant, the value of an on-board fire extinguisher became painfully evident. If we had not had an extinguisher, we would have lost the Defiant!

We have done a little research into the subject of fire extinguishers and the consensus is the "Halon" extinguishers are the only ones to consider. There are two types of Halon, 1211 and 1301. FAA says that Halon 1301 is best. However, the much more readily available Halon 1211 is still an excellent choice and is available in a small size well suited to our EZ cockpit. A lot of mail order catalog houses, such as Sporty's Pilot Shop, sell these fire extinguishers. A 2-1/2 lb. Halon bottle is well suited to a Defiant size airplane, but is really bigger than necessary in an EZ cockpit, while the tiny, aerosol size 12 oz. Halon bottles are probably marginally too small although they may well be a life saver if used soon enough on a small fire. They certainly are easy to mount in our small cockpits. Be sure you place the fire extinguisher where you can easily reach it in flight.

Do not use a dry chemical or a CO2 fire extinguisher in any aircraft for any reason.

CP51/6

ACCIDENTS AND INCIDENTS

Long-EZ N218EZ: Incident Report

Scenario: I was the pilot in command of Long-EZ N218EZ at Scottsdale Municipal Airport when it crashed into a Cessna 152 after hand propping the engine. The situation occurred as follows: I had just fueled up for a local flight and was preparing the aircraft for engine start. I placed the wheel chock under the port tire and set the magnetos for ignition. I set the throttle position incorrectly although I did not realize this until it was too late. I then hand propped the engine and she started on the first pull but the RPMs were too high and the Long-EZ jumped the chock. I ran around the port wing but then my last failsafe malfunctioned. The rubber stopper under the nose, which was made out of a hockey puck, sheared off and the Long-EZ raced away toward the active runway. A previous gear up landing prompted the installment of a stainless steel plate under the nose in the event that a gear up landing occur again. The steel plate offered little friction to the asphalt and she accelerated away from me (I am slow of mind not of foot). I was only able to get alongside the wing at full sprint and the plane was still accelerating toward the active runway. I decided to try to alter the plane's course and at my last chance grabbed the port winglet and pulled myself up off the ground. Off balance, the Long-EZ did veer away from the runway but my troubles were just beginning. Now a less than willing passenger on the wing of a pilotless plane going approximately 25 mph, I helplessly watched as the Long settled on a course directly at a parked Cessna 152. I had no choice but to release and watch the planes collide.

Damage: The Cessna suffered a collapsed wing and sustained propeller, nose gear, and engine cowl damage. The Long lost the canard and punctured the port wing strake on the Cessna's propeller.

Recommendations: This situation arose primarily because the throttle was set at too high a power setting thus initiating the runaway condition. Second, the rubber stopper was made out of the wrong material (hockey pucks are designed to slide) and it was not secured to the fuselage properly. For those who hand prop their planes, I would recommend installing a parking brake and/or some remote cutoff switch for the engine. A simple procedural solution would be to set the fuel valve to off so that if the plane runs away, it won't get too far. Always be certain of your throttle setting. By Michael Best

CP61/7

ACCIDENTS AND INCIDENTS

A New York VariViggen crash landed in the Piconic Bay shortly after take-off when the engine quit. The pilot, an experienced Viggen flyer attempted two re-starts but could not get it to run. He then turned into the wind and executed a near perfect gear up water landing.

The Viggen floated and the pilot was quickly rescued by some pleasure boaters. The Viggen was towed to the beach and, after spending some 20 hours in salt water, was returned to its hangar. The left wing root was heavily damaged and the builder probably will not rebuild. The pilot was bruised and shaken up but not seriously hurt.

The cause of the engine failure was traced to the mixture outer cable attach point near the carburetor. This attachment had been perfect for seven years and almost 600 hours but failed at 600 feet over the bay shortly after take-off. This failure was such that the mixture lever arm on the carburetor was pulled to the idle cut-off position. The pilot was unable to richen the mixture, or even to move the mixture at the carburetor, in spite of his best efforts.

