

# 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 63.

VariViggen (2nd Edition), newsletter 18 to 63.

VariEze (1st Edition), newsletters 10 thru 63.

VariEze (2nd Edition), newsletters 16 thru 63.

Long-EZ, newsletters 24 through 63.

Solitaire, newsletters 37 through 63.

Defiant, newsletters 41 through 63.

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 ONLY FROM 8:00 TO 12:00 AND 1:00 TO 5:00** When you call on Tuesdays for builder assistance, please give your name, serial number, and nature of the problem. 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. Please put your name and address on the back of any photos you send.

## REDUCED OPERATING HOURS AT RAF

As of May 1, 1990, RAF will be manned on Tuesdays only.

It has been five years since RAF discontinued selling plans and licensing builders to fabricate Burt's designs. That's a long time to support builders. RAF's bookkeeping procedures has always logged deferred income for 5 years after plans sales on the assumption that any serious builder would complete his project within that time. However, we do plan to continue, on a limited time basis, builder support. Mike's duties have become quite varied and, more and more, he is required to be at his desk at Scaled Composites. We hope we have hit upon an acceptable solution for you people who purchased plans from RAF prior to 1985 and are still busily building the flying machine of your dreams.

Each Tuesday, there will be builder support of an abbreviated nature. We ask that if you have a question or problem that can be sent in, please do so. (See page 1 of this CP). If you have epoxy dripping from your elbows, or if you have an urgent problem that requires attention within the next week or so, then Mike will attempt to return your call. This, of course, requires not only your name and serial number when calling, but also a brief description of your problem (in laymen terms, so Joan can understand and forward the information to Mike) and your agreement to accept a collect call.

Hopefully, this will still accommodate those of you who might encounter serious building problems while allowing Mike to fulfill his duties at Scaled Composites

We certainly appreciate your co-operation.

## OSHKOSH TALKS

ALL OF BURT'S TALKS THIS YEAR WILL BE IN TENT #3 AT 11:30 AM.

FRIDAY - JULY 27 - TOPIC: REQUIREMENTS FOR AVIATION GROWTH.

SATURDAY - JULY 28 - TOPIC: THE COCKPIT-A DISASTER ZONE.

SUNDAY - JULY 30 - TOPIC: ARES-THE DESIGN PHILOSOPHY AND TEST RESULTS.

### RUTAN BIRTHDAY BASH

This event is sponsored by David Orr and Dick Kreidel and will be held at Lake Isabella on the Kern Valley Airport on June 2, 1990 between 10:00am and 3:00pm. All builders and flyers of all Rutan designs are welcome. Kernville is at the north end of Lake Isabella and the airport can be found on a Los Angeles sectional. Elevation is 2614' and the runway is hard surfaced and 3500 feet long.

### JEANA'S BIRTHDAY PARTY

May 12, 1990 - 10AM 'til ? - Oceano Airport

Sponsored by Long-EZ builder/flyers Mike & Bev Rhodes, 234 Garden St. Arroyo Grande, CA 93420, 805-489-8155. RSVP requested.

### 1990 R.A.C.E. SCHEDULE

May 26, 27, & 28, 1990  
Kanab Canard Honk Out  
Coral Sands Motel  
801-644-2616

June 30, July 1 & 2, 1990  
Jackpot EZ Bash  
Cactus Petes\*  
Reservations: 1-800-821-1103

\*Note - Due to hotel construction, Shirl Dickey recommends making reservations at the Horseshoe Motel.

September 1, 2, & 3, 1990  
Wendover/Bonneville 125  
Stateline  
Reservations: 1-800-648-9668

November 24 & 25, 1990  
2nd Annual R.A.C.E Kilo Trials and High Points  
Championship Party  
Contact: Shirl Dickey at 602-491-1548

Come on up to the beautiful red cliffs of Kanab, Utah and honk it on with all your fellow canards.

This is your first chance of the year to be the lead honker in your class.

If you're not the lead honker, the view never changes.

If you think your canard really honks, bring it to the Kanab Honk Out and show us your tail feathers!

### ACTIVITY AT SCALED

Several builders have requested information on Burt's latest projects at Scaled. I have been fortunate enough to have flown the Triumph business jet as well as the Ares "mudfighter" as Burt calls it, so I thought I would give you just a taste of what these airplanes are and how they fly.

Ex-NASA test pilot, Fitz Fulton, flew the first flight of the Triumph twin jet. Since the flight card called for this flight to be done with the gear down and locked, and the speed not to exceed 150 knots, I was able to chase the little business jet with my Long-EZ! The flight was picture perfect and she looked beautiful against the Sierra Nevada mountains. This small business jet has seating for 4 to 6 passengers plus a pilot and copilot. It is powered by two FJ-44 Williams fan jet engines, each rated at 1800 lbs. of static thrust. It is designed to have a maximum cruise speed of 400 knots and a cruising altitude of 41,000 feet. The Williams engines are new, state-of-the-art, extremely fuel efficient, fan engines and are the quietest jet engines we have ever heard.

Take-off in the Triumph is quite a thrill. Generally for test purposes, we go to maximum continuous power while holding the brakes. Upon brake release, the acceleration is very impressive. You find yourself pressed firmly into the seat. Rotation normally occurs at around 70 knots and she lifts off at around 100 knots using, perhaps, 1800 feet of runway. We start the gear up soon after breaking ground and climb at more than 4500 feet per minute at 200 knots.

From breaking ground at Mojave to 41,000 feet takes only 18 minutes.

Flying qualities are excellent. Pitch and yaw controls are light and responsive, roll control is a little heavier but very powerful and the little jet does beautifully crisp aileron rolls! There have been a number of journalists who have recently flown Triumph so look for articles in "Flying," "Air Progress", "AOPA Pilot" and "Aviation Week" magazines.

Doug Shane, Scaled Composites' Chief of Flight Test, conducted the first flight of Ares and, once again, I was able to chase with N26MS! Of course, this was only possible due to the gear down and speed constraints on the first flight. The second flight had to be chased by the Triumph biz-jet! I was fortunate enough to fly the second flight and have flown a number of subsequent flights.

The Ares is a canard configuration, swept wing, twin tail, single engine jet fighter. The engine is a Pratt and Whitney JT-15D producing 2900 lbs. of static thrust. The airplane weights in at around 5000 lbs. for most of the testing done to date, so you can appreciate that she has excellent power-to-weight, and really gets with the program when you step on the gas! Take-off is really fun, full power gives dramatic acceleration and things happen very rapidly. Nose wheel lift off at 70 knots, mains lift off at 90 knots using about 1500 feet of runway. The gear comes up in 8 seconds and we climb at over 5000 feet per minute. So far, we have only opened the envelope to 280 knots and 4.5 "G" but ultimately we expect to open to 350 knots indicated and 8 "G". Roll rate is extremely high and the maneuverability of the aircraft must be seen to be appreciated.

