

#39K
(\$.05)

A SWITCH IS A SWITCH...OR IS IT???

Some years ago I was fortunate to be able to work alongside engineers from Underwriters Laboratories (UL) during destructive testing of electrical devices. This was part of my apprenticeship as a designer for a major electrical manufacturer and it was during this period that I acquired an appreciation for the real-world differences between AC and DC current and the impact those differences have on switch design and applications.

I share this with you because I am growing increasingly concerned at the widespread lack of appropriateness most home builders demonstrate when selecting switches for the cockpit environment. Each time a builder asks me to perform a pre-FAA inspection of the aircraft, I carefully examine the switches and, to date, over three-fourths of the projects inspected have turned up AC rated or non-rated switches in DC circuits.

"Current is current; what difference does it make DC or AC?"

The differences between AC & DC load carrying capability are dramatically non-linear and are best appreciated by carefully inspecting a high-quality switch carrying both AC and DC ratings. Typical of this is the roller and bar micro switch made by MICRO corporation (part # DT-2RV23-A7). Rated at 10 amps at 125 or 250 volts AC, the same switch can only carry .15 amps at 250 volts DC! In real terms, we have lost more than 98% of the original load carrying ability and all we did was go from AC to DC! The voltage stayed the same!

"But I'm using 120 Volt AC switches with only 14 volts DC."

Those of you who can still remember the old Kettering coil ignition systems will recall that when the condenser in the distributor went bad, the points generally turned blue and melted down in just a few minutes. Cockpit switches don't have the benefit of condensers to absorb the electrical inertia present in a DC circuit and as a result, the gap temperatures get hot enough to weld contacts. That includes AC rated switches, even those made with exotic high temperature alloys.

AC current changes directions 120 times in a 60 cycle circuit. As a result, there are 120 times each second when there is no current flowing at all. The current actually helps turn itself off the moment it sees a gap and switch designers use this phenomenon to help reduce the cost of manufacturing AC switches. In DC circuits, however, the "push" is constant even when the points begin to open and the resulting flash is DC current's way of demonstrating it's resistance to termination.

"But won't my circuit breakers protect me?"

No they won't. Fuses and CB's provide overload protection and a welded set of contacts will not, by themselves, cause an increase in circuit load. What often happened during UL testing was that the points welded shut making it impossible to open the circuit. Cycling the switch to the open position was often misleading: yes the lever moved but inside the switch, the cam had separated from the welded points. While it appeared to have broken the circuit, the circuit was, in fact, still hot. If the consumer involved was your fuel transfer pump or fuel boost pump and you thought it turned off when in fact it was still running, what would the consequences be? If it were a flap or elevator trim device or a landing gear motor, how would a tripped circuit breaker save you if the activating switch was welded closed and in a mode other than what is required for a safe landing?

A DC rated switch will cost you about 3 times more than an AC rated switch of identical current capacity. If your panel sports 10 switches (which is not likely) the difference will be less than \$35.00 (in 1986 dollars). You've gotten this far. Is it worth jeopardizing your investment or your safety by cutting corners with even one cheap or improperly rated switch?

Art Bianconi
EAA Designee # 1216

Art Bianconi trains engineers, designers and architects in the use of computer aided design and drafting and has made effective use of CADD in the design of both electrical and mechanical subsystems for his Long-Eze.

Spinner, Oh Spinner

David Orr (CA) - Someone I flew with to Kanab had an aluminium spinner split in flight and become a large source of vibration. We have all gone to lighter weight ones like Klaus' Kevlar Hershey Kiss type or the Santa Monica boy's smaller clone.

The aluminum spinner was designed to have a front plate, where the spinner leading edge is and a back plate under the prop's crush plate. After thicker props have been installed, the back plate will no longer fit and it is discarded. The remaining spinner support is now at the base of the spinner. That one plate does not provide enough support.

The failed spinner had only one support plate. In fairly close formation the spinner had a 3/4" wobble. The prop was very straight but the pilot reported severe vibration. I headed him off to a desert strip, cleared it for his landing, removed the spinner and continued to Kanab.

At Kanab we discovered the vibration had caused mag screws to back out. After the race, 3 prop bolts were broken and sticking out of the prop. The lug drive holes were egged out of round which made us all nervous. This was all from a spinner that had self destructed.

Electric Trim

Jim Voss (TX) - I have installed electric trim in my Long-EZ by using Mac servos attached to my current manual trim levers. These servos are available from aircraft suppliers or directly from the company which advertises in all the homebuilder magazines. This mod is relatively easy to do, it doesn't change the flying qualities of the airplane (which I like a lot), and even in the unlikely worst case of a trim system hardover failure you just fly to land with stick pressure against the trim springs.

I did my pitch trim first and that is what I will describe now. I have an electric

Long-EZ Project For Sale

Long-EZ 60% complete, fuselage complete on the gear, brakes and wheels installed: GU canard and elevators complete with first fill layer & sanded; wings, ailerons, and center section spar complete. I am a military pilot, have been transferred to England and can not take the project with me. Extras incl.; \$6500 firm. Excellent workmanship. Contact:

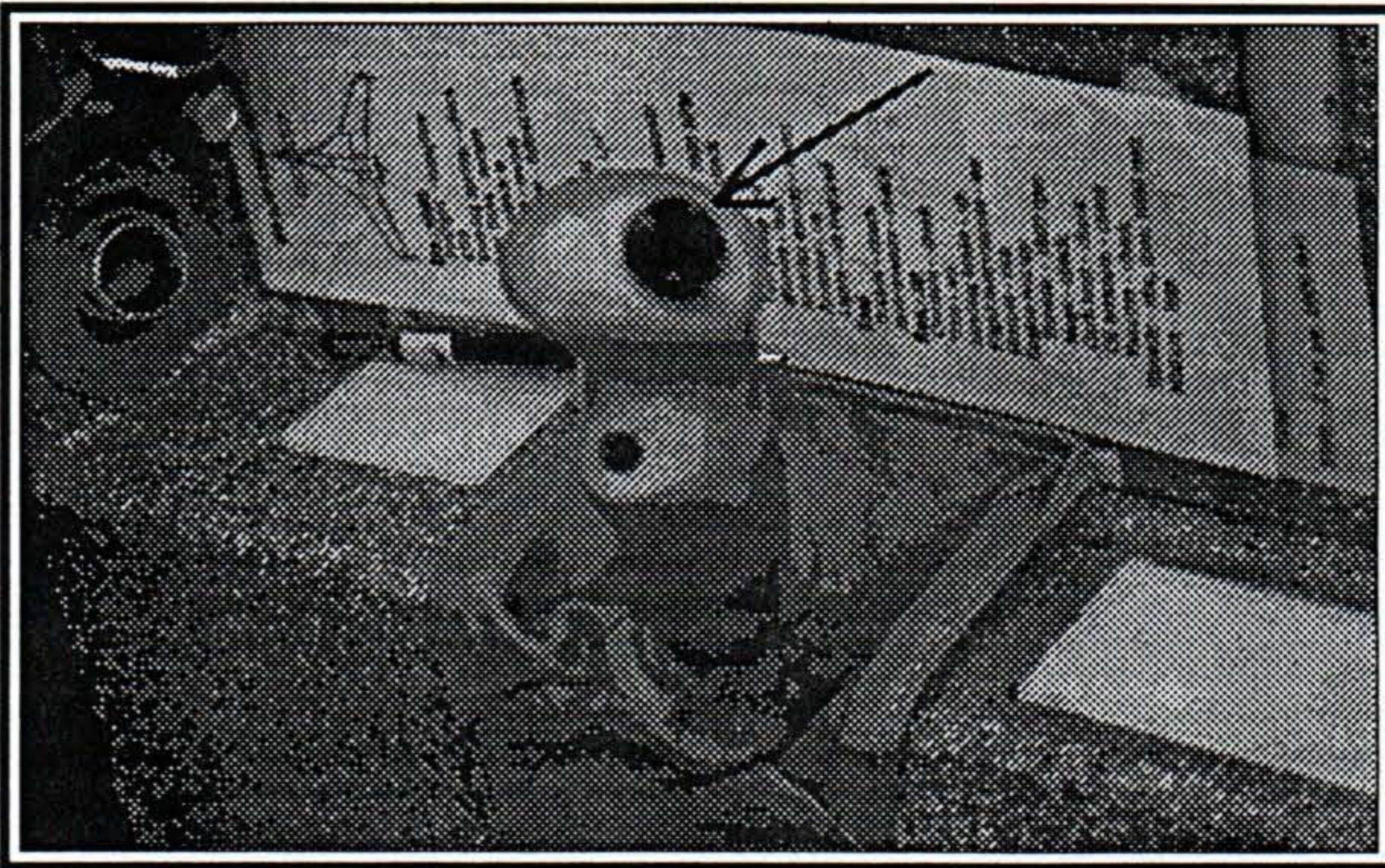
Mark Beres
1206 W. Broadway
Enid Oklahoma
(405) 242-8451

Arizona Sized Oil Cooler

Bruce Vinnola (WY) - One of the best kept secrets in homebuilt aviation is an oil cooler available from Shirl Dickey. When Shirl ruptured a certified aviation oil cooler with his V-8 powered E-Racer, he set out to create a suitable alternative. He succeeded with his conversion of a heat exchanger that is rated at 175 psi working pressure (burst pressure unknown). The cooler is Arizona sized at 6.3" x 3.8" x 13.5" and comes with AN fittings. \$180. Shirl's number is: 602-427-6384



The primary mission of Tom Kohm's Long-EZ is to provide transportation between Westhampton Beach, NY and Morehead City, NC.



Jim's roll and pitch trim servos are controlled by a neat coolie hat switch provided by Mac servo people. This professional looking installation eases pilot work load.

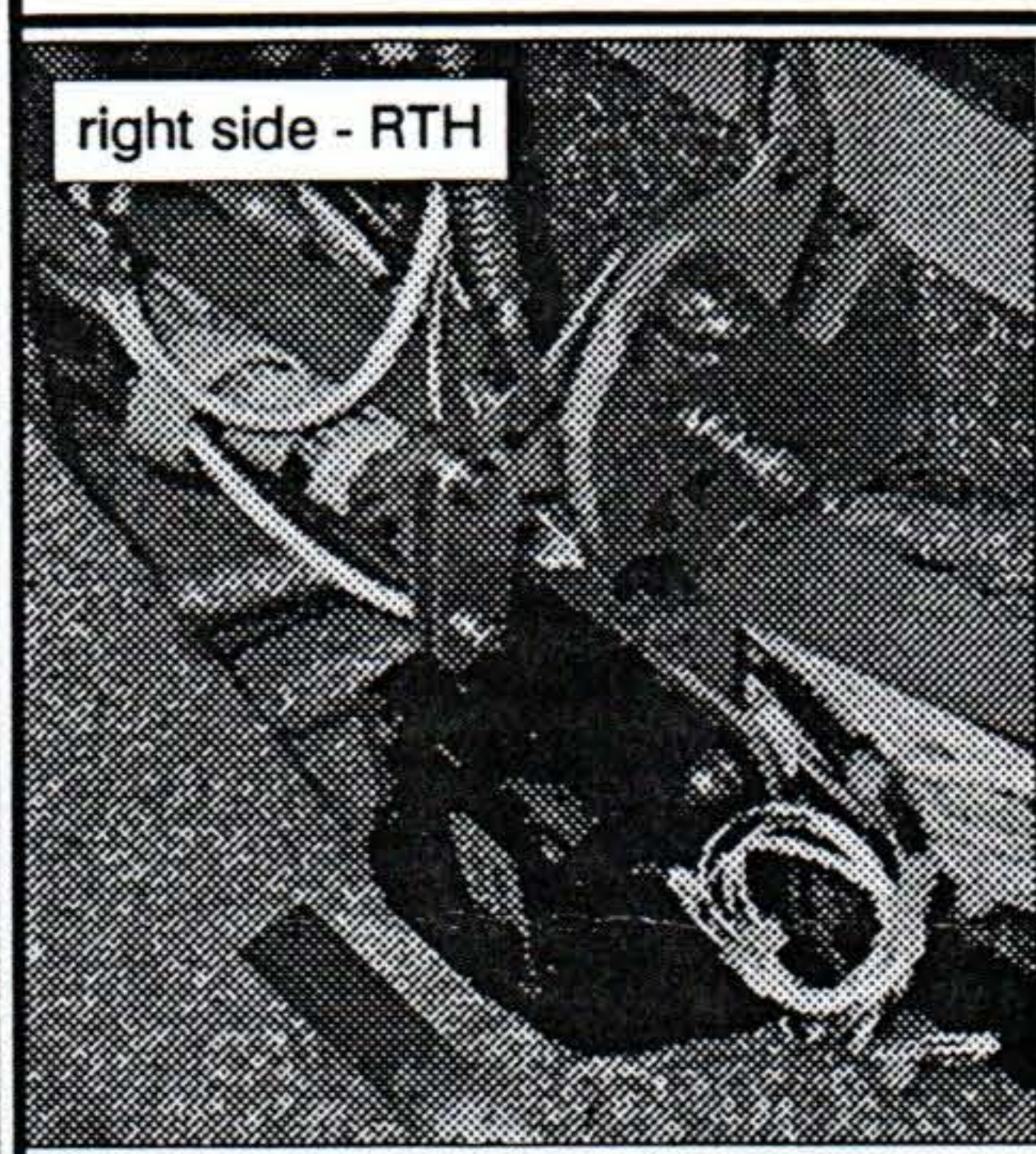
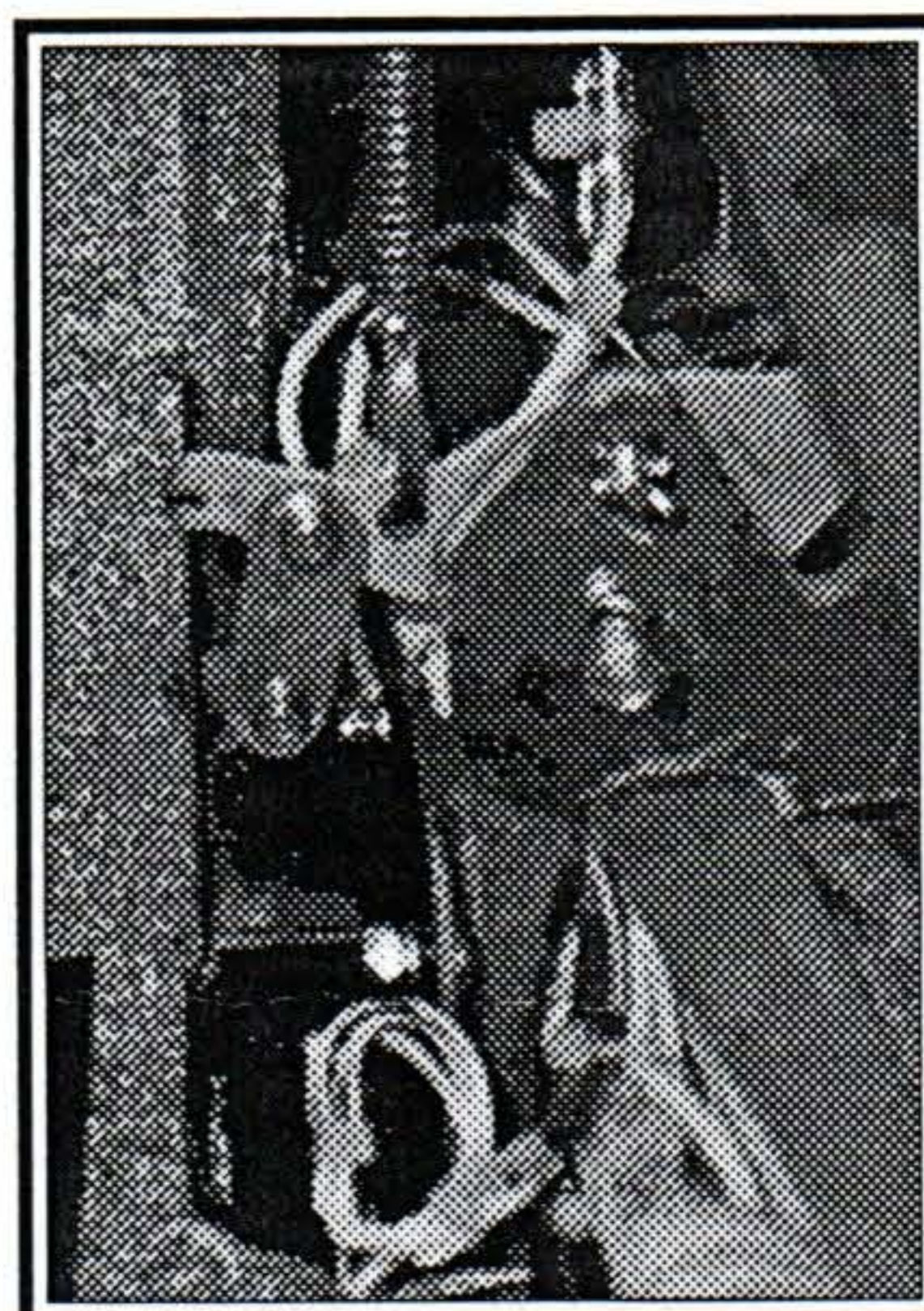
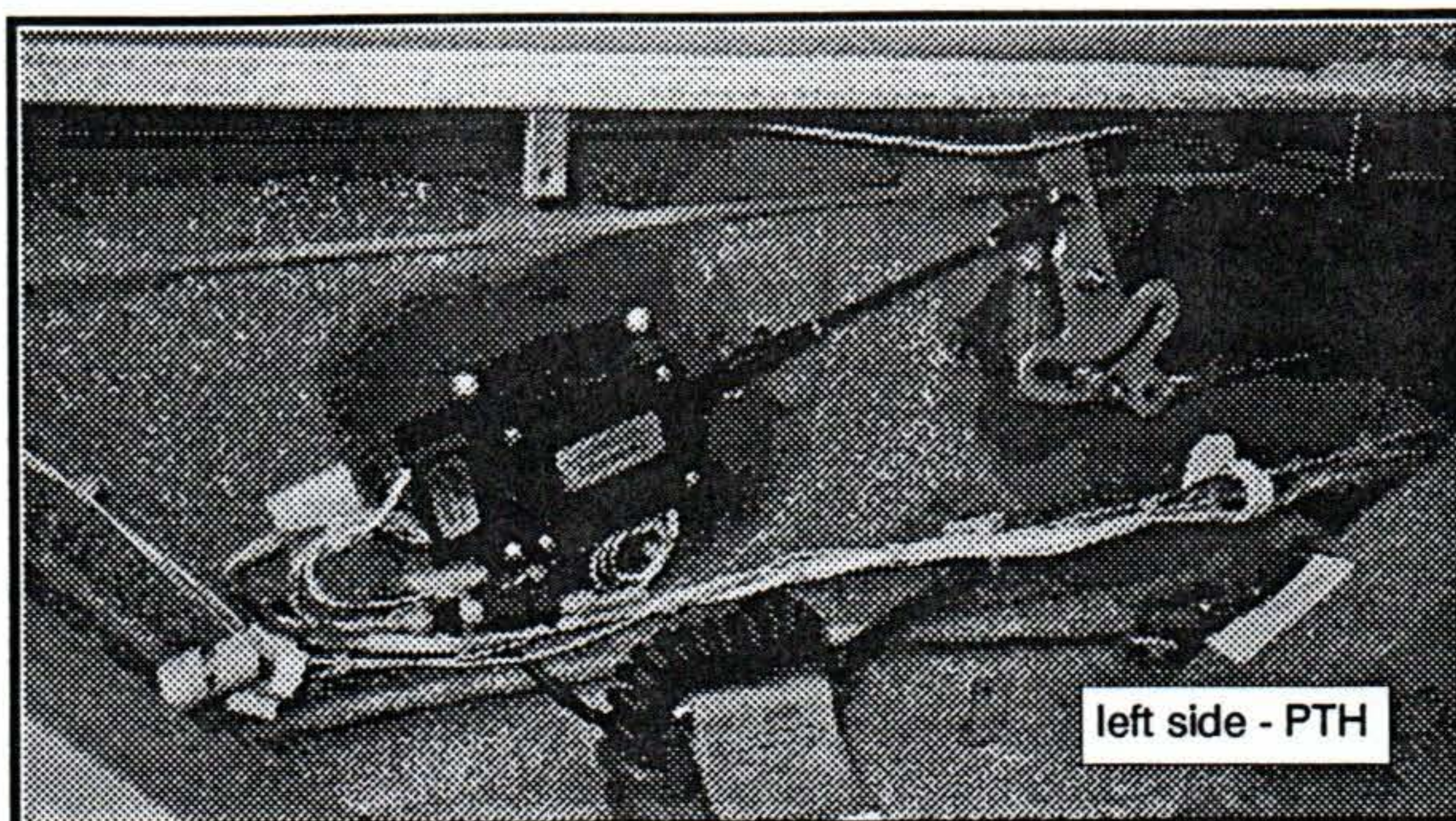
speed brake so the area near the trim lever is clear. I think with some extra work and careful planning someone can figure out how to fit this in around their manual speed brake lever. They could also put it forward of the trim lever instead of aft of it. This would be an excellent time to make the electric speed brake mod too.

