

TEXAS COZY

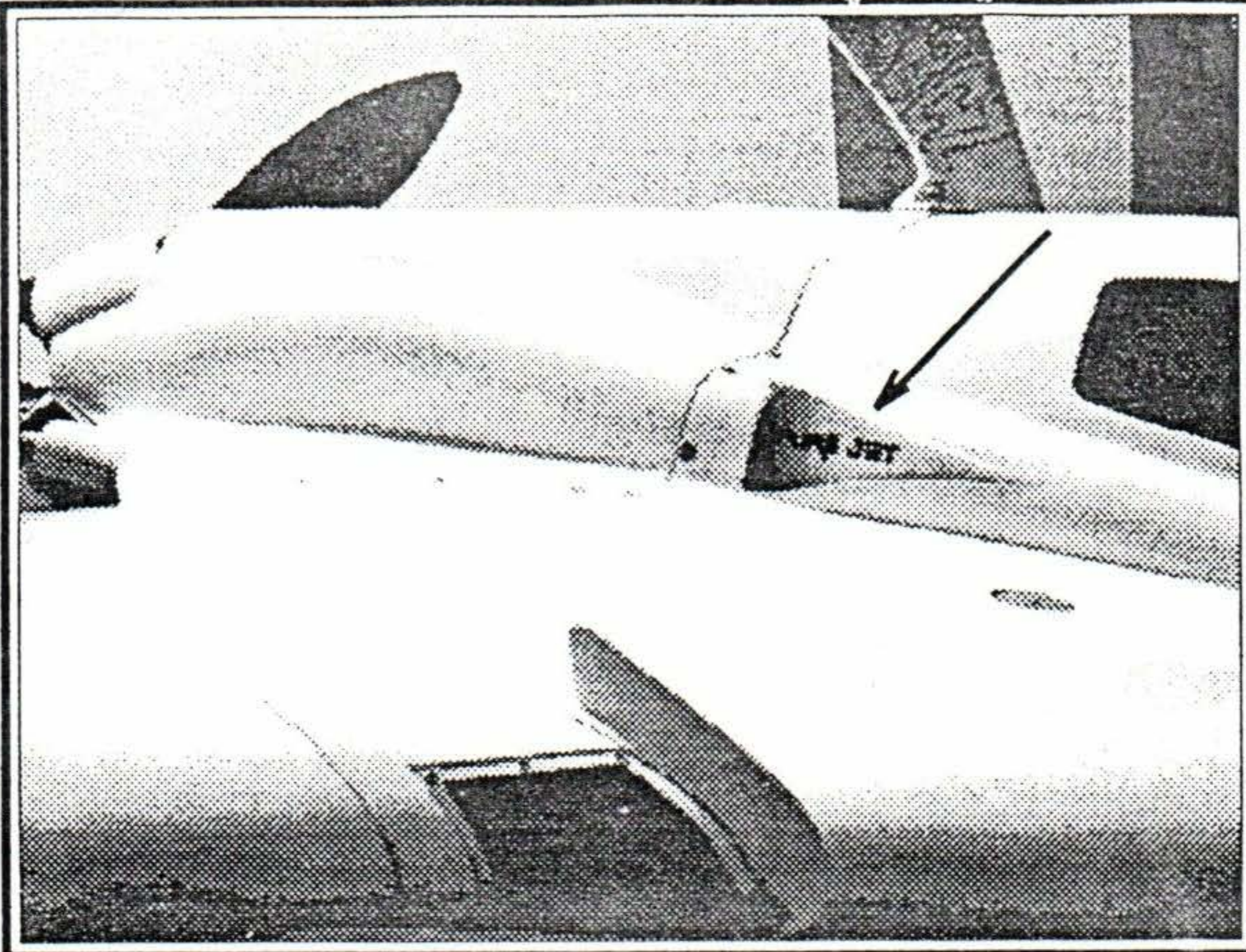
Vance's Latest Cozy Version

The latest Atkinson Cozy version has some very interesting additions. Notice the light in the strake. At first I thought it was a landing light, but I was wrong. It is a collision avoidance recognition light. It has a whopping big 600,000 CP flashing light inside. It must attract all the bugs in Texas at night.

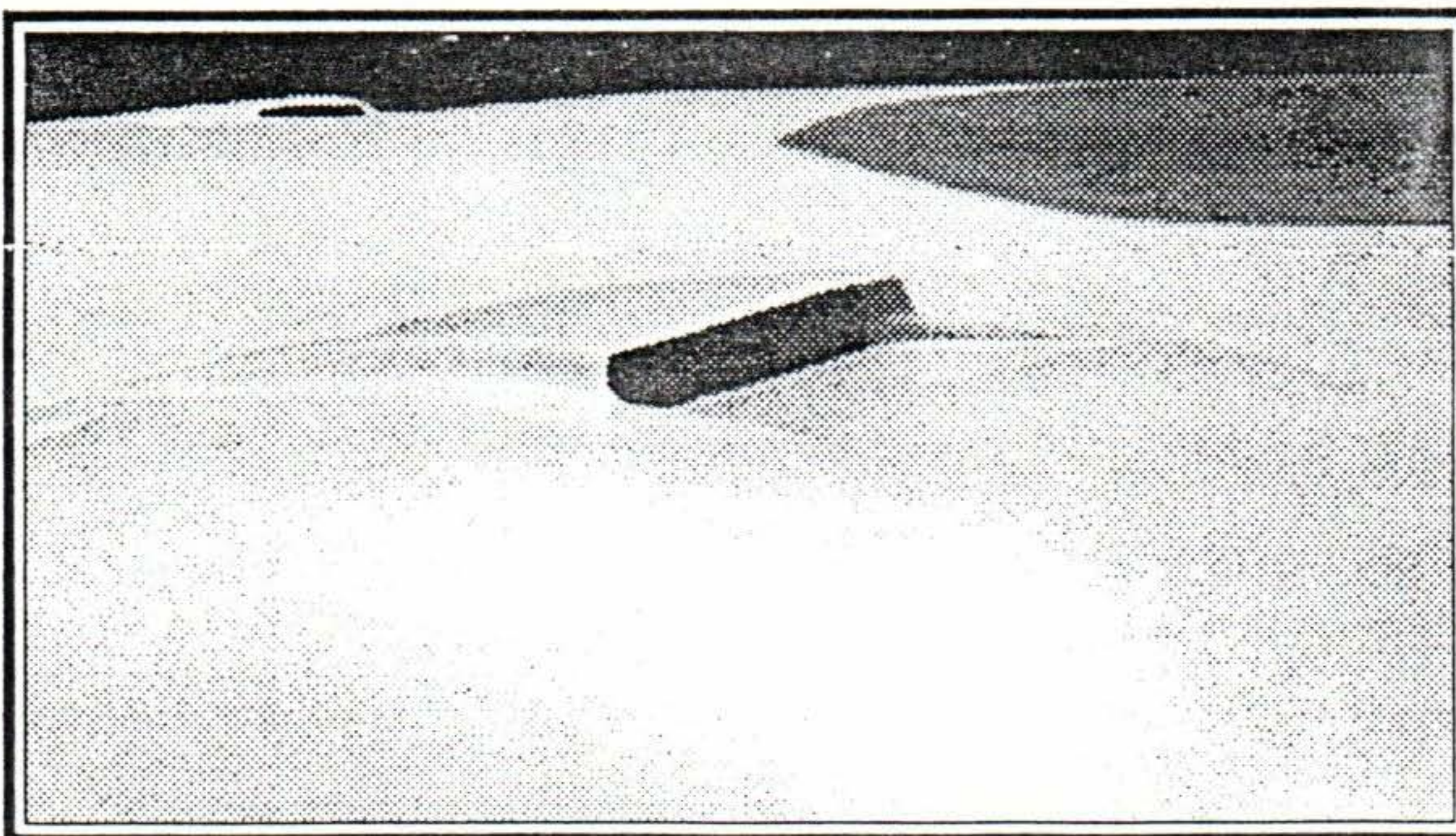
The spinner is painted in a spiral that seems to screw or unscrew through the air. *I guess Vance took that English airscrew idea seriously. Rumor has it the spiral is a secret weapon. As soon as anyone gets on his "6" they look at the spinner, get vertigo, and "split S" out.*

All joking aside, the Atkinson Cozy is an extremely fine airplane. It was chosen as winner of the **Best Exterior** trophy with good reason. Those of you who are building Cozys would be well advised to look at this one carefully. There are a lot of good ideas that "earn their keep".

Join
Central
States
Association



Note the oil cooler air inlet with a fence to guide air into the NACA flush scoop.



Exit scoops on top of Vance's Cozy let the hot air out with a minimum of drag.

it done." Contact:

Lowell Grisham
209 Pinewood
Godfrey, IL 62035

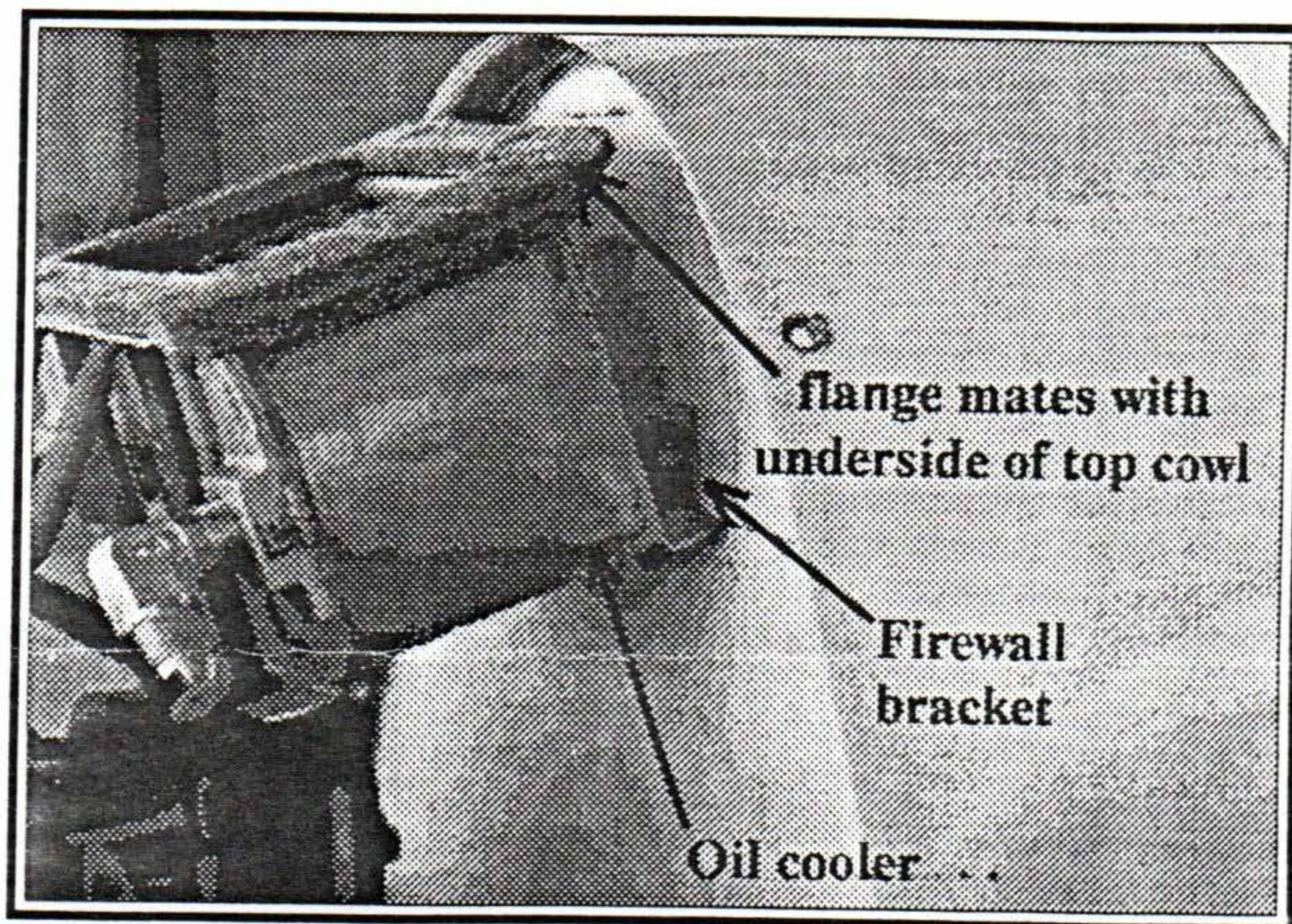
Top Mount Oil Cooler

Bob Davenport - It has been recommended by some in the past to mount the oil cooler up high in the engine cowl adjacent to the firewall. This location keeps the oil reasonably cool, but the primary reason for this location is to provide a "chimney" type vent for the cowl when parked after flight. This in turn, adds longevity to the mags and vacuum pump while keeping the oil cooler as close to the CG as possible.