Since this aircraft is designed to be a close air support and anti-helicopter fighter, obviously, much of our test flying includes all kinds of aerobatics and tight maneuvering. Very exciting and lots of fun. The aircraft is equipped with an UPCO ejection seat which is a zero/zero seat. We will eventually install and test a 25 mm GE GAU-12, 6 barrel Gatling gun. This gun is capable of shooting 2000 rounds per minute and produces almost 11,000 lbs. of recoil!

The airplane flies somewhat like a large edition of Burt's VariViggen and, like the Viggen, it can be flown to full aft stick with no departure. All you

get is an incredibly tight turn. Stall speed is 74 knots and we approach at 90 knots with a touchdown at 75-80 knots. It has very powerful dive brakes similar to the spoilflaps on the Solitaire. When these are deployed at 200 knots, the deceleration is impressive, throwing you forward in the straps.

We are still in the early stages of developmental flight testing and there is yet much work to be done. There has been a remarkable amount of interest in the aircraft so far and it promises to be one of Scaled's most interesting and successful programs.

Mike Melvill

#### LETTERS

"Dear RAF:

Please send me a copy of the flush rudder plans. I got a new pair of pants for Christmas that need a little epoxy dripped on them so they match the rest of my wardrobe.

Buzz Talbot"

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"Dear Burt and Mike,

Enclosed please find a picture of N81465. First flight was Feb. 3, 1990, Hemet airport. My flying experience includes about 50 hours of Bonanza time, so I didn't have any reservations about being able to handle this beautiful machine. The part that I was most concerned with was making sure my powerplant and flutter tests would be OK. My first landing was a good one, but I used the whole runway as I had anticipated I would. I just didn't know how long it would take to settle in once in ground effect.

I started this project, s/n 571, in 1981 and worked on it off and on over the years and I'm really happy to say when asked, "Have you finished your airplane yet?", "Yep!" I enjoy looking at the expression on their faces as most people don't think you'll follow through with the project.

My first flight took place with only one other person around, George Kelley, my neighbor, who currently has 600 hours on his Long. To prepare for my first flight, I flew back seat with George and paid particular attention to how high the canard came up when he landed. That helped me to determine how much to flare when landing. I highly recommend that any first flight be done very early in the morning. This will give you a chance to experience your new bird in DEAD CALM WIND.....Airplane flew hands off, no turns, no rudder correction. (I must have done something right).

Many thanks to Burt for a GREAT design, Mike for his help over the years. I would like to especially thank George Kelley for his advice and help in getting me off the ground!!

Happy Flying,  
Ray Gonzales"

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**CAUTION - OVERHEATED NAV LIGHT SWITCHES**

"Dear RAF;

During a recent flight in our Long-EZ, N888EZ, there was A sudden, terrifying smell of smoke! Turned off all power and made it to an airport. A careful examination of the electrical system disclosed a rocker switch (standard Cessna part) had overheated and melted. This switch had push-on, spade connectors, and apparently over the years, one connection had oxidized enough between one spade lug and the push-on connector to create a high resistance. This, together with a 7 amp current draw (nav lights), heated the lug and internal parts of the switch enough to melt the housing, rocker and some other plastic internal parts.

This switch is used in all single engine Cessna airplanes and is a SPST radio switch, P/N S2160-1. This switch is both UL and CSA (Canadian equivalent) approved. It is worth noting that it is a CSA requirement (but not UL!) that electrical components using plastic materials can not burn. They can smoke, but must not burn. Builders should look for the stamp (SA on their plastic electrical components.

What did I learn from this? Probably that screw-type lug switches are the right type to use even though spade connectors are more convenient. These Cessna-type switches are cheap at only \$2.15 each even at Cessna's inflated prices, but it could have cost a lot more in hardware and even human life if it had failed only one hour earlier when I was on a night IFR flight from Las Vegas.

I will quit writing now because I need to get to the store to buy some better switches - - - -

Dick Kreidel

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**SPORT FLIGHT EXHAUST SYSTEM FAILURE/SEPARATION AND FIRE ON GROUND - LONG-EZ, N80EZ**

"I had just taken a passenger for a ride. The preflight and run-up were normal as was the full power run-up at take-off. At cruising altitude, I could hear an occasional unusual ticking sound in the headphones, but at the time it seemed like one of those sounds you get on a dark night or when over water (not in my Long-EZ, of course).

Return and landing were normal, as was the taxi in. However, being the ever vigilant, I decided to make a post flight run-up on the ramp. My friend, who is a very highly experienced pilot, was watching. As I was making the run-up, the RPM began decaying and the engine quit! At the same time, my friend called out 'fire!' I immediately shut off the mixture and fuel valve and hastily egressed while lowering the nose.

Unfortunately, I had left my Halon extinguisher in the hangar which was about 200 feet away. I ran, retrieved my Halon - the hangar-mate next door brought his and we used both on the fire.

I don't know how long it takes to run 400 feet, but in that period of time the fire had a very good start. Both Halons were discharged and the fire was controlled.

I know there was not an in-flight, or taxi-in fire as my friend was watching. There was probably a crack in the exhaust system which was the sound heard in my headset.

The post flight run-up probably caused the final separation of the exhaust system and, of course,

the fire. If I had suspected an exhaust leak, I would not have made the run-up. However, I'm glad it failed on the ground at run-up rather than in the air.

This, of course, is a very serious situation because of the total separation of the right exhaust system and the ensuing fire caused by the direct torching effect of the exhaust emission.

The torching effect probably would not cause a fire while flying because of the airflow, however, the metal parts separating from the aircraft is a sure problem.

This aircraft has a Lycoming O-320B engine with a Sport Flight exhaust system circa '84. Total time on system, 225 hours.

The engine compartment was uncowed and checked 10 hours previously, with no apparent cracks or breaks.

The break was on the right rear exhaust at a point where the small 'S' tubing is welded to the larger straight exhaust pipe. The break was not in the weld. The break was right outside the weld on the larger pipe. It appears to be fatigue rather than a bad weld. What's puzzling to me is the springs that held the front tubing into the slip joint flange had stretched and given way. So now we have a total separation of the right exhaust system.

I'm sending the exhaust system to RAF for analysis. To my knowledge, this is not a common problem with a Sport Flight system.

I know the gentleman who produced the original system and consider him to be conscientious and capable. However, all systems should be checked. In the meantime, I will endeavor, with help from you folks, to determine the cause.

The damage is repairable. It was confined to the cowling, rib heat shield, right exhaust and finish on the prop. All systems and components in the engine compartment will have to be checked.