I used a Mac 6A servo which provides plenty of power to move the manual lever. The drawing and photos show where the servo goes. My removable side consoles simplify access, but it shouldn't be too hard to remove part of the console if they are built per plans.

With the geometry as shown, the 1" travel of the actuator moves the trim lever through the full range of fore and aft motion. Be sure to check the geometry for your airplane. Make sure you can get full trim travel. A little too much is better than too little. Excess travel will not hurt anything since, if you get past full elevator travel (which is not normal in flight), this just stretches the springs but you are assured of full trim authority.

To check trim travel, put the trim actuator at the normal cruise setting and hold or tape the actuator so the drive rod is approximately perpendicular to the edge of the pitch trim handle (PTH). Mark the spot on PTH where the attachment hole will be drilled. Move PTH to the full forward position, then drive the actuator full forward with a 12V battery and check to insure the drive rod reaches the place you marked on PTH. Repeat for full aft trim. If you don't get full travel, move the attachment point on PTH up or down and repeat the check until you get full travel in both directions. Mark the location of the final hole position on PTH and mark where the four screws will attach the servo to the fuselage side.

Make small holes (just big enough for the nutplates to go through) with your Dremmel tool in the fuselage side where you marked the four holes. Remove enough foam around these holes (about 1/2" diameter") to per-



The above pitch and roll trim installation photos show Jim's usual meticulous craftsmanship

mit you to securely flox the nutplates in place. Put the screws through the actuator attach holes, add one or two washers on each screw, then cover the whole bottom of the actuator with a sheet of plastic wrap, pushing the screws through the plastic wrap. Grease the screws so they don't get floxed in place and put the nutplates on the screws. Mix up some flox, fill the holes with it, then place the actuator in place, pushing the nutplates into the flox and the actuator flat against the fuselage side. Wipe off the excess flox and tape the actuator in place to cure.

One could probably just epoxy the actuator to the fuselage side, but I

always build with future maintenance in mind. After the nutplates cure, remove the four screws and actuator. Cover the nutplate area with 4 plies of 4" x 4" BID to insure it meets the homebuilders' creed of "It can't be too strong". Remember to sand first and use peel ply so the installation is neat and tidy.

Remove the PTH and drill the hole for the actuator attachment. Place it as far from the handle edge as the hardware will allow and replace the PTH temporarily. Open up the nutplate holes in the four ply BID, install the actuator and connect the actuator hardware. Trim the drive rod to fit if you didn't do that earlier.

Test actuator ability to drive the trim fully in both directions. I had to trim my PTH, as shown, to avoid contact between the actuator rod fork end and PTH when near the limits of travel.

When it all works properly, tighten the attachment bolt for PTH so it moves freely but doesn't wobble, cotter pin the attach points of the actuator drive rod and adjust the friction bolt on PTH. I replaced the friction washers with metal ones and lubricated the moving parts so it all works smoothly.

Wire the actuator per the very clear Mac instructions. I used their four-way coolie hat trim switch on top of my stick and it works great. Since I don't have any space left anywhere for the Mac provided trim indicators, I just left the manual trim actuator showing and use it as my trim position indicator.

The roll trim system is similar to the pitch trim system in that there is no modification to the control system itself. You just have an electric actuator, another Mac 6A, do what you now do with your hand.

First make a small, 2-1/2" X 3-1/2", 6 ply BID lay-up for the right angle bracket for the actuator. One side of the angle is 2-1/2" X 2-1/2" and the other is 2-1/2" X 1". I just laid up the wet glass on plastic wrap and draped it over the edge of a 2 X 4, let it cure, then trimmed to fit the actuator.

Next, remove the right console; easy if you have removable consoles, otherwise do what ever to get access to the roll trim system RT3 and RTH. On the roll trim handle (RTH) locate the inboard trim spring attach point and mark a point 1/2" inboard from there, centered on the "neck" of RTH. This is where you need to drill the clevis pin hole for drive linkage bar attachment. Size the hole for the clevis pin used. Directly below this is

ЗДРАВСТВУЙТЕ!

where the Mac actuator goes, as shown in the drawings. I had to cut a hole in the inner skin of the fuselage bottom and remove foam down to the outer skin to provide room for the actuator. You will also have to trim the plywood trim support bracket RT3 to allow proper positioning of the actuator. I later glassed the inside of this hole with 2 ply BID to reinforce it.

Make 2 drive linkage bars to attach the actuator to RTH. They are 2024-T3 or other suitable aluminum 1-1/2" X 1/2" X 1/16" thick.

Attach the actuator to the 6 ply support bracket with 4 small screws, washers and lock nuts. Trial fit the actuator in place. Put 2 pieces of scrap BID under the actuator to allow for the glass you will lay-up in the hole later. With the actuator drive shaft fully retracted, measure the distance from the center of the attach point on the actuator drive shaft to the hole you drilled in RTH while RTH is positioned for full left roll. This is the distance between holes on the linkage bars. Mine are 1-3/8" apart. Drill these holes, then trial fit again with everything connected. Use enough washers to make it all fit snugly but movable on the clevis pins. Now, fully extend the actuator drive shaft; and with the actuator bracket in the same place as before, the RTH should be in the full right roll position.

You may have to adjust the up/down positioning of the actuator or the linkage bar length or their holes to fit your installation. Check that the actuator has full travel without bottoming out on the slots that are cut in RTH, and that you get full left and right roll trim. With the geometry shown, mine all worked great without altering RTH.

When satisfied that it all fits, cut a piece of 1/4" plywood 1-1/2" X 1" to reinforce RT3 and to tie it to the actuator bracket. With everything in place, put the plywood piece in place with one edge against the actuator bracket and one flat against RT3. Mark the location of the plywood on the bracket, remove everything and attach the plywood to the bracket

with flox and 2 BID tapes. When partially cured, flox the bracket with plywood piece in place as shown. Doing this while partially cured allows some repositioning to get a good fit and allows everything to bond together to make it stronger.

Connect everything to verify alignment, then put a 2 ply BID tape across the bottom of the bracket (under the actuator - so tricky) and in the corner between RT3 and the bracket.

When cured, connect the wires per Mac instructions. I also used the Mac coolie hat trim switch for roll trim. Replace the phenolic washers on the friction adjusting bolt with steel ones, lubricate and adjust the bolts, holding PTH to RT3 to move freely without wobble.

Do a final test of the trim system to assure everything works correctly. The actuator should drive through it's full 1" travel without reaching any hard stops but should allow full left and right trim.

I trimmed the end of RTH so it sticks out of the side console and use it as a trim indicator. I covered the old slot in the console with a small plastic panel with a neutral trim position marked on it.

Before replacing the right console, you may have to remove some of inside of it to provide clearance for the actuator. I did this and put a layer of 2 ply BID on the inside where I removed foam and glass.

That is all there is to it. It took me a weekend to install and another to get it wired up (after 6 months of thinking and planning!). It works smoothly, allows very precise trimming - much better than manually, and makes flying even easier. I love it!

If anyone has questions, the best way to reach me is by E-mail because of the time difference with Russia. My address is james.s.voss1@jsc.nasa.gov My normal mailing address works but takes a month.

N81JV Pitch Trim

Cut out to allow full motion of PTH

Nutplates floxed into fuselage side then entire area covered with 4 ply BID

Hardware supplied with Mac servo

PTH

0.6 in

Trim cables

1.1 in

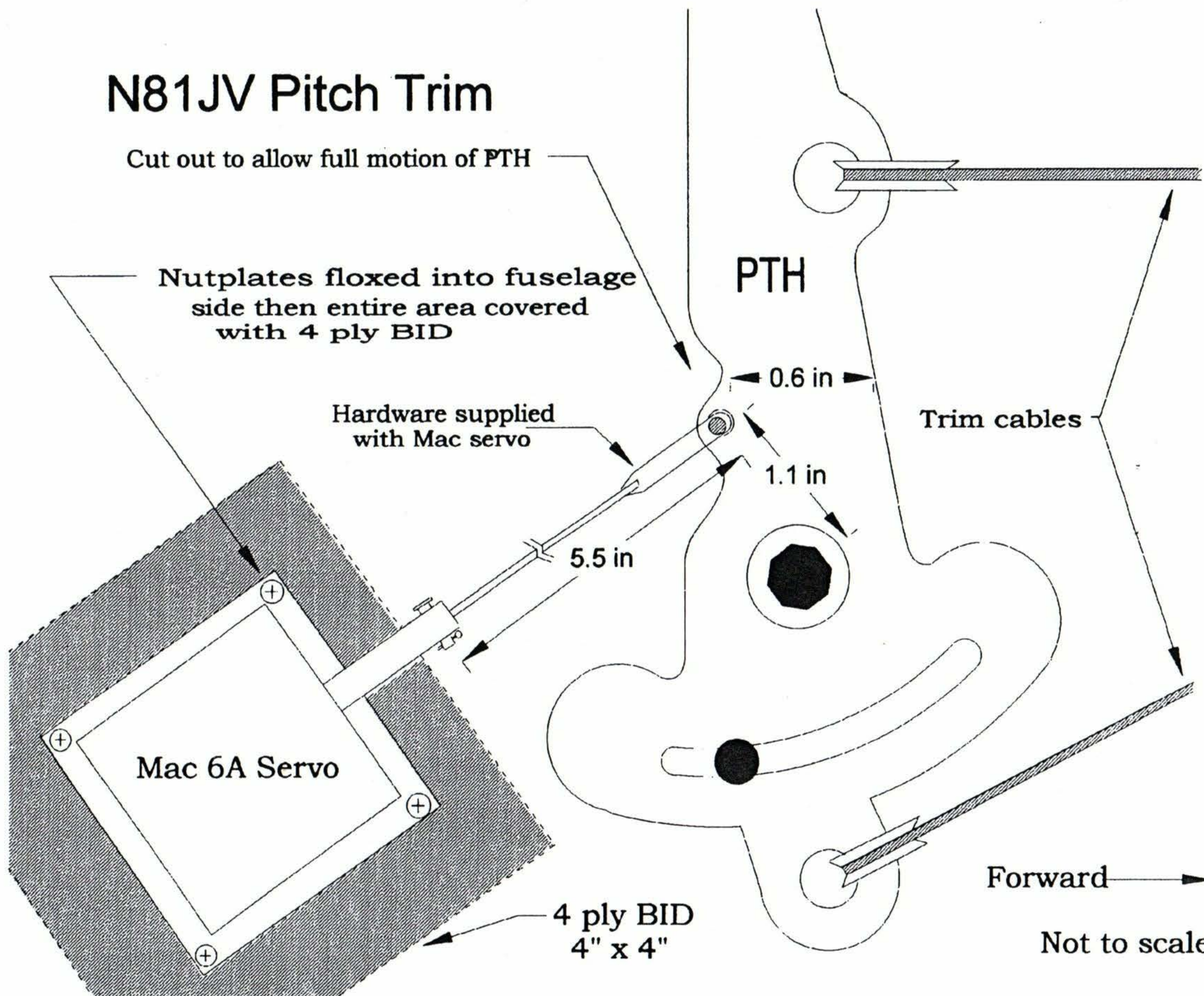
5.5 in

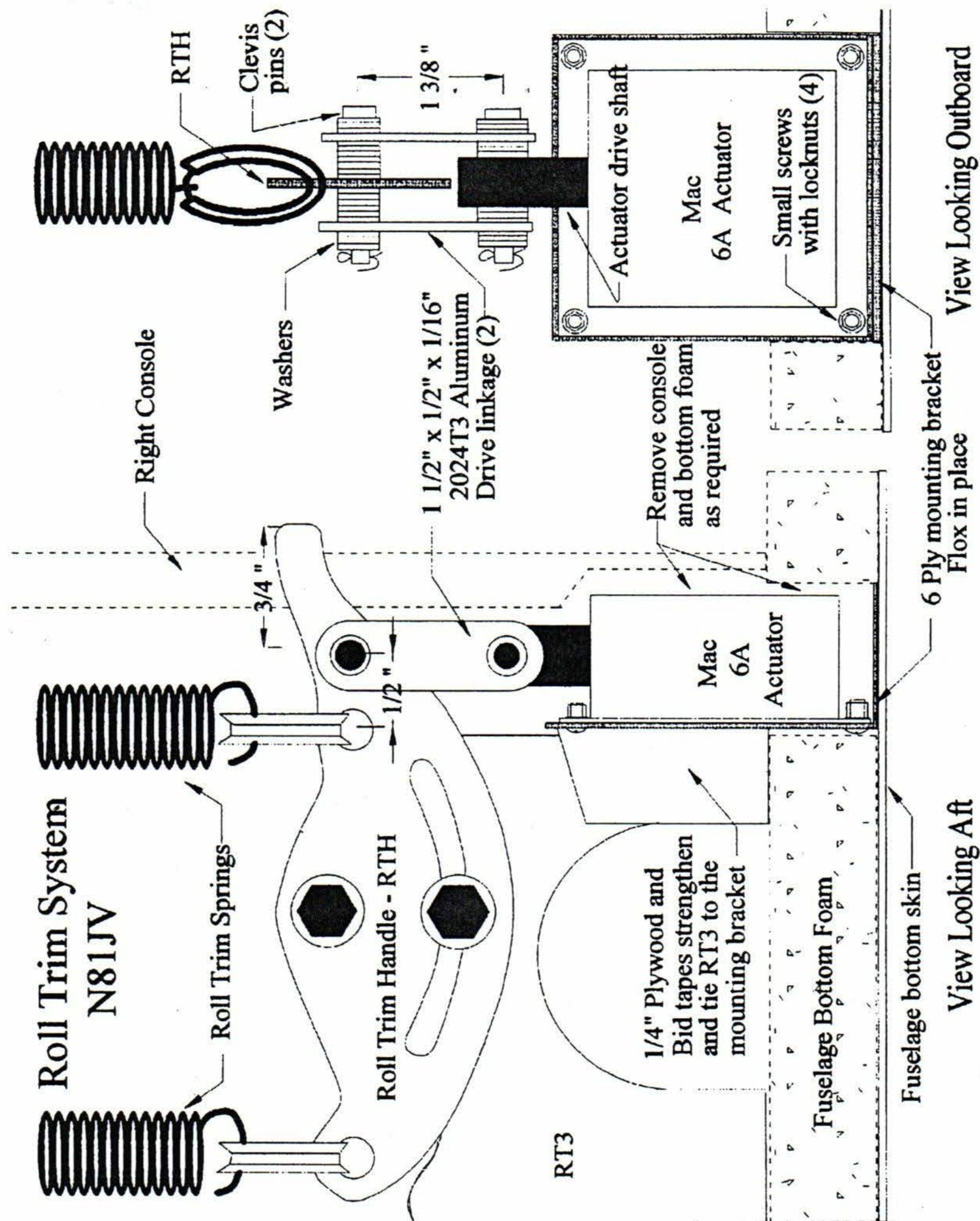
Mac 6A Servo

4 ply BID
4" x 4"

Forward →

Not to scale





Radio Transmitter License Requirement Update

The following information was taken from the FAA publication, Alerts.