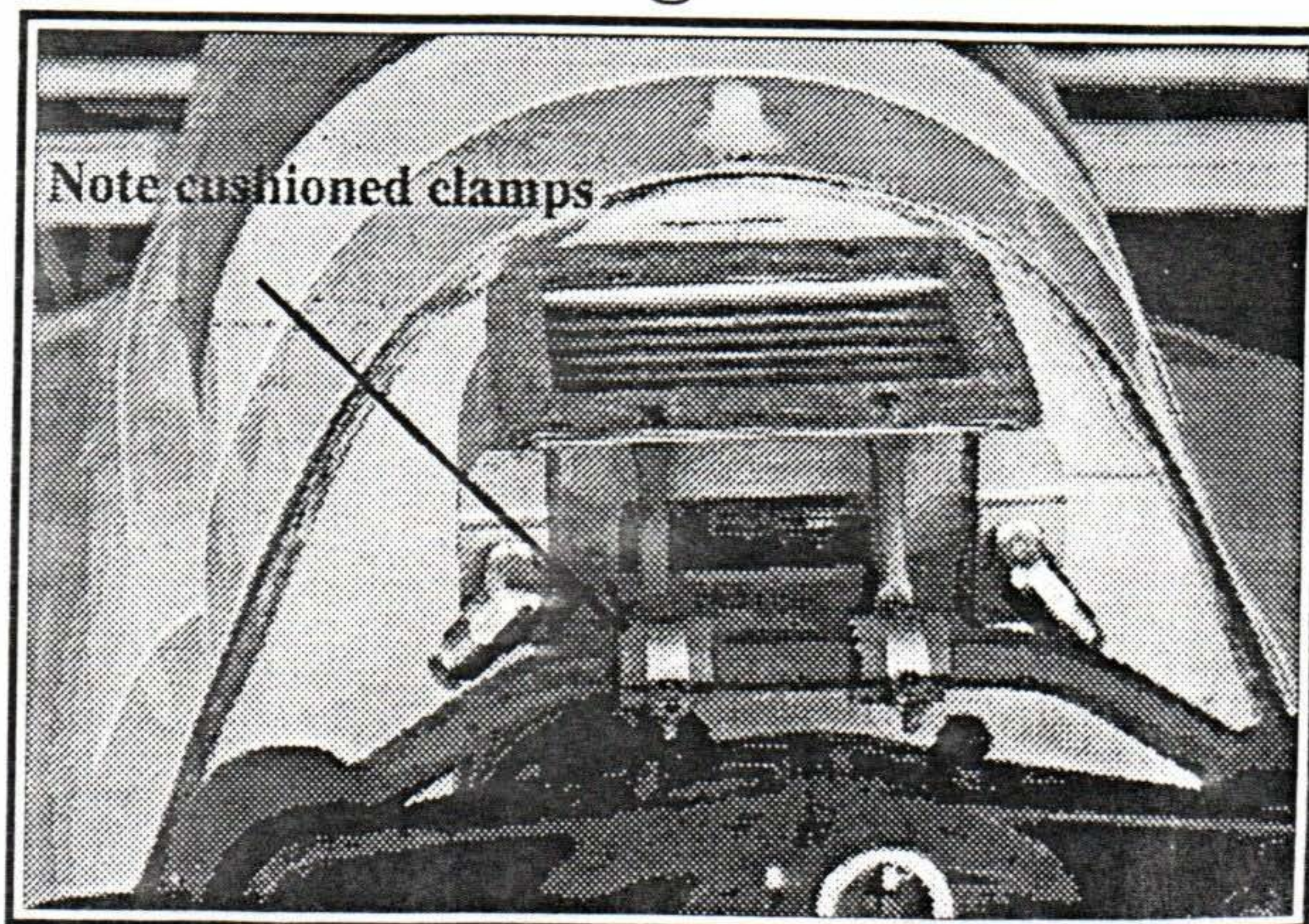
The photos show the installation on N282RD where the front of the oil cooler is supported by a light angle bolted to the firewall. The rear support consists of a pair of struts clamped to the dynafocal top cross over tube. The clamps fasten around rubber tubing to minimize vibration. A 1/4" thick felt seal bears against a mating flange of the vent duct which is built into the upper engine cowl.

If there is any interest, a bolt-on type kit for this installation can be provided for under \$45 delivered in the US.

Bob Davenport
P.O. Box 650581
Vero Beach, FL
32965



Looking forward





Frequently Asked Questions

Certification

1. Is the XP-360 Engine[®] a new zero time engine?

Yes. The XP-360 Engine[®] is a brand new, zero time engine designed to meet the increasing demands of the Sport Aviation market and airframe manufacturers. Each XP-360 Engine[®] comes with an Operator's Manual and new logbook.

2. Is the XP-360 Engine[®] certified?

No, although the majority of all components are FAA approved the XP-360 Engine[®] has not been Type Certified as a complete engine. Therefore, once assembled, the engine falls in the experimental category. Superior is in the process of Type Certification of a 180hp engine. The designation of this engine will be the SV-360 Engine.

3. What do you mean by the majority of parts are certified?

Superior has FAA approval on all major components and the piece parts with the exception of some miscellaneous hardware. Each of these components will be FAA approved once the SV-360 is certified.

4. When do you anticipate certification of the SV-360?

We anticipate the FAA type certification for the SV-360 engine in the third quarter of 2003.

5. Will the SV-360 replace the XP-360 Engine[®]?

The XP-360 Engine[®] will continue to be the branded product Superior sells to the Sport Aviation Market. This allows the customer to specify options currently available, yet not certified for his engine, such as high compression pistons, aftermarket fuel injection system or electronic ignition system. If a customer desires to have his engine Type Certified, Superior will have this as an option also.

6. If I purchase an XP-360 Engine[®] and you get certification on the SV-360, does that mean my engine is certified?

No. The SV-360 is a FAA type certified engine, manufactured and assembled under the guidelines and requirements of a Type Certificate number. The XP-360 Engine[®] is built under experimental guidelines and could have parts not applicable to the SV-360, such as high compression pistons, aftermarket fuel injection system or electronic ignition system.

7. Who builds my engine if I order an XP-360 Engine[®]?

Superior's new state-of-the-art build center is scheduled for completion in April 2003. Until this build center is completed Superior outsources the assembly and Acceptance Test to approved engine facilities.

Engine Characteristics

1. What is the difference between the XP-360 Engine[®] and a typical Lycoming 360?

The XP-360 Engine[®] includes the latest improvements in technology and many other custom enhancements, yet unavailable on a standard Lycoming factory engines.

- The crankcase has been strengthened with reinforced cylinder decks. The reinforced crankcase cylinder deck eliminates deck to deck cracking.
- The crankcase offers a balanced oil system. Totally redesigned, the balanced oil system lubricates the crankshaft and the camshaft from both sides to reduce oil pressure fluctuations and to equalize oil-flow through the entire engine.
- Pressured oil lubricates the crankcase thrust face, reducing friction on the loaded surface of the case where the crankshaft pulls the case forward. This process actually acts as a cooling system as well.
- A dynamically balanced VAR Steel crankshaft is balanced to within one-quarter ounce-inch to reduce engine vibration, component wear and pilot fatigue. Also, inside the front main reservoir, Superior's crankshaft has a smooth, groove-free plated I.D. surface that does not hold oil acids or corrode, eliminating the problems addressed in Lycoming's SB 505 inspection and corresponding AD.
- The weight-matched connecting rods and piston sets yield a statically and dynamically balanced reciprocating section for reduced vibration and reduced wear.
- Superior's exclusive computer optimized camshaft features new cam lobe designs for better cruise economy and lower valve train loads. This reduces cam and lifter spalling and decreases guide and valve train wear. The new cam is also optimized for smoother idle and power vibration characteristics, reducing pilot fatigue.

- Our Millennium Standard-Cast Cylinders provide 6% greater volumetric efficiency than conventional Lycoming Cylinders.
- Hi-flow, improved induction sump on standard updraft intake engine.
- Tri-metal bearings, state-of-the-art fatigue resistant bearing material.

As you can readily see, the XP-360 Engine[®] is significantly ahead of any other engine in its class. It comes with a comprehensive 3-year parts and labor warranty from Superior. Accessories are covered for 1-year from the date of installation.

2. What is the type and minimum grade of fuel?

The 180HP engine is approved for 91 octane unleaded auto fuel and a minimum of 100LL-aviation fuel. Superior recommends 100LL, although this is not a requirement.

A 170HP, 87 octane version is also available with 7.2:1 compression ratio pistons.

3. Does this mean I can use auto gas?

The XP-360 Engine[®] can operate and perform at rated power using unleaded fuel. When operating on unleaded fuel, Superior recommends using fresh, premium auto fuel available at a major brand, reputable gas station. Acceptable gasoline's are specified per ASTM D-439 and D-4814.

NOTE: Use of auto fuel blended with ethanol or gasohol is forbidden. Ethanol (alcohol) mixed with unleaded fuel can cause vapor lock, carburetor ice, reduction in range, carburetor problems and damage to the fuel system. The use of an alcohol (and water) tester is recommended.

4. Is there special or specific oil approved for the engine?

The recommended oil must meet MIL-L-22851, ashless dispersant grades. Multi-weights (15W50 or 20W50) are recommended for all temperatures and straight weight oils are recommended for various average ambient air temperatures.

5. Is the engine available in 12-volt and 24-volt configurations?

Yes, both 12 volt and 24 volt configurations are available.

6. Can I use my existing engine mount?

The engine mounts for the XP-360 Engine[®] were designed as a direct "drop-in" for a Lycoming engine replacement. Please note it is imperative to determine whether your existing engine mount is designed for #1 or #2 dynafocal mount or a conical mount style engine. The various mount types are part of the engine crankcase and cannot be modified once the engine is assembled.

15. Can I request optional accessories to the standard package?

Yes. Superior has several optional accessories available and will continue to add to the options as new ones come to the market. Currently, we offer packages for Lightspeed Ignition Systems, LASAR Ignition Systems, Aerosance FADEC Systems, Airflow Performance Fuel Injection Systems and Ellison Fuel Systems. See "Build an Engine" in Superior's web site www.xp-360.com for more details.

16. Can I buy replacement accessories from Superior

Aftermarket replacement accessories and spare parts are available from Superior's worldwide distribution network. For Distributor's and their locations see www.superiorairparts.com.

Performance

1. What is the maximum continuous horsepower rating of this engine?

Max continuous horsepower is 180 HP at sea level.

2. What effect does altitude have on this rating?

All aircraft engines are rated by the amount of horsepower they produce at sea level at standard ISA conditions. Superior's naturally aspirated XP-360 Engines[®] produce rated 180 HP -0/ +5% at sea level in standard ISA conditions. As with any naturally aspirated engine, as pressure altitude increases, available horsepower decreases, however, this effect does not change the rated horsepower of an engine.

3. Are Turbocharged versions available?

Superior is in the final testing stages of a turbo-normalized system for the XP-360 Engine[®]. Due to the variations in exhaust systems and cowlings, please contact the Superior sales staff for specific pricing. We anticipate this engine being available in the 4th quarter 2003. Check back at www.xp-360.com for the latest details.

4. What is the specific fuel consumption of this engine?

The specific fuel consumption of the Superior XP-360 Engine[®] is .43. ie; 10GPH @ 75% power, 8.7.

5. How does that compare to a typical Lycoming 360?

The Lycoming O-360-A1A burns 10.5 GPH at 75% power (compared to 10GPH for the XP-360) and 9.0 GPH at 65% power (compared to 8.7 GPH for the XP-360).

6. Are there performance curves available for the engine and how do I get them?

Yes. Superior has an XP-360 Engine[®] specifications sheet that provide dimensional data as well as power curves. They are available on our web site at www.xp-360.com.

TBO and Warranty

1. What is the TBO of this engine?

Superior has established a recommended 2000-hour TBO for the XP-360 Engines[®].

2. What is the warranty of the XP-360 Engine[®]?

Superior warrants the XP-360 Engine[®] to be free from defects in material and workmanship for THREE (3) YEARS from the date of purchase.

3. Does this warranty cover accessories?

Superior warrants the accessories for the XP-360 Engine[®] (Fuel System, Magnetos and starter) for ONE (1) YEAR, or manufacturers published warranty which ever is greater, from the date the engine is first placed in service.

4. Is there any specific warranty requirements for the engine such as; time between oil changes?

The XP-360 Engine[®] Operators Manual outlines the required maintenance to maintain warranty, including pre-flight inspections, the initial 25-hour inspection, and routine re-occurring 50, 100 and 500 hour inspections.

Service and Maintenance

1. What are the scheduled maintenance requirements for this engine?

The XP-360 Engine[®] Operators Manual outlines the required maintenance inspections including pre-flight inspections, the initial 25-hour inspection, and routine re-occurring 50, 100 and 500 hour inspections.

2. Who is authorized to perform maintenance on the engine?

The XP-360 Engine[®] is an experimental engine and as such, no specific FAA license is required. However, for the owner's safety and peace of mind, Superior strongly encourages owners to have a licensed mechanic work with an owner for the first inspections for the purpose of training and to insure the engine is thoroughly inspected.

3. Are piece parts readily available for the engine?

Yes. Superior has a network of Authorized Superior Distributors Worldwide that carries a large assortment of inventory. For a list of our Distributors, please review our web site www.xp-360.com.

4. Are there specific break-in procedures for the engine?

Yes. Superior has a published Service Letter 96-008B that applies to our XP-360 Engine[®]. Procedures are also included in our Operator's Manual and can be found on our web site at www.superiorairparts.com.

Cost and Availability

1. What is the cost of the engine and what is included in the cost?

Due to the various options available on the XP-360 Engine[®], Superior recommends viewing the "Build an Engine" portion of our web site www.xp-360.com to determine the price with the options you prefer.

2. What is the cost of options for the engine?

Due to the various options available on the XP-360 Engine[®], Superior recommends viewing our web site www.xp-360.com to determine the price with the options you prefer or call our toll free number (800-420-4727) and ask for a sales person for a quote.

3. Can I order an engine today and whom do I order it from?

Yes! You can order your XP-360 Engine[®] online at www.xp-360.com or if you prefer, call Superior at 800-277-5168 or 972-829-4627 and ask for an engine sales representative. Our sales representatives can assist you in determining the exact engine you want and answer any questions you may have. We have many options available to you, including being present at the factory and viewing the assembly and testing of your engine. We also offer an option of building your own engine with the technical assistance of our trained staff.

4. If I ordered an engine today, when can I expect delivery?

Due to the overwhelming demand for our XP-360 Engine[®], the only way to determine delivery dates is at the time of order. Once the engine is ordered, depending on the backlog of owners ahead of you, we can give you a firm date for delivery.

5. Is a deposit required and is it fully refundable?

Yes, a \$1,000.00 deposit is required to place your order into our production plan. Superior will notify the customer in writing in advance of the actual build date and the current price for their XP-360 Engine[®] and require full payment of the balance. However, should the price for XP-360 Engine[®] have increased at the time of the build notice, the Customer may cancel the build and Superior will fully refund the down payment deposit.

Miscellaneous

1. I have read about a SV-360, a SL-360 and the XP-360, what is the difference between the three?

The SV-360 is the designator for the FAA certified engine. This certified engine is built and tested by Superior under a FAA Type Certificate and Production Certificate. This is supplied with a new Data Plate, a Superior logbook and Operator's Manual and is primarily for use in a certified airplane.

The XP-360 Engine® is the designator for the experimental engine. This experimental engine is built and tested by Superior and is supplied with a XP-360 Engine® Data Plate, a Superior logbook and Operator's Manual and is primarily for use in an experimental airplane.

The SL-360 is the designator for an Engine Parts Kit. The SL-360 Engine Parts Kit was developed for the experienced builder who has the tools and ability to assemble his own engine or has the ability to have an experienced person assemble the Kit to a complete engine. The SL Kit Engine comes with all the necessary parts for a complete engine like the XP-360 Engine®.

2. Does the SL-360 Parts Kit have the same warranty as the XP-360 Engine®?

No, the SL-360 Engine Parts Kit carries Superior's standard parts warranty which is ONE (1) YEAR. Superior warrants the XP-360 Engine® to be free from defects in material and workmanship for THREE (3) YEARS from the date of purchase.

Superior warrants the accessories for the SL-360 engine kit or the XP-360 Engine® (Fuel System, Magnetos and starter) for ONE (1) YEAR from the date the engine is first placed in service.