I've seen some EZs operating without all the called for heat shields on the spar and ribs. Having these installed on mine helped, as did the

fire sleeves on the fluid lines. One fire sleeve was damaged. If it had been unprotected, who knows?!

Some possibilities are:

- 1) Excess vibration causing the break, although none was detected.
- 2) The front springs letting go caused the total load to be carried by the welded area.
- 3) Exhaust system rubbing on the cowling during engine torquing. I did leave adequate clearance and also had someone run-up the engine while I checked the clearance.
- 4) Simply age fatigue of the system.

I'm sure RAF will have their suggestions to go along with my article. If anyone has had a similar problem, please contact RAF or me at the address below.

Hope to be back in the air soon. The EZ is a great aircraft.

Good luck, fly safely,

Bob Frazier  
308 Bayshore Dr.  
Cape Coral, FL 33904  
813-945-4824

### HOW TO PAINT ZOLATONE

One of the most misunderstood and misapplied techniques used on our EZ's is the multi-colored, textured paint called Zolatone. If properly applied, surfaces are good looking and incredibly durable - but if it isn't done properly the results will be disappointing. Luckily, it is not a difficult process to master and is actually VariEze.

First off, the glass surface needs to be sanded dull (approx. 50%) before you begin; use 50 or 60 grit sandpaper - it is not necessary for the surface to be completely dull. The next step is important; the surface must be primed! RAF originally stated the primer was not needed but believe me, the adhesion and chip resistance

without the primer is not good. You will need a quart of Zolatone Plastic Primer #99 and some plastic primer thinner for spraying. The primer must be cut about 20% with the thinner before use. This primer is (unfortunately) white in color but can be tinted using lacquer or acrylic lacquer tints. Tinting the primer will help hide the white from showing though after the colorcoat chips or wears. The primer goes on best with a standard external mix spray gun with siphon feed - it sprays like most lacquers. It is not necessary or desirable to put on a heavy coat or even to completely hide the glass underneath. A light coat is best. The primer dries rapidly and you can spray the color coat in an hour or two. Do not spray the primer more than 8 hours before you apply the color coat or else you will have to scuff sand the primer - a big, big, job!

A few words now about what Zolatone actually is will help you understand why the following procedure is important. Zolatone paint is actually a colloid, or in plain language, globules of colored nitrocellulose (lacquer) enclosed in clear "sacks", suspended in a water base solution. Zolatone calls these sacks aggregates and manufactures aggregates in three sizes: fine, medium and heavy. They have about 20 colors of aggregates and by mixing different colors of aggregates and by mixing different colors and sizes of aggregates, the factory can create an almost unlimited array of colors. Most of their standard colors use 2 to 5 different color aggregates in different sizes and proportions. In addition to the aggregates, some colors also have black, white, or green "flecks" which are like super big aggregates. These flecks appear as large streaks on the sample chips, it is possible to spray the base color and avoid flecks (if desired) by a variation of the technique.

Since this paint is a collection of aggregates or colored sacks floating in the water carrier, it is extremely important not to break up the sacks when you open the can and start to stir. Never use a power mixer or paint shaker - you will break all the sacks and will be left with a gallon of slushy mess. Gently stir the paint with a wide stick as little as possible, and then finish the mixing by "boxing" the paint; that is, gently pouring the paint from one container to another until the paint is uniform in consistency. Zolatone will not appear as you would expect to

see (or like the finish surface) at this point - but keep the faith!

The biggest mistake that people make with Zolatone is using the wrong type of spray equipment. This stuff absolutely, positively must be sprayed using an internal mix, pressure feed system. Most people are unfamiliar with internal mix because these guns are generally the cheap (\$20-30) ones. You can recognize this type by the slotted air cap instead of what you normally see at the business end of the gun. What makes these cheapies less than ideal for most Zolatone colors (the Lilithe Charcoal is an exception) is that when in the pressure mode, the fluid pressure and air pressure are equal. What you really would like to find is a "dual-regulated, internal mix, pressure" set-up. For those of you who want the ideal rig, it would be a Binks #2001 gun with #6633x200 nozzle assy., internal mix air cap and a dual regulated one quart pressure cup. A remote tank with hoses to the same gun is even neater because the gun will spray in any position (in the strakes, upside down, etc.)

OK, you've borrowed, bought or otherwise found the correct spray gear, primed the cockpit and are ready to go. Zolatone is applied in a two steps process:

Step 1: This is the background color(s) step and utilizes high air pressure and low fluid pressure. Try about 40-45 psi on the air and 15-20 psi on the paint (fluid). Keep the gun 6"-12" from the surface and apply enough to cover the primer. You can alter the air and fluid pressure and change the appearance of the pattern - what's important here is the pressure differential between air and fluid.

Step 2: This is the pattern step and uses low air and high fluid pressures. This is when the large flecks and wild patterns are applied. If you don't want the big flecks you can minimize the pressure differential and obtain varying results. Assuming you want it to look just like the color chip, try 15 psi on the air and 30-40 psi on the fluid. Make sure you are 18"-24" away from the surface and apply the patterns until you have what you want. During this step, the more paint you apply the more fleck you will end up with so you need to carefully watch to make sure all areas

are uniformly patterned. With both steps you can play with the air and fluid pressures and the distance from the surface and obtain very different appearances. It's always a good idea to experiment some with this stuff on some dense surface material (aluminum, masonite, etc.) before you start in on your plane to be sure of your technique and preference. Also, you should write down somewhere what air and fluid pressures you used for each step so that years later when you want to touch up some areas it will match perfectly - otherwise it won't!

Clean-up is as bizarre as the paint is - use water first and then lacquer thinner. Another interesting point is that since these colors are actually composed of multiple colors and sizes of aggregates, you can mix Zolatone standard colors (by boxing) to come up with your own special mix. Zolatone will make any color you want but insists on a 23 gallon minimum order - no exceptions! There are about 12-13 colors that are standard other than the 2 or 3 stocked by Aircraft Spruce. You can contact Zolatone (aka Paramount Paint and Lacquer) in L.A. for their local dealer in your area.