What can we learn from this accident? Engine controls are every bit as important and critical to flight safety as flight controls are. Check your engine controls for correct travel and try to imagine what you could do to make sure that no matter what fails, the mixture fails to full rich and the throttle fails to full power. The opposite result is simply unacceptable. A spring that pulls mixture and throttle arms to full rich and full power could prevent such a problem. At least with full power you could use the cockpit mixture lever to regulate power (it works just like a throttle) or even the mag switches to cut power off to facilitate a landing. Using mag switches to regulate power is not as good as using the mixture control. Above all, check that the clamp that secures your throttle outer cable and mixture outer cable are as near perfect as your ability and skill allows. A failure here is not acceptable.

CP62/7

ACCIDENTS AND INCIDENTS

A VariEze crashed soon after takeoff in Aspen, Colorado. The pilot and passenger were both killed. Engine failure is suspected. The damage to the prop is such that the engine was not running when it crashed. The FAA has not officially come up with a probable cause for this accident, but their investigation is looking seriously at fuel exhaustion or, at least, a fuel stoppage as being the likely cause. This VariEze had been flown for at least 3-1/2 hours since the last time it was known to be refueled. Depending on the power setting and fuel tank capacity, this is very close to enough to have used a full tank of gas.

At the last known refueling, this VariEze was refueled while parked nose down. Also, the pilot did not supervise the refueling, rather, the line boy was told to fill it up.

First of all, it is not possible to completely fill the fuel tanks of an EZ while parked nose down. If for some reason you require all the fuel you can get, top if off in the 3-point position. Second, we have had it happen to us, that a line boy failed to top off an EZ fuel tank when using a very high rate of fuel flow due to the baffles in the tank causing the tank to momentarily appear full. Some refueling trucks and pumps have more flow capacity than the baffles in the fuel tank can allow the fuel to drain to all corners of the fuel tank. Don't forget this fact if you absolutely need to have the maximum fuel for a long trip. Most important of all, remember it is the pilot's responsibility to check how much fuel he or she has onboard, not the line boy's. On a VariEze, built per plans, you have a 2 gallon-plus emergency reserve fuel tank in the area above the center section spar forward of the firewall. Don't forget to check the level in this tank and to fill it if necessary. This is a get-you-home fuel supply, but it will do you no good at all if it has been used or has drained through a leaky fuel valve into the main fuel tanks. Keep this tank full, always - it could save your bacon.

CP62/8

Apparently the pilot got behind the airplane on final, got too slow and developed a high rate of sink. The airplane hit hard failing the gear, slid along leaving the runway and flipping over. The winglets were broken, one wing was ripped off and the canopy was smashed. The head rest broke off, but incredibly, when the airplane was lifted, the pilot had only minor cuts and bruises.

As with all accidents and incidents reported in the CP, the only reason we print them is to hopefully help someone else and maybe prevent a similar situation by being forewarned. There is no intention of judging a pilot or his or her actions.

What can we learn from the above accident? Although our own records do not show it, the FAA says that a high percentage of accidents in homebuilts occur on the first flight. This is one that did. There is no question that the sight picture out of the front seat of an EZ on final, is not like anything the average low time private pilot may have seen. It is unlikely that he has ever sat on the aircraft centerline before. The EZ must be set up to land a little differently than the "standard" Cessna, Piper, etc. In fact, it is much closer to a modern jet fighter in some respects. There is no prop in front of the pilot, the airplane does not pitch nose down as a Cessna or other single engine certified airplanes do when flaps are lowered, and it does not have to be rounded out or flared when close to the ground as a Cessna does. Rather, the landing attitude is set on 1/2 mile final by simply slowing to 80 or 90 knots. The landing brake creates no lift, no pitching moment as flaps do, all it does is provide drag to steepen the glide slope a little. The nose high attitude necessary to land is strictly a function of airspeed. Slow to approach speed and the airplane will automatically set itself to the correct touchdown attitude. Now, simply fly it onto the runway. When you have 20 to 50 landings in your log book, you can finesse the touchdown with a tiny flare, but for the new EZ pilot, this is not necessary or desirable.

Because of this "difference" in an EZ, whenever it is possible, always try to get at least a back seat ride in an EZ before you attempt your first flight, particularly if you don't have much flying experience. This can easily make the difference between a successful and unsuccessful first flight.