Most of you know that the Telecommunications Act, passed in February, allowed the FCC to stop requiring us to have transmitter licenses. The FCC still has a rule requiring us to

have one, however. They issued a NPRM investigating the question. It's comment period expired in late May and no opposition was expected. Pending final decision the FCC issued a temporary rule eliminating the individual licensing requirement for **private aircraft operating domestically** which are not required by law to carry a radio. 15

If the NPRM does not eliminate the license requirement, FCC will allow enough time to get your license. The FCC has an information Hotline set up. Dial (800) 322-1117, then press "2" and then press "1". Update information is also available via the internet at <http://www.fcc.gov/wtb/avmarsrv.html>

Navaid Autopilot GPS Coupler

Michael Marshall (MO) - It was with some trepidation that I purchased a GPS coupler from Porcine Associates one year ago. I didn't need a marginal thing to fiddle with. I have a Navaid Autopilot I built from a kit some years ago and a Garmin panel mount GPS. The Navaid never really followed a VOR signal very well. These three boxes work well together.

Now I can fly cross country direct, or watch the VOR needles flip as the coupled GPS flies from station to station. Jim Ham was friendly and helpful with advice about the compatibility and installation.



For Sale

Vari-Eze cowl \$100 each, Vari-Eze canopy \$150, 3" O-200 prop extension \$125, Continental O-200 125 TT, 50 SMOH \$6500/OBO (no vacuum, starter, or alternator), Narco Mk 12D w/Glideslope includes indicator \$1950, Collins transponder \$550. Contact:

David Hummer
P.O. Box 3760
Santa Monica, CA 90408-3760
(310) 990-2098

Breaker Switches For Sale

5 Amp breaker switches that sell at airshows for \$12. I will sell them at \$5 delivered to you. Contact:

Michael Amick
615-790-0341

GPS Interference

It is known that there may be GPS interference when the com radio is used. The interference was previously considered to be related to a harmonic frequency com transmitter signal.

A recent issue of Transport Canada's Aviation Safety Vortex magazine published an interesting finding. It seems avionics shops discovered when certain VHF frequencies were used, the outbound VHF signal impinged on the ELT antenna, traveled down the antenna and excited the final output transistor in the ELT. The ELT then put out a weak harmonic signal that interfered with the GPS.

Engineers switched to different brands of ELTs and had mixed results. Sometimes the interference vanished and some times it did not. Aircraft with antenna less than 3' apart may be more susceptible to interference than those with great separation. Even that concept is not proven, however, as helicopters whose antenna are usually less than 3' apart have reported no GPS interference.

It seems it will take a while to sort out the problems of the new nav system. If you have noticed GPS interference when you transmit please contact Transport Canada Aviation. Contact Bob Merrick; Transport Canada Aviation System Safety (AABA); Place de Ville; Ottawa ON K1A0N8. Phone: (613) 990-5440, FAX (613) 990-1301, and E-mail: Merrick@tc.gc.ca. It is nice to know that a government agency is doing something good.

State Representatives

Steve Beert 319-359-6781	Iowa	Buzz Talbot 708-759-1124	Illinois
"Sandy" Mondary 317-852-2890	Indiana	Terry Yake 913-451-8904	Kansas
Rex Rexin 313-349-8877	Michigan	Lynn Butters 314-837-2607	Missouri
Ken Pickel 216-235-1242	Ohio	Fred Warden 713-492-2078	Texas
Jim Evans 804-898-1231	Virginia	Mike Bern 215-647-5137	Pennsylvania
Gene Zabier 414-886-5315	Wisconsin	Steve Wright 615-373-9707	Tennessee
Dave Williams 201-938-5830	New Jersey	Rob Martinson 303-670-0799	Colorado
Paul Adrien 603-898-6146	Massachusetts	Mike Delaney 502-491-6851	Kentucky
Mike Stolle 505-858-1952	New Mexico	Norm Howell 805-256-1643	California
Lowell Dodson 918-245-7458	Oklahoma	Jack Fehling 407-744-1309	Florida
Alfred Coha 602-546-6646	Arizona	Dave & Ali Nelson 507-281-0469	Minnesota
Bob Sudderth 360-668-4900	Washington	Bob Iuliano 518-798-5915	New York
Perry Mick 503-463-5852	Oregon	A. Bruce Hughes 808-572-8864	Hawaii
Gus Sabo 702-454-0078	Nevada	Jerry Nibler 907-258-3086	Alaska

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For Sale

Long-EZ for sale: Parting out O-235-L2C, mode C, Great American prop.

Dan Mislik
4208 Woodland
Flushing, MI 48433
(810) 732-6547

Higher temperature also increases the number of reactive sites available and sets up the perfect condition for amine blush to occur. With all this technical goop set aside, most builders only want to know how to prevent amine blush or how to cure the problem that they now have on their laminate. The following are remedies for amine blush:

1. Use peel ply. Amine blush forms most generally on the outer most portion of the lay-up. By using peel ply the amine blush is removed when the peel ply is removed, leaving a laminate free of amine blush and ready for secondary bonding.

2. Use a high quality resin, or a fast hardener. The length of time that resin is uncured is the length of time of exposure for the formation of amine blush. Reduce this time and you will reduce the amount of amine blush.

3. Cap all resins as soon as possible. This reduces exposure to the elements that cause amine blush. (DO NOT USE EPOXY PUMPS) Humidity the fiberglass and core material will effect how a laminate will turn out too.

4. Work in a controlled environment if possible. It is often hard to have a temperature and humidity controlled shop, but we can do our lay-ups at times when the temperature and humidity is not extremely high as we frequently see it in North Carolina.

5. Amine blush can be washed off with a clean cloth and warm water once the initial cure has occurred.

6. Sanding will remove the amine blush and also gum up your sandpaper. **Amine blush must be removed before subsequent or secondary laminates or lay-ups are initiated. If the amine blush is not removed, the interlaminar sheer strength is only as strong as the amine blush.** I find that the easiest method is to purchase a high quality resin that is not so susceptible to amine blush and use peel ply. By doing this, I get the best of both worlds. I get a resin that is easy to work with and that has

higher qualities in virtually every area. I reduce sanding work and lighten my laminate by using peel ply. With these issues in mind, we use only EPOLITE 2183, 2184, 2187 hardeners which eliminate amine blush.

We, at AeroCad, have had bad results testing Amine base hardeners. On a glass to glass bond (tape glassing cured bulkheads in place to other cured glass) the tape glass would peel off like it was bonded to wax paper. We also found fully cured laminates to have poor peel strength between plies. Vacuum bagging also produced the same reaction.

We deal with 80 to 90 percent humidity in our areas most of the time. We feel you should always test your resin systems to see if these types of problems come up. Most of our peel strength problems were seen in the winter time. The longer the cure rate the more moisture that seemed to creep into the laminate. We had material reps examine the problems we found in our testing and, surprisingly, no answers came from them.

Our fix is to just use Styrene-Monomer base hardeners.

RAF is in the desert with almost no humidity so they will not have our high humidity problems. Use all resins as if you are a Guinea pig in your area. **TEST - TEST - TEST** until you know the resins will work for your needs in your area.

We also found that the T_g (glass transition temperature) was not what the resin manufacturer said it was. We took nose struts made of S-2 glass and sample resin from manufacturers and post cured it, slowly stepping up to 190°. We would then let it cool and re-heat it to 160° then 170° and so on until the resin became rubbery. Some samples would only reach 160° and others maybe 180°. Are resin manufacturers lying to us as end users? They told us to expect 10-20% lower T_g values because we were not in THEIR lab. If that is the answer you can expect from them, you had best **TEST - TEST - TEST**.

VHF Antennas in Long-EZ/Cozy Aircraft

Tony Rothwell (Australia) - I am building a Cozy 3 and am at the stage where I was making the winglets. I did some calculations and figured I knew better than the original designer of the radio antennae. I thought that each half of the VHF communications dipole should be around 22.6" rather than the 20.3" specified. I made one winglet antenna to the book dimension and one to my dimension and covered both.

Wrong! Fortunately, in those days I worked for the Australian Civil Aviation Authority and knew the fellow who ran the measurement and calibration laboratory. I took the winglets to the lab and had them measured for "bandwidth" and resonant frequency.

The plans built, 20.3" antenna was tuned nicely to 124.038 Mhz and the reflection co-efficient was less than 0.4 from 114-135 Mhz and less than 0.3 from 117 to 130 Mhz. Clever me had produced an antenna tuned to 111.04 Mhz, way down near the bottom of the navigation band and with a reflection coefficient below 0.3 only from 108 to 116 Mhz. Truly woeful!

I had to carry out an operation and shorten each antenna leg to its correct figure then repair the holes. More work and a heavier airplane resulted. I wish I could say I had truly learned a lesson and not made any more changes but it wouldn't be true.

I just hope my IO-320 with an MT prop delivers results to justify the weight and the cost. With a little luck, I'll know within the year. Gee doesn't work interfere with building?

For Sale

Cozy III, \$16,000. All glass work done, primed and ready for engine, instruments and paint.

O-200 Vari-Eze for sale, \$15,900, low time, light weight electric starter, etc. Call Chuck (352-637-1184)

Fuel Flow Instrument Caution

Carl Denk (OH) - Fuel flow instruments seem to be one of the latest gadgets, along with Lorans and GPSs. If planning to implement the FuelFlow's alarm function that calculates endurance based on time/distance to a waypoint received from a navigation device such as a Loran/GPS (below I will refer to GPS, but the same applies to Lorans, etc), the interface needs to be thoroughly investigated. Also if at a later date you decide to change the navigation device, it is likely that the compatibility will vanish!

The normal mode of conversation between the devices is through an "RS-232" serial interface (a pair of wires, one signal out, and the other ground or return. This is where the commonality ends! Specifications to be considered are:

1: Signal level: Real RS-232 is plus 12 volts and minus 12 volts. Avionics typically operate at plus 5 volts and zero volts. Some computers will accept either, many will not! With avionics type equipment, this probably will not be a problem.

2: Baud Rate: This is how fast the data is transmitted. 300 to 28.8k baud is common on computers, the avionics must both have exactly the same baud rate probably 1200 or 9600 baud. My II MORROW 820 Flybuddy GPS uses only 9600, I understand the II MORROW 600 series is programmable at numerous bauds from 1200 to 38.4k.

3: Data Bits: This is the quantity of binary (0 or 1's) digits used to describe the data character, and usually is either 7 or 8. The 820 GPS is 8 Data Bits. It must match exactly.

4: Stop Bits: This is mandatory timing space length, usually one, which is the case of the 820 GPS. It must match exactly.

5: Parity: This is a one bit primitive error checking number, and can be even, odd, or none. The 820 GPS is none.

If all the above are correct the data transmitted over the wire should be received as understandable information, but does not guarantee anything. First the GPS probably will set a flag in the data to say that it thinks the data good, i.e. no red light on the GPS signaling loss of satellite position. Also dashes or other characters will be transmitted instead of bad data. The fuel flow instrument should check the data for flags, out of range (too large or small) numbers, and correct order of data (sentence structure), before it sets the fuel flow endurance feature flag.

The sentence structure is a potential problem, since the data stream transmitted and expected must match exactly. The first several parts of the 820 GPS sentence in part are:

AN423215
Latitude North 42°32.15'
BY814523
Longitude West 81°45.23'
C056
Magnetic Track 056°
D215
Ground Speed 215 Knots

and it goes on for more than 11 items. There are non-printing control characters interspersed at various spots to better define the data. This sentence is transmitted (over the wire) regularly at specific intervals usually once every second or two. The fuel flow may watch this interval and use it as an additional check on valid data. Therefore both the sentence structure and timing are critical and must match exactly.

A caution related to all navigation receivers, if the transmittal interval time is long (several seconds), and the device connected has its own internal delays, then the device, a moving map display could lag by 5 or more seconds which translates to 0.3 mile inaccuracy in position, not good for finding an airport in poor visibility.

As if this isn't enough, there is still the possibility of defects, and dimensional tolerance type problems that will prevent things from working correctly.

Now for my experience with DPS instruments MINI-FUELWATCH, a very nicely crafted instrument. The installation went smoothly, with the flow sensor installed between the Bendix RS5A injector throttle body and the distribution block. The LCD display is readable under all lighting conditions, which I can't say for the ULTIMATE SCANNER next door. The warnings that are dependent on the GPS output have never worked.

1: Before the DPS unit was ordered, the II MORROW installation RS-232 data was faxed to DPS, with the reply that this was "ARNAV" specification output, and was compatible with the FUELWATCH!

2: After several phone conversations with DPS, as a last effort, hoping not to send the unit back, I opened the case, and traced the RS-232 input, only to find missing components. Another phone call resulted in directions to install a diode and resistor which I installed. It still doesn't work. A fax in each direction netted different component locations to install. I followed directions, it still doesn't work.

3: Phone conversation with DPS: I don't have time to do now, but later I can modify the FUELWATCH program to accommodate changes necessary to make the unit work.

4: The unit was sent back to DPS with a computer file of the GPS output. This verified that GPS manual and instructions did match, for what the GPS was saying, while on the ground with 3d position (no speed or distance to waypoint information).

5: Received FAX from DPS indicating refund of the \$20 for the GPS interface. The bottom line in my book is the info was provided prior to order, it's not my fault DPS didn't pay attention to details. Apparently the only inconsistency is the time interval of data transmission, which probably is easily fixed.

6: Recently the unit has become intermittent. I will pull it after the OKCGIG.

GPS Signal Interference

Ann & Rhett McMahon (LA) - The air was glass smooth as we hummed home in the twilight. It had been a perfect trip. We left Baton Rouge six days ago for our journey to Reno via Tucson and Sacramento and the Weather God had smiled. Majestic purple and salmon mountains met us at sunrise in the Sonoran desert, we ate a "Long-EZ" omelet at the General William Fox airport west of Mojave and experienced the dive into the Reno valley. I was so proud of my Long-EZ.

My reveries were interrupted by Houston Center calling me to contact Lake Charles approach as we entered Louisiana. I noticed my new Garmin GPS 150 signaling a message. For the first time in six days it reported poor GPS coverage. I pressed the status screen and watched 7 satellite signals dwindle to nothing. Rebooting produced no improvement. I amended my IFR flight plan toward Baton Rouge instead of my home base.

Garmin suggested the problem may have been caused by the VOR or COM radio frequency we were using at the time the GPS quit receiving satellite signals. Sure enough, we found the Lake Charles frequency of 119.35 sent reception to the cellar. Our culprit was not the COM frequency itself, but a harmonic of the simultaneous oscillator frequency that hit in the 1000 MHz range with the satellite reception frequency.

Now, what to do? Detaching the Garmin antenna from its mount in the nose and, with the 150 unit receiving several satellites on a "good" frequency, we walked around the aircraft. No matter where we located the antenna - under the canopy or right on

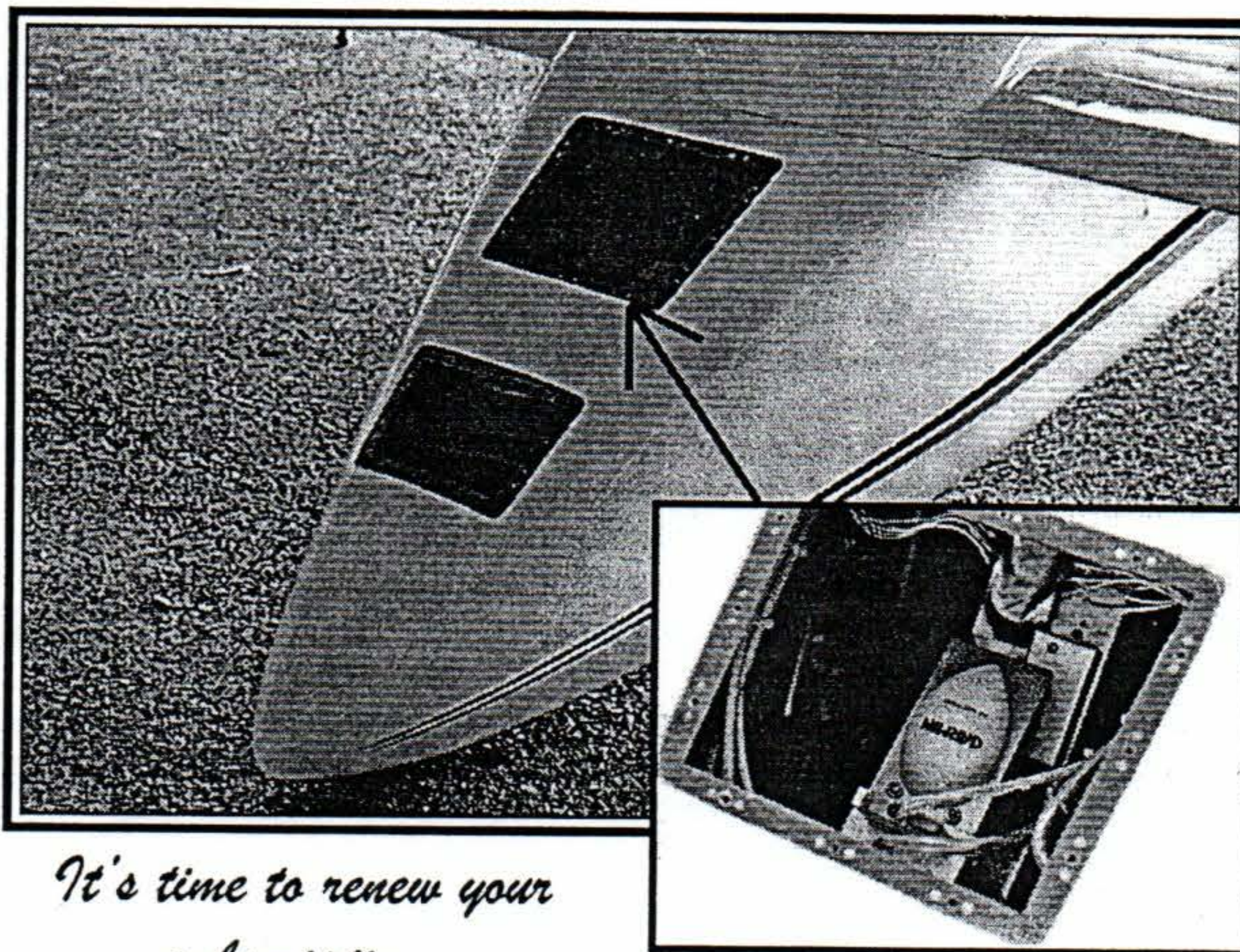
top of the radio stack or further down the nose - all signal was lost on the Lake Charles frequency of 119.35 and those frequencies adjacent to it.