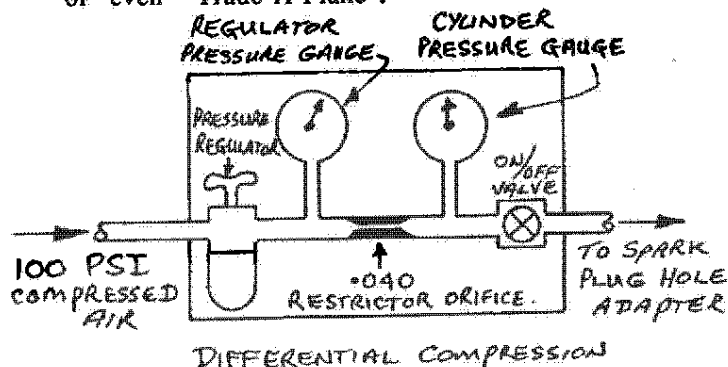
To review a few key points:

1. The unique look is achieved by the splattering of the sacks as they impact the surface. In the gun and just before they hit, they are still discrete globules.
2. You need an internal mix pressure feed spray gun for the color. Since Murphy is alive and well, this gun is not great for the primer.
3. Use care in gently mixing the paint by initially stirring and boxing.
4. Don't allow the paint to freeze (water base) or you'll have a big mess!
5. Many builders find that painting the interior is easiest if the fuselage is supported upside down on a couple of saw horses - you crawl underneath and just do it!

Dick Kreidel

## COMPRESSION TESTING

There are two accepted methods of testing the compression in a cylinder of an internal combustion engine. One is the "direct" method, generally used by auto mechanics on auto engines. This method uses a pressure gauge which is connected directly to the spark plug hole and the engine is then turned over with the starter or the engine and is run at idle. The peak pressure is read directly from the gauge. This method works but the results are not as precise as the method known as "differential compression" testing. This method is what is normally used in aircraft engines and requires the use of a tester consisting of two separate pressure gauges, a pressure regulator, a calibrated restrictor orifice, and an on/off valve. (See schematic) A source of compressed air (a compressor with a storage tank capable of a minimum of 100 psi) is required to perform the test. When you buy your differential compression tester, be sure it has a restrictor orifice of .040" (assuming your engine has less than 1000 cubic inches of displacement. An O-235 has 235 cubic inches, and O-360 has 361 cubic inches). You can find several suppliers of good reliable differential compression testers at Aircraft Spruce or Wicks, or even "Trade-A-Plane".



Continental, Lycoming and the FAA all agree that the compression test should be performed with the engine hot. This assures that you get optimum piston ring and valve seating. In any event, you should try always to use exactly the same procedure with each cylinder and each time you check your compression, if your testing is to give meaningful and comparable results. Careful and regular compression testing say, every 100 hours, can be one of the best, most cost effective preventive maintenance procedures. It is very important that accurate records are kept of which compression reading was for which cylinder! You

can read the number of each cylinder at the base of the cylinder. Note that Lycomings and Continentals use a different numbering system.

Remove the top spark plug from each cylinder and, for safety, remove each ignition lead from the bottom plugs. Rotate the prop by hand, in the normal direction of rotation (anti-clockwise for an American engine) until one of the cylinders comes up on compression. You can determine this by placing your thumb over the spark plug hole and feeling for a pressure buildup. Now, install the adapter (normally supplied with the compression tester) in the spark plug hole of the cylinder to be tested. Be certain that the air shutoff valve on the tester is off and connect the differential compression tester. **CAUTION:** Be absolutely certain the shutoff valve is closed and that you have a firm grip on the tip of one blade of the prop before connecting the system to your source of compressed air.

You will now have to find top dead center on the cylinder being tested. The easiest way to do this is to adjust the pressure regulator to about 20 psi and open the air shutoff valve. Carefully rotate the prop in the normal direction of rotation against the 20 psi pressure until you feel a "flat spot" or rapid loss of turning resistance. If you go too fast, back up beyond top dead center and try again. It is critical that you reach TDC with the prop turning in the normal direction of rotation, not while backing the prop up since this would unseat the piston rings. The piston rings must be at the bottom of their lands in the piston with the piston at the top of its travel.

Now, be certain you have the prop tip securely held. This is a good time to have a second person to help you. The air shutoff valve should be open and the pressure regulator adjusted to show exactly 80 psi on the pressure regulator gauge. Use caution because if you let the prop move in either direction beyond TDC, it will rapidly begin to rotate and it could beat the tar out of the unfortunate person who should have been holding it securely! Now, gently move the prop tip back and forth, just a tiny amount. Watch the cylinder pressure gauge and take a reading from it at its peak steady pressure. Again, this will be while moving the prop in the normal direction of rotation. Be certain that the regulator pressure gauge is holding precisely 80 psi. You should

have a differential pressure reading of between 60 and 78 over 80. Repeat this test as consistently as possible on all cylinders.

You should now have a series of numbers something like this, depending on the condition of the engine: 76/80, 74/80, 73/80 and 75/80. These numbers, hopefully, will be fairly close to each other in magnitude. What are the limits? What constitutes a bad (too low) cylinder? It is generally accepted that a cylinder reading below 60/80 would require removal from service. There is no rule or law that says this is the case. In fact, the FAA as well as the two engine manufacturers have no such requirement.

You should probably continue to operate the engine and check the compression every 20 hours or so if the compression is 50/80 or above. Before you remove any cylinder, it would be a good idea to borescope the cylinder. That is, to look inside through a spark plug hole using a light and a special optical device known as a borescope.

A single compression test does not necessarily mean anything. A single oil analysis also means very little. No single diagnostic test should ever be used to decide the health of your engine. The key is to do these tests regularly and keep good records of what you see. Compare each test and make your decision based on several tests conducted over a reasonable period of time.

If you have an abnormally low cylinder, you should start the engine and run it on the ground or even fly around the pattern once. Test it again. If it is still low, use a length of garden hose as a "stethoscope" and listen at the exhaust of the ailing cylinder. If you hear a hissing escape of compressed air here, you have an exhaust valve that is not seating. Similarly, listen carefully with the "stethoscope" at the carb or intake airbox. A hissing sound here would indicate leakage under the intake valve. If neither of these areas is leaking significantly, listen at the breather or oil dipstick/filler tube. A leak in this area is indicative of ring blow-by. This could be ring wear, barrel wear or scoring, or all the ring gaps may be lined up. Hissing between cylinder cooling fins is bad news, possibly a cracked cylinder. Valve leakage is the most commonly found cause of a low cylinder.



The differential compression test has its limitations but it still remains one of the best, most cost effective preventive maintenance procedures available to the builder/flyer. The method described here is simple and it works. Done every 100 hours regularly, you could save big bucks in the long run.

If you would like to learn more about this procedure and many other cost saving tips for keeping your engine in good shape, you could not do better than to obtain a copy of "Top End" from the Light Plane Maintenance Library.