Just as you carefully, even meticulously, prepare your airplane for first flight, so must you prepare yourself if you are to be the pilot. Get yourself current and proficient in at least two different aircraft: A Grumman TR-2 and a Cessna 150 would be excellent, or a Champ or Luscombe and a Piper would be fine. The point is to be as sharp as you can be. Then find someone who will give you a ride in their EZ. A VariEze or a Long-EZ, it does not matter. Get a little stick time, maybe even fly an approach, it will make an enormous difference if you have at least flown in an EZ.

That is not to say they are difficult to fly - they are not, they are just a little different. Another thing to keep in mind is this - ANY aircraft will develop a high sink rate if you get it too slow, including canard types. Don't be lulled into a false sense of security by thinking you can pull the stick all the way back on short final and the airplane, because it is a canard, will look after you! A canard airplane is just like a conventional airplane, it must be at or above flying speed to fly. Get it too slow and a canard airplane will sink just as a Cessna or Piper will.

CP64/3

CAUTION

How do you know what you are getting when you buy a complete, or even a partially complete, composite aircraft?

RAF gets this question more often than we care to relate. It's a tough question and we honestly don't know the answer. Perhaps the most logical approach would be to look at one with plenty of hours on it. At least, the structure is proven. The other thing to look at is the structural weight. Beware of an unusually lightweight EZ (might have some lay-ups missing, also, watch out for an excessively heavy airplane. It will probably fail at a lower "G" than a normal weight EZ).

We recently heard of a nasty accident in a VariEze that really drives home the point we are trying to make here.

The buyer purchased a structurally complete VariEze. Most of the contouring was done but not the engine installation or the wiring/instrumentation. This person spent a couple of years of hard work and lots of dollars until he was finally ready to try out his new bird. On the first high speed taxi run, with the nose wheel off the ground, he started to get it light on the main tires when suddenly the left wing folded. The right wing was lifting quite strongly and, without the left wing to balance the lift, the airplane abruptly rolled over and left the runway. It slid to a stop inverted, and although the damage to the airplane was fairly minimal, the pilot was seriously injured and spent several months in the hospital recovering.

Close examination of the wing attach area disclosed the fact that the wing fitting attach screws had never been installed! Since the micro used to contour the wings was already installed, the buyer had no way of knowing. This is just one way you could get in trouble when you buy a composite homebuilt. RAF has always been a strong advocate for build-it-yourself. If you want an airplane, build it yourself. Follow the plans as closely as you can. Have your friends or fellow EAA chapter members look at it over your shoulder as often as possible. Be conscientious and accept only your very best workmanship.

CP65/2

2. The latest lawsuit to be brought against RAF concerns the VariEze accident described in CP61 page 9. We did a thorough investigation of that accident and came to the conclusion that the wing attach taper pins, which were home-made, were a poor fit. The bolts that secure these taper pins were too long and all had had a threading die run onto them to increase the length of threads on each bolt! Aircraft bolts are roll threaded and heat treated. Under no circumstances should an aircraft bolt have threads extended or cut using a die! One of these bolts was missing as were the two taper pins. The three remaining bolts had been over-torqued allowing a wing to swing aft. The VariEze was seen to be doing aerobatic maneuvers by at least one eyewitness just prior to crashing. The pilot was found to have alcohol in his bloodstream. In spite of these facts, RAF and the builderâ€™s estate are being sued by the relatives of the passenger.

CP66/3

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." We have not seen this corrosion yet - he is sending us a sample of the affected tube. We will report further in the next CP. He says that this corrosion occurs only under the foam and glass. These 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 the bottoms of both elevators for bumps such as we have described here, before next flight. If any evidence of bumps or corrosion is found, ground the airplane and remove foam and glass locally. Inspect the aluminium 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.

The above report came out 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.

CP66/3

CAUTION

Check that what you order is what you get! Plastic fuel lines must be checked - often.