To solve this problem, we began by trying to isolate the antenna using aluminum foil placed strategically between the antenna mounted in the nose and points from the COM radios where we could imagine the oscillator emissions coming. Not only did this not work, it hampered the reception of the Garmin antenna. Next we replaced the standard antenna wire with 100% shielding. This slowed down the loss of reception on the "killer frequency", but did not stop it.

Finally, we called Narco Avionics, manufacturers of the MK12E COM radio in my Long-EZ. They said they believed the offending harmonic oscillations were coming from the face

of the Narco unit and impacting the reception in the Garmin antenna in nose of the aircraft! To test this, we unhooked the COM antenna from the back of the radio and then set it for the "killer frequency" once again. The same affect occurred, loss of satellite while the radio was tuned to 119.35. So, indeed, it looks like the interference is coming from the face of the radio.

Narco says they are working on a face plate for the radio that will stop the offending oscillations. Let's hope it doesn't look like the window on our microwave oven. In the meantime, when I have encountered a COM frequency that stops GPS reception, I ask the controller if it is possible to speak to them on another frequency. So far, they have been happy to comply and I have not had to amend my flight plan.

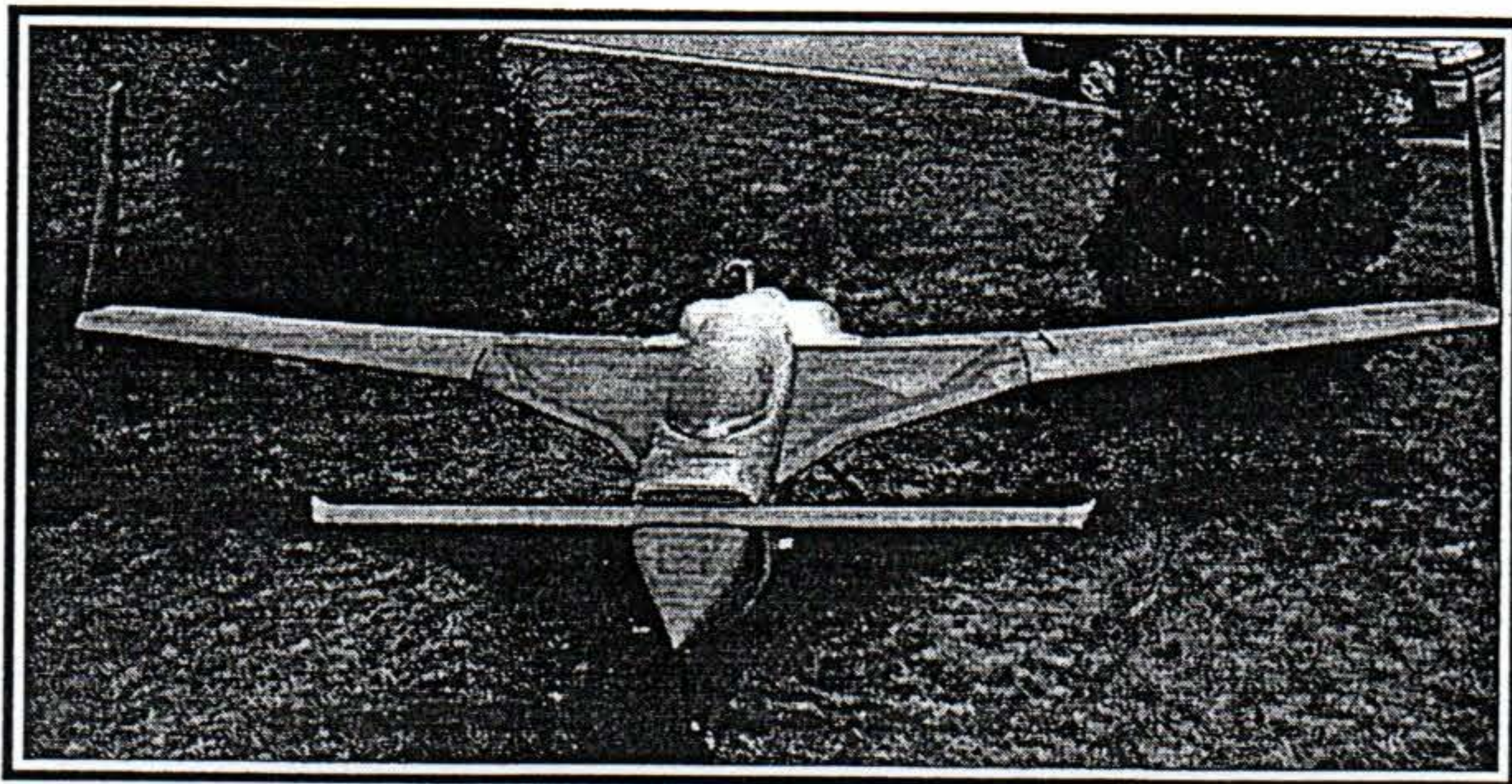


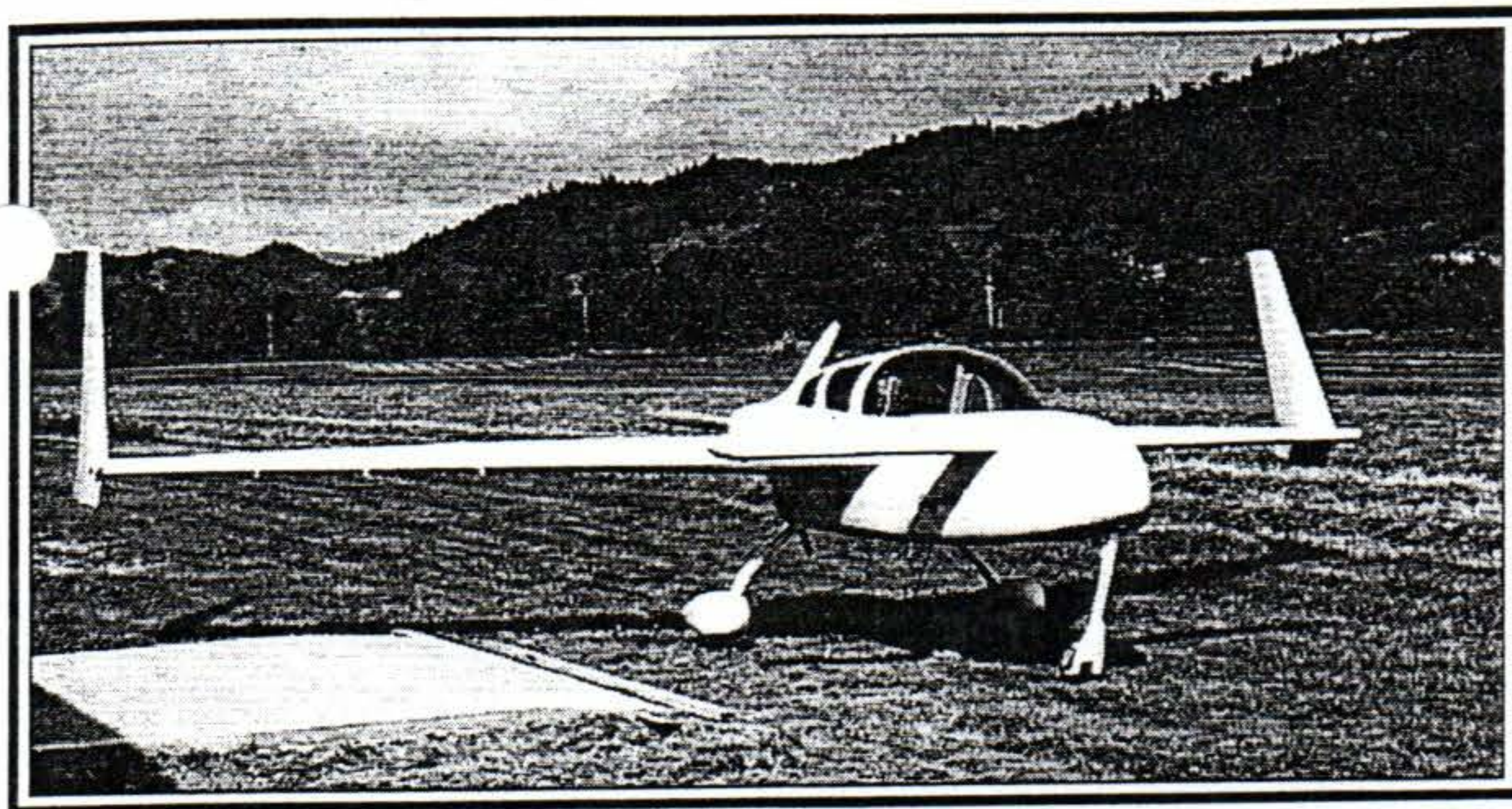
It's time to renew your subscription.

Long-EZ Project For Sale

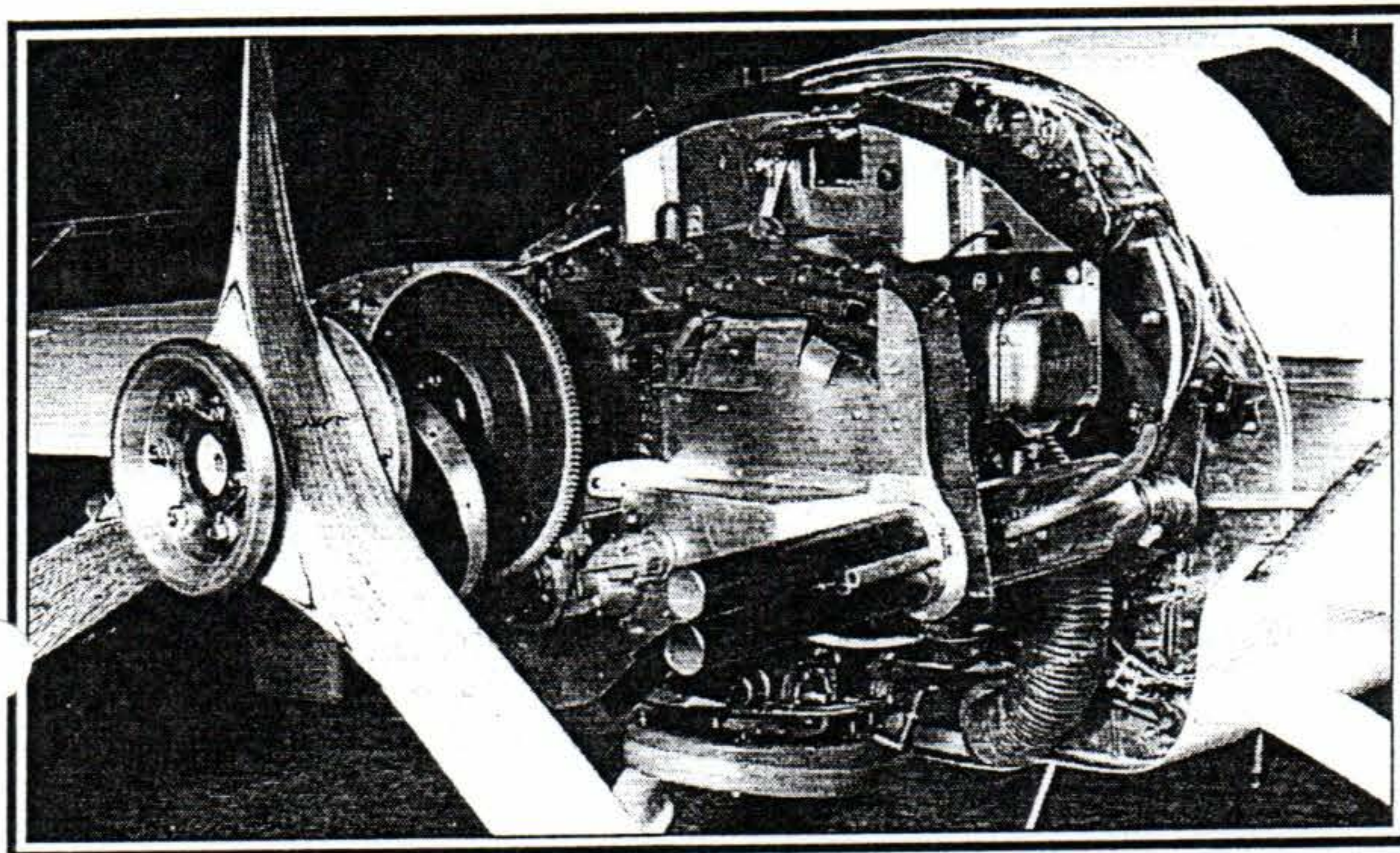
Save the first 2,000 hours of building. All major structures complete and mated. O-320-E3B mounted. Needs wiring and fill and sand. All plans, tools, and paperwork. Includes some instruments and Rocky Mountain Engine Analyzer. Asking \$16,000.

Contact Robert Stevens
9511 Stone Drive
Cincinnati, OH 45241
BSTEV9511@AOL.COM
(513) 779-8355 (H)
(800) 736-3973 ext. 2993 (W)





5 years of work and now the adventure begins!



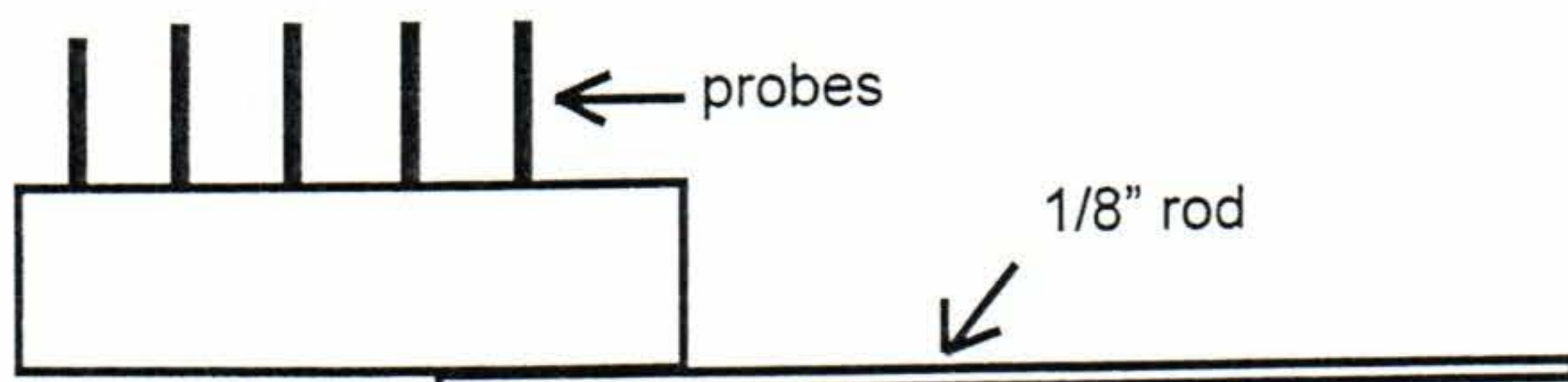
Beautiful O-360 installation

EGT Probe Calibration

John Nicholson - (ONT) I have never seen anything about calibrating EGT gages, so here is an idea. The absolute value doesn't seem too important (I could be wrong about this). It seems most important how they match each other for comparison purposes.

Take a piece of 1/2" square steel about

1-1/2" long and weld an 18" long 1/8" diameter rod to it. Drill 4 or 5 holes in the square steel to accommodate your EGT sensors. Put the sensors in the holes and a thermocouple from a pottery kiln in the 5th hole, if you can borrow one from a friend. Clamp the rod in a vise and heat the steel with a couple propane torches to cherry red. You can switch back and forth to see if they are all giving about the same reading.



1/2" x 1/2" steel

Cozy MK IV First Flight

Larry Sligar - (OR) I finally finished my Cozy Mk IV after 5 years. I now have 26 hours on it. What an airplane!

I have an O-360 Lycoming with dual electronic ignition, throttle body injector and 3 blade Performance prop.

Q-200 Handling Qualities Improvements

I recently received a letter and flight report from Brian Martinez, an Edwards based Flight Test Engineer and Q-200 builder. He has successfully labored for a considerable time to improve his Q-200's handling qualities. His work may improve other Q Birds that you know of. If you would like a copy of his report and letter please send me a SASE. His latest airframe change has resulted in improvements including: tail remaining on the ground for all the take off roll with reflexer centered and no ballast, reflexer trim providing a strong pitch stable climb to 8,000', significant improvement in trim to and stabilization at flight attitude, etc.