Write to: Light Plane Maintenance  
1111 East Putnam Ave.  
Riverside, CT 06878

#### FOR SALE

Plans for flush rudder belhorns for Long-EZ (sorry, not applicable to VariEze). As seen on Mike and Sally's N26MS - has been flying for 3 years trouble-free. Clean up the only thing on your Long that just does not look right and enjoy stronger rudder authority for taxiing with no compromise to flight safety. \$10.00 per set

Contact: Joan Richey  
Rutan Aircraft Factory  
Building 13-Airport  
Mojave, CA 9350  
805-824-2645 (Tues. only)

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Canard Pusher Digest - Stet Elliott's *Canard Pusher Digest for the Long-EZ* is still available. The Canard Pusher Digest is basically a recompilation of information from CP24-CP61 into chapters that correspond to chapters of the Long-EZ plans. (For a complete description of the Digest, See CP57). Not that the Digest is for builders and flyers of the Long-EZ only! The Digest does not support other RAF designs.

Quarterly updates to the Digest are also available. These updates provide additional information from newly published CPs to bring the Digest current.

CP Digest for the Long-EZ. \$67.00  
Overseas orders add \$20.00  
for airmail, otherwise, it will  
be sent via surface vessel.

Annual Update subscription. \$25.00  
(4 updates)  
Overseas orders add \$5.00 for  
postage.  
Send payment to Stet's new address below:

Stet Elliott  
5322 W. Melric Dr.  
Santa Ana, CA 92704  
714-839-4156

-----  
One Directional Gyro, 3-1/8"  
One Attitude Gyro, 3-1/8"  
One Vacuum Gage  
One Vacuum Regulator

Sell as one package - \$325.00  
Contact: Dan Mislik  
421 Rolston Rd  
Linden, MI 48451  
313-735-9663

-----  
One Aluminum EZ Spinner - as new - \$50.00

Contact: Dan Worley  
818-366-8803

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Computer program to calculate Center of Gravity on a Long-EZ or VariEze. Will work on any IBM or IBM-compatible computer. A simple program, EZ to use and it gives you a printout of your weight and balance to keep in your aircraft. A really simple and neat idea. Send \$5.00 to cover the cost of the 5" floppy disc and postage.

James H. Langley  
245 E Kimberly Street  
Republic, MO 65738  
417-732-1143

-----  
Bob Davenport nose wheel shimmy damper. Don't forget that Bob has informed us of his intention to quit producing this item. It is absolutely the best shimmy damper available at any price. Don't be left out in the cold, contact: Bob Davenport  
PO Box 650581  
Vero Beach, FL  
32965  
407-567-1844  
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## RAF RECOMMENDED SUPPLIERS

Aircraft Spruce  
PO Box 424  
Fullerton, CA 92632  
714-870-7551

Wicks Aircraft  
410 Pine Street  
Highland, IL 62249  
618-654-7447

FeatherLite  
PO Box 781  
Boonville, CA 95415  
707-895-2718

Brock Mfg.  
11852 Western Ave.  
Stanton, CA 90680  
714-898-4366

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

## PROPS FOR EZ'S AND DEFIANTS

RAF recommends the following prop manufacturers:

Bruce Tift  
B&T Props  
3850 Sherrod Rd.  
Mariposa, CA 95338  
209-742-6743

Ted Hendrickson  
PO Box 824  
Concrete, WA 98237  
206-853-8947

Unfortunately, we have to report that Great American Props has gone out of business. There does not appear to be much hope that they will recover at this time. We will, of course, keep you informed in this publication.

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Bruce Tift of B&T Props is, of course, inundated with orders at this time. He is doing his best to get the orders out as soon as he can but he has requested that we let you know that as of April 1990, his delivery time is a minimum of 3 months after receipt of order. He has requested that if you need a prop, get your order in early. If you are about ready to fly and you have not ordered your prop, you are already in trouble!

Bruce has also asked us to pass on to you that if you already have received your prop and, particularly if it is a multi-laminate prop, you should store it by bolting it onto the prop extension. This will help prevent the wood in the

hub from swelling in a high humidity area. If this happens, the prop may not fit onto the drive lugs due to the counterbored holes having closed up a little.

Bruce is very much into the wood prop manufacturing business and is constantly testing new ideas on his own Long-EZ. He is very knowledgeable on EZ props and is more than happy to advise you on which prop you might need for your VariEze, Long-EZ or Defiant.

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As far as we know, Ted Hendrickson is still in the business of manufacturing wood props. Ted has been in the prop business for many years and he is well known for building really marvelous examples of special one-off, three and four blade props of wood for old biplanes. We saw a stunning example, mounted on a Kinner engine, in a Fleet biplane on Long Island, NY. Of course, he also makes the more conventional two-blade, EZ-type propellers

With Great American Props gone, there is going to be some tough times ahead. GAP probably had the lion's share of the homebuilt market, shipping about 50 props a month. RAF has always advocated having two props. Let's face it, it is not unusual to damage a wood prop, particularly on a pusher like an EZ. If you have a spare, you can keep flying while you repair/refinish your spare prop. If you only have one, you may be grounded for quite awhile.

Whoever you decide to order your prop from, get your order in early! Don't wait until the last minute - you may be very disappointed.

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PLEASE NOTE NEW FORMAT

PLANS CHANGES AND OTHER IMPORTANT  
MAINTENANCE INFORMATION

VARIVIGGEN MAN/GND  
VARIEZE MAN/GND  
LONG-EZ MAN/GND  
DEFIANT MAN/GND

The cause of the VariEze accident that was reported in CP 62 that occurred at Aspen,

Colorado has been determined by the FAA to have probably been fuel starvation resulting in engine stoppage. Since this EZ was definitely fueled while parked in the nose down position, the FAA has asked RAF to remind our VariEze, as well as Long-EZ, builders/flyers that if you are planning a long cross country and expect to have full fuel tanks, it is mandatory that you fuel the aircraft while it is sitting level on all three wheels. This is the only way you can actually fill the fuel tanks to their maximum capacity. Obviously, if parked nose down (nose wheel retracted), you will not be able to completely fill the fuel tanks and depending on where you installed your fuel caps, you may, in fact, be several gallons short. We would also recommend that you fill the tanks yourself rather than have the line boy do it. Depending on how large the vent holes are in your fuel tank baffles, to someone not familiar with your airplane, your tanks may appear to be full when, in fact, they are not. Above all, remember you, the pilot, are responsible to see to it that you have sufficient fuel for the proposed trip.

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

### CAUTION

When using the breather system that Mike recommended in CP 56.

Several builders/flyers have informed us of a noticeable drop in fuel pressure, especially at low power. Mike had also noticed this and attributes it to the reduced pressure inside the crankcase acting internally on the diaphragm in the engine driven pump. Mike has been flying this system for 640 hours now with no problems, however, you should be aware that it may be possible to reduce your fuel pressure almost to zero at low power, particularly if you have a new, tightly sealed engine. Contact Wes Gardner for more information.