"Just re-read an article in the Canard Pusher about fuel lines in VariEzes. These "original call-out" urethane, flexible fuel lines have been reported to deteriorate over time and should be carefully inspected and replaced periodically. Unless the material for these fuel lines is the correct material, deterioration can be very rapid. Visually examining plastic tubing when it arrives from the supplier may not tell the builder/flyer that it is, in fact, the correct material. Even when the correct material is used, deterioration can occur and be invisible to all but an extremely thorough examination. Here is my experience:

Recently, I brought my VariEze home on a trailer and had it in the carport, nose down. It had been sitting there for quite some time awaiting my attention. When I finally got around to it and opened the canopy, I smelled fuel but could find no sign of liquid fuel. Later, I was checking fuel lines under the rear seat by squeezing them with my fingers to determine hardness or brittleness when the header tank fuel line fell off in my hand! This was the source of the fuel smell. With the nose down, fuel had slowly leaked behind the rear seat bulkhead and into the rear cockpit. All of the other fuel lines were discolored to a dark brown but still felt pliable. In removing them from the fitting, to my horror, they easily split and crumbled.

I had always assumed that deterioration would occur in low spots in the fuel lines where water may collect. These failures, however, were up high at the aluminum fittings. They had been installed in July of 1983 and flown for a total of 750 hours, so they were seven years old. I have used auto fuel, regular, when at home and 100LL Avgas when traveling. Lately, regular auto fuel is no longer available locally so I have been using auto unleaded (no alcohol). I have, on occasions, used Marvel Mystery oil as a fuel additive and, many years ago, I used TCP.

I believe that VariEze fuel lines should be changed at least every three years and great care should be taken to order the correct material. Also, make sure you receive the correct material. As a further safeguard, cut a few small pieces of the new fuel line and submerge some in a bottle of gasoline and some in a bottle of acetone. I check these samples from time to time for any obvious signs of deterioration.

Byron McKean"

Editors comment: Thanks for your report, Byron. We agree wholeheartedly with the suggestion to change plastic fuel lines at least every three years. Also, we have found that buying polyurethane-type tubing from a supplier like McMaster Carr (locations in Chicago, Los Angeles and New Brunswick, NJ) will get you a receipt that spells out part numbers. For example, according to McMaster Carr's catalog, Tygon tubing comes in at least two material types, one called out for fuel and lubricants, another for food and beverage! Each material has its own part number. Tygothane, the material originally called out in the VariEze plans, is recommended for fuels and lubricants. Using McMaster Carr, at least you have the verification of the part number on the receipt. We highly recommend this company as a source of an unbelievable variety of materials, tools, etc. Their catalog is an awesome tome!

CP66/4

CONTROLS CHECK BEFORE TAKE-OFF

An EZ pilot here at Mojave recently had an experience well worth relating and bears serious thinking about. He had had his canard off for routine inspection and maintenance and when he replaced it, he inadvertantly bolted the pitch control pushrod to the VECS12 arms incorrectly (due to a builder modification). This limited the nose down pitch authority but this fact was not discovered in preflight. In flight, this pilot discovered that at full forward stick, his elevator was essentially even with the canard tip! Reducing power enabled him to descend and he was able to land without incident. What this tells us is to not only feel the forward, aft and left/right stops when checking controls prior to take-off, but to look at the control surface you are moving and verify that it is, indeed, traveling to what you know is the correct direction as well as limit. There is no substitute for a complete, full travel check of flight controls before take-off.

CP66/4

CAUTION

"Be careful about flying your EZ in a relaxed manner with your feet forward of the rudder pedals. On one flight, my shoe lace loop got caught over one rudder pedal and it took me 90 miles to work it loose. I now have on my checklist to stuff the loops in my shoes before I get into my seat.

Ray Mucha"

CP66/4

CYLINDER HEAD AND OIL TEMPERATURE CONTROL IN EZs

The problem is that the two rear cylinders run too cool and the forward two run too hot. After trying virtually every suggestion in the CP, and some others, with little success, Bill and Terry decided to do some serious testing and analysis of the problem. Using an airspeed indicator as a pressure gage (remember, an airspeed is simply an accurate pressure gage with the face marked in MPH or knots instead of PSI), six 1/8" ID clear plastic hoses were run from the cockpit aft through the firewall to various positions in the cowling. These hoses were numbered and tagged on each end and the cowling ends were reinforced with 1" lengths of 1/8" OD brass tubing and securely lashed to various supports as available. The six locations tested were the top and bottom of the left two cylinders (4 places), just inside the NACA cooling inlet (5th place), and right on top of the per the plans installed oil cooler (6th place).