Cooling

John Nicholson - (ONT) Over the years many ideas have been tried to even up the CHTs but none helped much. Ramps helped a bit but not enough to be worthwhile. I typically ran #1 = 290, #2 = 335, #3 = 330, #4 = 400. Finally Bruce Bolton suggested an idea which works fine for me. Using silicone coated BID (an idea from the newsletter) I baffled the bottom of #4 cylinder both the head and the barrel leaving a 2-1/2" gap for the air to enter. Now the temps are #1- 315, #2- 325, #3- 325, #4- 330.

I calibrated by putting all 4 sensors in the same pot of boiling water and observing that they all showed about 215 degrees F on my analog gage. The engine is a standard 160 hp O-320 with stock MS carburetor.

MO-GIG 98

Carl Denk (OH) - Butler, MO CSA
Fly-in Awards June 12, 1998.

AWARD

BEST OVERALL N423CZ

Chris Esselstyn Cozy 3

BEST EXTERIOR N5EN

Carl Denk Cosy Classic

BEST PANEL N83EZ

Terry Sweat Vari-Eze

RACE RESULTS

1st 176 kts N16WF Bill Forbes
Long-EZ O-320 Catto 2 Blade

2nd 170 kts N59EZ Jeff Glynn
Cozy 3 O-320

3rd 162kts N412DM Dave Hag-
gard Long-EZ IO-320 Hendricks
2 Blade

4th 159 kts N95BJ Bill James
Vari-Eze O-235

5th 157 kts N5EN Carl Denk
Cosy Classic IO-320 Sensenich
2 Blade

6th 138 kts N34X John Cannon

7th 134 kts N86DC Alex
Trimble Long-EZ O-235

8th 132 kts N1014A Jim
Gabrick Long-EZ O-320 Sterba 2
Blade

9th Disqualified

The race ran from a standing start, covered a 30 mile triangular course and finished 1100 feet above the airport elevation. The first 3 places received awards. The disqualification was for cutting inside the pylons. Some racers had difficulty identifying the first pylon, a grain elevator, thinking there was another elevator ahead. I regret shredding an alternator belt during the race and this was not the most efficient prop I have has tested in the last months.

ELT False Activation

Carl Denk (OH) - I have an ACK ELT (the one that uses "D" batteries). For the third time in four years it went off after parking, tying down and leaving the aircraft. I recently returned the unit for determination of the problem.

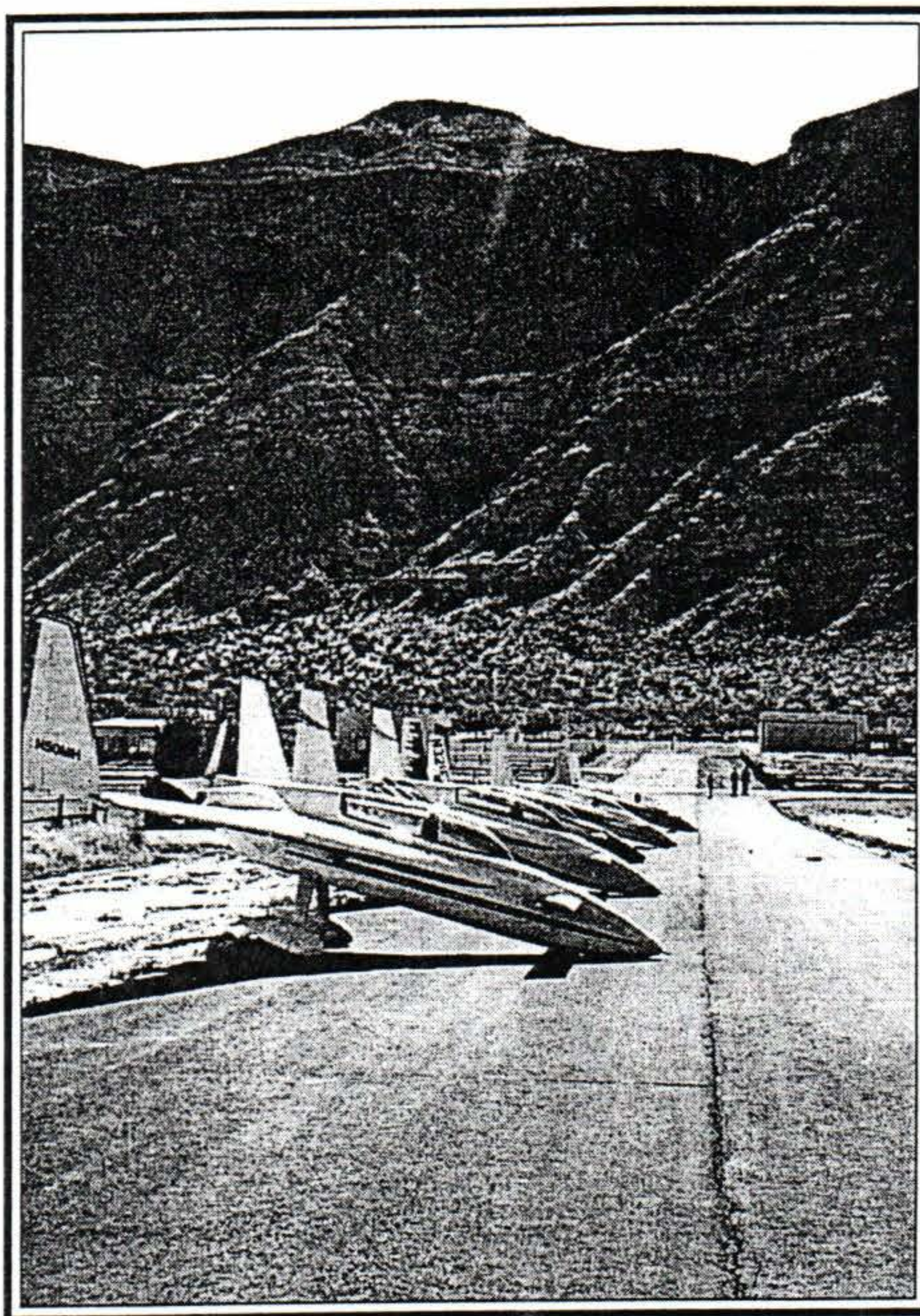
Discussion with the ACK people to-day revealed: ELT, antenna and re-

mote control wires should not be located near radio wave generators (transmitting antennas, heavy wires, battery, strobes, power supplies and the like).

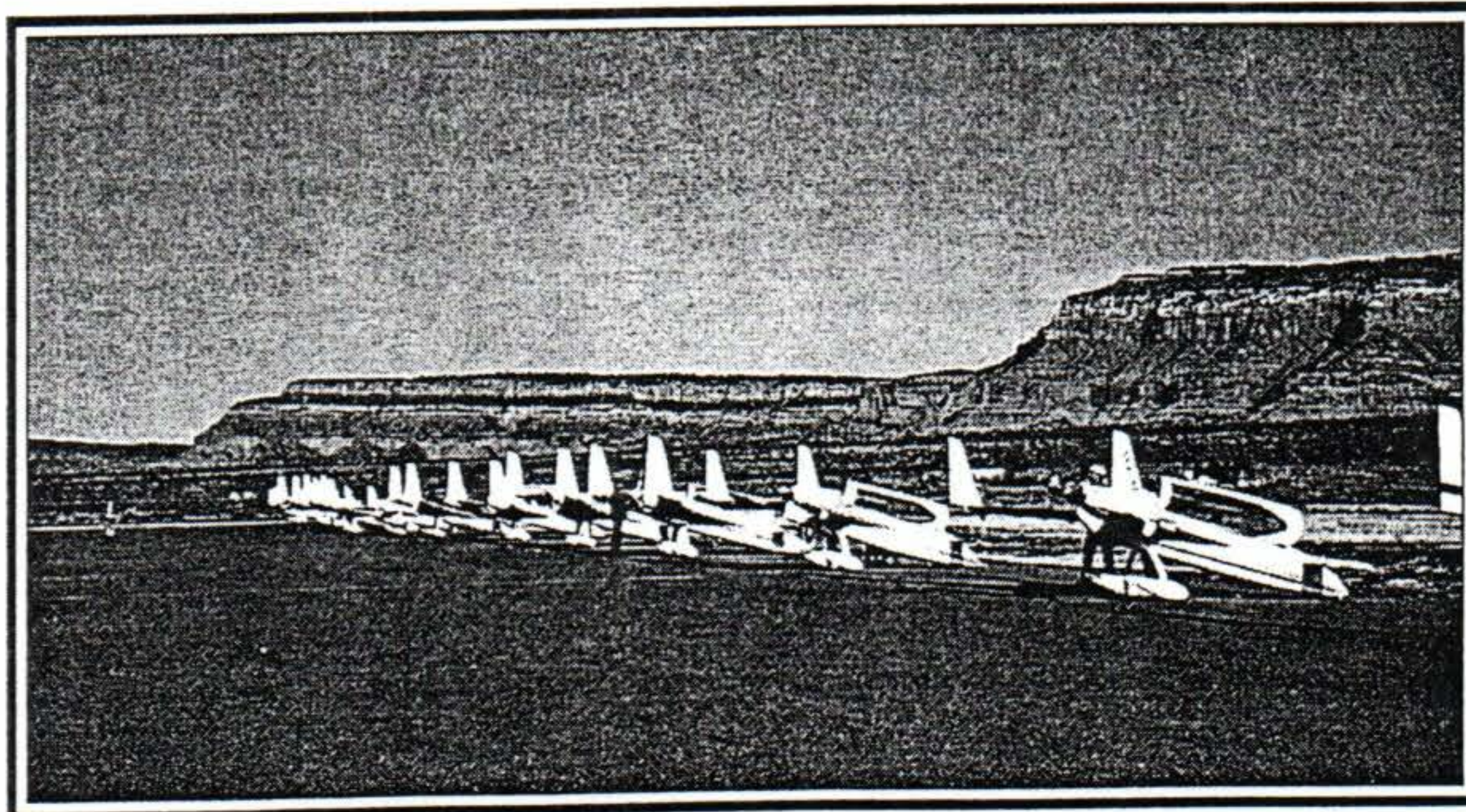
They indicated they would return the ELT within 3 days, and probably would replace a standby transistor. They thought a radio wave was causing the activation.

David Orr's photos capture the beauty in a R.A.C.E. event

Don't
use
the
east
downwind
leg
at
Hurricane,
Utah!



the lineup at Kanab 98



Kanab, UT - 98

Robert Bounds (NE) - I just got back from Kanab, UT yesterday after a trip out there to see what this RACE stuff was all about and to tour the countryside down there. I had a really good time. The weather was perfect and the group was very friendly. I picked up a few speed tips and saw what the fast guys do to go fast reliably. Anybody who flies over that country very much better be pretty confident in their plane.

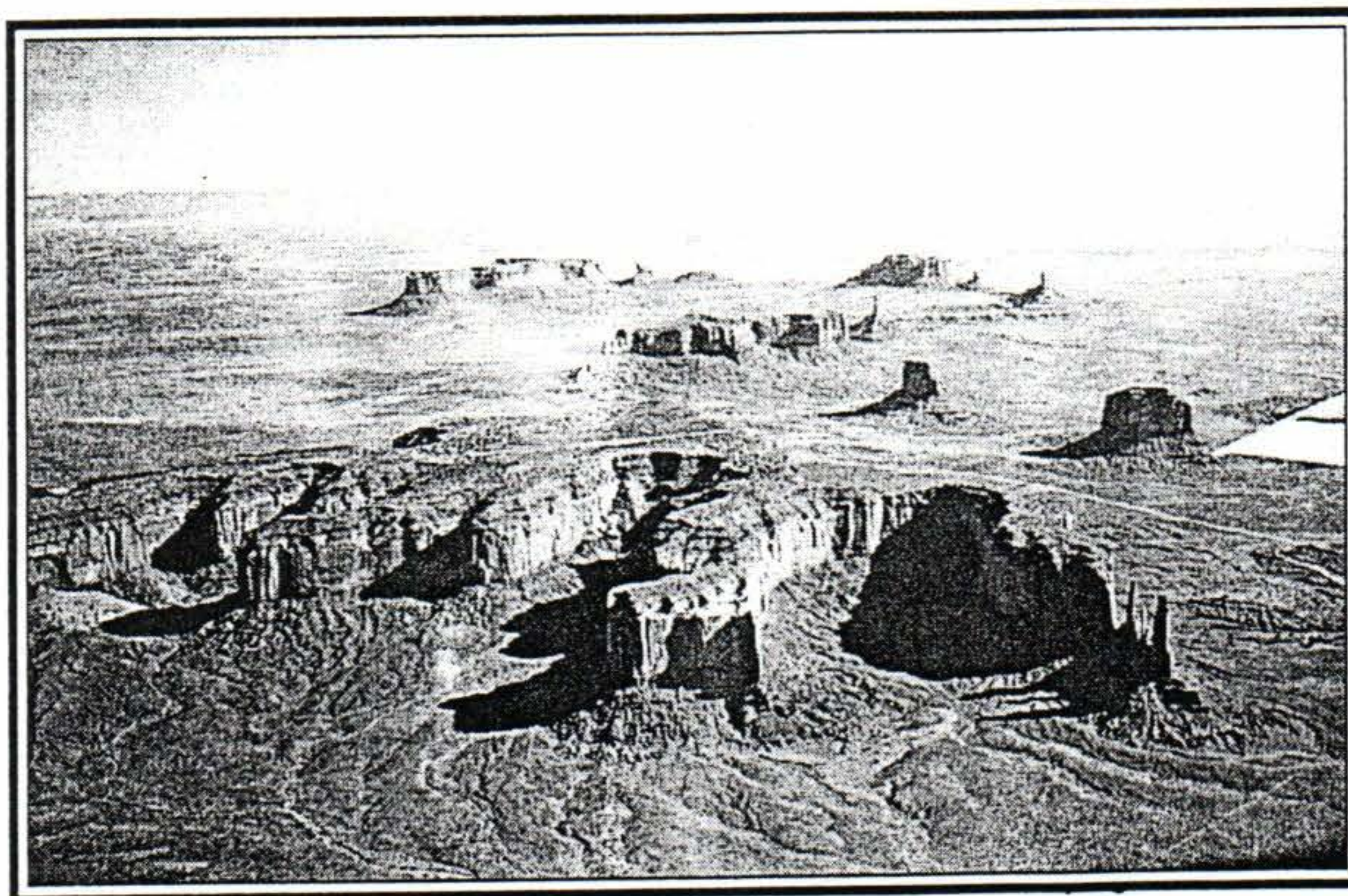
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run with the emphasis on safety. I felt it was safe enough that I decided to participate, even though I was a rookie. Since I figured I'd get beaten severely, I just flew with over a half tank of fuel, some tools and my 80 lb son in the back seat. To my amazement and my son's delight, we won the stock Vari-Eze class at 189 mph. Monday we went for a little cruise over Lake Powell and Monument Valley. Beautiful country! The trips across Colorado with the snow covered mountains were pretty too. Fly-ins like this are lots of fun as there is lots of flying and exchange of information. I also got to see some nice formation flying by EZ drivers. It was a good time and I got to do a little mountain flying.



Shirl's V-6 turbo Chevy E-Racer in foreground with Gus Sabo's **FAST** Long-EZ in the back

Monument Valley in Utah



Fly *fast* Life is short

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Vance Atkinson,
3604 Willomet Ct.,
Bedford, TX 76021,
817-354-8064,
vaatk@flash.net

Electronic Ignition Sensor Guard

Carl Denk (OH) - Recently, my alternator belt shredded and allowed one of these cables that reinforce the belt to come loose. It got stuck to the alternator pulley, wrapped many turns around the small pulley and tore out of the belt rubber. At some point, a long piece of rubber with fabric reinforcing flapped around hitting everything nearby including prop blades (6" extension), inside of top and bottom cowlings, starter, alternator brackets, and crankcase nose areas.

If I would have had an electronic ignition with the usual crank sensor installation, I would have lost it, compounding the alternator loss with one or less spark source.

Any ignition sensors located at the crank nose **SHOULD** have a substantial steel bracket and guard for the wiring. I'm talking of at least .125" material, using the big crankcase through bolts.

Baffle Material

Paul Krasa (VA) - A tip I just received from Gary Hunter is to use 5052 aluminum for engine baffles. 5052 has slightly lower strength compared to 6061, but it bends easier, is a marine grade alloy thus it is highly resistant to corrosion, and it cuts easily. Gary has used 5052 for the baffles on the AeroShell(tm) Pushy Galore.