### CAUTION - WHEEL BRAKE DISCS RUNOUT.

This can cause vibration in your main gear as you apply the brakes. Use a micrometer to measure disc thickness. Check it in six or eight places around the disc. Thickness should not vary more than .002". Use a dial indicator to check for side-to-side out-of-true. We have seen Cleveland brake discs run out more than .020"! This is completely unacceptable. Sometimes it is in the disc weldment itself, but even more upsetting, it can be in the machining of the wheel halves themselves! If you suspect this, you should return them to Cleveland for replacement.

A better bet may be the new Rosenhaan brakes. While we have not actually tried them, we recently saw a set and they are really neat. They have a very heavy (thick) disc and have dual calipers with four brake linings. Should have serious stopping power. The neat part is they are VariEze to true up if ever they should start to chatter. Simply have them ground flat on a Blanchard grinder. The disc itself is a flat piece of steel. If you are interested in this type of brake, contact:

Phil Mattingly  
PO Box 8604  
Salt Lake City, UT 84108  
801-583-2118

### CONTINENTAL ENGINE OWNERS

We have heard from several Continental engine owners of a problem they ran into when rebuilding their engines. It has to do with the camshaft. Specifically, the gear on the end of the camshaft that normally drives a vacuum pump or a fuel injection pump. Since most EZ drivers don't have vacuum pumps or fuel injection pumps there is a tendency to remove this little gear and install the camshaft without the gear. This is fine, but if you decide to do this, be aware that it is critically important that you install the 6 small screws that would have held the gear in place and safety wire them together. If you omit this step, you will find to your frustration, that when you start your newly rebuilt engine that you have ZERO oil pressure! This is because the six drilled and tapped holes in the end of the camshaft intrude into the main oil galley in the end of the shaft and it is a requirement that all 6 screws are in place to retain the high pressure

oil. You don't need the gear, but you absolutely do need the screws.

### YET ANOTHER LORAN UPDATE!

Just when we thought we had reported all we know! We now hear from a builder/flyer who tried Mike's loran antenna as described in CP 62. He built it exactly as shown and his Northstar performed poorly. Low signal-to-noise ratios. He tried all the usual things, alternator filter capacitor, voltage regulator, etc. Finally, a friend suggested that since he had his main electrical power wires running down one side of his fuselage, and his ground wire running down the other, that maybe this was causing a field (like an electric motor) with his loran antenna base right in the center of the field!! (We could not believe it either!). Anyway, he finally bit the bullet and ran a new ground wire on the same side as his power wire. The optimum wiring scenario is to wrap the power wire around the ground wire at a spacing of two twists per foot of ground wire. This, in effect, eliminates the field caused by running the two wires parallel to each other. PRESTO - his SNR's were as they should be, high 80's and 90's percent for the Southern California area. Weird, but if you have tried everything else this is something to consider.

On the same subject, Mike's Northstar loran suddenly developed a case of low SNR's. Maybe he was forgetting, or ignoring, the fact that he had recently had to replace an alternator. (He had had the old one since 1980 and it was used when he got it!) His alternator is an Airborne aircraft-type, 28v, 60 amp. The rebuilt one, looking exactly like a new one and costing big bucks, was bolted on and it work fine. At least, it was charging.

Anyway, when the loran signal-to-noise ratios declined, he assumed it was the filter capacitor. Upon removal, it was found to have a broken connection. A new one was purchased from Dusty Rhodes at Vista Aviation on Whiteman Airport in Los Angeles. The cost is about \$26.00 and without one of these in parallel with your "BAT" connection and "Ground" connection on your alternator, your loran will never work much better than at 30% of its capability.

This helped, but did not cure the problem. The next purchase was a B&C linear voltage regulator from Bill Bainbridge of B&C Specialties in Newton, Kansas. This replaced the cheap looking Cessna-type regulator Mike had since building his Long-EZ in December of 1980. Well, to make a long story even longer, this did not do the trick either! Finally, he did what he should have done in the first place, he turned off the alternator field while in flight, while actually looking at the signal-to-noise ratios displayed by the Northstar in the self test mode. As you will have already guessed, these percentages jumped from the low 30's to the high 90's!! A trip down to Vista Aviation and Dusty diagnosed bad diodes in the new alternator!

After all that work and all those dollars! At least, now everything in the charging system is new and the linear voltage regulator is a much superior design from a noise standpoint. Aviall replaced the faulty alternator and now the loran is back to its usual excellent performance and usefulness.

### VFR-MOJAVE TO LONG ISLAND. NEW YORK IN A LONG-EZ

I have almost 1600 hours in our Long-Ez, N26MS, which is equipped for light IFR (or California IFR) including a full gyro panel, localizer, glide slope, Northstar loran, transponder and encoder, oxygen and a big engine. The airplane I was about to ferry across the USA was equipped with an O-235-C2C, 108 horsepower engine, a one-and-a-half nav/comm (so called because you can comm or you can nav but you cannot do both), and a recently installed Micrologic ML6500 loran completed the avionics package. It was to be a real back-to-basics experience for me.

I went over the airplane very thoroughly prior to departing and felt good about its ability to make the trip. The weather in March across the nation is not always great, but I was hoping for good VFR.

I took off from Mojave just as the edge of the sun showed on the horizon. I had some baggage and full fuel tanks so with just me in the front seat, take off weight was at 1380 lbs. She used up only 1500 feet of runway to break ground and climbed

well at 800 feet per minute. I climbed to 11,500 feet and set sail for Santa Fe, New Mexico, direct. This is a very rugged route, but is quite spectacular and beautiful. I passed by the San Francisco peaks at Flagstaff, Arizona in 2-1/4 hours. These mountains are very scenic, reaching to almost 13,000 feet and covered with snow. I flew over the Navajo and Hopi reservations to Santa Fe, all the way with beautiful clear blue skies and unlimited visibility - and a 10 knot tail wind!

The weather man had told me of a huge, fast moving, cold front coming down from Canada into the nation's midsection but I was hoping to beat it. Alas, no such luck! As I peeked over the Rockies at Santa Fe, there was a solid undercast as far as I could see. The bad news was it was all the way to the ground. Tucumcari, NM, was zero/zero in blowing snow, as were most of the other towns along my intended route of flight.

I changed my route to follow the edge of this cloud mass and found myself going almost south to Roswell, NM, then southeast to Midland, TX. From there I flew south of Dallas-Fort Worth and on over to Pine Bluff, AR, where I landed and spent the night. This was a flight of 9 hours and I used 46 gallons of fuel for an average fuel burn of 5.1 GPH. There was a flight service station at Pine Bluff but it turned out they did not open on weekends! The outlook for the morning was pretty dismal but I got a good night's rest at the local Holiday Inn.