It really takes two people to conduct this flight test. Data was taken at a range of airspeeds and altitudes with OAT, CHT on each cylinder, oil temperature and engine RPM recorded for each set of pressure (MPH) readings. These data were then plotted up on graph paper as a function of altitude on one graph and airspeed on another. Careful examination of the numbers and graphs revealed that under all conditions tested, the rear cylinder, bottom side, consistently had the highest pressure while the rear cylinder, top side, had the lowest pressure.

Assuming all cylinders are externally essentially identical, with new identical baffling at the time of the test, then each cylinder has the same inherent resistance to air flowing through the fins. The pressure difference, bottom to top, across the forward cylinders, was much lower than the pressure difference across the rear cylinders. This results in much lower cooling air flow though the forward cylinders than the rear cylinders and, therefore, higher cylinder head temperature.

Almost all of the cooling air was going through the rear two cylinders. Basically, what happens is that the cooling air rushes in through the inlet, follows the bottom of the cowling as it swoops upward at the back till it hits the vertical rear baffle where this high velocity air is abruptly slowed down, raising its pressure. On the top side of the two rear cylinders, the lowest pressure exists due to proximity to the cowling outlet and the scavenging action of the prop. There is high pressure under the rear cylinders, low pressure on top and, presto, most of the cooling air flows through and around the rear two cylinders leaving the forward cylinders with less cooling air and much higher temperatures.

Obviously, the way to improve the cooling of the forward two cylinders was to increase the resistance to cooling air flow at the two rear cylinders. This was accomplished with some trial and error by installing temporary baffles forward of the vertical rear baffles under the two rear cylinders and cylinder heads to cover all but about 2" of the fin area of those two cylinders. With these temporary baffles wired in place, another flight test was conducted and instantly the CHT's were much closer to being even. One more iteration of even more restrictive, under-cylinder baffles permanently solved the cylinder head problem.

The oil temperature problem, however, still existed on this 0-320 powered Long-EZ. Many ideas were tried. Some helped a little but nothing cured the problem until a second oil cooler was added on the right side. A "brute force" method to be sure, but one that worked incredibly well, although not too elegantly.

CP66/9

THROTTLE/CARB PROBLEMS ON A VARIEZE

"Dear RAF,

Enclosed is requested survey information on our VariEze, N222HK, SN 222. We are the original builders and continue to maintain and fly this thoroughly enjoyable aircraft. During our eight years of such, 222HK has proved to be remarkably free of serious problems. It has flown five times Utica, NY to Oshkosh. There are a couple of things I would like to relate, however.

The most sever problem which I can recall was with the throttle carburetor control. Very small diameter portals built into the carb (Marvel Shebler mounted on a Continental 0-200) became clogged to such an extent that they created hydraulic back pressure on the primer piston. The result was very sluggish response of the actuator arm on the carburetor with the following consequences: Failure to provide adequate prime on opening the throttle, this made for hard starting. Failure of the two springs to quickly

move the throttle arm to full open on demand, - a serious problem in the event of a go around. Failure of the cable to push the throttle arm to full open.

During servicing the aircraft, I noticed when opening the throttle using the control handle the cable actually buckled up and the arm did not move. Probably with the engine running vibration caused the arm to move slowly and would only be noticed in the event a sudden surge of power was demanded. I believe the change was a slow process and very subtle indeed.

Disassembly of the carburetor revealed the clogged portal and the fact that the fuel injection piston could not force a stream of fuel into the carburetor during prime. I do not know what material caused the clogging, perhaps a small residue of epoxy.

Whenever the cowl is removed, a simple check can be made to insure that the carburetor arm responds quickly when the throttle handle is advanced. It may take two people to do this.

A second issue involves small particle fuel contamination which has been virtually eliminated in 222HK by installation of an in-line auto fuel filter. We didn't like the heavy gascolator so installed three low point quick drains and the filter. The filter is a glass enclosed cylinder about 1 inch dia. x 4 inches long and easy to service. The clear glass allows visual inspection whenever the cowl is removed. We have found particulates such as Teflon, fiberglass and other unknowns in spite of thoroughly cleaning all tanks before placing in service.