3. If I get an A&P mechanic to build a SL-Kit engine for me, can I get an XP-360 Engine® Data Plate?

No. The XP-360 Engine® data plate is supplied for the XP-360 Engine® only.

4. Is the XP-360 Engine® suitable for aerobatics?

Superior does not produce an aerobatic version of the XP-360 Engine® at this time. However, the present engine is capable of conversion to aerobatic flight.

5. Does a vacuum pump come with the engine?

Superior does not include a vacuum pump with the XP-360 Engine®. Because of the various applications the engine may fit in the kit plane market, some customers may not require a vacuum pump. Since vacuum pumps are readily available in the marketplace and to keep the cost down, we allow the customer to make the decision as to whether he needs a vacuum pump.

6. Where does the alternator mount?

Although the XP-360 Engine[®] is not supplied with an alternator, a provision has been provided to mount a bracket to the lower left front portion of the engine. Because of the various applications the engine may fit and the different requirements for electrical systems and to keep the costs down, Superior does not supply an alternator with the XP-360 Engine[®].

7. Is there a provision on the XP-360 Engine[®] for bayonet style cylinder head temperature probes?

Yes. Superior's Millennium Cylinders installed on the XP-360 Engine[®] have provisions for bayonet style cylinder head temperature probes.

8. Are there any other versions of the engine in development?

Yes. Superior is currently working on a 200 HP version with a counter-weighted crankshaft, a 320 cubic inch version, a front mounted prop governor version, a version with a solid crankshaft, etc. Our engineering research and development department will always be developing new products for the marketplace.

9. When will they become available?

We anticipate most of these options to be available in the first or second quarter of 2004. Check back at www.xp-360.com for the latest developments.

10. Can I put a deposit on one now, for delivery when it's available?

Yes. If Superior has determined the price for the version you request and an estimated completion date, we will accept your order and down payment. If the price and delivery date have not been established, we will accept your deposit to insure your place in line. When the price and delivery date have been established, we will contact you for an order. If you elect not to purchase the engine due to price or delivery date, Superior will promptly return your deposit in full.

11. Can I come to the factory to see my engine built?

Absolutely! We encourage all XP-360 Engine[®] owners to come to the Superior factory to watch their engine being built or participate in building their engines themselves. We also offer both engine assembly options for an additional fee. Please see our web site www.xp-360.com for more details.

12. Can I get the engine in the color of my choice?

Yes! Superior offers a number of different color choices for the customer that wants his engine personally customized. Visit our web site at www.xp-360.com for the various options offered. If it's not listed, call us. We are poised and eager to satisfy your requirements.

For More Information Contact:

**Superior
Attention Engine Sales Department
621 South Royal Lane
Suite 100
Coppell, TX 75019
800-277-5168
972-829-4627
Xp-360info.com**

Volumetric Efficiency

The following article was based on material taken from John Schwaner's Sky Ranch Engineering Manual (SREM). If you don't have it you are missing a lot of education. Call (916) 421-7672. At about a nickel a page you can't beat it!

"Volumetric efficiency is a performance measure of the cylinder as an air pumping device and measures just the efficiency of the cylinder and valves. Volumetric efficiency of a cylinder is limited by the flow resistance in the intake manifold and by the residual combustion products in the cylinder. The shape and size of the whole inlet system, from atmosphere to inlet ports, have a strong effect on the pumping efficiency of the cylinder."

Improvements in volumetric efficiency increase fuel consumption. The more air you feed the engine the more fuel it needs to maintain the same fuel/air ratio. The more air and fuel you feed an engine, the more power is produced. Increasing air pumping efficiency through any means, including flow porting, requires additional fuel. Along with the increased fuel and air, comes higher horsepower."

The mass (weight) of the air entering the cylinder is of more importance than the volume of air. "Power is roughly proportional to the rate of air

flow through the engine, 6 pounds per horsepower on the average." We all know cold air has more mass than hot air and therefore provides a more powerful charge to the cylinder for combustion. "Engine horsepower increases approximately 1% for every 10°F drop in air temperature."

The cooler the fuel air mixture we feed the cylinder the greater power we will get from the engine. "Lycoming engines have intake and exhaust pipes close together. An increase in volumetric efficiency can be gained by heat shielding or insulating the intake pipes. Bell Helicopter tried insulating intake pipes many years ago. Several problems resulted. The insulation trapped moisture and caused corrosion and the increased weight of the intake tubes wore the intake boss. Chrome plating the intake pipes was found to act similar to a heat shield by reflecting the radiant energy and slightly lowering the temperature of the intake air."

There is no free lunch, however. When the induction air is cooler the engine will produce more power but with decreased fuel economy. "Cold induction air adversely affects fuel vaporization and consequently the fuel mixture has to be richer to compensate."

Many people believe if we ram the induction air into the induction system we will increase volumetric efficiency. While that may be true, it seems not a great deal is gained.

Impact pressure charts show only about 1/2 psi pressure increases at 170 mph. This all is effected by the design of the carb air box. There are many different designs out there and many different results.

Hal Hunt's Long-EZ Air Box literature states that Dave Ronneberg's air box design required, "8 iterations in design and tooling (all of which degraded performance) before he hit upon the right balance of flow factors increasing engine top end performance."

If you decide to build your own air box there are some "rules of the road" presented in the SREM.

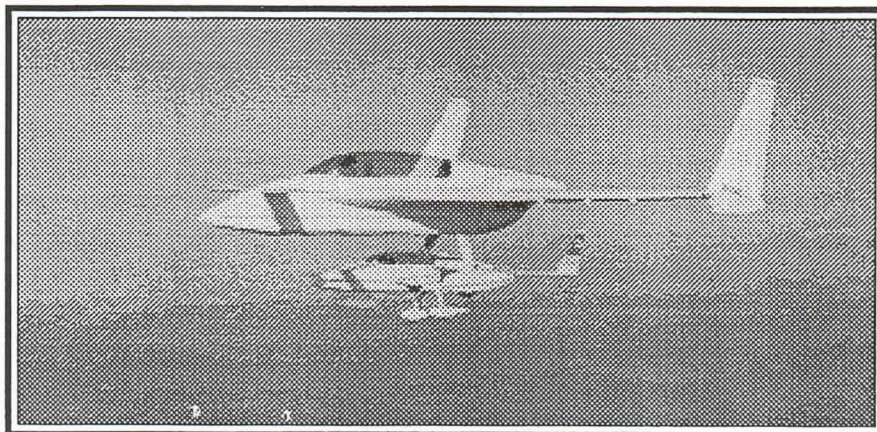
"The air box represents a diffuser whose purpose is to turn high velocity, low pressure air into low velocity and high pressure air as quickly as possible and with as little turbulence as possible. Tests at Lycoming have shown that for a cone shaped diffuser, the optimum design for volumetric efficiency is one where the total angle of expansion of the cone is 7 degrees. For a rectangular diffuser, the rectangular sections should have an 11 degree total angle of divergence."

Next SREM addresses pressure drop across the air filter. It shows pressure drop across a new Brackett air filter to cut the ram speed by about 70 mph. As the filter is used this - - - **Hey, go buy the book! It is low cost but valuable education!**

Bostic Long-EZ

This Long-EZ appears to be mating with an other. It seems to explain why California builders put out EZs at such an incredible rate. They have simply found it is faster to grow them than build them.

This beautiful 961 pound example, N68MB, belongs to Miles Bostic. It cruises at 165 kts with an O-320 Lycoming and B&T prop.



Herb Sanders (GA) - I was glad to see that you honored Vance Atkinson for his articles and participation in CSA. Many people may not have stopped to consider the significant value we get from Vance, Ken Miller, and others who do the same testing.

When a new system comes out that we all have an interest in and someone is willing to buy the system, go to the work of installing it, experience the risk of injury, death, or even worse (loss of his EZ), foot the fuel bill and expenses to do the flight tests, and then **give** us an unbiased report of the performance and results, we are certainly getting a lot for our nickel.

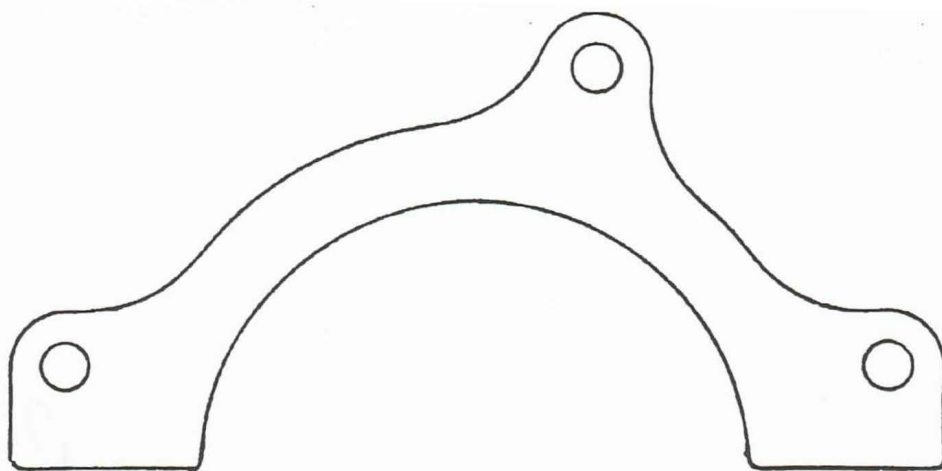
AMEN Herb!!

More Landing Gear Shake

Baine Whipkey (GA) - I have heavy duty Cleveland wheels and brakes on my Long-EZ. While doing taxi tests I experienced **SEVERE** vibration when braking from 40 mph on down. I checked disc run-out and found each one at more than .020". I called Cleveland and found their run-out limits were .020". They checked my set and found my discs were good but replaced both of my wheel assemblies.

On the new set I found run-out still over .010". I checked with Mike Melvill and discovered the run-out must be less than .010" to work satisfactorily. After much hassle I got a third wheel assembly from Cleveland that had less than .010" run-out. After that change I've had no further vibration problem.

The most important thing I would like to pass on is that run-out is not necessarily only in the disc but may be in the two wheel halves. The wheel wobble causes the disc to also wobble. I find that just the paint between the two wheel halves makes a difference in run-out. You can also assemble each wheel in three differ-



Crankshaft Seal Retainer

John Nicholson (Ont) - Here is a drawing for a crankshaft seal retainer which I made and installed. The pattern is from a Lycoming part. Two are required for a complete extension. I made them from 1/16" cold rolled steel but aluminum would probably be OK. They were cut out with a hacksaw and filed to contour. They didn't take long to make.

To drill and tap the crankcase, first remove the prop and extension and draw the large prop bolt bushing out of the crankshaft flange using a socket and short 3/8" bolt as a puller. Through this hole you can drill and tap a hole for a 1/4"-20 x 1/2" bolt. Two people are required for this. One will drill and one will give drill alignment. With the airplane parked nose down it is almost impossible to line up the drill by yourself. Install the retainer plates with the 1/4"-20 x 1/2" bolts and lock washers.

Editor note: If you drill and tap a 1/2" deep hole you'd better use a bottom tap or you may run out of threads before you get the bolt screwed in all the way.

Reinstall the prop bushings, extension, and prop. You'll now have no more worries about losing your oil.

The installation takes about 2 hours if you have to drill and tap the crankcase, less if your case already has the holes drilled and tapped.

ent positions - so pick the one with the least run-out.

Run-out on an automobile wheel is a problem when it exceeds .002". I fail to see how Cleveland expects us to accept ten times as much on their product. It's no wonder we are having problems with vibration.



John Nicholson (ONT) - When I built my O-320 powered Long-EZ in 1984 I could not get the 28 gallons per hour required flow because of a FLOSCAN sender in the fuel line. If you look into the unit the hole appears quite large but it is a tapered hole and will not pass a 1/8" drill. I estimate the hole is less than 3/32" in diameter. While talking to the people at DPS Instruments, I learned they want the FLOSCAN sender to be installed downstream from the fuel filter.

In view of the tiny hole and the foam chips we sometimes find in our tanks I think it would be a good idea to warn builders, for safety's sake, that the sender **MUST** be installed downstream of the filter.

If FLOSCAN has redesigned their unit since 1984 perhaps this warning is no longer valid. I doubt it though!

Brake Pad Change

David Haggard (KS) - My Long-EZ has heavy duty Cleveland brakes and has used the asbestos Parker Hanifin #66-102 pads until recently. I found they were no longer being sold and that the replacement pad, #66-106, was of a different thickness.

To change to the new size pads I was told I needed to purchase a special modification kit. It consisted of a spacer that is .098" aluminum, AN - 4H - 15A bolts, and the new pads. This wonderful kit, #199-2000, **ONLY** costs \$33 per wheel. I could have also made the spacer out of aluminum sheet and saved the Parker Hanifin charge.

I explained that I thought this was a real rip-off as **they** had changed the pad size for **their** convenience and that I had no control over the situation. I still wanted the old style pads that were thicker, therefore, giving a longer service life. After much discussion I reached Parker Hanifin's service representative, Sandy, at 800-272-5464. I explained the problem again and found she would send me a free kit for both wheels if I would use the magic words "warranty replacement" in my request. I wasn't really expecting free brake pads, however, the shim # 068-00401 should definitely be a warranty replacement.

Try it. It worked for me.

Keeping Cool

Fuel Line Failure

Vance Atkinson (TX) - Recently a new Cozy was damaged during an off field landing in the Washington, D.C. area. The forced landing resulted from power loss attributed to fuel starvation due to a broken fuel line. It seems the builder had an O-320 with an Airflow Performance fuel injection system installed.

The fuel line that runs from the throttle body to the fuel distribution block was made of solid metal line. The tubing flare broke, causing fuel starvation.

A call to Airflow Performance revealed that you are **NOT** supposed to run a solid line in that area. However, their instructions make no mention of that statement. I have all flex lines in my engine compartment.

Editor note: It is easy for me to see why the builder would use a solid line in this application. It has been accepted policy, by many, to run solid lines on engines between parts that are solidly connected to the engine. The theory is that they vibrate at the same frequency and shouldn't have any relative motion to cause fatigue. Evidently this thinking is not correct.

Roger Ramjet Sez

Some EZ flyers are really frustrated jet jockeys and like to keep up on the latest jargon. While at KCGIG 93 I asked Norm Howell, official Edwards AFB test pilot, what the latest buzz word was. He said the new acronym



Safety Tip

Ken Miller -

I'd like to offer a safety tip to those who are currently flying their EZ's. Since canards aren't prone to stall/spin, the long taught procedure of "always land straight ahead" doesn't always apply. The typical EZ pilot doesn't know the average altitude loss, prop windmilling, of their EZ in an attempted return to the runway of departure.