I departed Pine Bluff at dawn in a fine drizzle with visibility down to 3 or 4 miles. I headed southeast toward Florida to get out from under the front which had overtaken me during the night. I crossed Mississippi, Alabama and Georgia in light rain, poor visibility and low ceilings. Quite a change from typical Southern California weather! I crossed South Carolina and North Carolina into Virginia. I crossed the coast at Norfolk, VA, 15 hours and 41 minutes after departing Mojave. I had failed to beat the front to the coast however, and although I tried to fly up the east coast along the beach, I only made it as far as Accomack County Airport on the Delmarva peninsular (Delaware, Maryland and Virginia). It was raining very hard as I flew up the coast and I actually picked up a pretty good load of ice trying to make it to Salisbury, before turning back to land at Accomack Co. I spent the night in

a delightful motel called The Captains Quarters - good food and real friendly people.

In the morning it was snowing! Ceilings were quite low but visibility was acceptable so I flew up the beach across the mouth of the Delaware, past Atlantic City where the ground was white with snow all the way to the beach! The weather improved dramatically as I flew north and was clear as I worked my way around the New York TCA. I crossed the Long Island Sound and landed at Mattituck airport, my destination. A short airport with an approach over some 30 foot trees. A very tough proposition in a Long-EZ. I was thankful to get it down in one piece.

My trip had covered some 3000 statute miles in 18-1/2 hours using 99 gallons of gas for an average fuel burn of 5.3 GPH and an average ground speed of 162 MPH. Not bad economy - over 30 miles per gallon.

The 1-1/2 nav/comm was a pain in the neck and I really missed my KX-155 with flip-flop frequencies. The Micrologic loran was amazingly accurate and performed very well but it, too, is a high workload since it has no database and every waypoint must be entered as you go. This was tough at times, especially when the weather was bad, which it was for more than half the trip. I must say, I did enjoy the trip overall. It is quite remarkable that a simple, built-exactly-to-the-plans Long-EZ can be such an efficient, comfortable flying machine.

Sally and I will be essentially repeating this trip in June in our own Long-EZ. It will be interesting to compare the two airplanes.

Mike Melvill

### ACROSS AUSTRALIA, NONSTOP - TWICE!

The trip from Brisbane to Perth nonstop and return three days later, is a crossing of 1948 nm Great Circle Route across Australia. This was a planned, nonstop trip to see our buddy homebuilders in Western Australia for the weekend function. The trip didn't take long but the drama of preparing paper work to satisfy the bureaucrats was something else. To get a permit for a homebuilt 39% overweight, for a 16 hour

flight sounded easy. The reply was, "We have never done this before." Nothing is impossible; the Civil Aviation Authority chaps are great guys but are bound by structured rules that are out of date. With a so-called modern aircraft, Long-EZ or, for that matter, anything different - with no engineering justifications; the EZ Flight Manual so conservatively written - things looked bad for any approval.

The only way to get anything through is to sit back and wait until you US EZ guys do your thing and get approval on History of Performance, but this is where it starts for us down under.

I must thank Rutan Builder Support for all their time and nonprofit effort to justify overweight Long-EZs that have flown in record breaking attempts with success. After this effort, all this evidence had to be set up properly by an aeronautical engineer and his Statement of Approval was necessary. The tank and fuel system had to be designed; the tank, 9G forward load with 7-1/2 psi pressure test, weighed only 9 lbs. Fibreglass/foam panel is amazingly strong. The tank, 49 US gallons, was built in a big hurry. Some glass/foam panel was left over for an oil tank made with 5 minute flox joints.

Nothing was built until approval for safety and airworthiness came through the system. The Engineer had to have all the Special Flight Manual Inserts with CAA signatures all over them, and a one square meter drawing of tank and fuel system. It all looked good in the end for a late getaway. As usual. Jean, my son, Glen, and friend crawling all over the Long-EZ for the final inspection/completion.

In the rush, a last minute decision to try the Vortex Generators - this time without approval, fitted on the canard. On the way to the Brisbane Airport, 75nm, I found a cloud to try them in. Believe me, it really worked. No down pitch. I knew then that I might stand a chance for a successful trip.

Next morning, raining, of course. After the rush of preparing for this flight, the three hours sleep were welcome. There was no point in expecting a VFR departure 2 hours before light so I waited till first light and saw a couple of holes in the sky - really only good for F18-type aircraft. The rain had eased with low clouds, 1/8-1800 ft. Out

came the TV cameras. Two national channels had been waiting in rain 2 hours but they weren't disappointed. The aircraft, at 1850 lbs. approved maximum take-off weight, flew normally and climbed 500 ft./min. under this cloud cover. Testing the canard and climbing into this spitting heavy cloud for 15 minutes. was fine, "the bloody thing worked, no trim change."

Departed on radial, clocked on departure by the Tower, and I disappeared into a white, precipitating cloud and never saw the ground for 30 mins.. while climbing a coastal range. The stick pressure did get heavier as it rained, but climbing with this weight, normally my canard would have given up long ago.

Now settled in at 10,000 feet in between stratiform layered clouds, I knew this was about as bad as it would get for this trip. Bearing west for 945 nm, intercepting a couple of NDB stations, went smoothly. The fuel burn was established on the Alcor Fuel Meter and full throttle was acceptable with maximum fuel flow of 22.5 liters/hour (5.9 gal.). The 0-235-L2C maintained 2700 rpm with all engine gauges showing normal and the TAS averaging 150 kts., over and back.

Very soon the tree line disappeared, leaving red sand and only an occasional salt lake for direction. At the 945 nm mark, the NDB was working. The average ground speed was now 145 kts. for the 945 nm. The next 757 nm was strictly dead reckoning, 5 hrs. on the new RMI compass, resulting in a track error of 30 or 40 nm off track, acceptable for a homebuilt, plastic aircraft.

The next, and last, 300 nm flight was over a civilised part of the country with a few trees visible and signs of cattle tracks leading to water holes and, soon after, the fields were ploughed.

The sun was still high in the sky giving a beautiful reflection in the Indian Ocean. This was one of the highlights of the trip - to experience seeing the Pacific Ocean on departure and then, the Indian Ocean on arrival. This puts it together in a nutshell: it's a long way across this 2000 nm wide, barren continent in a light aircraft, nonstop.

The reception was overwhelming with meeting old friends again. The TV didn't miss the landing

either. So now the Long-EZ, "Winglettes" stands taller in the misnamed category "Ultralite".