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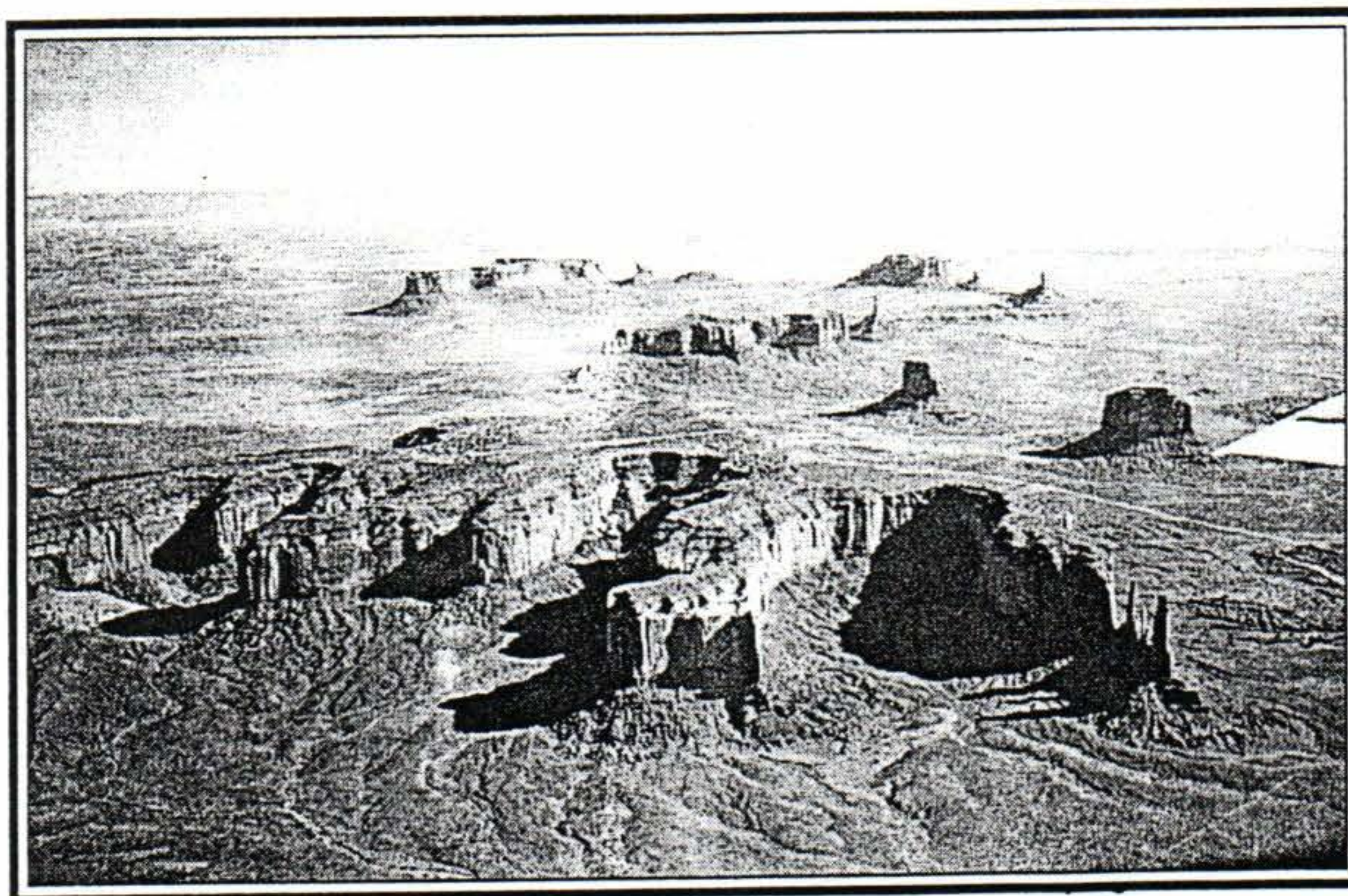
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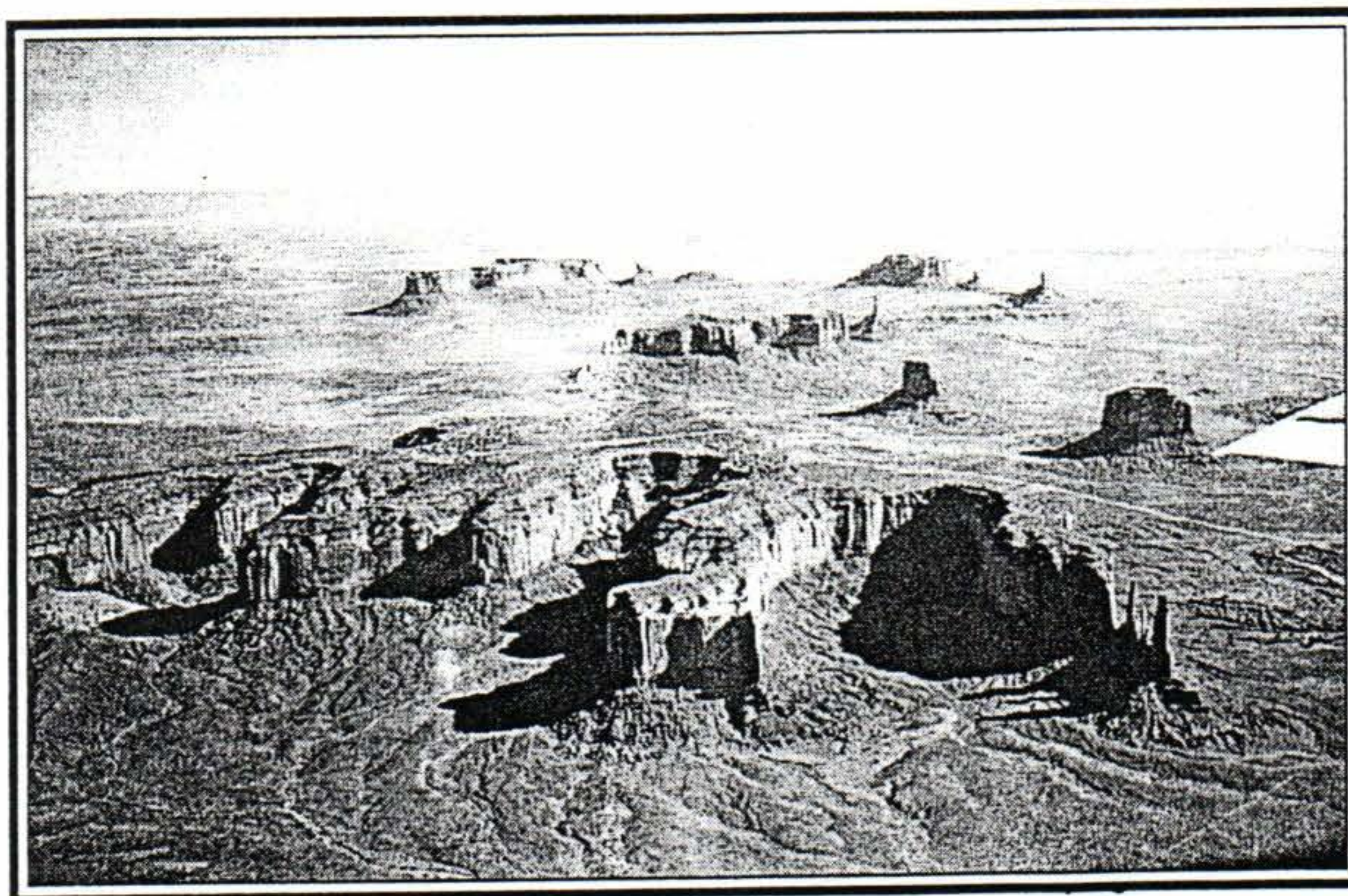
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Kanab Honk Out 98

David Orr (CA) - Shirl Dickey brought his turbocharged E-Racer to Kanab this year. He asked me to start the races. We had a group of 10, O-320 Long-EZs and Glasairs in the first race and the speeds were good. Not one Long-EZ was under 200 mph for the 98 mile course. Next was a heat of unlimited EZs, an O-320 Lancair, and stock Long-EZs and Vari-Ezes.

All races were well organized and we didn't even have a single mechanical problem. A number of new pilots were there with their airplanes, including a new Vari-Eze built in Nebraska by Robert Bounds. Had Shirl given an award for best looking at Kanab, it would have been the one - gorgeous! To top it off, Robert's airplane was the fastest stock Vari-Eze on the track, first time out!

The 1998 Kanab Honk Out Race was the 10th in this beautiful city of 5,000 who go all out for us. We also had the Spot Landing contest. The Unofficial Formation practice was led by Verne Simon and featured the Las Vegas aerial ballet. The Unofficial Ribbon Cut was organized by Bill Oertel with help of local Glassair III and Cessna owners, Ray & Rhoda Batson, who live near Hurricane, UT. They dropped weekend plans and invited the westbound fliers to breakfast at their home in Hurricane. An 8 ship formation enjoyed Zion National Park on the short flight, then pitched out for breakfast and headed home

to overcast weather. It was typical southern California spring weather.

We had 8 new pilots join R.A.C.E. for the first race this year. We hope to see more of you as your weather improves.

Results:

Unlimited

Bob Holliston	Long-EZ
214.37	
Alan Dean	Long-EZ
209.04	
Bruce Elkind	Cozy
208.94	
Bill Oertel	Vari-Eze
195.78	
Morgan Dean	Cozy
193.89	

Super Stock

Steve Cassling	Vari-Eze
187.61	
Dan Patch	Vari-Eze
173.79	
Ken Mintz	Vari-Eze
155.56	

Vari-Eze

Robert Bounds	Vari-Eze
189.02	
Dave Kilbourne	Vari-Eze
183.75	
Cary Thomas	Vari-Eze
157.78	

Long-EZ

Bob Eckes	Long-EZ
194.76	
Alex Trimble	Long-EZ
183.85	

Super Stock

Gus Sabo	Long-EZ
223.98	
Bill Forbes	Long-EZ
214.31	
Verne Simon	Long-EZ
208.46	
Eric Cobb	Long-EZ
207.79	
David Orr	Long-EZ
205.53	
Stan Susman	Long-EZ
203.19	
Mike Brown	Cozy
202.29	
Bob Hutter	Long-EZ
200.68	

Of the 28 airplanes in attendance, 13 were 2nd owner aircraft.

1997 R.A.C.E. National High Points Winners

Super Stock	Gus Sabo
	2050 points
Super Modified	Klaus Savier
	2000 points
Vari-Eze	Dave Kilbourne
	1550 points
Unlimited EZ	Bruce Elkind
	1150 points
Long-EZ	Mike Stevens
	1000 points
	Bob Eckes
	1000 points

High points awards were presented at Kanab on May 23.

R.A.C.E. Wear

David Orr (CA) - "Special Tees" 183 S 100 East, Kanab, UT 84741 sold some professional looking hats and T-shirts with Long-EZ picture and N number for a reasonable price to our fly-in group at R.A.C.E. A single order for hat and T-shirt for \$25.

Rob Martinson also has high quality golf shirts with this year's R.A.C.E. EZ logo and the words: "Life is short-Fly Fast" for \$28.

1298 Starwood Lane,
Evergreen, CO 80439-9702
303-670-0799
N6LK@aol.com

1998 R.A.C.E. Schedule

July 3-5 JACKPOT EZ BASH Horse-shoe/Cactus Pete's 800-821-1103

September 5-7 Labor Day WENDOVER 800-648-9668 Stateline Inn, 800-531-7300, call early there will be no block of rooms.

September 26-27 JEAN R.A.C.E., Gus Sabo 702-454-0078

October 31- November 1 Mesquite SPRINTS WEEKEND Virgin River

Resort 800-346-7721

November 28 KILO TRIALS Buck-eye Airport, Fly into Goodyear, AZ for Comfort Inn motel 602-932-9191.

Shirl Dickey and therefore E-Racer and King Racer have a new address and telephone: P.O. box 828, Aquila, AZ 85320, 520-685-3126. E-mail mrracer@primenet.com They are at Eagle Roost Airpark, Aquila Airport 75 NW of Phoenix.

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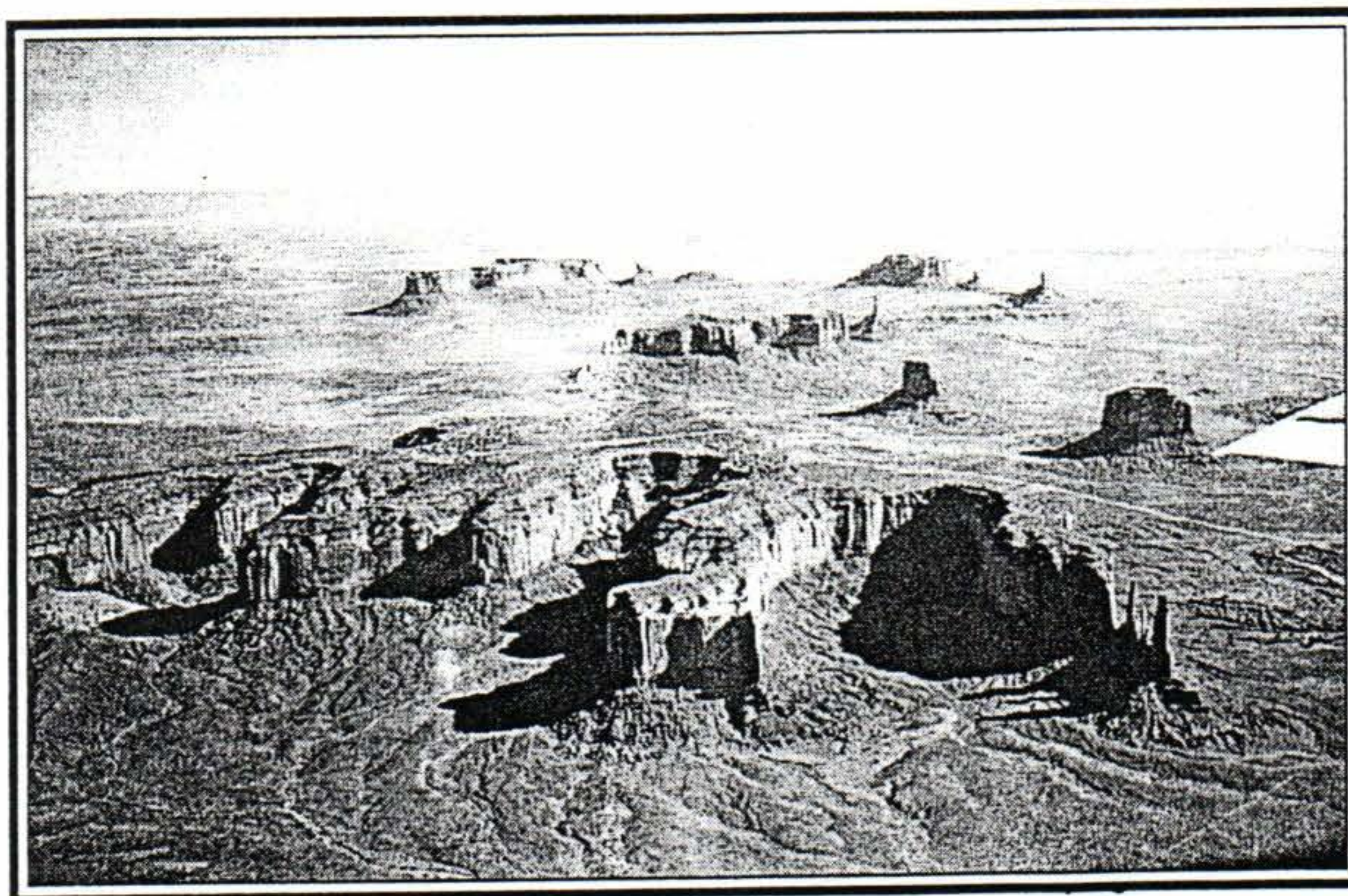
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Prop Mods

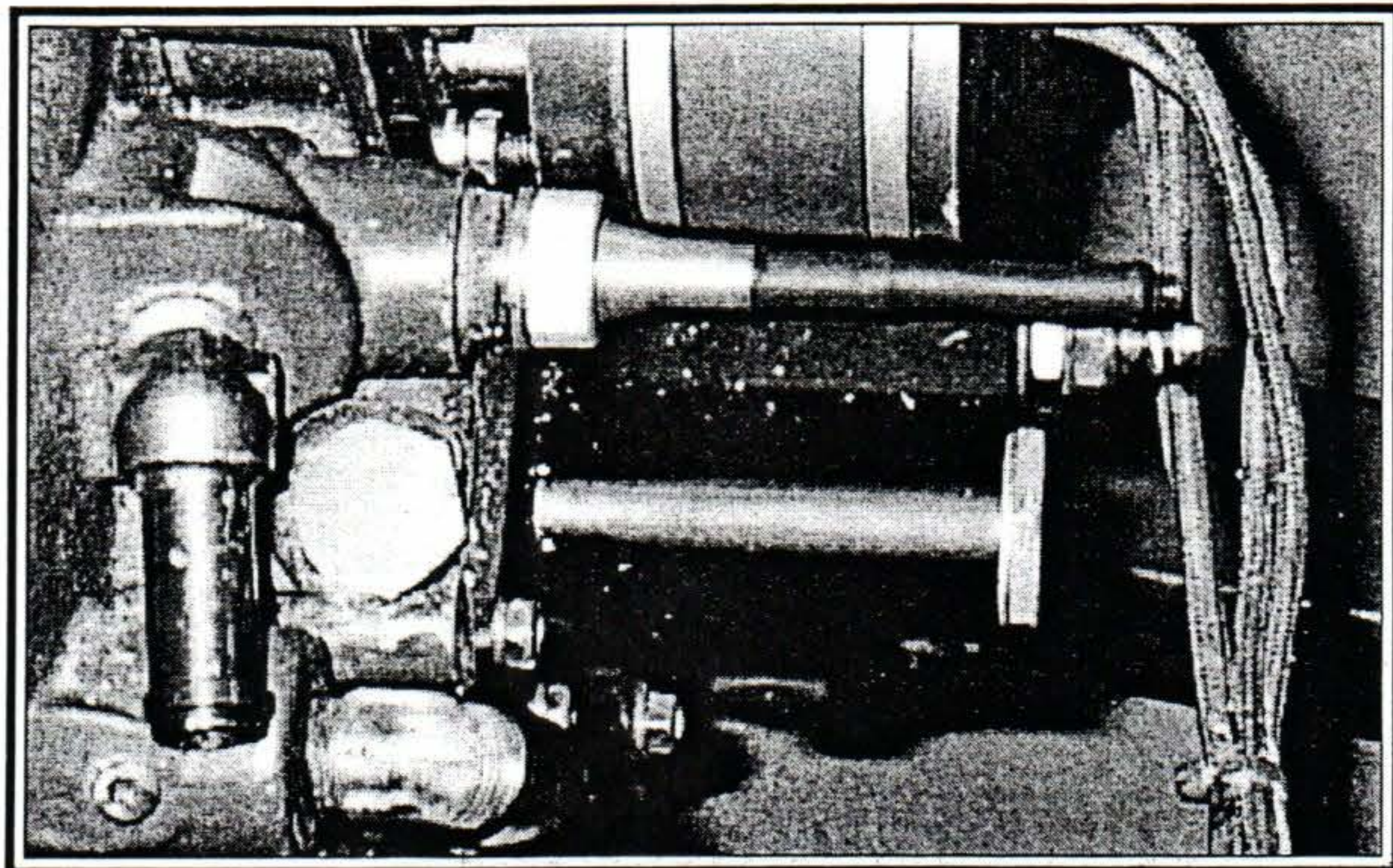
Don Bates (CA) - On page 2 of the October 1999 CSA newsletter is a picture of an extreme propeller mod by Bill James. It sports an ever widening chord down to the axis of rotation. Periodically someone always comes around to trying to get extra thrust out of the hub area of the blade. After all, why waste it? Intuitively it seems correct to have the pitch angle go to 90 degrees at the axis of rotation. But what is the result approaching the axis? No thrust, just drag and torque. So what should that chord be at the axis? If not longer, shorter? How much? Difficult to imagine, but theoretically for optimum efficiency the engineering equations tell us the chord must go to zero at the axis of rotation!