EDITOR"S NOTE: We certainly appreciate Charles' experiences, but instead of the in-line auto fuel filter we would recommend a Kinsler in-line fuel filter. These are available from:

Kinsler Fuel Injection

313-362-1145

The filter assembly, part #9020, costs $85.00 and extra filters, part #9023, costs $8.00 each.

These are quality parts, machined from solid aluminum and have Dash 6 (3/8") AN flared fittings machined on to each end. The internal paper filter is replaceable (Kinsler part #9023) and can be cut apart to look for particulates at each annual. These filters are made for fuel injected engines and work very well. Mike and Sally, Doug Shane and Dick Rutan are all currently using this in-line fuel filter.

CP66/10

â€œDear RAF,

I took a trip last August in Norse Nomad, my Long-EZ, which has over 400 hours to date.

I had an uneventful flight to McKinney, TX from my home in Carbondale, IL to visit with my son's family. On the way home via Texarkana and Little Rock, I suddenly experienced a noticeable drop in rpm. Since I had put in 20 gallons of 100LL before departing, I suspected water in the fuel. I did a 180-degree turn and made it to an airport with the engine running rough and surging between 2400 and 2600 rpm's.

I removed the gascolator and found a half teaspoon of sand and sediment but no water. A quick test flight revealed that I had not found the problem. I decided to leave the Long-EZ, fly home commercially and return with a trailer. To make a long story short, when I got my Norse Nomad home, I started the engine and got a bad mag check on the right mag. The mags had checked perfectly on the previous two flights, but not now.

The culprit was a break in the shielded P-lead from the mag to the starter switch. where the wire made a 90-degree turn close to the switch. A single strand had cut the insulation and grounded the center electrode!

Knowing what I know now, I would have simply removed the P-lead from the mag and flown home.

This would have left me with a "hot" mag but it would have been much better than the 650 mile trailer trip! Also, I did not check the mags in the air when I had the problem. That check probably would have revealed the problem. A sudden loss of about 10% of your rpm is, in most instances, a magneto problem. Another clue was that the cylinder head temperature on my number 4 cylinder was unusually low. This plug runs off my right mag.

Hopefully, this experience may help other EZ flyers who may run into similar problems. Remember, any sudden drop in rpm, check the mags, if possible, check individual cylinder head temperatures, land and disconnect the P-leads. Watch out no one touches the prop with the mags hot. This may get you home where you can effect proper repairs. Keep in mind that P-leads can shut you down if grounded! These wires should be shielded and installed very carefully to minimize any chance of accidental grounding.

CP69/9

Chapter "Other"

CP Issue 21-4

Subject plans changes

Cumulative list of plans changes up to July 1979.

CP69/10

Chapter 1

CP Issue 21-4

Subject correction

Cumulative list of plans changes up to July 1979.

CP69/10

Chapter Maintenance & Inspections

CP Issue 22-8

Subject screens

MAN/GND Clean all screens before first flight, then every 25 hours for first 100 hours, then every 50 hours.

CP69/10

Chapter Maintenance & Inspections

CP Issue 22-8,4

Subject hoses

MAN/GND Inspect induction hoses for correct safety of wire and cord.

CP69/11

Chapter Maintenance & Inspections

CP Issue 26-6

Subject wing fitting

MAN 100 HR Remove and inspect wing attach bolts for corrosion annually or each 100 hours. Spray LPS #3 on bolts and cones.

CP69/12

Chapter Maintenance & Inspections

CP Issue 31-5

Subject main gear

At annual or 100 hour inspection jack airplane and check gear for excess motion.

CP69/12

Chapter Maintenance & Inspections

CP Issue 62-7

Subject exhaust system

MAN/GND Inspect exhaust system for cracks.

CP69/13

Chapter Maintenance & Inspections

CP Issue 61-10

Subject wing fitting

MAN/GND Inspect AN-4 bolts & taper plugs in wing fittings. Caused fatal accident.

CP69/13

Chapter Maintenance & Inspections

CP Issue 53-7

Subject airspeed indicator

Check accuracy of airspeed indicator. CP shows manometer for doing this.

CP69/13

Chapter Maintenance & Inspections

CP Issue 57-7

Subject placards

MAN/GND Check for proper placards in cockpit. Install "You may die if you fly this airplane" placard.