A "return" requires a half teardrop maneuver, totalling nearly 360 degrees! A 180 degree turn gets you aimed in the opposite direction, but you are 1/4 to 1/2 mile off the center-line. In reality, you continue to turn another 90 degrees, then reverse and turn 90 degrees to line up with the runway. This takes a lot more altitude than a simple 180 degree turn. No mere Cessna or Piper could hope to complete these maneuvers **without** 1,000 feet of air between them and the ground. I've tried it. The EZ's, however, can perform this feat in a lot less.

Next time you're at altitude, begin a full power climb and let the airspeed bleed down to what you use on initial climb. Pull on carb heat as needed, then chop the throttle. Count 1, 2, (for the **OH S---**). Then initiate an immediate push over followed by a 45 degree banked turn for 270 degrees in one direction and reverse 90 degrees in the other. Note your entry and exit altitude loss. Do this maneuver two or three times, in both directions. Average the altitude loss, say, 700 feet or whatever you do in your airplane. Burn this number into your EPROM between your ears. If you find yourself in an emergency engine out shortly after takeoff, you can then be able to tell if you can make it back

to the runway with a quick glance at you altimeter.

I also got in the habit of setting my altimeter at 0 feet for local flights which made it easier to decipher my distance AGL at a glance. After I'm airborne, I get an altimeter setting from ATIS if I need to fly in positive controlled airspace.

If you don't feel comfortable setting your altimeter at 0 then mark your altimeter with a redline next to the altitude of your homefield plus your "return to runway" cushion.

I know this all sounds like a bit much, but I watched a friend in an EZ depart my home field, turn 100 degrees back towards the runway with plenty of altitude to return safely, then turn back the other way for an ill-fated off-field crash on a bridge. I was one of the first ones on the scene and it was very sobering. The fact remains, however, that from an estimated 400 ft. AGL he glided, prop windmilling, for nearly a mile!!

Electric Retract Nose Gear

Steve Drybread - I have a retract system for the nose gear that is electric with a manual override. This can be done for \$350 tops. It really is great to have this with a retractable main gear. The whole installation took me about half a day to install as it bolts directly to the u-joint for the stock Brock worm gear system.

I should have plans available shortly. If anyone is interested they can contact me at:

827 Skysail
Carlsbad, CA
92009.
(619) 431-5562

Editor note: For you new members, Steve has been installing a retractable main gear in his Long-EZ. It was designed by Scott Swing and is very much like the successful installation in the Velocity. Check the 1991 index for the article.

Lycoming Remote Oil Filter Mount Adapter

Larry Danner - This aluminium casting is designed for several popular automotive spin-on oil filters. It weighs about 1/2 pound and has 1/2" NPT inlet and outlet, female, pre-tapped holes. Add some NPT to AN adapters and you can put a spin-on oil filter anywhere you can find the room. This beauty cost only \$15 (I threw the 3/8" automotive hose, the 1/2" NPT to 3/8" hose slip fit adapters and the band clamps into my misc. auto parts box.)

Since I was already committed to building an adapter plate for a remote filter on my Lycoming accessory case I also thought a thermostatic oil cooler valve for \$25 was a nice buy. The housing this valve comes with is a bit of a bruiser, but the spring, thermostat and other internal parts should go into my adapter block very nicely. The thermostat starts to divert oil to the cooler at 165 degrees F and is fully open at 185 degrees F. I purchased these parts from Impact Parts Inc., Glenwild, New York, (914) 434-3338. The parts are on a close-out; **when they are gone there are no more.**

I did some spin-on oil filter research at my local auto stores and found three filters which fit the above spin-on adapter and have an internal bypass valve in case the filter clogs up. Their part numbers and sizes are listed for your convenience.

NAPA	WIX	O.D.	Height
1348	51348	2.95"	3.42"
1452	51452	3.7"	5.45"
1521	51521	3.7"	3.8"

Although other sizes are available, I would rather have dirty oil circulating through my engine, at night, over the (Rockies, Bermuda Triangle, you name your nightmare) than **NO OIL!**



Safety Tip

Ken Miller -

I'd like to offer a safety tip to those who are currently flying their EZ's. Since canards aren't prone to stall/spin, the long taught procedure of "always land straight ahead" doesn't always apply. The typical EZ pilot doesn't know the average altitude loss, prop windmilling, of their EZ in an attempted return to the runway of departure.

A "return" requires a half teardrop maneuver, totalling nearly 360 degrees! A 180 degree turn gets you aimed in the opposite direction, but you are 1/4 to 1/2 mile off the centerline. In reality, you continue to turn another 90 degrees, then reverse and turn 90 degrees to line up with the runway. This takes a lot more altitude than a simple 180 degree turn. No mere Cessna or Piper could hope to complete these maneuvers **without** 1,000 feet of air between them and the ground. I've tried it. The EZ's, however, can perform this feat in a lot less.

Next time you're at altitude, begin a full power climb and let the airspeed bleed down to what you use on initial climb. Pull on carb heat as needed, then chop the throttle. Count 1, 2, (for the **OH S---**). Then initiate an immediate push over followed by a 45 degree banked turn for 270 degrees in one direction and reverse 90 degrees in the other. Note your entry and exit altitude loss. Do this maneuver two or three times, in both directions. Average the altitude loss, say, 700 feet or whatever you do in your airplane. Burn this number into your EPROM between your ears. If you find yourself in an emergency engine out shortly after takeoff, you can then be able to tell if you can make it back

to the runway with a quick glance at you altimeter.

I also got in the habit of setting my altimeter at 0 feet for local flights which made it easier to decipher my distance AGL at a glance. After I'm airborne, I get an altimeter setting from ATIS if I need to fly in positive controlled airspace.

If you don't feel comfortable setting your altimeter at 0 then mark your altimeter with a redline next to the altitude of your homefield plus your "return to runway" cushion.

I know this all sounds like a bit much, but I watched a friend in an EZ depart my home field, turn 100 degrees back towards the runway with plenty of altitude to return safely, then turn back the other way for an ill-fated off-field crash on a bridge. I was one of the first ones on the scene and it was very sobering. The fact remains, however, that from an estimated 400 ft. AGL he glided, prop windmilling, for nearly a mile!!

Electric Retract Nose Gear

Steve Drybread - I have a retract system for the nose gear that is electric with a manual override. This can be done for \$350 tops. It really is great to have this with a retractable main gear. The whole installation took me about half a day to install as it bolts directly to the u-joint for the stock Brock worm gear system.

I should have plans available shortly. If anyone is interested they can contact me at:

827 Skysail
Carlsbad, CA
92009.
(619) 431-5562

Editor note: For you new members, Steve has been installing a retractable main gear in his Long-EZ. It was designed by Scott Swing and is very much like the successful installation in the Velocity. Check the 1991 index for the article.

Lycoming Remote Oil Filter Mount Adapter

Larry Danner - This aluminium casting is designed for several popular automotive spin-on oil filters. It weighs about 1/2 pound and has 1/2" NPT inlet and outlet, female, pre-tapped holes. Add some NPT to AN adapters and you can put a spin-on oil filter anywhere you can find the room. This beauty cost only \$15 (I threw the 3/8" automotive hose, the 1/2" NPT to 3/8" hose slip fit adapters and the band clamps into my misc. auto parts box.)

Since I was already committed to building an adapter plate for a remote filter on my Lycoming accessory case I also thought a thermostatic oil cooler valve for \$25 was a nice buy. The housing this valve comes with is a bit of a bruiser, but the spring, thermostat and other internal parts should go into my adapter block very nicely. The thermostat starts to divert oil to the cooler at 165 degrees F and is fully open at 185 degrees F. I purchased these parts from Impact Parts Inc., Glenwild, New York, (914) 434-3338. The parts are on a close-out; **when they are gone there are no more.**

I did some spin-on oil filter research at my local auto stores and found three filters which fit the above spin-on adapter and have an internal bypass valve in case the filter clogs up. Their part numbers and sizes are listed for your convenience.

NAPA	WIX	O.D.	Height
1348	51348	2.95"	3.42"
1452	51452	3.7"	5.45"
1521	51521	3.7"	3.8"

Although other sizes are available, I would rather have dirty oil circulating through my engine, at night, over the (Rockies, Bermuda Triangle, you name your nightmare) than **NO OIL!**

LOOK OUT



Beware of Failure on 4 Pipe Exhaust Systems

Dick Kreidel - A note on 4 - tube exhaust systems: I designed and built 3 of these patterned after Mike Melvill's. I have one with over 600 hours on it, Sid Stiber has one with over 300 hours on it, and Sam Kreidel has a third with 170 hours on his IO-360. None of these systems has had any failure. Mike's, Doug Shane's (Scaled EZ driver), and our 3 all have Brock ball joints in each pipe. I'm convinced that these are essential unless you use the Sport Flight "spring" type of connector to decouple the vibration. I have seen several other type systems that work OK for a while and then fail, sometimes **through the prop !!**

Even Dave Ronnenberg had one of these fail on his Berkut at Oshkosh this year! Unfortunately, I don't know of any one that builds these exhaust systems with the ball joints. I can attest that the work required to build one of these systems with the ball joints is not a trivial task. The angles for the cuts and miters to keep it inside the cowl mold lines are tough to work out.

Maybe somebody will offer such a setup. Perhaps Hal Hunt can be persuaded to offer the ball joints as an option. I would consider the ball joint option mandatory, however.

Editor note: Dick speaks with a great deal of experience. His Long-EZ has over 1,670 hours on it and has been flying since July of 1983. He was founder of Long-EZ Squadron #1 in 1981 and has seen lots of EZs. If he says a vibration de-coupling joint is needed to prevent failure, I believe it.

State Representatives

Steve Beert	Iowa	Buzz Talbot	Illinois
319-359-6781		312-759-1124	
"Sandy" Mondary	Indiana	Terry Yake	Kansas
317-852-2890		913-451-8904	
Rex Rexin	Michigan	Lynn Butters	Missouri
313-349-8877		314-837-2607	
Ken Pickel	Ohio	Fred Warden	Texas
216-235-1242		713-492-2078	
Jim Evans	Virginia	Frank Proski	Pennsylvania
804-898-1231		412-963-8546	
Gene Zabler	Wisconsin	Steve Wright	Tennessee
414-886-5315		615-373-9707	
Chuck Howard	North Carolina	Dave Williams	New Jersey
919-776-0453		201-938-5830	
Paul Adrien	Massachusetts	Mike Delaney	Kentucky
508-682-5656		502-491-6851	
Mike Stolle	New Mexico	Norm Howell	California
505-821-3778		805-258-6954	
Phil Cornelius	Oklahoma		
918-247-3123			

Propeller Blade Protractor

I just received a propeller protractor from Warp Drive, maker of composite 2, 3, and 4 blade ground adjustable pitch props. This protractor unit was developed by Warp Drive to check blade angle of variable pitch propellers while installed on the airplane. It could also be used to check blade angles on fixed pitch propellers.

Are you having excessive vibration with your prop and think your prop is in balance? Perhaps your blades don't have the same angles at all stations. Consistent pitch from blade to blade is imperative for smooth performance. This unit makes it possible to take a survey of the blade angles on your prop like a pro.

My brother had a prop on his Cassutt that he thought was OK except for a little vibration. He checked the blade angles and found that some stations had up to a 5 degree difference from one blade to another. Your prop might be a victim of this also.

If you wish to borrow this protractor send me a note and I'll send it right out. Please keep the loan time to a week and you'll be responsible for postage both ways.

Tool collectors who must have their own to caress and fondle may call Warp Drive free at 1-800-833-9357. Before you pay your \$35 you might wish to try this one out, however.

They also have an interesting looking stainless steel leading edge kit to be applied to "just about any propeller". The cost is \$7 per blade.

Great Quotes

"As soon as the stewardess serves the coffee, the airliner encounters turbulence"

Roger's Law

Explanation of Roger's Law:

Serving coffee on aircraft causes turbulence.

LOOK OUT



Beware of Failure on 4 Pipe Exhaust Systems

Dick Kreidel - A note on 4 - tube exhaust systems: I designed and built 3 of these patterned after Mike Melvill's. I have one with over 600 hours on it, Sid Stiber has one with over 300 hours on it, and Sam Kreidel has a third with 170 hours on his IO-360. None of these systems has had any failure. Mike's, Doug Shane's (Scaled EZ driver), and our 3 all have Brock ball joints in each pipe. I'm convinced that these are essential unless you use the Sport Flight "spring" type of connector to decouple the vibration. I have seen several other type systems that work OK for a while and then fail, sometimes through the prop !!

Even Dave Ronnenberg had one of these fail on his Berkut at Oshkosh this year! Unfortunately, I don't know of any one that builds these exhaust systems with the ball joints. I can attest that the work required to build one of these systems with the ball joints is not a trivial task. The angles for the cuts and miters to keep it inside the cowl mold lines are tough to work out.

Maybe somebody will offer such a setup. Perhaps Hal Hunt can be persuaded to offer the ball joints as an option. I would consider the ball joint option mandatory, however.

Editor note: Dick speaks with a great deal of experience. His Long-EZ has over 1,670 hours on it and has been flying since July of 1983. He was founder of Long-EZ Squadron #1 in 1981 and has seen lots of EZs. If he says a vibration de-coupling joint is needed to prevent failure, I believe it.

State Representatives

Steve Beert	Iowa	Buzz Talbot	Illinois
319-359-6781		312-759-1124	
"Sandy" Mondary	Indiana	Terry Yake	Kansas
317-852-2890		913-451-8904	
Rex Rexin	Michigan	Lynn Butters	Missouri
313-349-8877		314-837-2607	
Ken Pickel	Ohio	Fred Warden	Texas
216-235-1242		713-492-2078	
Jim Evans	Virginia	Frank Proski	Pennsylvania
804-898-1231		412-963-8546	
Gene Zabler	Wisconsin	Steve Wright	Tennessee
414-886-5315		615-373-9707	
Chuck Howard	North Carolina	Dave Williams	New Jersey
919-776-0453		201-938-5830	
Paul Adrien	Massachusetts	Mike Delaney	Kentucky
508-682-5656		502-491-6851	
Mike Stolle	New Mexico	Norm Howell	California
505-821-3778		805-258-6954	
Phil Cornelius	Oklahoma		
918-247-3123			

Propeller Blade Protractor

I just received a propeller protractor from Warp Drive, maker of composite 2, 3, and 4 blade ground adjustable pitch props. This protractor unit was developed by Warp Drive to check blade angle of variable pitch propellers while installed on the airplane. It could also be used to check blade angles on fixed pitch propellers.

Are you having excessive vibration with your prop and think your prop is in balance? Perhaps your blades don't have the same angles at all stations. Consistent pitch from blade to blade is imperative for smooth performance. This unit makes it possible to take a survey of the blade angles on your prop like a pro.