Why is this important? Often I hear the comment that the center of the propeller doesn't do much anyway. It may not produce much thrust, but it is an integral part of the overall blade loading. There is an optimum blade loading for each individual combination of speed, drag and power. If you drastically change one part of the loading, it throws the entire loading off and cuts efficiency. Just because one prop performs better than another doesn't a rule make. It only says the old one was a worse match than the new one.

Rough River at Oshkosh, The Best of Both

Ernie Raudenbush (FL) - You can have the best of both worlds by landing at Wautoma airport, Y50, 35 miles west of OSH. The uncontrolled field has free camping, showers and air conditioned buildings for the hot days. The Saturday night beef/corn roast is \$10. Meals are provided by Kiwanis.

You can fly into OSH each day or take the van for \$15 round trip. We have a good time and nobody tries to sell you anything and the only noise is the airplane noise we make. Bring your own tie downs. Contact Wautoma airport 920-787-3030 or 787-5163



Bob Davenport's solution to the short tach cable need

Microair Radio

Steve Sorenson (VA) - The little Microair radio is installed and working beautifully; but it wasn't easy. First, the radio worked only with electret mics. When transmitting I got terrible feedback and the signal went nowhere. The Australian factory provided helpful support. I rewired the system, removed the old RST intercom and searched for suspected ground. This time the radio spontaneously went into transmit mode and kept squealing until shut down. I returned it to American Avionics, who promptly sent a replacement.

The replacement had a much better installation manual so I again rewired with shielded wire. I still I got feedback. I looked at the antenna and noticed I had never installed toroids, an important feature of Jim Weir's

antennas. It worked flawlessly with the old radio so I didn't expect it as the problem. Three toroids added on the coax next to the foil antenna produced fantastic transmission and reception. The intercom feature works too, but has a hot mike when on.

I recommend this radio. It is light, cheap and loaded with features like flip flop tuning, frequency memory and transmit light. The LCD display is a little hard to see in bright light. I don't know if the first radio was defective, but I suspect I damaged it in my first installation. The Microair Company and American Avionics stood by their product and I now have a new radio that I am very happy with for my second 18 years of Eze flying.

Wanted

Good used 2 blade cruise propeller, crush plate, spinner, and 6" prop extension for O-235-C1 large bolt hole pattern. Contact:

Chuck Hartsell
chartsell@michweb.net
(231)775-4085
8150 S. 35 Rd.
Cadillac, MI 49601

For Sale

O-235-C accessory case, 800 hrs. since new. \$50 No provision for oil cooler or fuel pump.
O-290 cold induction oil sump and induction tube system for MA-3 carb. Lowers engine profile considerably. \$250 OBO.

Terry Schubert
9283 Lindbergh
Olmsted Falls, Oh
44138-2407
jschubert@juno.com
440-826-3055
issue 57 page 27

For Sale

3-bladed performance propeller for IO-360 200 hp motor or Franklin engine installation in a cozy. It has 90 hrs on it and is in perfect condition. \$1400.00 Larry Aberg 503-789-7116

**Ellsworth, KS Central States
Spring Fly-in
April 26-28**

Kerry Woods (KS) - We invite you to Ellsworth, Kansas (9K7) for a good airplane time. We plan a free early bird cookout for Friday evening and free breakfast for Saturday morning. A tour of an Atlas missile silo, which is being made into a home, is planned for Saturday afternoon. Ellsworth was a cattle drive railhead town, so there are many interesting things to see with self or guided tours. Lodging is available in the form of Motel, Bed & Breakfast, or RV camping in the RV camp or dry camping at the airport. We look forward to a great fly-in and are eager to meet all that come. Free transportation will be available to all the listed facilities and activities. We hope to have Powersport fly their Mazda 13B /

RV-6A in for viewing.

The Motel will be the Garden Prairie Inn (Best Western) Located 1-1/2 miles from the airport. Rates are \$60.00 single and \$66.00 double. 785-472-3116.

Ira E. Lloyd House Bed & Breakfast located 2 miles from airport is \$59-\$79. 785-472-5100 1575 Ave. JJ, Ellsworth, KS 67439.

Das Borell Baus House Bed & Breakfast, 615 27th St. Willson, KS 67490 785-658-3814-Master bedroom \$85.00 (will sleep 4) Normal for 2 \$65.00 15 mi W www.dasborellhaus.com

We look forward to meeting you and a great fly-in. If you need more information contact either Kerry or Evelyn Woods 785-472-4114 work days 785-

472-4113 evenings or e-mail at kewoods@ellsworth.net or Charles Grauer at cgrauer@wtciweb.com or 785-658-2525.

RV hook-ups: Southeast edge of town near golf course. Contact Loren Reber 785-472-3492.

RV dry camping at airport. Tent camping: OK at airport, no showers are available there.

Ellsworth Airport (9K7) N38 44.85' W98 13.84' Elev. 1615 fuel 100LL New 3900' asphalt runway 17-35 South end of 35 is displaced 412'. Note that there are two Restricted Areas east of the airport between Ellsworth and Salina. Be alert for Military aircraft in that area. Unicom is 122.7 Bring your tie downs.

Manifold Pressure Sources

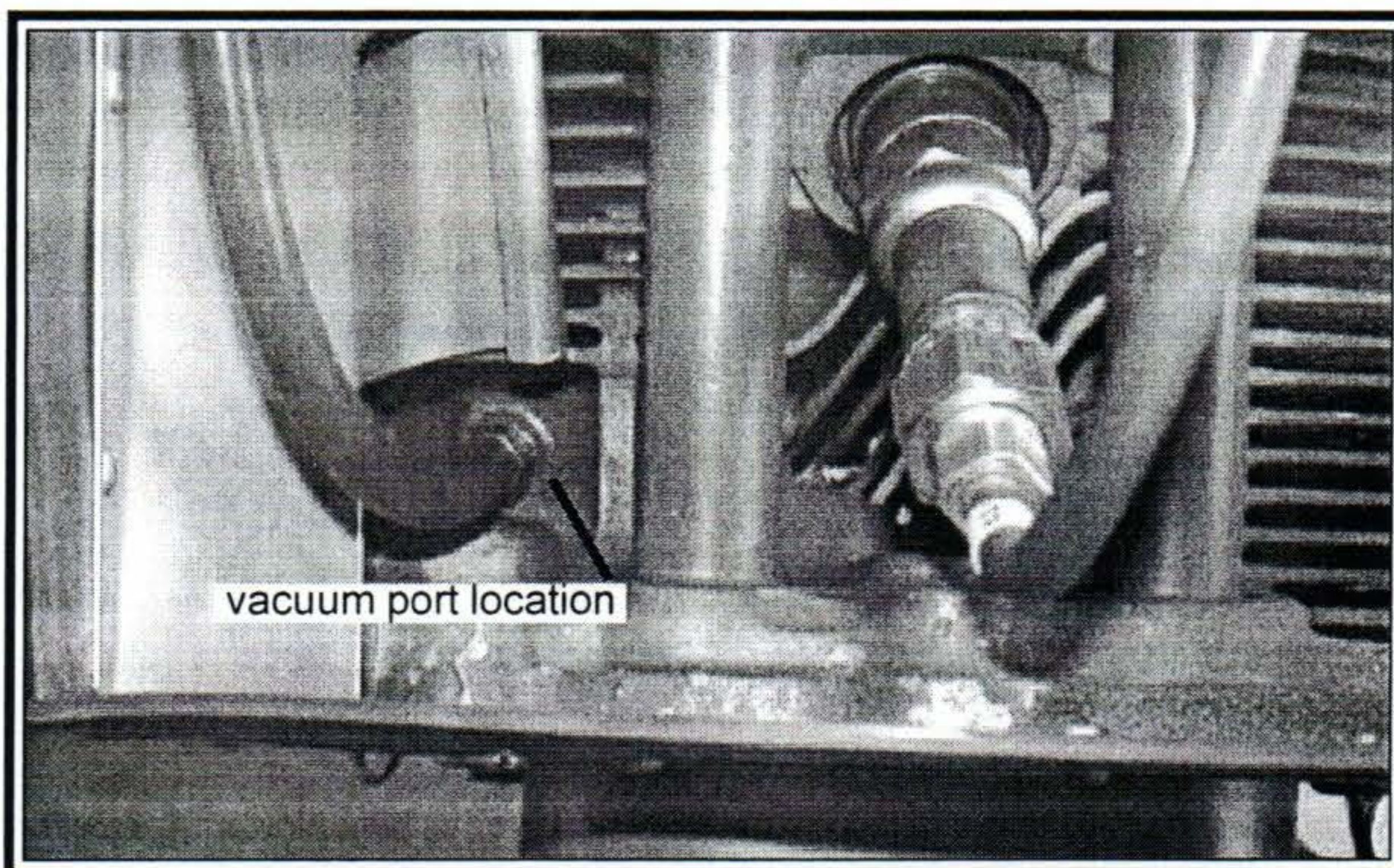
ED: Installation of electronic ignition is growing more common as its benefits are noted. One system requirement is a manifold pressure source for the MAP sensor. Several locations are possible. A common source has been a primer fitting port to feed the electronic ignition and/or manifold pressure gage.

Robert Bounds (NE)- I had a welder weld a quarter inch thick by about half inch square chunk of metal onto an intake tube and then drilled and tapped it. I screwed in the appropriate barb fitting and attached the hose.

Bill James (TX) - I tapped a nipple off an intake tube. I drilled a hole and floxed a 1/8 inch copper tube, an inch-and-a-half long, on to the hole and wrapped it with a BID and UNI collar.

The 1/8 inch copper tube was flared on one end and had a washer over that flared end that met the intake tube. A nail was temporarily used for alignment into the intake tube hole and was removed after cure.

The copper tube is positioned so it and the vacuum line can be supported. A "T" inside the firewall provides vacuum to the MP gage and brain. I looked



for a fitting to replace the copper tube with a more mechanical connection to the intake tube, but decided it worked well enough.

Don Burton (VA) - An A&P friend showed me that there is a blank spot on the top of each cylinder which may be drilled and tapped for a manifold pressure line. It's a little pad (space) left of the intake valve on the topside of all the cylinders. On some engine cylinders it is already drilled and has been plugged.

Remove the intake tube from the cyl-

inder of your choice, rotate the crank to close both valves so that no chips go into the cylinder; as an added measure I put a small rag up into the intake. Then drill and tap the hole for a 1/8" pipe fitting. I found the tap at Home Depot for about \$7-8. Then I installed a 1/8" pipe to 1/8" hose barb fitting to a high temp rubber line that is rated for 25 in. Hg vacuum.

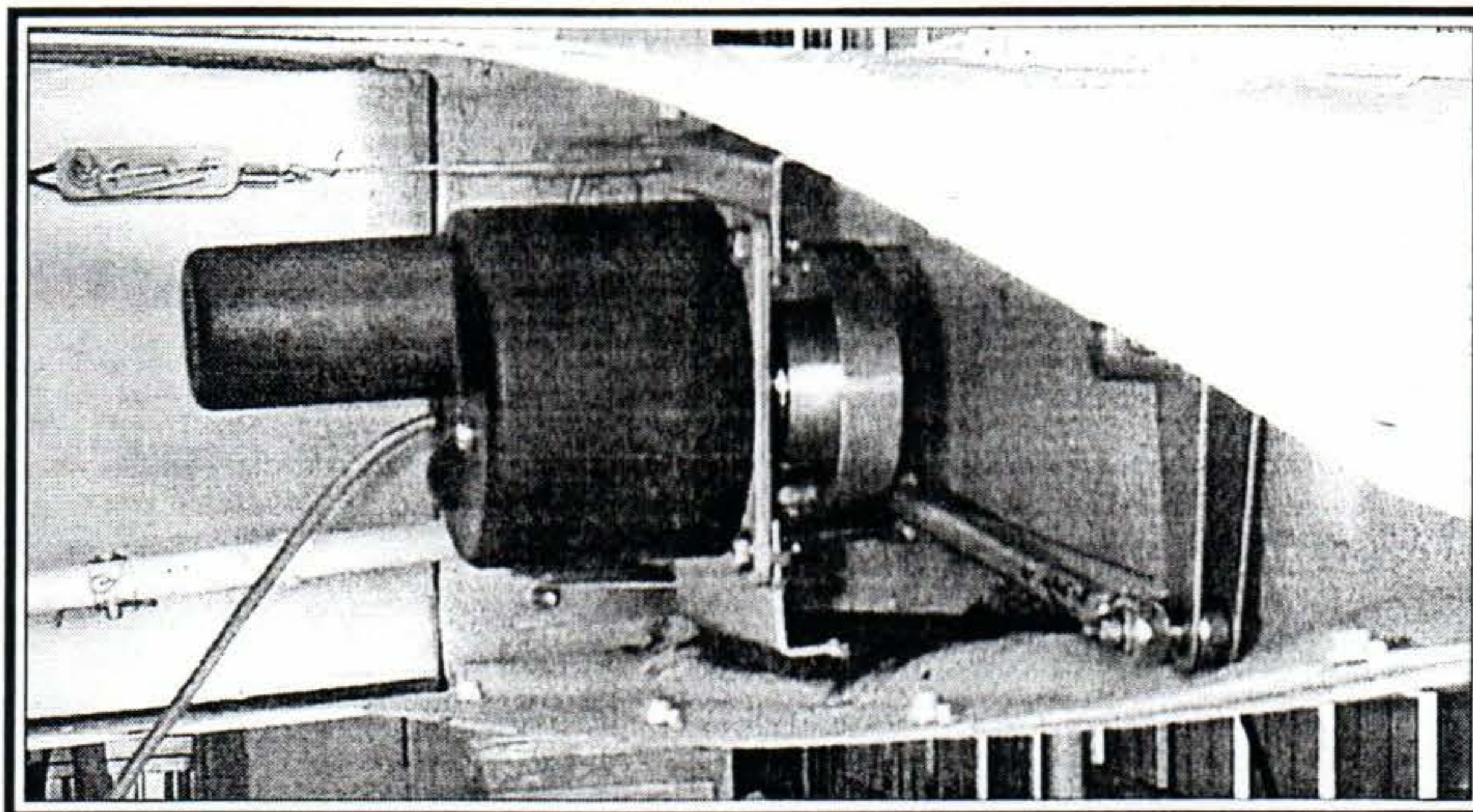
After tapping the hole, vacuum out the intake port area and reassemble. The whole job takes about 1 hour. I have 4 primers, hooked to the Parker solenoid valve and a pickup for a manifold pressure gauge with a tee into the electronic ignition's MAP sensor.

Installation of an S-Tec System 30 in a Cozy Mark IV

Ed Richards (FL) - I think most pilots would agree that having an autopilot is a real asset to flying cross-country, particularly in the IFR environment. I was convinced that I wanted a two-axis (pitch and roll) system, although nothing too sophisticated. I selected the S-Tec System Thirty as it fit performance and space requirements. One of the really attractive aspects of this unit was that it fit in place of the standard turn coordinator with only a few additional switches to be mounted on the panel or the stick. It should be noted that the S-Tec unit provides a standard turn coordinator as part of the roll computer so the instrument is not lost when replacing the turn coordinator.

The first step was to purchase the unit. S-Tec was very "up-front" advising that this would not be plug-and-play. The closest documented installation to the Cozy is a Long-EZ and S-Tec and I both agreed that this should get me pretty close. Again they cautioned not to be surprised if this installation required additional tweaking beyond the Long-EZ. I was confident that it would be "no problem".