CP69/13

Chapter Maintenance & Inspections

CP Issue 55-5

Subject wing fitting

MAN/GND Check wing attach fittings for corrosion.

CP69/14

Chapter Maintenance & Inspections

CP Issue 53-7

Subject wing fitting

MAN/GRD Check wing attach fittings for corrosion. Alodine new fittings. Do not anodize.

CP69/14

Chapter Maintenance & Inspections

CP Issue 51-6

Subject mixture control

MAN/GND Problems with mixture control have caused 2 forced landings. Check for proper installation & operation.

CP69/14

Chapter Maintenance & Inspections

CP Issue 48-5

Subject brake lines

MAN/GND Inspect brake lines for damage from disc heat or sunlight.

CP69/14

Chapter Safety & Accident Information

CP Issue 44-8

Subject hot dogging

Low flying causes or contributes to many LE accidents. Don't!

CP69/15

Chapter Maintenance & Inspections

CP Issue 44-8

Subject cracks

MAN/GND Cracks have been found in the bottom skin of fuel tank - center section area. They were probably caused by sanding away structure at the edge of CS spar. Includes info on how to repair.

CP71/6

EACH 25 HOURS Conduct a general inspection of all composite structure. Any visible crack must be investigated to determine if it is only paint and filler damage or if it extends into the fiberglass structure. All paint and filler cracks should be repaired or sealed to prevent water intrusion. All fiberglass damage must be re-painted before flight. Check skin surfaces for evidence of depressions or bulges that indicate a failure of the underlying foam core. Note the integrity of the underlying core by pushing on the skin and tapping with a 25-cent coin. Good core is indicated by a sharp "tap" or "knock" noise. Bad core is indicated by a "dull thud". Listen carefully as you tap and mark with a grease pen directly on the skin the boundary of any suspected disbond area. Ground the aircraft if any core damage area is larger than the following:

Fuselage, wing/canard - 3" diameter.

Winglet, control surface or VariEze outboard wing - 2" diameter.

Repair per instructions in the annual/100 hour below.

CP71/6

ANNUAL/100 HOUR Conduct a very careful 100% skin surface coin tap, surface stiffness and contour smoothness inspection. Include interior areas in fuselage, cowl and wing with wings removed. Repair all suspect areas (even 1" diameter ones) by drilling #50 holes and injecting epoxy in one side of the void/bulge/dent area until the epoxy vents out the bulge (any divergence from the intended smooth contour) must also be repaired and reinforced per the standard repair methods in the plans.

CP71/7

SHOP AIR AND FOAM CORE WINGS

High pressure shop air can cause serious disbonds between skins and foam cores. Be extremely careful using shop air to blow off a wing, winglet, canard, etc. If there is a small hole such as a drilled hole for wiring, antennas, etc. and the high pressure air gets into this hole, it will literally blow the skins off the surface. We have had it happen to us and we have had several reports from homebuilders who have had this problem. Sometimes it can be repaired fairly simply - other times, it can be a really tough repair. The answer is not to get into this situation. The greatest danger would be if it occurred and went undetected. This could lead to a structural failure and a serious accident. See "Warning" in this newsletter for information on "tap" testing for disbonds.

CP73/9

ACCIDENTS AND INCIDENTS

"Dear Mike,

On May 20, while doing touch-and-go's at Clark Co. airport in southern Indiana, my VariEze (N64SJ) was extensively damaged. I had elected to go around because of a slower aircraft ahead (C-150). While traveling along the right side of the active about half throttle in a very shallow climb, just past the take-off end of the runway, I moved the throttle to full power. The engine (0-200) started to respond then tailed off to nothing. I turned back toward the airport but came up about 50 yards short of the intersecting runway. It had rained quite heavily for several days previously and the sod was very soft.

The aircraft rolled several yards before the nose gear failed causing the plane to flip forward landing inverted and traveling another few yards before finally coming to rest, tail first, upside down.