The trip from Perth to Brisbane was much easier to handle and it helps if you go to sleep sometimes. The return flight from Perth started 2 hours before first light and I must say, in Australian terms, "as black as a sheep's gut". When dawn broke, I was 10,000 ft., in stratiform layer clouds with the outline of the coast to the south; a beautiful sunrise mixed with Swan Lake stereo music tickling my excitement made it one of my life's most precious starts for the day.

I flew over the South Australian coastline with 700 miles of the whitest and purest beaches fading from green to the deepest blue ocean you'd find anywhere. I have flown this area with Jean at water level; it's beautiful, pure, clean and undisturbed. This trip was a mixed bag of air with little, if any, tail wind. Density altitude for most of the trip over and back was around 12,500 ft. I used only .5 liters. of oxygen and I'm sure this kept me on the ball.

Long range flying is another dimension of flying, if you can lie back as you do in the Long-EZ, you don't get muscle fatigue from sitting, I was amazed. The fourteen hours soon went in excitement.

Eventually, the coast came up - Brisbane at 10,000 ft. for a Tower clock timing a final decent to Oakey, 75nm west again, landing in the night.

What a private welcome! Jean had the hangar doors open and we had lots to talk about.

#### FILED RECORD

BN - PTH - 1948 nm (Great Circle) clocked 13hrs, 41 mins., (heading west) 145.57 kts. av., 24.12 L/hr (6.35 US gal.) - 380 litres fuel useable - 330 litres used - 50 litres remaining.

#### FILED RECORD

PTH - BN - 1948 nm (Great Circle) clocked 13 hrs., 55 mins., (heading east) 140.88 kts. av., 24.43 L/hr. (6.45 US gal.) - 380 litres fuel useable - 340 litres used - 40 litres remaining.

#### FILED RECORD

Longest distance-2037 nm nonstop for C1B Class, Australia."

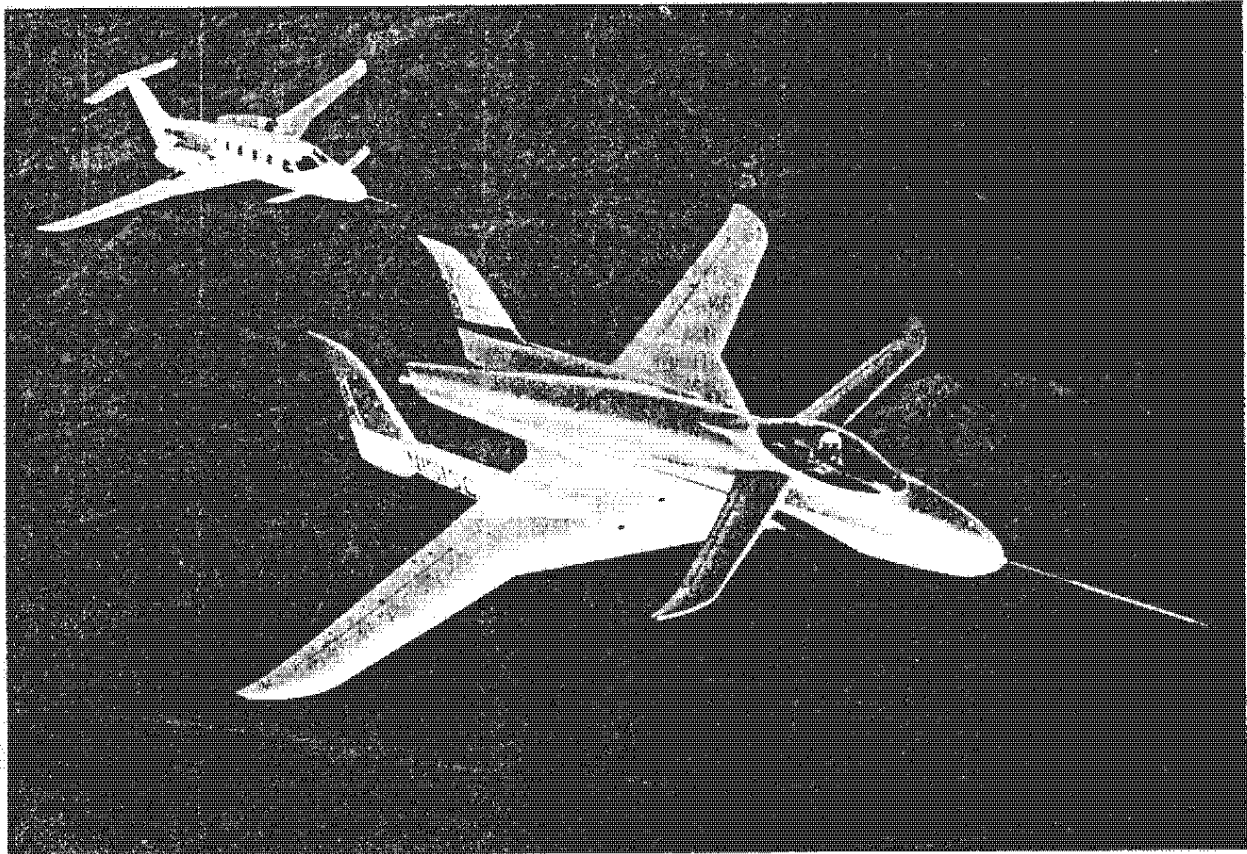
Magna Liset



Magna Liset (Rt) & his navigator for the Around Australia Race, Wayne Johnson. (See CP59) VH-MJL is of course, Magna's Long-EZ which he used to fly twice across the width of Australia



Al Fink's beautiful VariEze just out of the paint shop. The helpers are Dan Pierson, Louie, Brian Blue, Billy & Al Fink. Al hopes to fly from Mojave airport some day real soon.

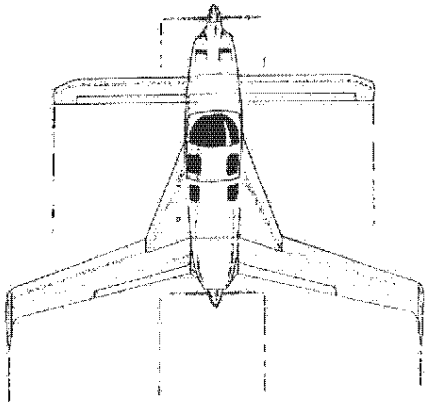


Burt's latest - "Ares", a single engine jet fighter powered by a JT-15D Pratt & Whitney engine with 2900 lbs. of static thrust. Seen here on its second flight chased by Burt's "Triumph", a Williams powered twin engine, 4 to 6 place mini business jet.

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

*[Faint, illegible text]*

**first class mail**



**TO:**

**April '90**

The line which appears above your name lets you know through which Canard Pusher you are paid. If your label says **LAST ISSUE CP 63** then this is your last issue, and you need to renew.

**CP 63**