My brother had a prop on his Cassutt that he thought was OK except for a little vibration. He checked the blade angles and found that some stations had up to a 5 degree difference from one blade to another. Your prop might be a victim of this also.

If you wish to borrow this protractor send me a note and I'll send it right out. Please keep the loan time to a week and you'll be responsible for postage both ways.

Tool collectors who must have their own to caress and fondle may call Warp Drive free at 1-800-833-9357. Before you pay your \$35 you might wish to try this one out, however.

They also have an interesting looking stainless steel leading edge kit to be applied to "just about any propeller". The cost is \$7 per blade.

Great Quotes

"As soon as the stewardess serves the coffee, the airliner encounters turbulence"

Roger's Law

Explanation of Roger's Law:

Serving coffee on aircraft causes turbulence.

LOOK OUT



Beware of Failure on 4 Pipe Exhaust Systems

Dick Kreidel - A note on 4 - tube exhaust systems: I designed and built 3 of these patterned after Mike Melvill's. I have one with over 600 hours on it, Sid Stiber has one with over 300 hours on it, and Sam Kreidel has a third with 170 hours on his IO-360. None of these systems has had any failure. Mike's, Doug Shane's (Scaled EZ driver), and our 3 all have Brock ball joints in each pipe. I'm convinced that these are essential unless you use the Sport Flight "spring" type of connector to decouple the vibration. I have seen several other type systems that work OK for a while and then fail, sometimes through the prop !!

Even Dave Ronnenberg had one of these fail on his Berkut at Oshkosh this year! Unfortunately, I don't know of any one that builds these exhaust systems with the ball joints. I can attest that the work required to build one of these systems with the ball joints is not a trivial task. The angles for the cuts and miters to keep it inside the cowl mold lines are tough to work out.

Maybe somebody will offer such a setup. Perhaps Hal Hunt can be persuaded to offer the ball joints as an option. I would consider the ball joint option mandatory, however.

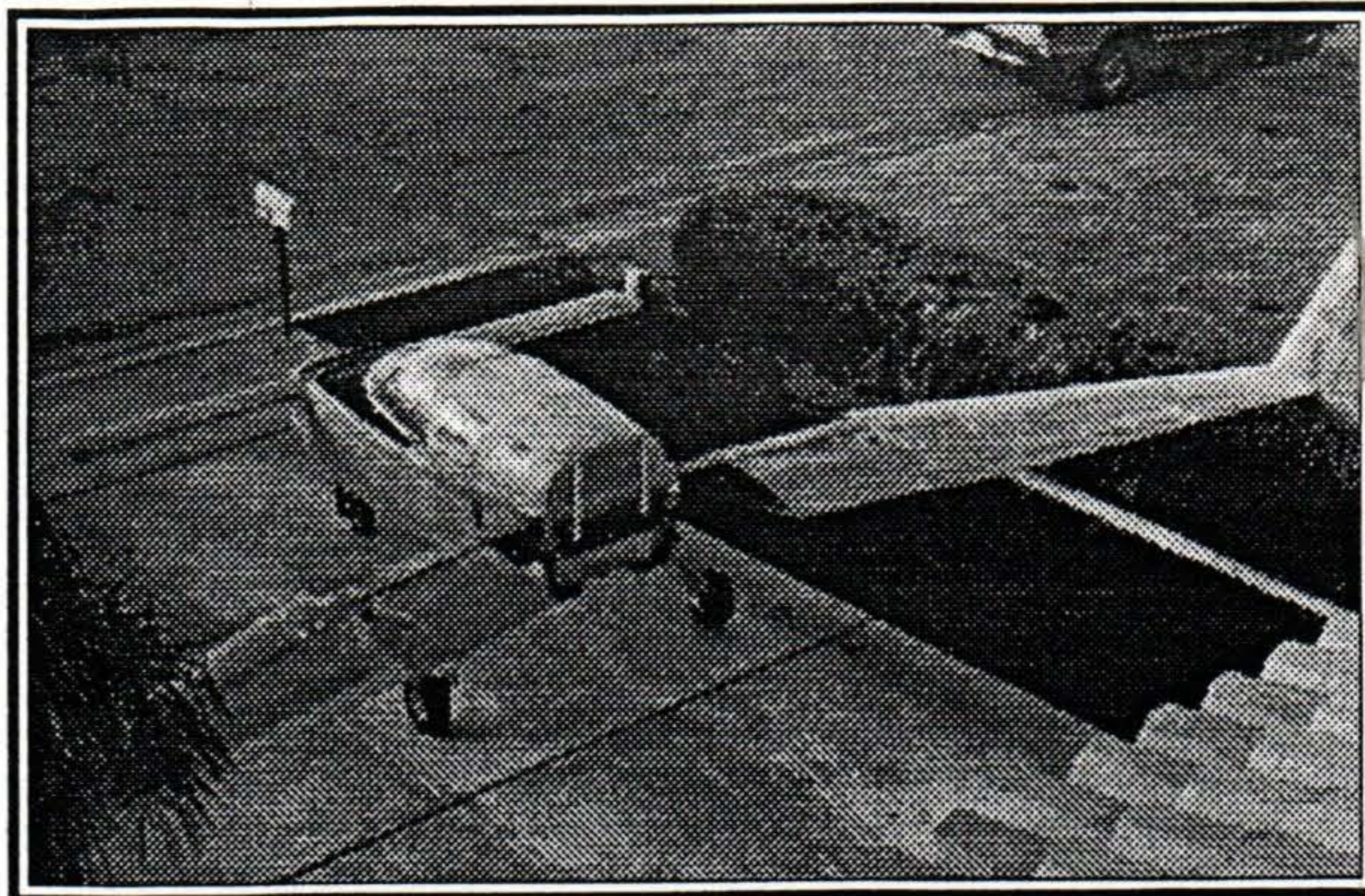
Editor note: Dick speaks with a great deal of experience. His Long-EZ has over 1,670 hours on it and has been flying since July of 1983. He was founder of Long-EZ Squadron #1 in 1981 and has seen lots of EZs. If he says a vibration de-coupling joint is needed to prevent failure, I believe it.

Solvent Gloves Stop Epoxy Reaction

✓ **Larry Sligar (CA)** - Several months ago I wrote of Vaseline on my hands being successful as an epoxy barrier. That worked for a while but then the allergy returned. I tried several other combinations but the reaction grew worse.

I have been using solvent gloves with cotton liners for a month now and the rash is gone. I can work all day in epoxy without any reaction as long as I have the gloves on. I change the cotton liners daily and wash them before reuse..

I purchased the gloves at ACE Hardware. They are made by Ansell-Edmont and are described as: medium duty solvent glove with nitrile coating and a light lining. A photo of my Cozy Mark IV is shown above. I am incorporating the under seat fuel sump and electric activator for the landing brake.



Retrofit Cabin Heater

✓ **Doug Shane (CA)** - The latest EZ mod was to install a real live airplane-type heater. I simply bought a Wicks heat exchanger (#CESS-2-\$45) and a Spruce cabin heat box (# 08-04000). The hard part was getting the 2" CAT duct to the front of the airplane. I had to remove the aft left side console and part of the front one.

Due to the IO-320-B1A installation there was no room below the center section spar to pass the duct through. As a result, I ran the duct over the spar and through the rear seat head rest. It looks horrible but really works well.

Also owing to the IO-320, my carburetor heat lever/cable was unused. I now use it for a cabin heat control.

The back seat opening is controlled by a sliding sleeve (see drawing) and directed by a scoop entering the hot air flow. The front seat opening is just an open tube.

Morals to the story:

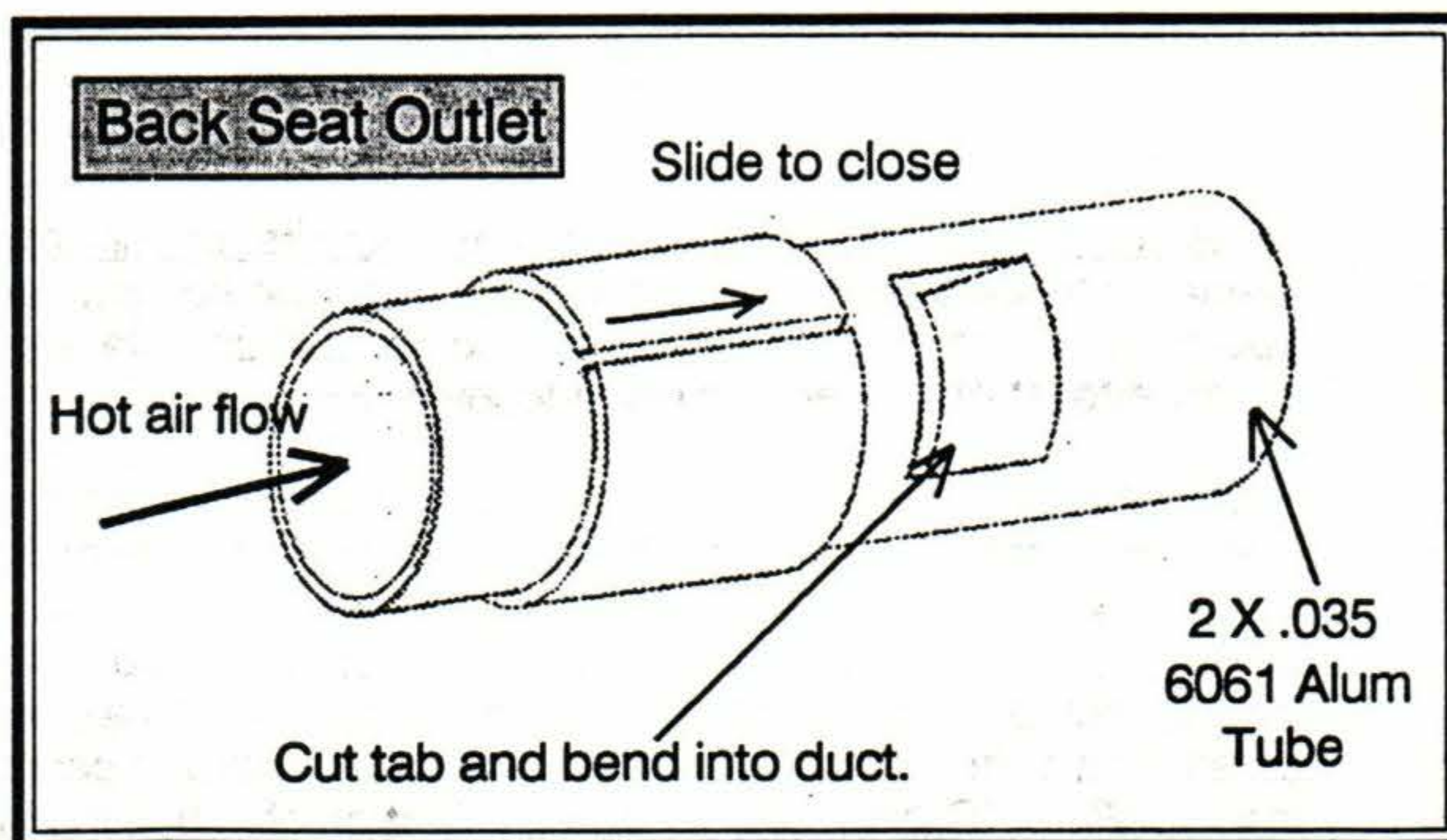
(1) I should have built the duct in originally, but was unsure of the value of a manifold heater.

(2) It can be retrofitted. (Have a Dremel tool)

(3) It is well worth the small cost and effort. It works well and did not require a blower.

Editor note: With over 1,000 Long-EZ hours in northern Ohio as experi-

ence, I second Doug's remarks about the value of a manifold heater. You don't need a blower for good flow either. Most horror stories come from people running too small a size duct and using that miserable flexible duct hose. The flow loss is very high. (See newsletter Oct 92 p.11 Breathing Easier)



Didja Hear? Hear What? Hear that Norm Howell is Coming to KCGIG 93?

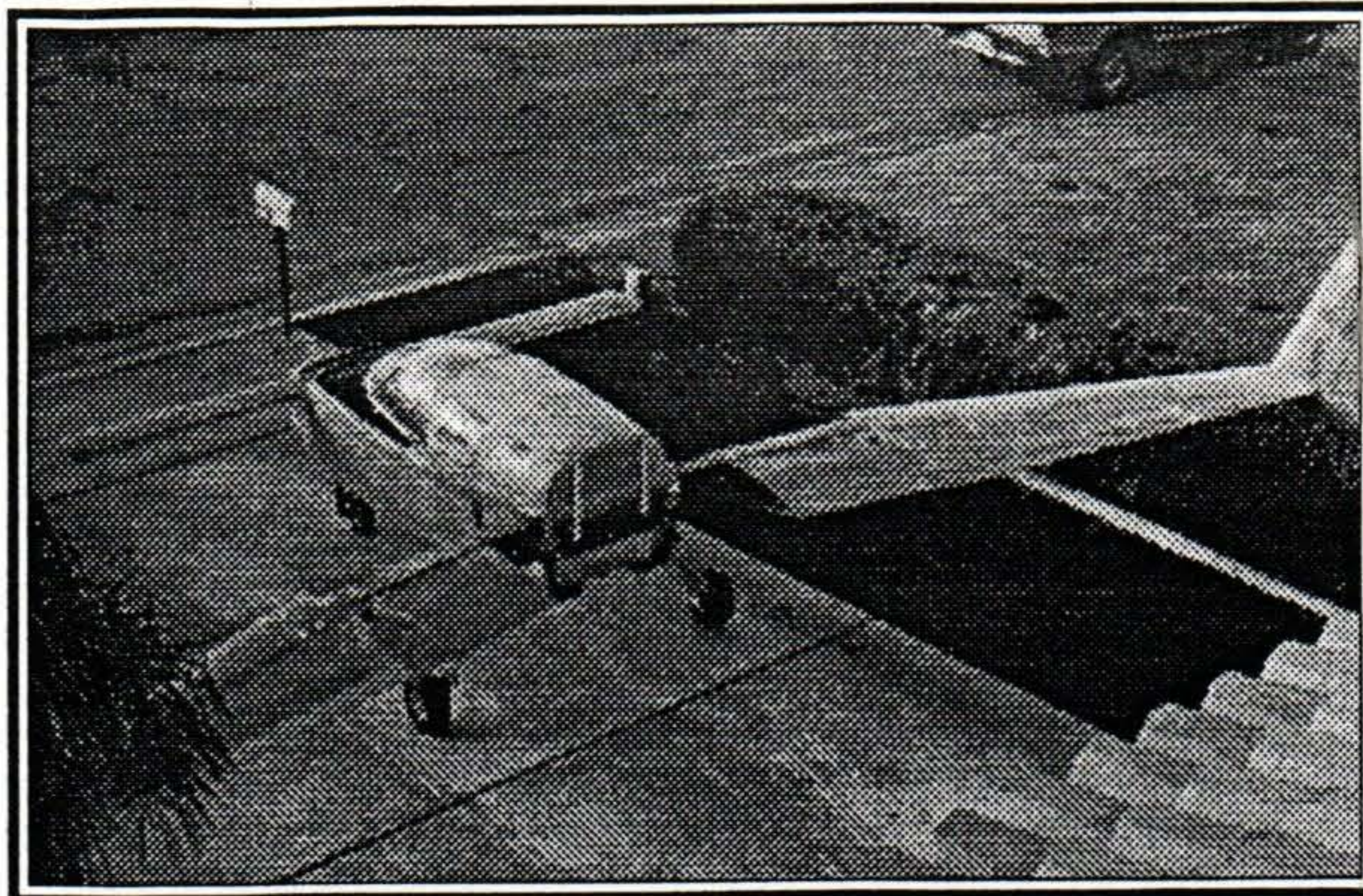
Well he is planning to come to the greatest canard fly-in of the year. He is always full of great ideas and good stories. Ask him about the shoot out between an F-4 and a Long-EZ. Ask him -- never mind just be there. It'll be great !!!!