Damage included -- Right wing broken just o/b of the wing attach fitting, left wing broken at mid span, Canard separated from aircraft taking a small part of F-22 bulkhead, the elevator control pushrod did considerable damage to the right side of forward fuselage before it finally broke, the canard has a small tension tear in the top skin at mid span, the main gear has some torsional damage, both winglets were broken near mid span, the taper pin holes in the top sides of both inboard sections of the wing attach fitting were slightly elongated from tension, other damage to canopy and cowling that I won't go into here.

After removing the cowling, the cause of the engine stoppage was obvious. The aeroduct between the carb heat valve and the carb had collapsed. A further check confirmed that both ends of the coiled wire were held tightly under the worm clamps. The wire coil had become completely disorganized and, in fact, parts of it looked somewhat like a Slinky that had been mistreated.

On a subsequent engine run, the engine repeated the in-flight shutdown. After removing the aeroduct, the engine ran normally.

I feel the shoulder harness and seatbelt and rollover structure worked very well as I was uninjured.

I can't say how much I enjoyed and miss my EZ. I would appreciate any advice you might have about possibly rebuilding.

Please pass on my experience with the aeroduct,

Best regards,

James Bierly"

CP76/5

A VariEze crashed on departure from the Kansas City GIG on June 13, 1993. Since there were a lot of EZ builders and flyers on the field at the time, a rather extensive investigation was conducted on the spot, not only by FAA/NTSB personnel, but also by several EAA members, all of whom are very familiar with EZs. Tragically, two people died in this accident.

By all accounts, the airplane was refueled some time prior to take-off. The fuel caps on this particular VariEze were not the plans-recommended Brock-type fuel caps. They were the "Thermos" expanding 'O' ring-type. This type of fuel cap requires regular lubrication of the 'O' rings at 25 hour intervals. If this is not done, the 'O' rings will crush and crack and, even though you may have the locking tab down and "locked", the cap in fact will not be locked!

Shortly after take-off, the engine was heard to surge and loose power. The airplane began a 45 degree bank turn to the left. After completing 90 degree of the left turn, the nose began to drop and the aircraft impacted in a plowed field, 30 degree nose low in a 45 degree left bank.

The investigators located all airframe parts except for the tip of one blade of the prop and the right fuel cap. The next day, parts of the fuel cap and pieces of the wood prop blade were found near the center line of the runway on the airport. This verified the theory postulated by the investigators that a fuel cap had come off and gone into the prop disc, breaking the prop. The resulting heavy vibration probably caused the pilot to pull the power back. For some reason, he elected to try to turn back to the runway. With little or no thrust, a heavy airplane in a steep bank (which causes high inducted drag) simply got too slow to fly and descended to the ground at a high sink rate.

It is too late for the couple in this VariEze but it is not too late for all of us who fly to learn from this tragedy. If you are flying a RAF design and have not complied with the CP advisories recommending you chain your fuel caps to the filler neck - do not fly again until you have corrected this omission. If the fuel cap on this VariEze had a chain to retain it, this accident would not have occurred. Please check your back issues of the CP for more information about chaining the fuel caps to the filler neck. See CP28, pg. 7&9; CP 31, pg. 5; and CP50, pg. 5&7.

Another lesson we should all learn from this accident is the problem of trying to make a 180 degree turn back to the runway while low and slow. A landing straight ahead into the wind (which was 15-20 knots that day) even if near the end of the runway, is much more likely to be survivable than a landing with a 15-20 knot tailwind. Think about it. Assume 100 knots airspeed. With 20 knots of headwind, your ground speed would be 80 knots. Downwind, it would be 120 knots! The kinetic energy in a downwind landing, in this case, is 2.25 times as high as it would be in a upwind landing. This could turn a survivable 15 "G" impact into an unlikely-to-survive 34 "G" impact! This assumes that you have not caused a higher sink rate due to the extra drag in the steep turn!

Please read this accident report and never forget the lessons learned. It is much, much better to land long, into the wind, and roll off the end of a runway at slow speed, even if you have to negotiate obstacles, than to land off field, downwind, at high speed.

CP87

Cozy crash due to aft CG. Donâ€™t shortcut the weight and balance measurement process. Make sure you do it right.

CP89

Engine was torn out of a Varieze when the lower cowl failed and went through the prop.

CP90

Consider getting a halon fire extinguisher. A brake or engine fire can ruin the whole plane.

CP106

Ditching a Long EZ