THE CANARD PUSHER

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If you are building a RAF design, you must have the following newsletters:
VariViggen (1st Edition), newsletters 1 to 57.
Variviggen (2nd Edition), newsletter 18 to 57.
VariEze (1st Edition), newsletters 10 thru 57
VariEze (2nd Edition), newsletters 16 thru 57.
Long-EZ, newsletters 24 through 57.
Solitaire, newsletters 37 through 57.
Defiant, newsletters 41 through 57.

A current subscription for future issues is mandatory for builders -- as this is the only formal means to distribute mandatory changes. Reproduction and redistribution of this newsletter is approved and encouraged.

PLEASE NOTE: BUILDER SUPPORT IS ON TUESDAY AND FRIDAY FROM 8:00 AM TO 5:00 PM ONLY. If you have parts that you would like us to see and/or would like to drop in, please make it Tuesdays and Fridays if you can. If you need to come other than those days, please call so we will be sure to be here. When you call on Tuesdays and Fridays for builder assistance, please give you name and serial number. It is required before you can be put through to Mike. This is a company policy and we must adhere to it.

When writing to RAF, send along a stamped, self addressed envelope if you have builder's questions to be answered. If you are placing an order, it's best to keep it separate from a request for an answer.

OSHKOSH 1988

As most of you know by now, it was the biggest event ever - more people, more planes, etc. Actually, it was a good show and a safe show and there were a lot of planes. Burt's mom, Irene Rutan, counted 3 VariViggens, 8 Defiants(!), 45 VariEzes, 77 Long-EZs and Burt's Catbird plus the Scaled Composites AT^3 (twin turboprop) and 6 or 7 other derivatives of RAF designs. Quite a turn out.

Burt flew the Catbird from Mojave via Norfolk, NE to Oshkosh having to navigate around some early morning thunderstorms in the Las Vegas area. Mike and Sally flew their Long-EZ from Mojave, Loran-direct to Sioux City, IA, had a coke, picked up a little fuel and flew directly to Oshkosh. They left a couple of hours earlier and missed the thunderstorms and had perfect weather all the way. Fitz Fulton (ex-NASA test pilot) flew the Scaled AT^3 from Mojave to Grand Junction, CO, then via Sioux City, IA to Oshkosh. Fitz also put on an excellent flying demonstration on Saturday afternoon with the AT^3, demonstrating the astonishing short field capability of the prototype twin turboprop transport.

The weather was good at Oshkosh from Friday through Tuesday when Burt, Mike and Fitz had to fly back. Except for headwinds, the enroute weather was good all the way. Mike and Sally spent one day at Durango, CO where they took the little steam train ride up the mountains to Silverton and back, a really neat trip, before returning to Mojave.

All of our aircraft performed well with no maintenance required, except for the Catbird which had a minor prop strike at Oshkosh which Burt repaired with a hacksaw and a file.

OUTSTANDING WORKMANSHIP AWARDS AT OSHKOSH 1988

Congratulations to Arnie Ash of Davenport, IA, Long-EZ, N69AA, and to Ron Schroeder of Torrence, CA, Long-EZ, N29RS. Both Long-EZ builders were recognized for their building skills at Oshkosh this year.

A LONG-EZ FLIES INTO RUSSIA!

We have had reports of Long-EZ's that flew around the world; that flew from San Diego to Ireland and back; that flew from California to South America to Alaska; to the Bahamas, etc., etc., but we have never heard of any flying into Russia until now. Gert Martinsson of Uplands, Sweden flew his Long-EZ, SE-XFM, from Sweden to Leningrad, USSR and back in July, 1988 to visit friends. He says it took him about six months to overcome all the paperwork and bureaucracy, but finally he received a permit and successfully completed what he believes is the first flight of a Long-EZ into Russia. Gert has 400 hours on his EZ now and enjoys it very much.

CANARD PUSHER DIGEST FOR THE LONG-EZ

Stet and Kim Elliott of Governors Island, NY have come up with the ultimate tool to help Long-EZ builders find pertinent information in the CP newsletters. Using a computer, they have created what they call the "Canard Pusher Digest". They have taken the complete text of all CP articles that pertain to building, inspecting and safely flying the Long-EZ and rearranged them in plans chapter order. If a particular CP article affected more than one plans chapter, then the complete text of that article was duplicated for each chapter affected. The resulting document (over 500 pages long!) has been professionally printed on doubled sided paper using a computer laser printer. The Digest, which includes information from CP24 throught CP56, is organized into 41 chapters. Chapters 1-26 of the Digest correspond directly to the 26 chapters of the basic Long-EZ plans. Chapter 27-41 are "Supplemental Chapters" to group CP information pertaining to

Changes to the back cover of the plans
The Appendix Drawings,
Long-EZ Section VI, Landing Brake Plans,
Section 11L, Lycoming 0-235 Engine Installation,
Optional Special Performance Canard Plans,
Optional High Performance Rudders,
Long-EZ Owner's Manual.
Weight Control
Builder Support
Builder Modifications
Long-EZ General
Maintenance and Inspections
Accidents/Incidents
Liability and Insurance
Additional Reading.

Each chapter of the Digest is further broken down by sections that correspond to particular areas of interest. The first section in each chapter gives plans changes that affect that chapter. The Digest includes a master table of contents, as well as a separate chapter table of contents at the beginning of each major chapter. The Digest is extremely comprehensive, as evidenced by the chapter on Lycoming 0-235 installation, which alone is 72 pages long and includes 20 separate sections!

Stet originally envisioned the Digest to include every article in the CP's. Once it was completed, however, Stet says it was over 700 pages long! To save printing and shipping costs, the Digest has been pared down by omitting articles that don't specifically pertain to building, inspecting or safely flying the Long-EZ. The following types of information have been omitted:

Advertisements for "one each" items that individuals (not suppliers) offered for sale. One exception is 0-235 engines offered for sale. Stet felt that this information, while obviously dated, would still be of sufficient interest to builders who might want to review the price history of the 0-235.

Articles and Plans Changes pertaining to designs other than the Long-EZ and that have no relevance to building, inspection or flying the Long-EZ. However, all of these articles were examined to see if they contained any information that could be of use to Long-EZ builders. Any articles that were found to have merit were included in the Digest.

Articles pertaining to social gatherings (i.e. flyins), and that have no relevance to building, inspecting or safely flying the Long-EZ.

Since drawings, sketches, graphs and some tabular information could not be readily duplicated in text form, they were also omitted. A notation in the Digest, such as "SKETCH OMITTED" will key the user to look in the CP's to see the relevant drawing, sketch, etc.

Obviously, photographs have been omitted from the Digest. Photo captions, however, have been included for all relevant photos. The notation "Photo Caption" appears in the annotated heading for each photo caption to key the user to look in the CPs to see the relevant photo.

The Digest would be of enormous benefit to those who are still building the Longs. There have been cases where builders have missed important information in the CPs, and have built portions of their aircraft incorrectly. We also continue to receive builder questions about subjects that have already been covered in the CPs. Use of the Digest could solve most of these problems once and for all.

