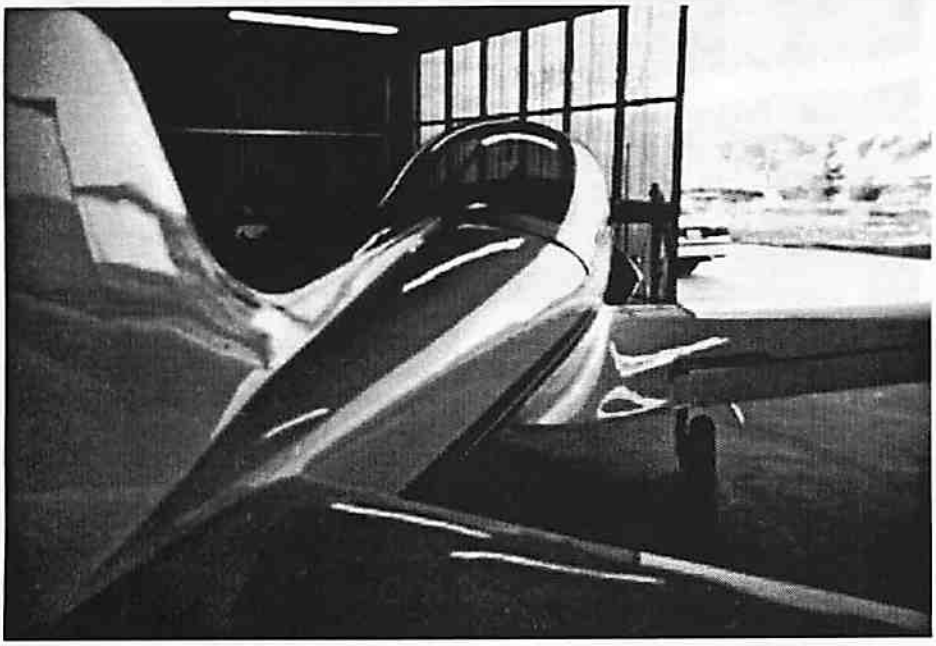
Falco Builders Letter



The reflections on Larry and Ann Black's Falco say it all.

First Flight: Larry and Ann Black

Eat your heart out, Rip van Winkle, the absolute, unquestioned record for the longest build time on a Falco has now been established by Larry Black. Twelve years is now the standard by which all other pokey builders will be judged, and it was only through perserverence and true grit that Larry managed to stretch it out as long as he did—the last three weeks took him seven months.

How're you gonna top that? Here's an airplane that's just flown for the first time, yet parts of it are half of the age required to be judged as a Classic at Oshkosh. ClassicEze?

This Falco didn't just happen. Larry had practice. He'd already built a Cavalier over a six-year period, and Larry was right at home with aircraft woodworking when the Falco came along. One thing that was obvious to me from the first time I ever talked to Larry was that here was a guy who was going to build a beautiful airplane. He's one of those people, much like Karl Hansen, who spends so much time talking about the finer points of craftsmanship that you know that their whole being is focused on doing things right.

With Karl Hansen, I knew he was building a spectacular airplane from the things he talked about—in fact, *Flying's* Nigel Moll arrived to photograph it as the paint was still drying. Larry Black's Falco is exactly the same sort of beast, a compulsively, fanatically finished airplane—Larry admits discarding approximately one-third of "an ugly Falco in rejected, self-made components. To begin with, I set myself minimum standards that I would not deviate from. I think I better mention that the kits that I did buy from Sequoia or Sequoia's sub-suppliers always met or exceeded my standards. Everything fit without cutting or modifiction required."

An admitted Falcoholic—"My name is Larry, and I'm a..."—Larry made almost everything himself, one part at a time. The airplane was built on a budget and with a family there were priorities: food, clothing, education, medicine... the Falco came first, of course.

"I want to mention Ann, my special partner and wife for the last 30-plus years," says Larry. "She's the quiet little lady some, or all, of you met at the West Coast Falco gathering. Ann has been a major support in the building of the Falco. She's hit me very few times for messing up the house with dust, shavings, both wood and metal, and smells of the most obnoxious chemicals, all of which are required to build an airplane. We both agree that wood smells nice, but it must be protected. When you build an airplane in an attached garage, you don't only get wood smells."

The early years were simply a process of cranking out parts. At times progress stopped for lack of funds, and various ups and downs of business. Larry had an auto body shop business in San Jose, California, and finally got burned out with the rat race, sold his business, sold his house, moved to Post Falls, Idaho, and bought an electrical kit for his Falco. It was a classic story of 'gonna have lots of time to build my Falco' and in fact he did almost nothing on the airplane when he was 'retired'.

It wasn't too long before he was back in San Jose, trying to pick up the pieces of his old business that he still held paper on and which the new guys had screwed up. It's during these rat-race, got-no-time periods that Larry made the most progress on the airplane—aren't people are logical creatures?

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There was a low point a couple of years ago when Larry called me to say that he was going to have to sell his project. Things were pretty bad, and all he needed was a prop, a few instruments and to complete the wiring. But somehow he and Ann pulled through that period, and Larry called me sometime later to say that he was going to finish the plane.