Solvent Gloves Stop Epoxy Reaction

✓ **Larry Sligar (CA)** - Several months ago I wrote of Vaseline on my hands being successful as an epoxy barrier. That worked for a while but then the allergy returned. I tried several other combinations but the reaction grew worse.

I have been using solvent gloves with cotton liners for a month now and the rash is gone. I can work all day in epoxy without any reaction as long as I have the gloves on. I change the cotton liners daily and wash them before reuse..

I purchased the gloves at ACE Hardware. They are made by Ansell-Edmont and are described as: medium duty solvent glove with nitrile coating and a light lining. A photo of my Cozy Mark IV is shown above. I am incorporating the under seat fuel sump and electric activator for the landing brake.



Retrofit Cabin Heater

✓ **Doug Shane (CA)** - The latest EZ mod was to install a real live airplane-type heater. I simply bought a Wicks heat exchanger (#CESS-2-\$45) and a Spruce cabin heat box (# 08-04000). The hard part was getting the 2" CAT duct to the front of the airplane. I had to remove the aft left side console and part of the front one.

Due to the IO-320-B1A installation there was no room below the center section spar to pass the duct through. As a result, I ran the duct over the spar and through the rear seat head rest. It looks horrible but really works well.

Also owing to the IO-320, my carburetor heat lever/cable was unused. I now use it for a cabin heat control.

The back seat opening is controlled by a sliding sleeve (see drawing) and directed by a scoop entering the hot air flow. The front seat opening is just an open tube.

Morals to the story:

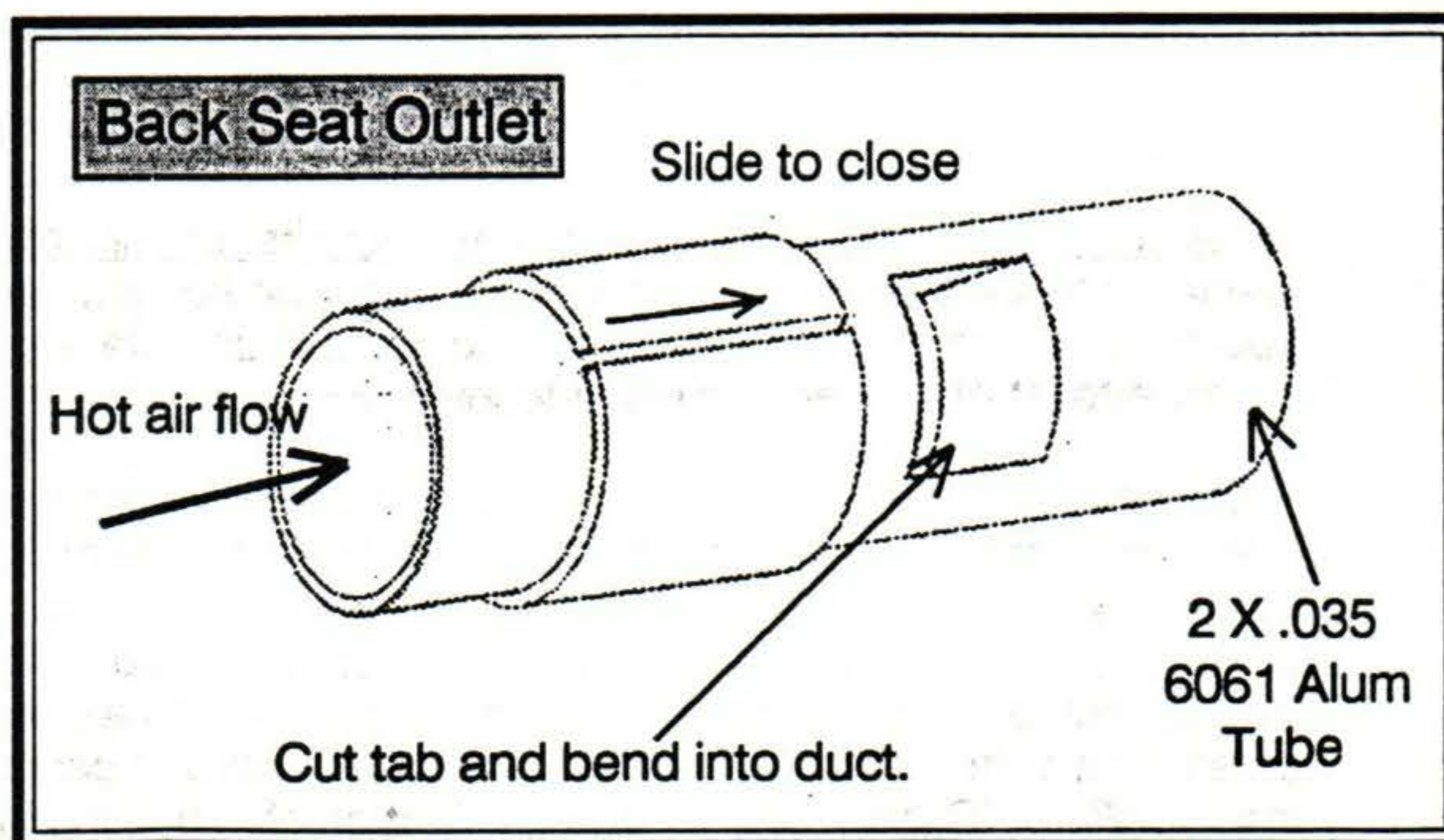
(1) I should have built the duct in originally, but was unsure of the value of a manifold heater.

(2) It can be retrofitted. (Have a Dremel tool)

(3) It is well worth the small cost and effort. It works well and did not require a blower.

Editor note: With over 1,000 Long-EZ hours in northern Ohio as experi-

ence, I second Doug's remarks about the value of a manifold heater. You don't need a blower for good flow either. Most horror stories come from people running too small a size duct and using that miserable flexible duct hose. The flow loss is very high. (See newsletter Oct 92 p.11 Breathing Easier)



Didja Hear? Hear What? Hear that Norm Howell is Coming to KCGIG 93?

Well he is planning to come to the greatest canard fly-in of the year. He is always full of great ideas and good stories. Ask him about the shoot out between an F-4 and a Long-EZ. Ask him -- never mind just be there. It'll be great !!!!

Changing Mags

✓ **Mike Stolle (NM)** - I recently decided to change magnetos because of high time in service and because I wanted the improved starting characteristics of a second impulse coupled mag.

My first surprise was finding that an impulse coupled mag uses a different drive gear than a non impulse coupled mag. The gear runs over \$300 new, but there are several parts houses that sell a used gear for about \$150. The part number is 61665. Since the impulse coupled mag is longer than the non impulse coupled mag, you also need longer mounting studs (part number M-2639) and an adapter/spacer (part number 61666). Also required are a pair of gaskets (part numbers 62224 and LW12681) for each mag, one between the mag and the adapter and one between the adapter and the back of the engine accessory case (see drawing). I got all my parts from El Reno Aviation in El Reno, OK (405) 262-2387. The salesman's name was Ted and he was very helpful.

My engine was remanufactured by Lycoming in 1981 and had Slick 4200 series mags on it when I got it back in 1982. I looked at several magneto applications charts to find out what mag I should look for as a replacement. Light Plane Maintenance magazine had a good issue on magnetos in March 92, so I knew Slick had upgraded their mags recently and I wanted to get the latest version available.

Just a note, when shopping for mags, I found that some suppliers will attempt to sell you rebuilt Slick mags for the same price as new ones.

Don't be set on replacing with the exact model of mags that you remove. There are some really old mags still in use out there. Slick has made some real improvements in their new mags (see LPM articles). After getting confused by talking to several suppliers about the best mag for my engine, I decided to call Slick

and talk to the people there. I'm glad I did that because I found out some things I had wondered about before. For instance, did you ever wonder what "lag angle: 25 degrees" on the name plate of your mag means? You will notice that it is only applicable to a mag that has an impulse coupling. It is the angular delay between where the mag fires normally (when the engine is running) and where the impulse coupler fires during starting. For example, if your engine timing is normally set to 25 degrees before top dead center (BTDC), and your magneto has a lag of 25 degrees, then for starting, the impulse coupler on your mag will fire close to top dead center, ie 25 degrees after the normal timing setting. Since the purpose of the impulse coupler is to fire the spark close to TDC for starting you want to look for a lag angle that is close to the magnitude of the timing angle. NOTE: I did note, though, looking at the Slick Application Data Sheet that there are impulse mags with 15, 20, 25, 30, 37, and 45 degree lags. So be sure to check with someone knowledgeable before selecting the proper lag angle for your application.

For my O-235-L2C I bought two new Slick 4373's with a 25 degree lag since I usually set my timing at about 23 degrees. The best price I found was through San-Val in Van Nuys, CA. By the time they add on the core charge (\$150 per mag) you end up with a healthy charge on your credit card. I also bought a new ignition harness.

To start the installation process, I removed the top plugs and all the spark plug wires. This will make timing the mags easier in the end. It also makes sure you don't have any compression or parks in the cylinders in case you accidentally get a spark from a mag that you weren't expecting. I then decided that working on the back of the engine would be a lot easier if I removed the oil screen housing and the vacuum pump. This next step is optional but will save you some time if you have access to an engine hoist.

Using an engine hoist, you can loosen the engine mount bolts and move the engine away from the firewall an inch or so. This small movement does make a difference in being able to get the harness cap screws off the backs of the mags (especially the longer mags with the impulse couplers). You have to remove the harness cap from the mag in order to have enough room to slide the mag out of the engine. I have talked with a Long-EZ pilot who said he can change mags without removing the cap first, so there are some exceptions.

Another item that makes a significant difference is whether or not you replaced the harness cap screws with socket head screws as Mike Melvill recommended in the Canard Pusher. The difficulty comes from the fact that you can't see the screw heads. Therefore, using a straight slot screwdriver blade is almost impossible. If you have the regular slotted head screws, try using one of the small thin offset ratchet screwdrivers as sold at Sears. With the socket head screws, it is easier to get the 3/32" allen wrench in there. No matter how you do it, plan on spending at least 20 minutes getting the three screws out of each mag.

Once you have removed the harness caps from each mag, remove the mag P lead, loosen the two 1/2" nuts on each mag remove the locking ear hardware from the studs and slide each mag out. If you are changing one of the mags to an impulse coupled mag as I did, now is the time to remove the old accessory case studs, insert the new longer studs, and install the gaskets and adapter (see drawing). I'd recommend you replace all the gaskets while you have everything apart, even if you don't disturb the one between the one adapter and the case. I sprayed the old studs with Liquid Wrench, waited 20 minutes or so and they came out easily with a pair of vice grips.

The next process was perhaps the most difficult. You have to remove the drive gears from the old mags and install them on the new mags. The first step is to remove the cotter pin in the castle nut holding the gear to the mag. Then loosen the castle nut. To loosen this nut you will need an other set of hands or access to a vice. I clamped a large Crescent wrench in my vice and used it to hold the flange on the mag that the slot on the drive gear fits on (see drawing). This keeps the mag from turning and allows you to loosen the nut. If your mag is non impulse coupled it won't have the flange to hold with the Crescent wrench. In this case I secured the drive gear with a couple pieces of wood clamped in a large C-clamp while I loosened the nut. Install the gears in the reverse order and torque the castle nuts to the value called for in the instructions. Mine called for 120-250 inch pounds. As you torque down these nuts, keep in mind that you will have to line up the nut on the studs so you can get a cotter pin back in there. I found that the cotter pin was easier to insert if I "pre curved" it so I could get it started through the hole. I then used a small punch and a hammer to gently tap it through the slot and bend the ends over. My mags came with new cotter pins to replace the ones I destroyed when getting the gears off.

Editor note: For those of you with Bendix mags be advised that special stainless steel cotter pins are to be used - not the regular steel ones.

Once you have installed the drive gears on the new mags you are ready to prepare the mags for installation on the engine and prepare the engine to accept the mags. What we'd like to do is to set up both the mag and the engine so they are in the proper position to fire for one of the cylinders. For convenience, let's use cylinder number one. I'm going to assume that the reader knows how to set the timing on his engine. Since an impulse coupled mag fires close to TDC, let's set up the number one cylinder at TDC. There are different

ways of doing this but I use one of the indicators that screw into the spark plug hole along with a protractor that attaches to the prop hub.

Once you have determined TDC on the engine, leave it there, ie. don't move the prop. As you are determining TDC make sure you are on the compression stroke and not the exhaust stroke. This is easily determined by placing your finger over the top spark plug hole as you are moving the prop toward TDC. If you are on the compression stroke, you will feel a rush of air trying to get out of the top plug hole. This, of course, assumes you have the bottom spark plug in place.

Now we need to set up the mags so they are in the correct orientation to fire cylinder number one. While the mag is on the workbench, attach the harness cap. If you aren't replacing the harness, you'll have to take the mag over to the plane to attach the cap. The cap only fits on one way and the back of the cap is marked for cylinder number one. With the cap on, position the spark plug end of the number one lead next to the case of the mag near the flange where it isn't painted. An extra set of hands is helpful here. Now turn the mag (in the correct direction... check the name plate for the proper rotation direction) until the number one lead sparks. Hold the gear in this position and remove the harness cap. Using the pin supplied with the mag, slip the pin into the hole on the back of the mag to hold the orientation of firing number one cylinder. These mags had two holes on the back for this pin, but the pin would only go all the way in on one of them.