Those of you who have already completed construction of your Long-EZ's could also benefit from the Digest, especially from those chapters dealing with the Owner's Manual, Maintenance and Inspections, Accidents/Incidents, Liability and Insurance, etc. The Maintenance and Inspections chapter is an excellent reference source (along with the Owner's Manual) for compiling a Maintenance and Inspection program for newly completed Long-EZs.

The Digest is truly a magnificent piece of work. Stet and Kim have put an awful lot of effort into this excellent product and it is well worth your consideration, especially the next time you can't find what you are looking for in the newsletters!

Cost of the Digest is $45.50, plus $4.00 shipping. New York state residents add 8-1/4% sales tax.

Stet is also considering providing quarterly updates to the Digest which would be mailed to subscribers within a few weeks after each CP is published. The update material would be compiled such that it could be inserted at the back of each Digest chapter. When you place your order for the Digest, please indicate whether you might be interested in updates as well. If there is sufficient interest, Stet may make updates available. Please contact:

Stet and Kim Elliott
Bldg. 12-1-2
Governors Island, NY 10004
212-825-0011 (after 5:00pm)

SOME REFLECTIONS ON 3 MONTHS OF THE EZ LIFE

On the sixth of July of this year, my Long-EZ N316DB flew. Thus ended some 7 years of anticipation, occasionally very intensely focused work, and an inordinate outlay of cash. And thus began a probable lifetime of very enjoyable flying, occasionally very intensely focused work, and monumental expenditures.

The pressure was on. I had to complete my 40 hours of test flying (all within a 25-nm circle with an airplane of range about 50 times that) within 15 days in order to make my departure deadline for The Big Trip.

The Big Trip was what had kept me motivated for the previous seven months or so. Back in December of 1987, Sid Stiber (Shelter Island, NY) and Mike and Sally Melvill and I had discussed a tour of the east coast after Oshkosh '88. I had never been to New England, or many of the areas we planned to tour, and so it was the perfect motivation. Plans were set.

And so the Runabout (as I call my Long) and I departed Mojave on 22 July bound for Kansas City. I left early for Oshkosh in order to attend my 10th high school reunion. I climbed directly to 17500 ft and averaged about 165 ktas into (of course) about 15 kt of headwind. As I crossed Colorado, it became apparent that I was going to have to slow down in order to make the trip nonstop. By the time Great Bend, Kansas arrived, I ran the left tank dry, and had about 6 in the right. Playing the fuel flow against the time-to-go (thank you, Alcor and Northstar), I was able to arrive at Johnson County Industrial airport with about 20 min fuel left (2 gal). Total flight time was

7 hours, 50 minutes. The distance was 1180 nm, and I used 50 gallons of fuel. I was, to say the least, extremely pleased. This was the first time that the Runabout had been away from its test area, and it had gone more than halfway across the country nonstop! I was amazed to find that I was not particularly fatigued, and I felt that after a pit stop I could have gone for several more hours.

After several more days of flying around the Kansas City area, I continued to Oshkosh. There the final details of our trip east were cemented. Mike & Sally decided that they would not be able to go after all, so Bruce and Bonnie Tifft, Sid, Dick Kreidel, and I left Wittman Field on Tuesday, 2 August for Montreal (aka the Great White North). Four-and-a-half hours later, the flight of four made a tower-requested low approach at the international airport in Montreal, and landed at St. Hubert's. Kay Kreidel joined us that evening (via airlines) in Montreal. I must say, the people that we met in Montreal went out of their way to make our visit enjoyable. It was, however, still over 450 degrees Fahrenheit outside. Sadly, this was our last experience with air conditioning for two more weeks.

After a quick trip to Burlington, VT to clear customs, we proceeded to Rockland (Owl's Head), Maine. Dick Kreidel hadn't eaten (whole) lobster before, and videotapes of the spectacle are available from Squadron 1. On to Wiscasset (Bath), ME, then to Boston (or is it Bastun?), then the Runabout and I made a ceremonial pilgrimage to Martha's Vineyard and Nantucket islands. The group rejoined at East Hampton airport, where Sid bases his Long. The next day we were joined by Peter Magnuson and his USAF Thunderbird Fighting Falcon Long-EZ. Peter and Dick and I enjoyed flying formation and 1v1v1 combat maneuvers over the coast of Long Island. Then a trip to Mattituck, to visit where Dick's engine was assembled. The next day, it was on to Linden, NJ (New York City) via Central Park, the Hudson River, and the Statue of Liberty (at 500' agl, no less!). Several days were then spent being poached in and around Central Park.

Well, so far so good. The return to Kansas City went well (nonstop from Linden to Columbia, MO). It looked like a trivial trip back to Mojave. And then...

Dick and I were descending together into Farmington, NM (our planned fuel stop) when, as if by magic, the Runabout was no longer hitting on all four. We informed the tower of my problem and were cleared to land. We were about six miles out, I guess, and about 4000 ft agl. The engine was still making power (some), but the CHT on the #4 cylinder was way lower than the rest. Nothing in the usual litany of procedures produced any good results, so I pressed on to a high overhead approach to the west. Still high, a lot of slipping, but the airspeed was high on final (about 90 kt). Better to be high than low, but this is silly. The engine won't idle below 1500 rpm or so (on the idle stop). Touch down, no problem, some crosswind but don't notice it, roll out, plenty of brake. Made it. Taxi back, park, shutdown.

Wow, bad day. I got out and went back to look at the engine area. No oil, but the prop is really beat up. Wow. Now what? Must have broken a valve, and the pieces went out the exhaust pipe and through the propeller.

But the worst came next. I looked down at the right main gear and imagine my surprise to find the wheel and wheel pant sitting about 90 degrees from where they should be. Much worse news than the engine problem!

So the trip ended with the airplane in a hangar at Farmington, and me riding home in the back of Dick's Long-EZ.

THE FIX

I was all set to get a trailer and take the Runabout apart and haul it home. I envisioned having to take the engine off, flip it over, and put a new strut in. Also, who knew what kind of engine work lay ahead?

Fortunately, I know more rational people. Dick Rutan, who had once trailered his Long home, said that no matter how much work he had to do away from home, he would never trailer his again. Burt said the same thing. Mike was convinced it could be fixed there. So it was.

Mike and I flew to Farmington in his long-EZ the next weekend with three critical parts. First, a replacement propeller. Second, a new cylinder and all its attendant parts. And the really important one,The Splint.

Mike had made The Splint from some 1/4 inch 4130 steel strap, sort of roughly formed over his right main gear strut. The plan was to remove the axle, bend the strut back straight-ish, and install The splint to sandwich both sides of the gear strut. The axle then would be mounted outboard of the steel piece with longer bolts.

It worked. We had thought ahead and brought two industrial-strength heat guns, and these were mandatory in order to reheat the gear strut to bend it straight, for although the fibers were failed locally, the resin had rehardened to a startling degree.

I should digress and describe the failure more thoroughly. Apparently, I had used more braking than I thought during the landing (due to both landing fast and the high idle speed). Also, the other tire was low, which required more right brake. And I had the shimmy damper adjusted too tight, requiring even more brake. Finally, since the Runabout is a bit on the hefty side, I have the big brakes. More heat. The failure was in an arc, the same size and shape as the brake disc, and the mode of failure was resin burnout from direct heating of the brake disc.