At Sun n' Fun 2001, I purchased the system from Gulf Coast as S-Tec only sells through their distributors. The unit arrived, as promised about 4 weeks later, with all component parts and very good documentation. The only thing missing seemed to be all the mating connectors. How am I supposed to wire this thing without the connectors? I called Gulf Coast; it was a waste of time. They only sell the unit; you need to call S-Tec I was told. S-Tec informed me that a wiring harness is provided with the unit. All I needed to do was give them the branch lengths and they'd build the harness. That all worked out pretty well. I was very conservative on the "run" lengths so I probably have more wire than I need, but none were too short. In reality I actually estimated all the lengths for the harness so it could be made while I was installing the servo drives.



roll servo installed in right wing root

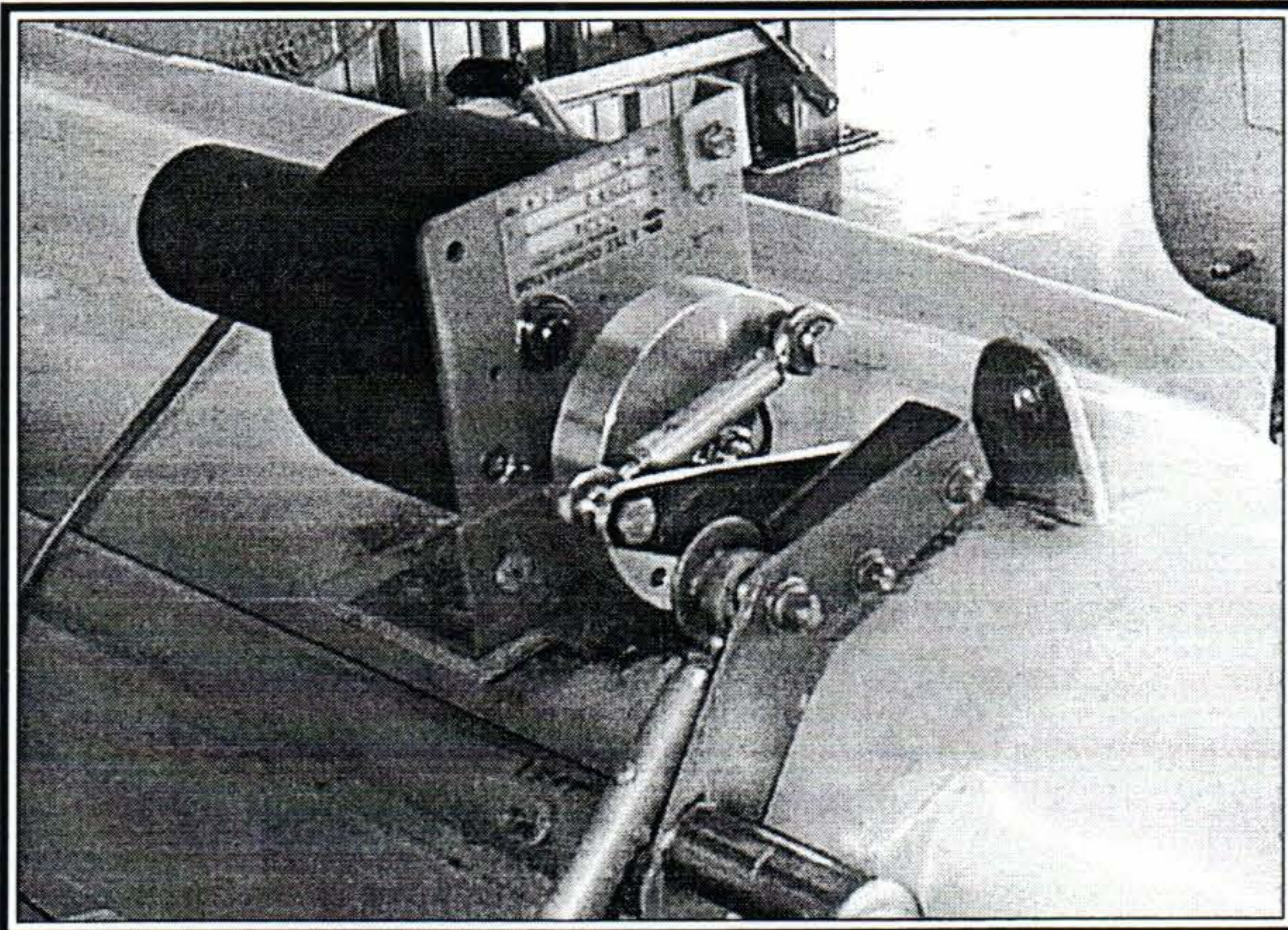
The installation drawings call for the roll control servo to be mounted in the right wing root with a push rod connected to the aileron bell crank. The installation worked out almost exactly per the Long-EZ drawings provided.

The pitch servo installation required a bit of engineering to adapt it to the Cozy elevator arrangement. The bracket provided by S-Tec was to be pop riveted to the elevator torque tube and the servo mounted to F-22. There were two problems with this. One, the bracket for the torque tube didn't fit properly (wrong radius). And two, mounting to F-22 was not only going to be difficult to do but would make removal of the Canard a real pain. So I reconstructed the linkage with the servo mounted directly to the canard, trying to keep the geometry of the

servo basically the same. With this arrangement all that is required to disconnect the autopilot when removing the canard is to unplug the servo.

The linkage is constructed such that the elevator is controlled from the servo push rod via a custom crafted bracket, which is attached to the opposite side of the balance weights on the left CZNC-12A control arm. The only additional modification was to shorten the push rod as supplied by S-Tec. Again, I was careful to try to preserve the geometry of the servo system keeping the arm lengths the same and positioning neutral elevator near top-dead-center of the servo crank.

The other items to install were the pitch computer, which is a small electronics box that must be mounted directly



planes and talked to more EZ drivers. I saw Steve Wright, who said he'd sold 75 of those EFIS ONE units that week. They are taking the world by storm, it appears.

I went to a couple forums and left for home at noon Thursday. I drove straight through again and got home at 6:30 AM Friday morning. The weather was still rotten. I drove through about 200 miles of less than 400' and a mile with very heavy rain for about 100 miles.

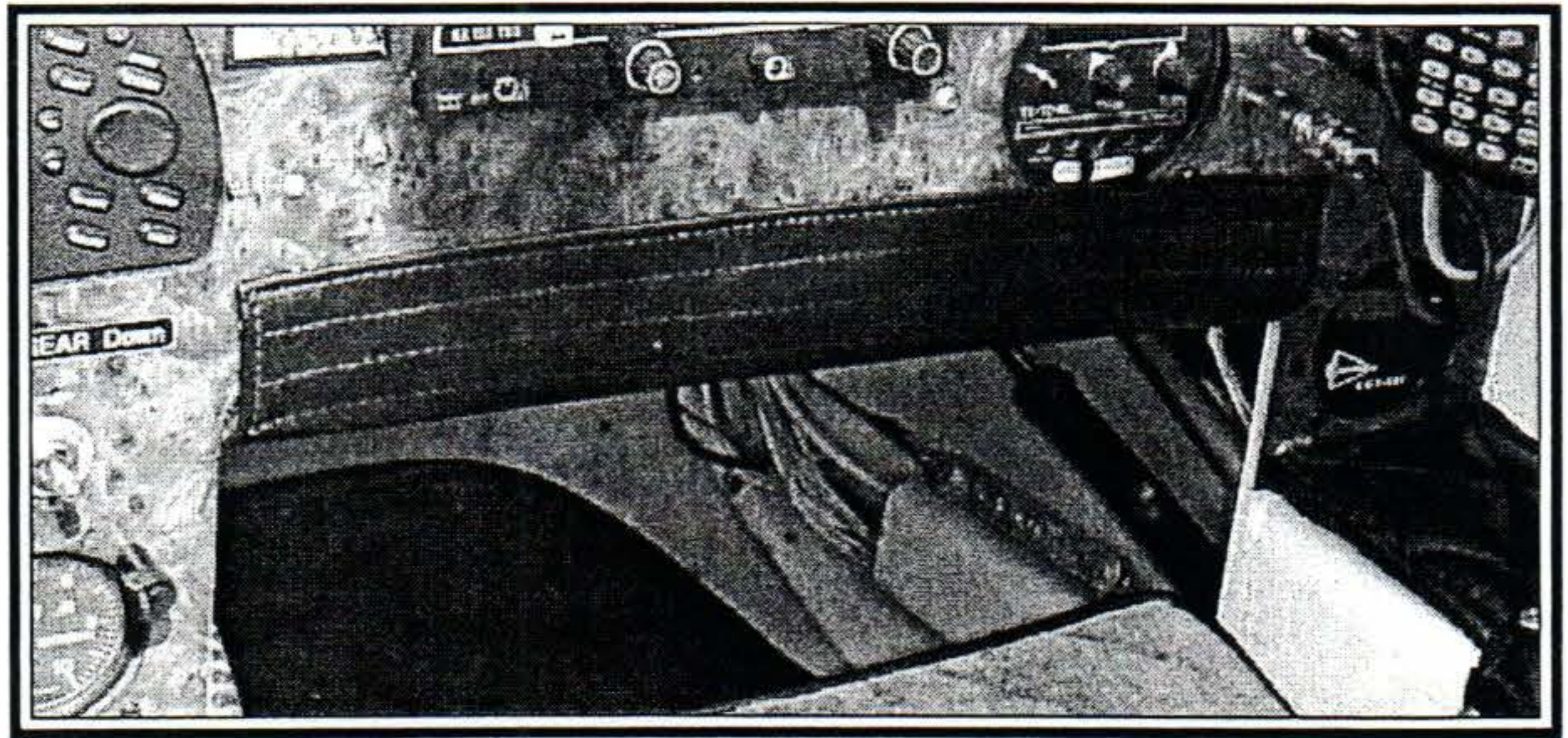
The best part of the fly-in was visiting with the people. I guess that is the same at all these fly-ins.

The vendors had the usual stuff with some interesting exceptions. UMA (800-842-5578) has a new electroluminescence light bezel for individual instruments. It replaces protruding post lights and offers a very nice bulbless illumination. It makes the instrument appear to be internally lighted.

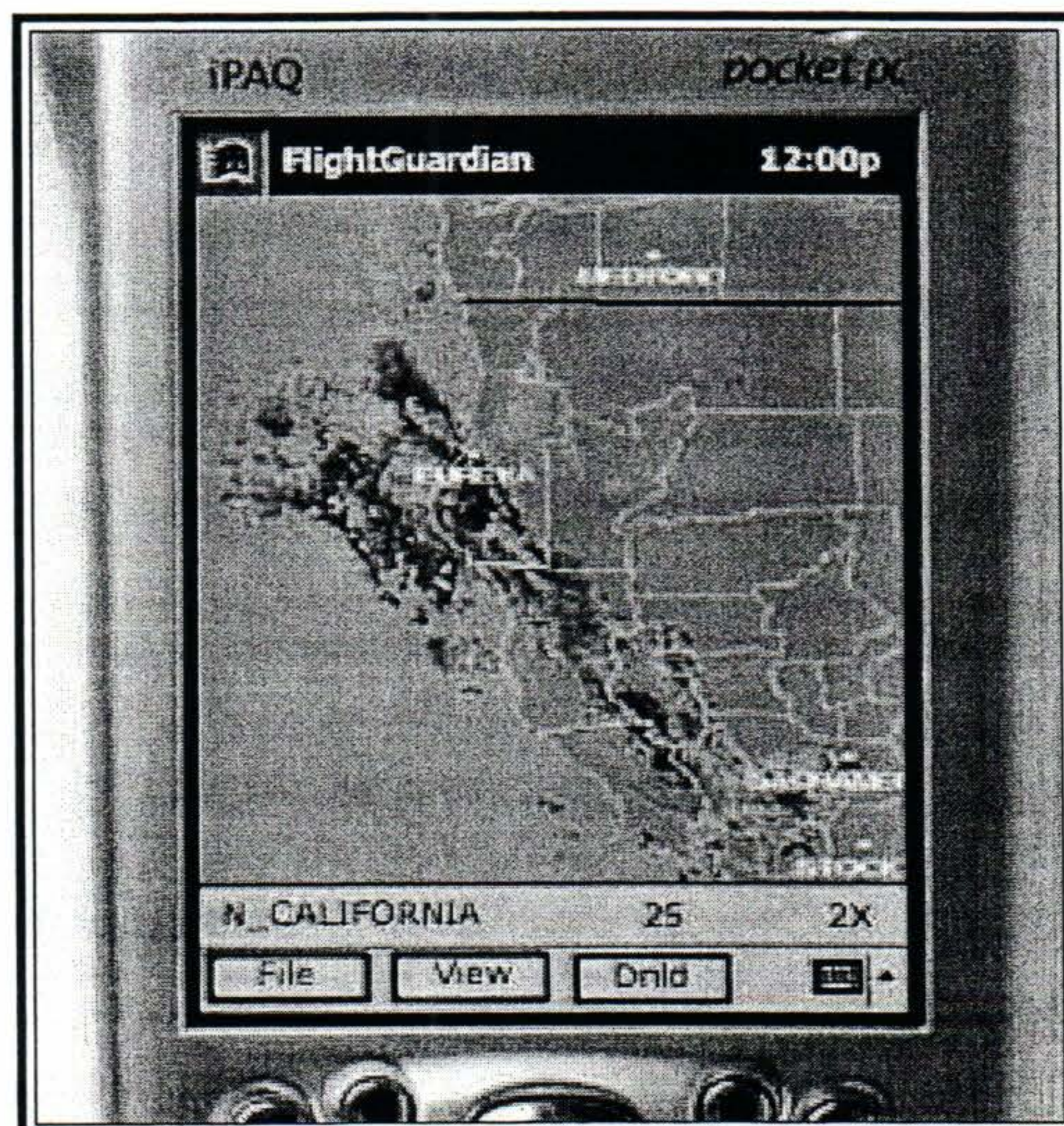
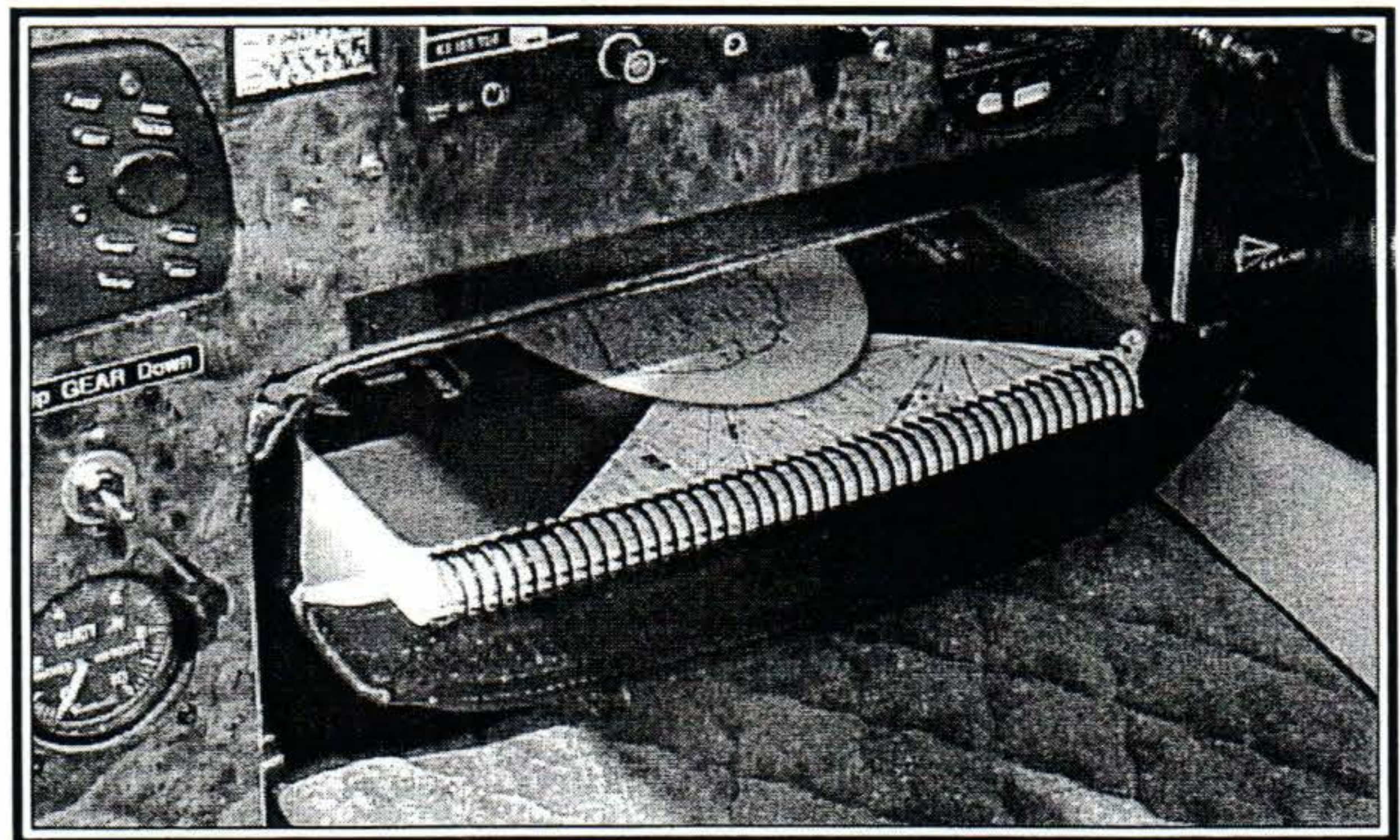
The 1/4" thick unit fits between the panel and the instrument. It is available in white, green or red and 2-1/4 and 3-1/8 instrument sizes. A \$35 required DC to AC inverter powers up to twelve gages which cost about \$40 each.

Quiet Technologies (866-784-3883 or quiettechnologies.com) has an interesting "insert" headset. It fits into the ears with replaceable elastomeric foam tips. Its 1-1/2 ounce weight makes it seem an interesting alternative to the heavier headsets. It is claimed to be as quiet as the ANR headsets (25-35 dB reduction). If your GIB resists 5-hour legs with headsets that crush hair and skulls, perhaps this \$325 investment will be worth looking into.

AirCell (888-328-0200 or aircell.com) and Control Vision have united to deliver NEXRAD weather images to your cockpit. Images can be uploaded to PDA, EFB or MFD displays. Anywhere Wx and Flight Guardian can provide NEXRAD weather images to 2 km of resolution in typically less than one minute. The new system is pres-



Tim Freeze's MK-IV has a neat map pocket that closes for passenger entry and then opens in Wendy's lap



Some day you may have this in your airplane.