An alternate method of "sparking" the mag is to identify the number one cylinder barrel on the back of the magneto by temporarily holding the harness cap in place. Then remove the harness cap and fit a small piece of safety wire into the barrel and curve the other end around so it rests close to (not touching) the mag case. Now you can turn the mag until the

safety wire sparks to the case. Slip the pin in as described earlier to hold this orientation. You may have to move the gear slightly to get the pin to go in up to its shoulder. Now you are ready to install the mags back on the airplane. **WHEW!!**

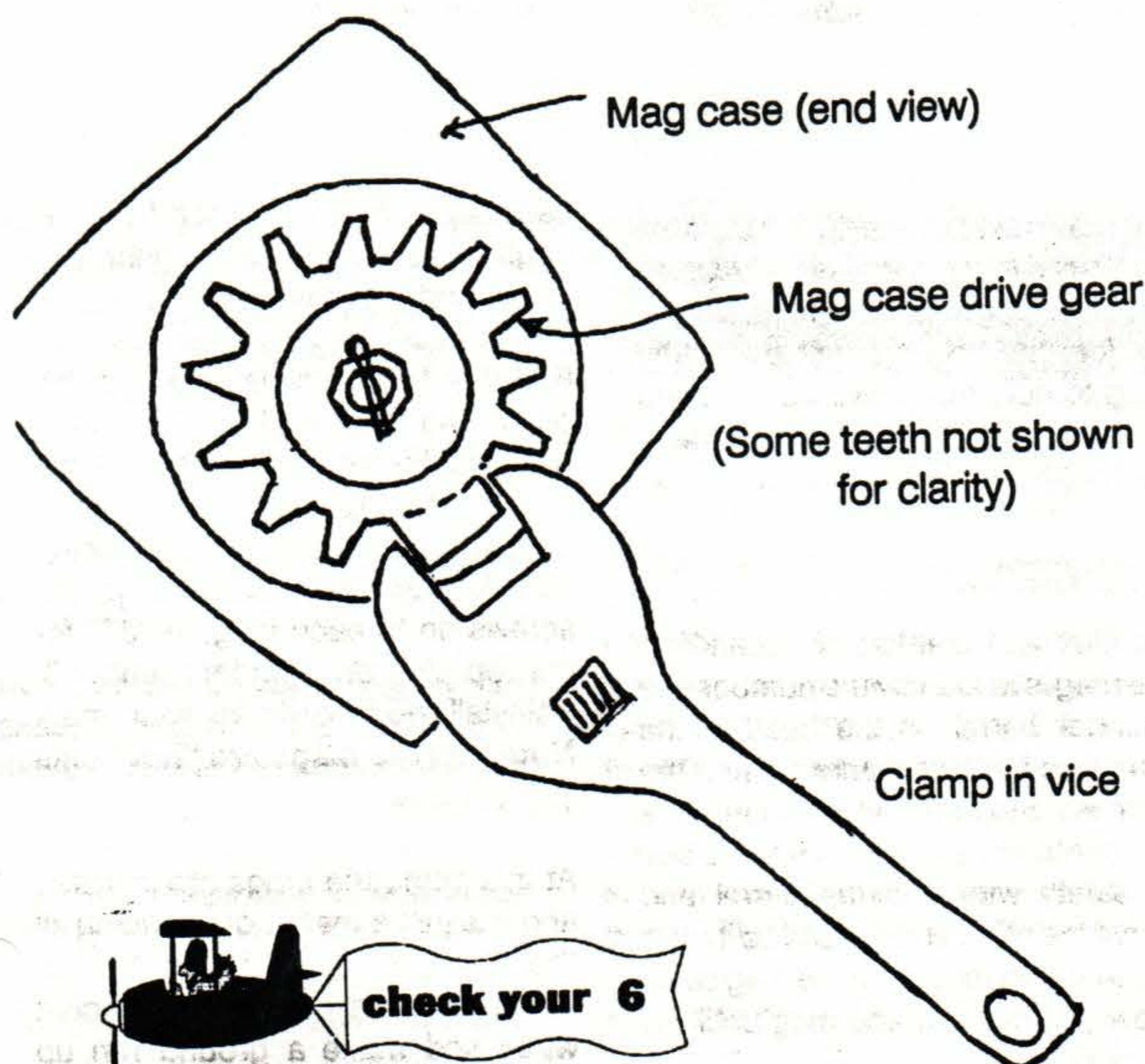
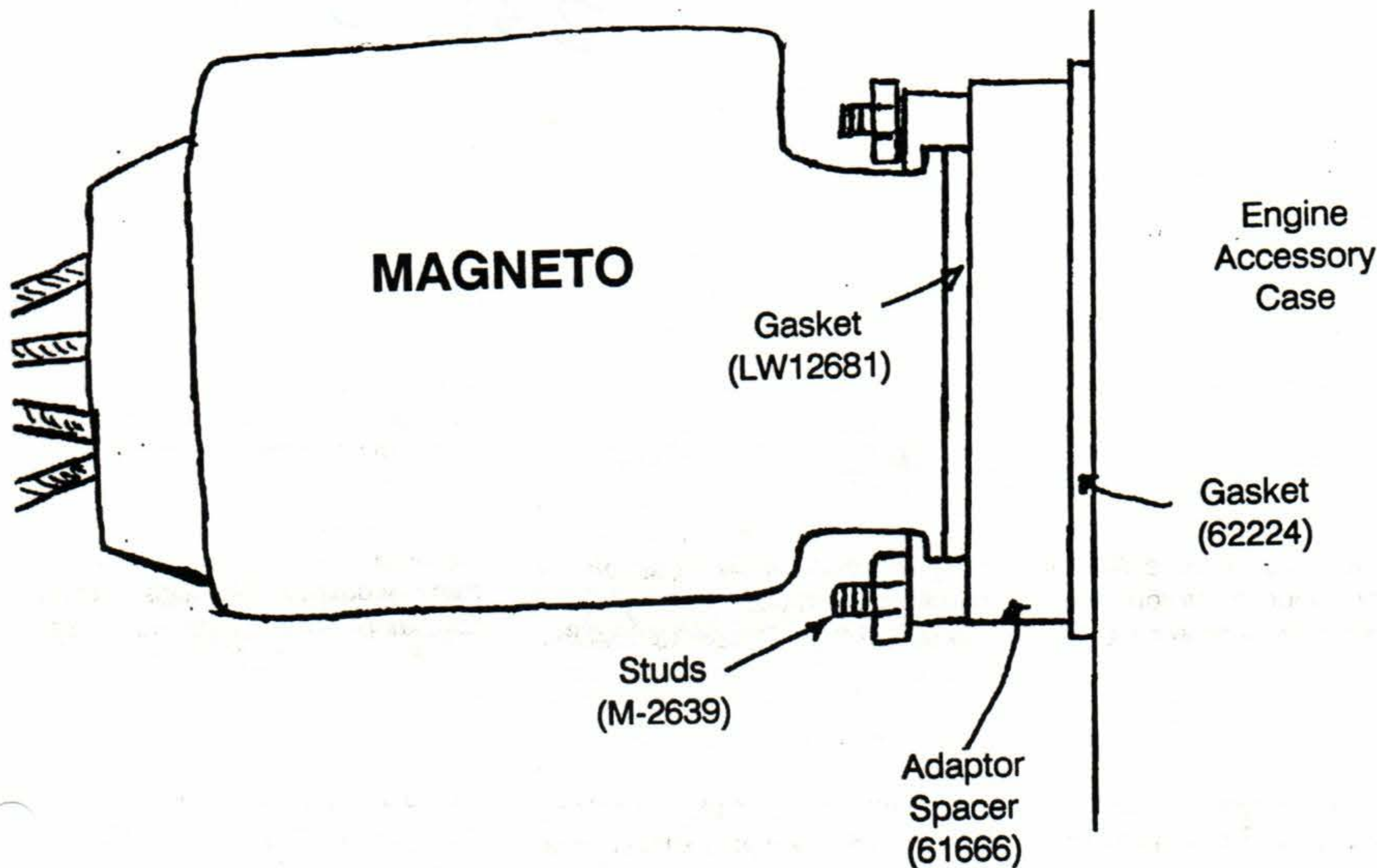
Use caution that you don't shock yourself. These mags put out a pretty good jolt! It would be a shame to drop a new mag on the concrete hangar floor.

Make sure you have replaced the gaskets and that the adapters are properly seated on the accessory case before replacing each magneto. Reinstall the attach hardware on the two studs and lightly tighten the two nuts... just enough to keep the mags in place. Remove the pins from the back of the mags. Before going any further, we'll time the mags to their proper BTDC setting. Rotate the prop to it's firing position (mine is 23 degrees BTDC) using the protractor temporarily attached to the prop hub. Using a mag timing box, rotate the mags until they "fire" at the BTDC position selected by the prop. Once you are satisfied with the timing, tighten down the 1/2" nuts holding each mag. If you find you don't have enough rotation available to time the mag where you want it, you can, carefully, remove the mag from the engine, rotate the drive gear one tooth, and reinstall the mag.

Reinstall the harness caps, at this point, and run the plug wires to the proper cylinders (if you are installing a new harness). Note that the spark plug wires are marked for their respective cylinders at the cap that screws on to each plug, ie "3T" for the top plug on cylinder number 3. Reinstall the P-leads for each mag. **Note that the mags are "hot" until you do this.**

At this point, the mags are installed and it is just a matter of replacing all the things you took off to get to the mags. Be sure you secure the plug wires and make a ground run up before you reinstall the cowl.

The whole process probably took me about 4-5 man hours to complete, but I was learning as I went along. I probably don't need to remind anyone to box up their old mags and send them in for the core deposit.



What's New?

Are you looking for a special epoxy material that is thermally conductive but electrically insulative and can stand thermal shock from +450 degrees F to -100 degrees F? How about a one component system that reportedly provides excellent adhesion to both metallic and non-metallic substrates with high temperature stability up to 500 degrees F. These are not laminating resins but may offer some characteristics you are looking for on a special project.

Contact:

Master Bond Inc.
154 Hobart Street
Hackensack, NJ 07601
Attn: Tech Dept.
(201) 343-8983



Antennas Without Ground Planes

Bill Butters (MO) - Advanced Aircraft Electronics has announced a new series of antennas, specifically, to be used without a ground plane. This means composite and fabric covered airplanes can now have their antennas mounted totally within the structure.

These antennas are designed using the latest engineering technology. Laboratory measurements show them to have better electrical characteristics than currently available products. The unanimous reports from pilots, who have been using them, confirm that they out perform everything now available on the market.

One antenna model, priced at \$149, will work for nav, com, or ELT. The transponder antenna costs \$99. The antennas carry a lifetime guarantee and are less than half the weight of conventional antennas.

Editor note: This product is being launched by CSA members Bill and Lynn Butters who have an O-235 powered Vari-Eze and are familiar with composite construction.

Rocky Mountain Sport Aviation Fly-In

The 15th annual Rocky Mountain Sport Aviation Fly-in will be held June 26-27 at Greeley Weld County Airport.

Kitplanes, homebuilts, antiques, classics, warbirds, and ultralights will be judged. The first place winner will receive a custom oil painting of their aircraft. 25 other awards will be given. No registration fees, free camping, free transportation to town, food on the field, and many other attractions. See the best of beautiful Colorado!

For information contact:

Bill Marcy
6068 S. Lakeview St.
Littleton, CO 80120
(303) 798-6086

Prop Extension For Sale

SAE #1 - 3" prop extension manufactured by Brock \$100.

Contact:

Paul Adrien
(508) 682-5656 days
(603) 898-6146 eves.



4 Pipe Exhaust With Expansion Provision

In a recent conversation with Nat Puffer, I discovered he has made a stainless steel 4 pipe exhaust system available. The system will mount to all Lycoming 4 cylinder engines and will fit in a Cozy, Cozy Classic, Cozy Mark IV, Long-EZ or an E-Racer.

The pipes are secured to the exhaust flanges by way of stainless steel springs that shouldn't stretch out with heat the way some of the steel Sport Flight springs did.

I inspected one of Nat's exhaust systems that Carl Denk has installed on his IO-320 powered Cozy Classic and it appeared to be well made and included a provision for getting a start on a carb/cabin heat installation. The builder must wrap aluminum around the shroud that is welded to the exhaust pipes to duct the incoming air over the exhaust pipe. I feel additional perforated baffling should be added to the affair to extract a reasonable amount of heat, but at least a good start is there.

One pleasant surprise is the price. They are \$500 per set, lowest cost in the 4 pipe arena.

Contact Nat Puffer at:

Cozy Development:
2046 North 63 rd Place
Mesa, Arizona 85205
(602) 981-6401

Job Wanted

Does anybody have any contacts to help an EZ builder with 20 years experience in the development, marketing and operation of health care and data communications systems? He is capable of: development of marketing/business plan, product presentations and support of marketing & sales, analysis of business needs and systems requirements, program, product and project management, production of user and technical documentation.

Contact:

Stephen W. Rothert
2616 Bowling Green Drive
Vienna, VA 22180
703-698-9576

Aviation Style Flashlights at Non-aviation Prices

Pat Saffron (OH) - If you are looking for a reasonably priced flashlight (under \$7) with a red lens, try an Army-Navy Surplus Store. I fly with two of these lights. They are manufactured by Fulton, model MX-991/U; operate on two D cells, have four easily changable lenses (red, white, blue, & clear). The lenses store in the flashlight cap which also contains a spare bulb. The lights were purchased at:

Army-Navy Surplus
4420 Main Avenue
Ashtabula, Ohio 44004
(216) 992-8791

Free Epoxy

Milton Matthews (MI) - I have two five gallon kits of high temperature epoxy (no, not Safety-Poxy) that I will give to someone if they will pay the shipping charges. This epoxy cures very quickly with high exotherms but can be used to fill low areas when mixed with micro.

313-754-9680
27070 Clarpointe
Warren, MI 48093

Antennas Without Ground Planes

Bill Butters (MO) - Advanced Aircraft Electronics has announced a new series of antennas, specifically, to be used without a ground plane. This means composite and fabric covered airplanes can now have their antennas mounted totally within the structure.

These antennas are designed using the latest engineering technology. Laboratory measurements show them to have better electrical characteristics than currently available products. The unanimous reports from pilots, who have been using them, confirm that they out perform everything now available on the market.

One antenna model, priced at \$149, will work for nav, com, or ELT. The transponder antenna costs \$99. The antennas carry a lifetime guarantee and are less than half the weight of conventional antennas.

Editor note: This product is being launched by CSA members Bill and Lynn Butters who have an O-235 powered Vari-Eze and are familiar with composite construction.