The Splint worked admirably. The cylinder change went without difficulty (the piston hadn't broken, and there was no metal in the screens). In fact, the entire time on-site was less than 24 hours. The next afternoon, the Runabout completed her trip east, a cross-country of well over 6000 nm. She had 89.5 hours on the Hobbs (in less than 60 days).

After returning to Mojave, we repaired the gear strut. A particle board fixture was made for the inboard side of the gear strut, and bondoed in place. A body grinder was used to grind away about 2/3 of the S-glass strut at the bottom, tapering to nothing about 12 inches up the strut. Some dry S-glass roving (see your neighborhood Defiant builder) was wet out on a piece of visqueen and then put in place and mummy-wrapped with peel ply to hold it. The next day, the axle holes and brake cutout were transferred from the inside of the strut to the outside. Then, the inside of the strut was ground away, and more S-glass was put in place, essentially replacing the lower part of the gear strut with new material. The next day, the per- plans torsional wraps were put on, the brake line and relief tube bonded back into place, some bodywork, and Presto! a 3-day gear repair.

The next magical trick was to install a 1/8 thick aluminum plate between the axle and gear strut. This fan-shaped plate extends upward to just above the brake disc, and is intended to protect the strut from the direct radiant heat of the brake disc. The usual Fiberfrax and aluminum tape were reinstalled. The aluminum plate may seem like overkill, but I don't ever want that to happen again.

The prop was sent back to Great American for repair...$120 later, it was fixed.

Anything else? Oh yes, I replaced the other three exhaust valves with new Superior model 17540 units. I had so many people tell me how dumb I was not to put NEW exhaust valves in my engine instead of the unknown-history USED valves I ended up using, that you might think I'd have listened. But no. Instead of spending the several hundred dollars up front, I spent them later, plus about 700 more for a new cylinder, a couple of hundred for hangar rent away from home, a hundred more for the prop, and a lot of anxiety dollars for the landing duress and gear malady. But the lessons you learn, huh?
Doug Shane.

SHOPPING

NOSE MOUNTED BRAKE CYLINDERS

A few years ago, Long-EZ builder/flyer, Debbie Iwatate put together a neat little booklet containing plans for some of the neatest ideas she had incorporated into her own Long-EZ such as forward mounted brake master cylinders, a real slick roll trim modification, etc. Well, Debbie still has this

booklet available at the same price, $20.00, but she has moved. Please contact Debbie at:

804 Cottonwood Loop
Richland, WA 99352
509-943-9579

AIRCRAFT MARKINGS

Custom made "N" numbers, "experimental" signs and virtually any other application, such as fuel grades, capacities, "no step", or "no push" markings.
Aerographics in Denver Colorado make the best we have ever seen. They do lettering and numbers in 50 different styles and sizes from 1/4" to 24" tall in every color imaginable. Their letters can be slanted, made in script or even reversed for inside a window application. These stick-on letters and numbers are cut from very thin vinyl material, correctly spaced on a paper facing with a sticky back. Unroll them, pull the backing off, stick 'em down and pull off the facing paper - Voila! Perfect "N" numbers. The stick-on letters are guaranteed for 7 years! If you prefer to paint your own, they also sell the masks which stick better than any we have tried.

For those who have seen Burt's Catbird, the "N" numbers and "experimental" sign were obtained from Aerographics who will ship 2nd day air if you call their toll free number: 1-800-336-9633.

SHIMMY DAMPER

Any VariEze or Long-EZ still flying with the original shimmy damper is running a serious risk of nosewheel shimmy and possible loss of the nosewheel and fork. Contrary to popular belief, it is not a hard landing that will break the nosewheel fork. It is shimmy! Control the shimmy and the problem is eliminated. Bob Davenport has designed, and offers for sale, the best solution to this problem we have seen. Contact: Bob Davenport

PO Box 650581
Vero Beach, FL 32965-0581
305-567-1844

HINGE PIN KITS

Gary Hall's teflon hinge pin kits are suitable for all RAF designs. The kit consists of stainless steel hinge pin material together with a pure teflon tubing sized correctly to fit over the hinge pin and inside the aluminum hinge knuckle. This virtually eliminates hinge wear, particularly on the aileron hinges which take quite a beating from engine/prop associated vibration. Contact:

Gary Hall
4784 NW 43rd St.
Lauderdale Lakes, FL 33319
305-484-4949

RAF RECOMMENDED SUPPLIERS

Aircraft Spruce	Wicks Aircraft
PO Box 424	410 Pine Street
Fullerton, CA 92632	Highland, IL 62249
714-870-7551	618-654-7447
FeatherLite	Brock Mfg.
PO Box 781	11852 Western Ave.
Boonville, CA 95415	Stanton, CA 90680
707-895-2718	714-898-4366

The above suppliers are still the only authorized RAF dealers for all your various aircraft materials and components.

FOR SALE

Brand new 12v Quartz heater, ELT, strobe and Variac hot wire power supply. Contact:

Steve Franseen
10196 W. Keene Ave.
Denver, CO 80235
303-534-8181

For health reasons, we will not be able to complete our EZ. We have some parts we would like to sell: Continental 0-200 Engine, NavCom with intercom, etc. Contact:

D. & K. Lambert
11215 161st Ct. NE
Redmond, WA 98052
206-882-2852

Rodie Rodewald would like to sell his homebuilt long range Long-EZ (rear cockpit) fuel tanks (25 + 57 gallons additional fuel). $100.00 for both.
He also has a 100 gallon long range tank for his Defiant which he does not need now that he lives on the mainland. Fits in the rear seat

area and essentially doubles the range of the Defiant. He used it to ferry his Defiant from Hawaii to California. $100.00. Contact:

Rodie Rodewald
10681 Minnesota Ave.
Pengrove, CA 94951
707-664-0252

Cleveland 500x5 wheels and brakes with McCreary tires and tubes - never used - $200.00. Extra pair of brake calipers for above wheels - $50.00.
Wanted, new or used - Apollo 706 com., pair of David Clark H-10-30 or H-10-40, or equivalent, headsets, Whelen strobe set per RAF specs. Contact:

Avrel Mason
Rt 1 Box 184-G
Draper, VA 24324
703-980-1891

PLANS CHANGES

We at RAF, of course, cannot enforce a mandatory change as FAA can on a type-certified aircraft. The regulations allowing amateur-built experimental aircraft recognize that the homebuilder is the aircraft manufacturer and that the aircraft does not need to conform to certification requirements. This allows experimentation by the homebuilder giving him the freedom to develop new ideas. FAA achieves their goal of providing adequate public safety by restricting the homebuilder to unpopulated areas and to solo flight until his aircraft is proven safe.

It is the homebuilder's responsibility to maintain, inspect and modify his aircraft as he desires. However, we at RAF feel that part of our job is to provide information to the homebuilder in the form of recommendations that, in our opinion, are required for him to achieve a satisfactory level of flight safety.

Category	Definition
MAN-GRD	Mandatory - ground the aircraft. Do not fly until the change has been accomplished.
MAN-XXHR	Mandatory - accomplish the change at next convenient maintenance interval or within XX flight hours, whichever comes first.
DES	Desired - strongly recommended but not requiring grounding of the aircraft.
OPT	Optional - does not affect flight safety.

Please submit any significant plans changes that you may come across as you go through the building process.

Since RAF is no longer active in the development of homebuilts, we are not likely to discover many new errors or omissions in the plans. For this reason, we need help from you.

PLANS CHANGES

LONG-EZ, DEFIANT--remove, inspect & if necessary, replace the Facet fuel boost pump per page 11 in this newsletter.
VARIEZE, LONG-EZ,VARIVIGGEN SOLITAIRE, DEFIANT - ALL AIRCRAFT. Insert the following plans change.

MAN GRD; Photocopy, clip out, or otherwise clone the placard below and install one each in your appropriate owner's manuals and easily viewed location in each cockpit, visible to each pilot and passenger seat. Also, assure that the other placards in the owners manual (Pg. 22-VariEze; Pg.24-Long-EZ; Pg. 24 Defiant and Pg. 14-Solitaire) are installed.

As we have discussed previously in the Canard Pusher and as has been reported by Aviation Consumer magazine, the experimental homebuilt airplanes have an accident record that is worse than that experienced with certificated, factory-built aircraft. This is due to a number of factors. There are more chances for non-conformality to occur, thus each airplane built is actually a new, experimental, research, high-risk

article. This new research aircraft is often tested by pilots who have very little time in type and who often do not follow careful flight safety procedures in their testing. Also, because these aircraft are more fun to fly and have higher performance, many accidents are the result of improper aerobatics or other high-risk flying. For example, as we reported in CP47, seven of the eleven Long-EZ accidents occurred during low altitude buzzing or aerobatic maneuvers. Because many individuals, including those who may purchase one of these aircraft or may ride in one as a passenger may not be aware of the risks involved, we are including a plans change in this newsletter requiring placarding the aircraft and the owner's manual.

WARNING !

STATISTICS INDICATE THAT AMATEUR BUILT AIRCRAFT ARE MORE LIKELY TO HAVE AN ACCIDENT, INCLUDING A FATAL ACCIDENT, THAN FAA CERTIFICATED, MANUFACTURED TYPES. WHILE STRICT ADHERENCE TO APPROVED MAINTENANCE & OPERATING PROCEDURES CAN REDUCE THIS RISK, THE HAZARDS ARE SIGNIFICANT, PARTICULARY DURING INITIAL FLIGHT TESTING OR WHEN OPERATED IN A NON CONSERVATIVE MANNER.

MAN GRD: Conduct an inspection or provide a certification that the elevator quality regarding correctness of laminate schedule, orientation of plies, numbers of plies and workmanship relative to the weight of the lay-up and straightness of the primary surface is correct. This should include inspection or verification that additional filler materials have not been added to increase the elevators weight and thus change its natural frequency of oscillation. If you have purchased structure from someone else and cannot otherwise verify the structural quality and conformance, conduct a dissection of the elevator skins to assure the proper structure, or better yet, discard the elevator and build new ones that you know are in conformance with the tested and approved configuration. Any variance in weight, stiffness, or shape should be suspected of being dangerous and not allowing you to rely on the testing that was conducted to verify freedom of flutter. The weight limits shown are absolute maximums. A properly fabricated, accurate core with a properly squeeged minimum-resin laminate will result in weights well below the limits shown in CP 21 pg 5. In order to provide more margin for variables in this extremely important area, we are now recommending that any elevators that require additional mass balancing beyond those weights shown for the basic configuration be discarded and new elevators fabricated. If you are unable to build elevators that can be balanced by the basic balance weights, both inboard and outboard, you are possibly unable to produce adequately safe flying components. Do not compromise by using up your margin of safty by merely increasing balance weight. This increases the weight of the elevator and lowers the frequency of its oscillation. Above all, be certain that your elevators meet the balance hanging angle of 12 to 20 degrees after painting. If there's any doubt that they are absolutely perfect, discard them and start over. It is possible, with proper tube orientation, to retain the aluminum tubing when building new elevators.

VARIVIGGEN

Install this placard summary in the VariViggen cockpit and owner's manual.

COCKPIT PLACARDS

Solo - Front seat only
Minimum pilot weight - xxxlbs.
Maximum pilot weight - xxx lbs.
Maximum gear extension speed - 90 mph
Maximum speed with gear down - 120 mph
No aerobatic maneuvers are approved
Intentional spins are prohibited
Maximum wind for taxi - 40 kts. (all quarters)
Maximum crosswind component:
for take-off - 15 kts.
for landing - 20 kts.

Fuel tanks(s) - xxx octane rating, xxx capacity (near fuel cap)
Red line speed - 185 mph
Maneuvering speed - 125 mph
Maximum gross weight - 1700 lbs (150hp), 1860 lbs. (180hp)
Center of gravity limits - forward - 119.0, aft - 126.0.

ACCIDENTS AND INCIDENTS

A TEXAS HOMEBUILDER took eight years to complete his VariEze. His total experience consisted of about 150 hours in Cessna 150's and 172's. He had not flown solo for some time. He called RAF and explained what had happened. He successfully made his first flight, although it was very short and he had a lot of trouble with pitch control. On the second flight, during the take-off and climb, he again had difficulty with overcontrolling in pitch. At higher speeds, it flew great, but when he slowed down to land, he got into a PIO (pilot induces porpoising), got slow while trying to get it under control, the EZ pitched up then pitched down, crashing hard on the runway. The nose gear and left main gear were torn off; the prop and lower winglets were broken.

By his own admission, this pilot said he was anxious to fly. , but he overstepped his ability and his experience. He says, "Don't lie to yourself, don't fool yourself. If you are not ready, get someone else to fly it and check you out, or get the necessary training".

We appreciate this pilot's honesty and his guts in calling us with this accident report. Don't kid yourself into believing you can do it if you know in your heart that you are not ready - profit by this pilot's experience - it cost him his airplane and eight years of hard work. Don't let it happen to you.

A CENTRAL CALIFORNIA VARIEZE experienced in-flight severe flutter of the elevator and canard which caused a structural failure of the canard, and the pilot was killed when his VariEze crashed on a wooded hillside. He had about eight hours in his VariEze before the crash.

He had not built the airplane but had purchased it with all of the structure done. He then completed the finishing and systems installation. The elevators were carefully checked for correct balance and some weight was added inboard on each elevator to bring the elevators into the proper balance tolerance.

Prior to the fatal flight, the pilot had removed the canard to check something in the nose. Previously, a friend had helped him to install the canard and noted that he had had great difficulty in getting the canard attach bolts to line up and thread into the nutplates.

A very careful post crash investigation by the FAA, as well as by RAF, determined that the probable cause of the catastrophic flutter was that one of the canard attach bolts was not correctly installed. Either it was not torqued up at all, or it was cross threaded. In any case, it did not clamp the aluminum lift tab to the F-22 bulkhead. This resulted in the natural frequency of the canard being lowered considerably since it was only firmly attached on one side. A gust, or something, excited the elevators driving the canard into a divergent destructive flutter mode.

Although the elevators were balanced, they were very heavy, having been modified from the original short chord design to the long chord by the addition of a large, heavy piece of balsa wood and several plies of BID. This caused the elevators to have a lower natural frequency of oscillation. Thus, these overweight elevators may have contributed to this accident, however, the primary cause was the failure of the pilot to properly install the canard.