Rocky Mountain Sport Aviation Fly-In

The 15th annual Rocky Mountain Sport Aviation Fly-in will be held June 26-27 at Greely Weld County Airport.

Kitplanes, homebuilts, antiques, classics, warbirds, and ultralights will be judged. The first place winner will receive a custom oil painting of their aircraft. 25 other awards will be given. No registration fees, free camping, free transportation to town, food on the field, and many other attractions. See the best of beautiful Colorado!

For information contact:

Bill Marcy
6068 S. Lakeview St.
Littleton, CO 80120
(303) 798-6086

Prop Extension For Sale

SAE #1 - 3" prop extension manufactured by Brock \$100.

Contact:

Paul Adrien
(508) 682-5656 days
(603) 898-6146 eves.



4 Pipe Exhaust With Expansion Provision

In a recent conversation with Nat Puffer, I discovered he has made a stainless steel 4 pipe exhaust system available. The system will mount to all Lycoming 4 cylinder engines and will fit in a Cozy, Cozy Classic, Cozy Mark IV, Long-EZ or an E-Racer.

The pipes are secured to the exhaust flanges by way of stainless steel springs that shouldn't stretch out with heat the way some of the steel Sport Flight springs did.

I inspected one of Nat's exhaust systems that Carl Denk has installed on his IO-320 powered Cozy Classic and it appeared to be well made and included a provision for getting a start on a carb/cabin heat installation. The builder must wrap aluminum around the shroud that is welded to the exhaust pipes to duct the incoming air over the exhaust pipe. I feel additional perforated baffling should be added to the affair to extract a reasonable amount of heat, but at least a good start is there.

One pleasant surprise is the price. They are \$500 per set, lowest cost in the 4 pipe arena.

Contact Nat Puffer at:

Cozy Development:
2046 North 63 rd Place
Mesa, Arizona 85205
(602) 981-6401

Job Wanted

Does anybody have any contacts to help an EZ builder with 20 years experience in the development, marketing and operation of health care and data communications systems? He is capable of: development of marketing/business plan, product presentations and support of marketing & sales, analysis of business needs and systems requirements, program, product and project management, production of user and technical documentation.

Contact:

Stephen W. Rothert
2616 Bowling Green Drive
Vienna, VA 22180
703-698-9576

Aviation Style Flashlights at Non-aviation Prices

Pat Saffron (OH) - If you are looking for a reasonably priced flashlight (under \$7) with a red lens, try an Army-Navy Surplus Store. I fly with two of these lights. They are manufactured by Fulton, model MX-991/U; operate on two D cells, have four easily changable lenses (red, white, blue, & clear). The lenses store in the flashlight cap which also contains a spare bulb. The lights were purchased at:

Army-Navy Surplus
4420 Main Avenue
Ashtabula, Ohio 44004
(216) 992-8791

Free Epoxy

Milton Matthews (MI) - I have two five gallon kits of high temperature epoxy (no, not Safety-Poxy) that I will give to someone if they will pay the shipping charges. This epoxy cures very quickly with high exotherms but can be used to fill low areas when mixed with micro.

313-754-9680
27070 Clarpointe
Warren, MI 48093

Sony GPS Report

Mike Flowers (IN) - I have a Sony GPS installed in my Vari-Eze. I like it but have had problems with it not updating automatically for short periods of time. As long as you hold the unit in your lap the display is easy to read. If, however, you try to mount it in a panel the reflections make it difficult to read.

Davenport Shimmy Damper Update

Bob Davenport (FL) - I'd like to report on a letter which was received from Mark Buxbaum of Richland, WA. It seems, after making a series of "not so good landings" last summer, he experienced catastrophic shimmy on landing at Dubois, WY. This occurred with the Super Shimmy Damper Installed !! After replacing the nose gear assembly with another complete assembly, including a Super Shimmy Damper, Mark continued on his way to OSH with no further problems.

On returning home and checking over the failed nose gear assembly Mark discovered he had bent the wheel disc on one of those "not so good landings". Run-out was found to be .020", which he believes drove the nose wheel in oscillation beyond the capacity of the shimmy damper.

If that is correct, then we should all check our nose wheels for run-out regardless of the type of shimmy damper installed.

Mark did not indicate which type of wheel was installed but my guess is his unit was of the single center disc type with the overhung wheel bearings. This wheel is very prone to bending under a side load and could possibly provide a little excitement in your life similar to Mark's experience.

For a better way to go, see Norm Howell's article Vol. 19, July '90", page 19 of the Central States Newsletter.

I occasionally receive requests for the Super Shimmy Damper from people who are near first flight. I feel I need to clarify the supply situation.

I do not have a machine shop and, therefore, subcontract all parts to a high quality shop. I keep no inventory of parts or complete assemblies. I hold all orders until a total of 25 accumulate. That quantity is required to keep the delivered sale price to \$71.48. All checks are kept until two weeks prior to shipping.

Save yourself a disappointment by ordering the unit when you can afford a waiting period that won't disrupt your schedule.



Ellison Safety Consideration

Harry Bawcom (AZ) - Having replaced my carbureted O-235 with an O-320 with Ellison throttle body I have a safety observation to make. My throttle body has an Electronics International temperature probe located in the throttle body flange that mounts to the engine. The probe is open to induction air.

The safety concern is that, at idle with a cold engine, the probe reads 35 degrees F below ambient temperature.

While taxiing out for takeoff with an outside air temperature of 41 degrees F and a dewpoint of 40 degrees F and with cold engine oil, ice can accumulate in the induction system setting the stage for an abnormally low power takeoff. In my case, even at an altitude of 6,600 feet, the takeoff was successful due to the excess power of the O-320 and the 8,000 feet of runway.

The temperature drop no longer ex-

isted at full throttle and soon the increasing oil temperature warmed up the induction manifold thus melting the ice and all was well.

Closed throttle operation, during descent, doesn't result in such a drastic temperature drop. I assume this is due to the hot oil warming the induction manifold.

A throttle body injector mounted on a Continental or any engine with cold air induction could be a real safety concern unless fitted with an effective carb heat source.

I deal with the problem by monitoring induction air temperature while at reduced throttle operation. During taxi and run up I use carb heat, when necessary, to keep induction air temperature no lower than 38 - 40 degrees F.

My incident was the first high altitude takeoff with a new prop and engine. With a 1,400 pound gross weight I didn't know what to expect. Due to the low power, I bounced the nose wheel on the runway at rotation. I unwisely persisted in the takeoff, achieving a weak but positive rate of climb. Manipulating the mixture control made things worse, not better. It never occurred to me to use carb heat on climbout. Moisture on the wings was probably a contributing factor to the poor climb performance, also.

Perhaps this information could keep a Lycoming or Continental pilot from having to depend on luck and good fortune, as I did.

The greatest risk for induction icing, with the Ellison, appears to be during descent in high humidity and cool temperature conditions on a Continental or any engine using an unheated air induction manifold.

Don't fly a throttle body without carb heat! (some people do) Consider using carb heat before takeoff. A better solution would be to use a carb air temperature gage.

Sony GPS Report

Mike Flowers (IN) - I have a Sony GPS installed in my Vari-Eze. I like it but have had problems with it not updating automatically for short periods of time. As long as you hold the unit in your lap the display is easy to read. If, however, you try to mount it in a panel the reflections make it difficult to read.

Davenport Shimmy Damper Update

Bob Davenport (FL) - I'd like to report on a letter which was received from Mark Buxbaum of Richland, WA. It seems, after making a series of "not so good landings" last summer, he experienced catastrophic shimmy on landing at Dubois, WY. This occurred with the Super Shimmy Damper Installed !! After replacing the nose gear assembly with another complete assembly, including a Super Shimmy Damper, Mark continued on his way to OSH with no further problems.

On returning home and checking over the failed nose gear assembly Mark discovered he had bent the wheel disc on one of those "not so good landings". Run-out was found to be .020", which he believes drove the nose wheel in oscillation beyond the capacity of the shimmy damper.

If that is correct, then we should all check our nose wheels for run-out regardless of the type of shimmy damper installed.

Mark did not indicate which type of wheel was installed but my guess is his unit was of the single center disc type with the overhung wheel bearings. This wheel is very prone to bending under a side load and could possibly provide a little excitement in your life similar to Mark's experience.

For a better way to go, see Norm Howell's article Vol. 19, July '90", page 19 of the Central States Newsletter.

I occasionally receive requests for the Super Shimmy Damper from people who are near first flight. I feel I need to clarify the supply situation.

I do not have a machine shop and, therefore, subcontract all parts to a high quality shop. I keep no inventory of parts or complete assemblies. I hold all orders until a total of 25 accumulate. That quantity is required to keep the delivered sale price to \$71.48. All checks are kept until two weeks prior to shipping.

Save yourself a disappointment by ordering the unit when you can afford a waiting period that won't disrupt your schedule.



Ellison Safety Consideration

Harry Bawcom (AZ) - Having replaced my carbureted O-235 with an O-320 with Ellison throttle body I have a safety observation to make. My throttle body has an Electronics International temperature probe located in the throttle body flange that mounts to the engine. The probe is open to induction air.

The safety concern is that, at idle with a cold engine, the probe reads 35 degrees F below ambient temperature.

While taxiing out for takeoff with an outside air temperature of 41 degrees F and a dewpoint of 40 degrees F and with cold engine oil, ice can accumulate in the induction system setting the stage for an abnormally low power takeoff. In my case, even at an altitude of 6,600 feet, the takeoff was successful due to the excess power of the O-320 and the 8,000 feet of runway.

The temperature drop no longer ex-

isted at full throttle and soon the increasing oil temperature warmed up the induction manifold thus melting the ice and all was well.

Closed throttle operation, during descent, doesn't result in such a drastic temperature drop. I assume this is due to the hot oil warming the induction manifold.

A throttle body injector mounted on a Continental or any engine with cold air induction could be a real safety concern unless fitted with an effective carb heat source.

I deal with the problem by monitoring induction air temperature while at reduced throttle operation. During taxi and run up I use carb heat, when necessary, to keep induction air temperature no lower than 38 - 40 degrees F.

My incident was the first high altitude takeoff with a new prop and engine. With a 1,400 pound gross weight I didn't know what to expect. Due to the low power, I bounced the nose wheel on the runway at rotation. I unwisely persisted in the takeoff, achieving a weak but positive rate of climb. Manipulating the mixture control made things worse, not better. It never occurred to me to use carb heat on climbout. Moisture on the wings was probably a contributing factor to the poor climb performance, also.

Perhaps this information could keep a Lycoming or Continental pilot from having to depend on luck and good fortune, as I did.

The greatest risk for induction icing, with the Ellison, appears to be during descent in high humidity and cool temperature conditions on a Continental or any engine using an unheated air induction manifold.

Don't fly a throttle body without carb heat! (some people do) Consider using carb heat before takeoff. A better solution would be to use a carb air temperature gage.

Sony GPS Report

Mike Flowers (IN) - I have a Sony GPS installed in my Vari-Eze. I like it but have had problems with it not updating automatically for short periods of time. As long as you hold the unit in your lap the display is easy to read. If, however, you try to mount it in a panel the reflections make it difficult to read.

Davenport Shimmy Damper Update

Bob Davenport (FL) - I'd like to report on a letter which was received from Mark Buxbaum of Richland, WA. It seems, after making a series of "not so good landings" last summer, he experienced catastrophic shimmy on landing at Dubois, WY. This occurred with the Super Shimmy Damper Installed !! After replacing the nose gear assembly with another complete assembly, including a Super Shimmy Damper, Mark continued on his way to OSH with no further problems.

On returning home and checking over the failed nose gear assembly Mark discovered he had bent the wheel disc on one of those "not so good landings". Run-out was found to be .020", which he believes drove the nose wheel in oscillation beyond the capacity of the shimmy damper.

If that is correct, then we should all check our nose wheels for run-out regardless of the type of shimmy damper installed.

Mark did not indicate which type of wheel was installed but my guess is his unit was of the single center disc type with the overhung wheel bearings. This wheel is very prone to bending under a side load and could possibly provide a little excitement in your life similar to Mark's experience.

For a better way to go, see Norm Howell's article Vol. 19, July '90", page 19 of the Central States Newsletter.

I occasionally receive requests for the Super Shimmy Damper from people who are near first flight. I feel I need to clarify the supply situation.

I do not have a machine shop and, therefore, subcontract all parts to a high quality shop. I keep no inventory of parts or complete assemblies. I hold all orders until a total of 25 accumulate. That quantity is required to keep the delivered sale price to \$71.48. All checks are kept until two weeks prior to shipping.

Save yourself a disappointment by ordering the unit when you can afford a waiting period that won't disrupt your schedule.



Ellison Safety Consideration

Harry Bawcom (AZ) - Having replaced my carbureted O-235 with an O-320 with Ellison throttle body I have a safety observation to make. My throttle body has an Electronics International temperature probe located in the throttle body flange that mounts to the engine. The probe is open to induction air.

The safety concern is that, at idle with a cold engine, the probe reads 35 degrees F below ambient temperature.

While taxiing out for takeoff with an outside air temperature of 41 degrees F and a dewpoint of 40 degrees F and with cold engine oil, ice can accumulate in the induction system setting the stage for an abnormally low power takeoff. In my case, even at an altitude of 6,600 feet, the takeoff was successful due to the excess power of the O-320 and the 8,000 feet of runway.

The temperature drop no longer ex-

isted at full throttle and soon the increasing oil temperature warmed up the induction manifold thus melting the ice and all was well.

Closed throttle operation, during descent, doesn't result in such a drastic temperature drop. I assume this is due to the hot oil warming the induction manifold.

A throttle body injector mounted on a Continental or any engine with cold air induction could be a real safety concern unless fitted with an effective carb heat source.

I deal with the problem by monitoring induction air temperature while at reduced throttle operation. During taxi and run up I use carb heat, when necessary, to keep induction air temperature no lower than 38 - 40 degrees F.

My incident was the first high altitude takeoff with a new prop and engine. With a 1,400 pound gross weight I didn't know what to expect. Due to the low power, I bounced the nose wheel on the runway at rotation. I unwisely persisted in the takeoff, achieving a weak but positive rate of climb. Manipulating the mixture control made things worse, not better. It never occurred to me to use carb heat on climbout. Moisture on the wings was probably a contributing factor to the poor climb performance, also.

Perhaps this information could keep a Lycoming or Continental pilot from having to depend on luck and good fortune, as I did.

The greatest risk for induction icing, with the Ellison, appears to be during descent in high humidity and cool temperature conditions on a Continental or any engine using an unheated air induction manifold.

Don't fly a throttle body without carb heat! (some people do) Consider using carb heat before takeoff. A better solution would be to use a carb air temperature gage.