This tragic accident brings it home to all of us, just how careful we must be as we work on our aircraft. When you are doing a critical job such as as installing a wing or a canard or a control surface, you, and only you, are responsible to ensure that all fasteners are correctly installed and properly torqued. Too often we get sidetracked while working on a critical installation when we get interrupted by a friend or passerby. Should this happen to you, do not stop until you have the critical

part installed and safetied - even if you have to be rude to your visitor.

Accidents such as this have been caused by an interruption or disruption of your thoughts while working on an important aspect of the aircraft. A simple example is changing the oil. The oil is drained, the drain plug replaced, then a visitor shows up with a bunch of questions - you forget to fill the sump with fresh oil and - presto - a destroyed engine when you start it. It happens so easily, it seems so unlikely, but it happens. Be conscientious, use checklists, be very particular and careful if you have removed a canard or wing or canopy, etc. Be absolutely certain you have adequately completed any task you do on your airplane. Last of all, be very conscientious about doing a thorough preflight on your creation before you commit your, and perhaps a member of your family's or a friend's, life to your workmanship.

As you know from past Canard Pusher newsletters, the subject of flutter has been a major concern for years. CP numbers 17,18,19 and 21 have reported discussions and/or warnings relative to the importance of conformality in the fabrication of the canard and elevator system. **It is extremely important to be aware that elevators improperly fabricated, too heavy or with the incorrect bending or tortional stiffness characteristics which result from improper materials, or fiber orientation, cannot be balanced with any method.**

A mass balance called out for the elevator and the specification for balancing them, applies only to an elevator fabricated with the same weight and stiffness as that which has successfully passed all the flutter testing. It is extremely important, and life-critical, that the manufacturer or owner of each VariEze, Long-EZ or any plane for that matter, assure, without a doubt, that the control surfaces are conformal to those which have passed flight tests and been shown to be flutter free.

The advisory shown in the plans change section must be followed to assure that there are no non-conformal elevators that could contribute to, or result in, an accident. Do not take this situation lightly. As we have indicated before in the CP, - IT COULD KILL YOU.!

MAIN GEAR LEG OVERHEATING

Suddenly, we are receiving a number of reports of softening main gear problems. This subject has been covered before, but there is now a new factor so it bears mentioning again.

The new factor is, of course, the very popular "big" brakes, particularly for the Long-EZ. We believe the big brakes are aggravating this problem and we feel that it may be appropriate to install an aluminum heat shield between the brake disc and the main gear strut. We have done this quite easily by cutting a piece of 1/8" thick 2024-T3 aluminum that fits between the axle flange and the strut, and is clamped in place when the four AN-4 bolts holding the axles on are tightened. The 1/8" thick plate will probably require the use of one size longer AN-4 bolts. This heat shield should be tall enough to protect the strut to about one inch above the brake disc, and should be wide enough to prevent the heat radiating out of the disc to "see" any of the main gear strut. (see Doug Shane's article: EZ LIFE.)

Several Long-EZ's are flying now with these heat shields with no further problems reported. Don't let it happen to you. Never do taxi tests, low speed or high speed, with wheel pants installed. Be aware that your brake discs can, and will, get red hot. This heat can radiate directly into the "S" glass and epoxy strut. Once the epoxy in the strut reaches its heat distortion point, the strut will fold up, an extremely frustrating experience at best, requiring extensive repair or replacement of the strut. If this happens away from home, it can be even more frustrating. Take care of your main gear strut and it will take care of you with years of trouble-free service.

1) Wrap the strut with fiberfrax covered with Reynolds wrap or aluminum tape. Use RTV silicone to glue the fiberfrax to the strut.
2) Install the 1/8" aluminum plate heat shields.
3) Cut vent holes in the TOP of your wheel pants to vent the hot air inside, after a panic stop.

4) Plan your taxiing and landings so as to use minimum braking - better to roll to the end using little or no braking, than to brake violently in order to make the first turn off.

LONG-EZ, DEFIANT, **ELECTRIC BOOST** FUEL PUMP ALERT.

Returning to his home base airport after a flight, a Southern California Long-EZ pilot was approaching the 45 degree entry to downwind when, abruptly, his engine quit. He was unsuccessful in getting it restarted but, to his credit, he flew the airplane, announced his situation and made an uneventful, successful landing. Feeling a little weak around the knees, he pushed his airplane into his hangar and went home.

The next day, he conducted a careful examination of the aircraft and discovered that the Facet solid-state fuel pump was completely blocked and would not allow any fuel to pass through to the engine driven mechanical pump! One of the two valves in the pump had deteriorated in the 100LL fuel and had worked its way out of the metal cage that normally prevents this, and had been sucked into a position that prevented the flow of fuel. The part number on the mounting flange of this pump was 480615. The plunger valve was made of VITON- this pump is no longer being manufactured.

Before next flight, check the part number of your pump. If you have one of the following part numbers 40023, 480615, 480616, remove the pump and replace it.

The most desirable Facet solid-state pumps that we recommend are part #40108 for 12 volts and part # 40154 or 480610 for 24 volts. Both pump fuel at a regulated maximum 6 psi, and the valves in these pumps are **pure nylon** which, other than swelling very slightly in avgas, are not affected nor do they deteriorate. The design of these valves (the foot valve and the plunger valve) are such that they cannot physically get into a position where they can prevent fuel from flowing through the boost pump. Both of the above pumps have AN-style, 37^0 flare fittings which fit 3/8" tube, AN 818-6. nuts,

Facet manufactures over one hundred variations of the small square solid-state fuel pumps. The above two pumps have AN-type flare fittings machined right on the pump bodies and we prefer this type because they are easy to install (no elbows or nipples required), but also because these two models have only nylon valves, no rubber, Buna, or Viton. Many of FACET's other models have Viton plunger valves or Buna N check valves and these will deteriorate in avgas.These are specifically for use in some other liquid known not to affect these materials.

To check your pump, remove it and look into the inlet and the outlet using a small flashlight and verify that the inlet valve (foot valve) is a round, white dome or ball (nylon), not a flat, black rubber disc. Verify that in the outlet there is a white nylon valve under a steel pin which crosses the port and retains this valve. If this valve is dark gray or black (Viton), remove the pump before next flight and discard it. If you have to a pump with female pipe threads (to accept elbows or nipples) due to your firewall layout, choose one with 3/8 NPT female threads rather than the 1/8NPT female threads, but examine it closely to be sure it has while nylon valves in the inlet and the outlet ports. Discard it if there is any black or gray Viton, Buna N or rubber valves.

If you have had your Facet fuel pump more than a year or so, you probably have one that could go bad. AT a cost of approximately $30.00, it is not worth the risk. Remove it, discard it and install a new one as called out. We believe that the serious consequences that could result from a fuel supply stoppage, more than justifies the immediate replacement of any suspect pump.

We have replaced the boost pumps on Burt's Defiant and on Mike and Sally's Long-EZ and **we recommend in the strongest possible terms that you do the same.**

AEROQUIP GENERAL AVIATION ALERT NOTICE.

RECALL ON AEROQUIP 601 HOSE.

This week, we received a notice in the mail with the above title. If you look back through past issues of the CP, you will find that we have been reporting incidents with Aeroquip 601 hoses since 1986 (see CP49, and CP52).

We have had these hoses spring a leak in the middle of the hose (not at a fitting), and we recommended Stratoflex hoses instead. We use nothing but Stratoflex hoses on all of our aircraft here at RAF and that is still our recommendation.

This notice says, essentially, that if you made up the hoses yourself, as we have often done, and you obtained the hose from between April 1984 and May 1988, remove it from service and replace it. If you had these hoses made up professionally, they should have a metal identification band. On this band will be an assembly date and cure date shown as follows:
A2Q87 -assembly date, 2nd quarter, 1987
1Q87 - cure date, 1st quarter, 1987.

If you have such a set of numbers you can identify, remove the hoses if the cure date is between the first quarter of 1984 and the third quarter of 1987. Contact an authorized Aeroquip hose shop and they will supply you with new hoses. You will be billed for these until the authorized distributor receives your removed, suspect hoses, then you will be credited in full.

This note is more than a mandatory AD. A leaking hose could easily cause a fire which could have tragic results. Check your hoses and don't fly until you have replaced them.

PAINT 'EM WHITE

We are alarmed by the trend to paint composite aircraft dark colors. An orange or dark blue or dark red surface, can easily reach a temperature of 190 degrees on a warm sunny day with no wind. We saw at Oshkosh 1988, a deep orange Velocity and a dark red Lancair, parked, unprotected in the hot sun. We would not have flown in either of these aircraft for any reason.. All RAF airplanes use room temperature cured epoxy in their construction and these room temperature epoxies have a heat distortion point of only about 150° to 160° F. All of the composite aircraft that we are aware of in the USA, at least, also are put together using room temperature curing epoxies or vinyl esters. Don't be lulled into a sense of false security by the examples of those who must not have considered the possible consequences of their actions. Paint you airplanes white.

MAGNETO WIRING CHECK PRIOR TO SHUT DOWN.

The other day, Burt came in from a flight in his Defiant and reported a broken wire on the right rear magneto. He discovered this condition because, as has always been his habit, he conducted a magneto wiring check just before he shut the engine down.

How many of us do this with any regularity? How many do it at all? If you have never done this check, you may possibly have a "hot" magneto, even though you have both mag switches turned off. This is a potentially dangerous situation. Anyone who moves the prop may suffer a prop strike. Many people during the history of aviation have been seriously hurt, even killed, by a "hot" magneto.

The procedure to check if both of your magnetos are correctly grounded, is as follows: Just before you pull the mixture to shut down your engine after a flight (be sure the avonics master switch is off), momentarily flip both mag switches off and then back on. This only needs to take a second or so. The engine should instantly quit. If it continues to run, you have one or both magnetos "hot" or not grounded. Remember, a magneto is always hot unless it is connected to ground. Your mag switches should connect each magneto to ground when they are in the off position. Check the wiring at the magnetos or between the firewall and the magnetos. This is the most likely place for the wiring to fail due to the movement of the engine during start-up and shut down. Be sure to have adequate strain relief for the wires, and don't have the wires from the firewall to the engine too tight - you need adequate length to allow for the considerable movement of the engine relative to the airframe.

Try to develop the habit of conducting this test each time you shut down; power to idle, avionics off, both mags off for a second, engine should abruptly quit, mags back on, engine should catch and run, then mixture to idle cut off as normal. Knowing, for a fact that your magnetos are indeed grounded and that anyone, including yourself, is not likely to get surprised by the engine suddenly firing when the prop is moved is very comforting.

STICKING FUEL VALVES (AGAIN)

On at least three occasions, we have brought up this subject in past CP's. We continue to hear from EZ builders and flyers that they are still experiencing occasional problems. Thanks to Long-EZ builder/flyer, Jim Evans of Yorktown, VA, we have what we believe to be an excellent alternative to the present brass valve with the tapered brass cone that sometimes sticks!

Jim tells us he has over 80 hours on his new Long-EZ and has used a "Whitey" valve which has a stainless steel body, stainless steel ball and stem and uses pure teflon seals. Stainless and teflon are not affected by fuel and these valves are easily available - and they turn smoothly! We obtained one of these valves and Mike has installed it on his Long-EZ and is extremely pleased with it.

The valve body is machined from solid 316 stainless steel bar stock, as is the one piece ball/stem. The ball, itself, (not a cone) is encapsulated between teflon seals which can be adjusted without removing or disconnecting the valve.

There are several sizes and fitting styles available. The Swagelok fittings look good but are not what we are used to in "aircraft style" fittings. The valve we are recommending for all VariEzes, Long-EZ's and Defiants, is Whitey's catalog number SS-44xF4. This valve has an orifice through the stainless ball .281" in diameter, has female 1/4" NTP pipe threads in the inlet and left and right outlets. These will accept the AN 822-6D 90^{0} elbows. The one piece stainless ball/stem eliminates any backlash and the black plastic handle has positive stops for left and right positions. The "off" position is in the center and does not have a positive stop. The handle points left for the left tank and right for the right tank. We checked the flow rate through this valve, using gravity and a 6" fuel head (simulating the worst case, low fuel in a gravity feed VariEze). We measured almost 30 gallons per hour, more than adequate for any VariEze and, of course, for the pumped systems on Long-EZ's and Defiants - probably an "over kill" -however, keep in mind that there have been two incidents that we know of where the pilot had a forced landing due to a stuck valve.

These valves can be obtained from your local Whitey distributor. We obtained ours from Bakersfield Valve and Fitting Co. in Bakersfield, CA. Contact Whitey Co., 318 Bishop Rd., Highland Heights, OH, 44143, for the name of your nearest distributor. Phone-

ELECTRICAL WIRING AND ASSOCIATED PROBLEMS

Wiring an airplane is relatively easy for some builders and very difficult for others, depending on your background/experience. If you are one of the latter, try contacting Bob Nuckolls. Bob has been in electronics and aircraft wiring for over 20 years and is incredibly knowledgeable about the dumb little nit-picking questions I always seem to have. Finally, here is a guy that can answer these questions and not only that, but he speaks a language even I can understand! The best news of all is that Bob is now writing a neat newsletter called "The Aero Electric Connection". He plans on producing two of these a year and the subscription is $20.00 annually with a $2.00 deduction if you are an EAA member and a further $2.00 deduction if you are a member of AOPA.

The first edition, Volume 1, number 1, is now out and we have it in our hot little hands! It is excellent. He encourages you to send him wiring problems or questions which he will research and answer in his newsletter. What a deal, this man knows his electrical stuff and we heartily recommend subscribing to his newsletter or, at least, writing him with your question.

Bob works with Bill Bainbridge of B&C Specialties and the linear voltage regulator Bill sells is one of Bob's designs. Contact Bob Nuckolls at "The Medicine River Press
PO Box 12703
Wichita, KS 67277-2703.

TIME FOR AN OVERHAUL? TIRED OF LEAD FOULING YOUR PLUGS?

If you have an 0-235-L2C and it is getting tired or fouls its spark plugs in spite of using REM37BY Champions, this may be something to consider.

Light Plane Maintenance, October, 1988, Vol. X, N°. 10, pg 21, suggests an interesting compromise. You can get rid of the -L2C's tendency to lead -foul spark plugs by having Engine Components, Inc., 9503 Middlesex, San Antonio, TX 78217, 512-828-3131, convert your engine. ECI has STC's to convert your present 7/16" exhaust valves to 0-320 1/2" valves and to machine an anti-lead-fouling valve pocket into the cylinder heads. This pocket increases the cylinder volume by approximately 5% which enables you to install the -F high compression pistons without ending up with too high a compression ratio. Your standard -L2C has 8.5:1 compression, the -F has 9.7:1, but the above conversion would give approximately 9,2:1.

According to *Light Plane Maintenance*, "This might offer the best of several worlds: A little higher horsepower (122hp approx.) reduced lead fouling problems and better knock resistance than the 125hp -F engine." You should get more power and longer life out of your 0-235-L2C.

This mod is not recommended for the low compression 0-235-C2C which does not suffer from lead-fouling and is generally extremely reliable.Also, these older 0-235 LYC's do not have crankcase through-bolts. High compression pistons would certainly result in alower TBO, or worse. Contact Engine Components, Inc. for prices, and keep in mind, with the extra horsepower, you will need one-to-two inches more pitch in your prop. (Submitted by Buzz Talbot, Long-EZ builder/flyer - Thanks, Buzz).

A subscription to *Light Plane Maintenance* costs $72.00 for 12 issues (expensive, but worth it), PO Box 359135, Palm Coast, FL, 32035

CONGRATULATIONS John Steichen! First Flight of his Defiant was October 10, 1988. John's is the 14th Defiant to fly that we know of. Of these 14, 8 of them were at Oshkosh - pretty good percentage!

John had some nosewheel steering problems prior to his first flight and we will have a summery of those problems and solutions in CP58. Defiant builders are a determined bunch. We know of several more very close to flying and we believe that, eventually, all of the Defiant plans out there will one day be airplanes.

WARNING !

STATISTICS INDICATE THAT AMATEUR BUILT AIRCRAFT ARE MORE LIKELY TO HAVE AN ACCIDENT, INCLUDING A FATAL ACCIDENT, THAN FAA CERTIFICATED, MANUFACTURED TYPES. WHILE STRICT ADHERENCE TO APPROVED MAINTENANCE & OPERATING PROCEDURES CAN REDUCE THIS RISK, THE HAZARDS ARE SIGNIFICANT, PARTICULARY DURING INITIAL FLIGHT TESTING OR WHEN OPERATED IN A NON CONSERVATIVE MANNER.

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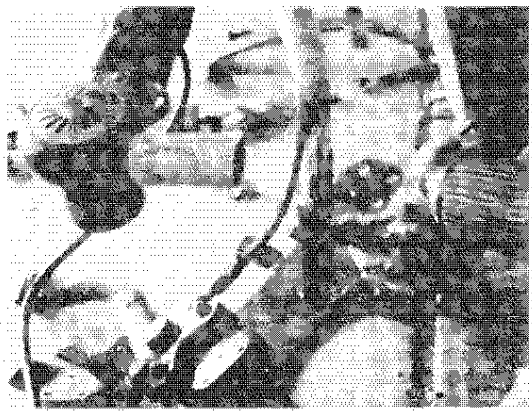
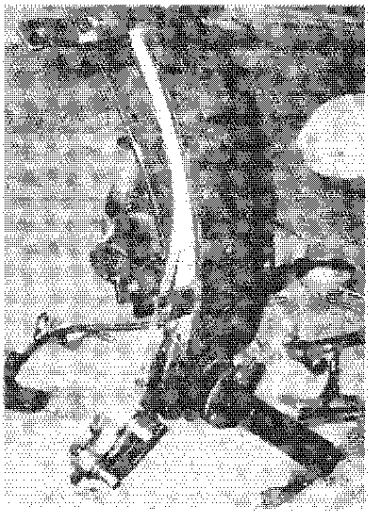
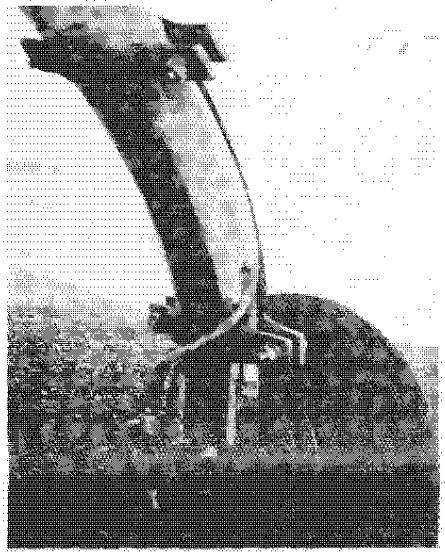
Sad but true!- the result of heavy braking & riding a brake.

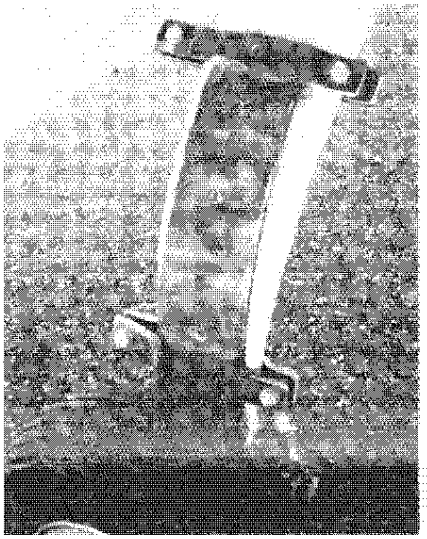


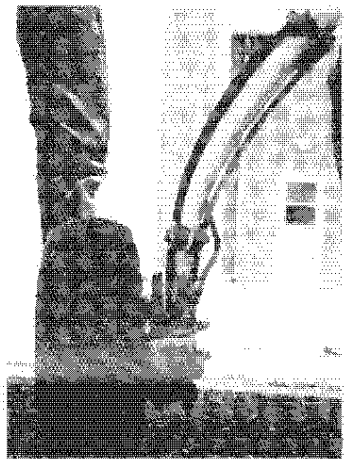
It took two heat guns to warm the epoxy enough to straighten the strut.



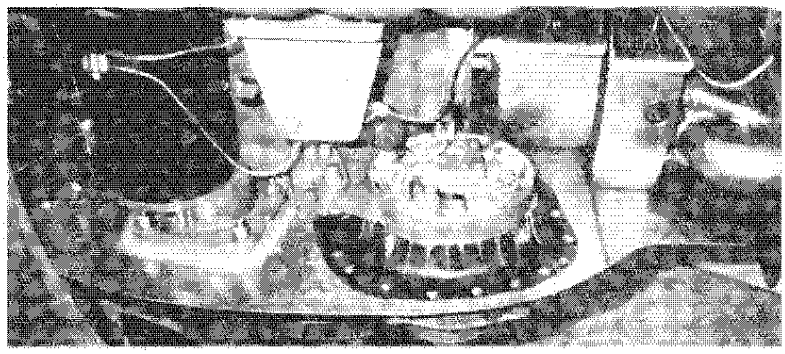
Fitting The Splint!



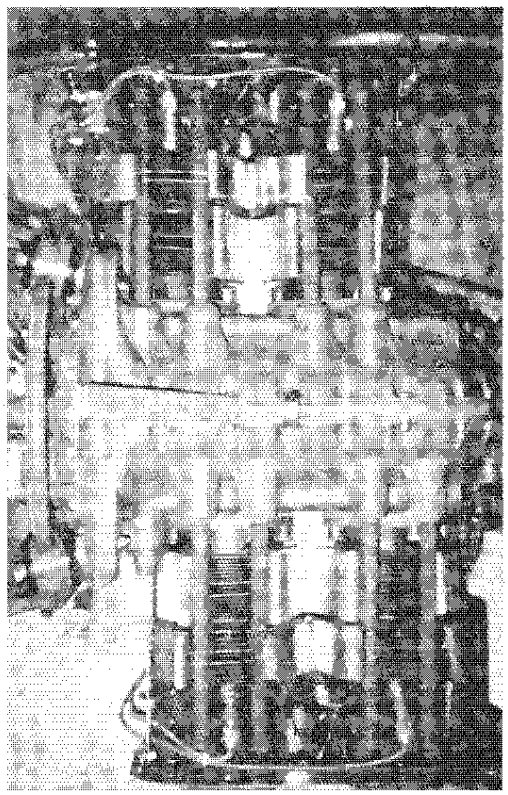


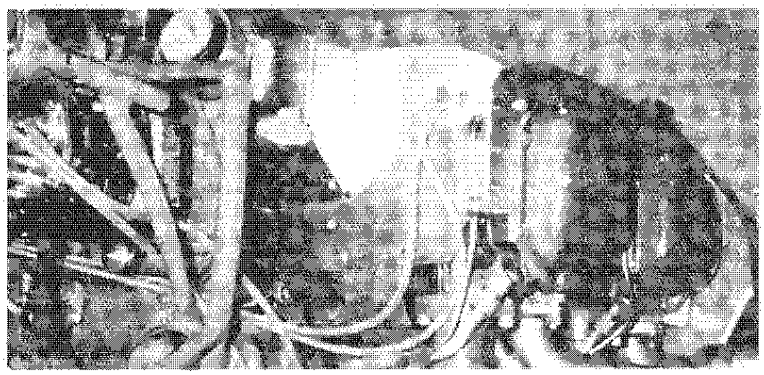


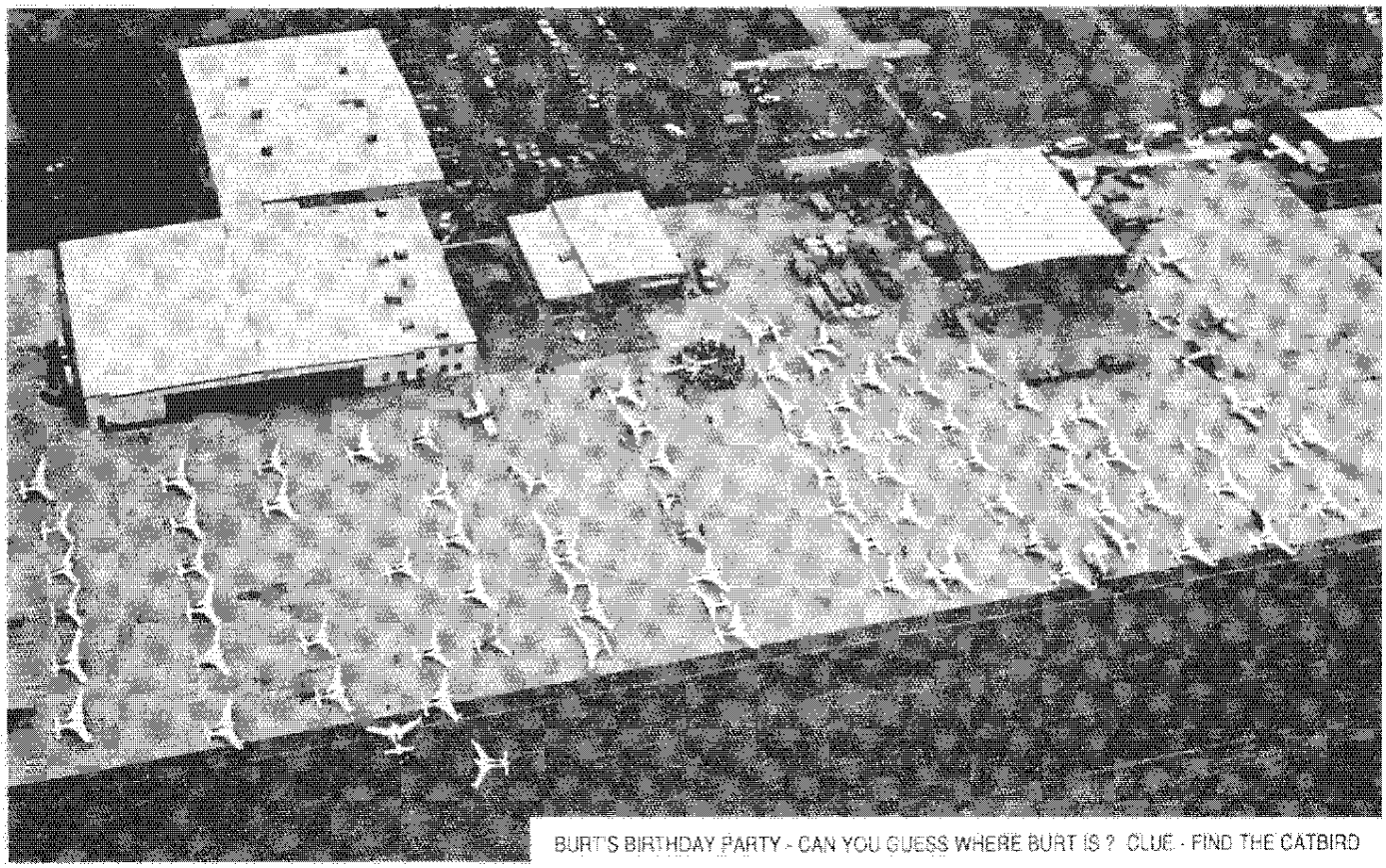
A perfect fit!, incredibly the toe-in was even correct!



Baffling! .032 6061-T6 aluminum. This is how it should be done. The neoprene/asbestos material still has to be installed.

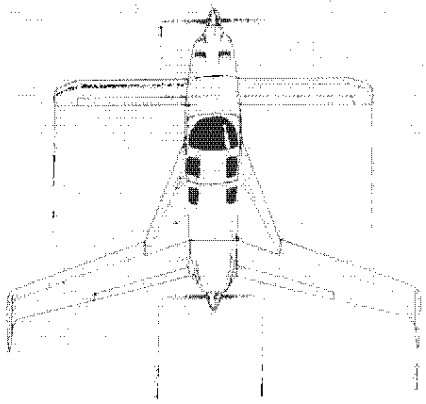






BURT'S BIRTHDAY PARTY - CAN YOU GUESS WHERE BURT IS ? CLUE - FIND THE CATBIRD

Rutan Aircraft Factory
Building 13, Mojave Airport
Mojave, CA 93501



first class mail

TO:

October '88

The line which appears above your name lets you know through which Canard Pusher you are paid. If your label says **LAST ISSUE CP 57**, then this is your last issue, and you need to renew.

CP 57