Finally, in May 1991, the Falco was moved to the Frazier Lake Airpark. Listen to how Larry describes it: "I moved it on a trailer that I had built just for the move, and it went without a ding or scratch." See how he talks? "I figured three weeks until completion. The last seven months has been the longest three weeks I ever spent. The final check of systems revealed very few problems, but four weekends were spent on this alone. The airport is 45 miles of mostly city traffic from where we live."

As fate would have it, the hangar where Larry finished the Falco belongs to Stan Weiss, who made some of the earliest wood kits for the Falco. "I haven't had a lump or bump since the Falco has been moved to the airport. Ann was at the airport to help with the unmasking of the Falco and commented, 'It was like opening a Christmas present.'"

In May of 1991, Larry went up to Northern Idaho, and John Harns checked him out in his Falco. At that time, John pronounced Larry capable of test flying the Falco. Larry maintained his currency by flying a friend's Christen Eagle.

"When I felt I was about ready for the FAA inspection, I turned the final inspection portion of the Falco Flight Test Guide over to Walt Weiss (Stan's dad), who is an A&P. Walt spend one day over, under, and around the Falco. He found three bolts not cotter-keyed. The following week, I made my own final inspection and found a couple of minor things. Another friend and airplane builder/pilot from Idaho came down for support and to do his own inspection of the Falco."

"I arranged to meet the FAA inspectors at January 24, 1992. In talking with the inspector, there seemed to be an air of reluctance. Apparently they had seen a piece of s—t a couple of days prior and made no bones about it. At 9:00 AM on that day, it appeared two FAA inspectors fell in love with a Falco! The inspectors did not bring the paperwork with them to give me an airworthiness certificate. They looked over the Falco, expressed satisfaction, and said, 'We didn't plan on giving an airworthiness certificate until the first week of February.' They told me there is a lot of typing and paperwork, and asked if I could be at the San Jose FSDO by 2:30 that afternoon. I received the certificate at that time!"

"On the following day, Saturday, Stan Weiss made his final inspection and found a couple minor things. I want to stress the importance of having others inspect your work and airplane. Did anyone ever wonder where they left that hammer, only to find it in their hand?"

"After these final inspections, taxi tests were performed. Checking the aileron, elevator and rudder authority proved no instability problems. On the second-to-final run prior to flight, a brake line broke at an over-torqued fitting. After the repairs were completed, one more taxi run was made. No problems were found, so the next run was the first flight."

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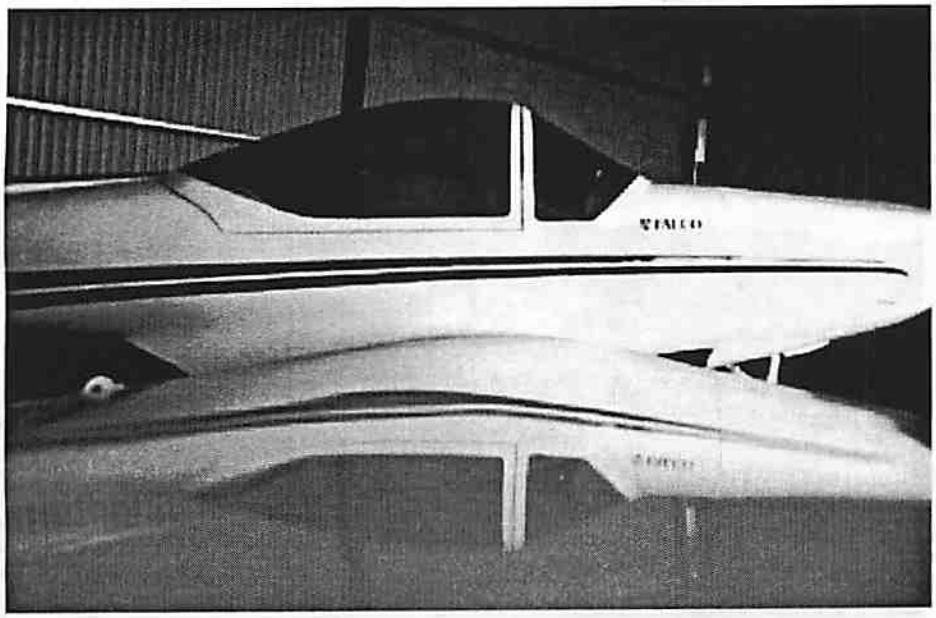


"The Falco was on rails, however the indicated airspeed on takeoff was 200 knots, and I stabilized the climb at 150 knots indicated. The airspeed indicator was not cooperating! I had another plane flying chase, and we determined that 150 knots indicated on the Falco was 120 mph."

I spent an hour aloft and did approach to stalls and shallow turns to get a feel for the Falco. Our Falco flew as close to hands-off as one could expect. Hands off, a very slow right roll began about one degree every two seconds. I picked up the right wing with light rudder pressure, and on taking my feet off the pedals as soon as the wing started to lift, the wing continued lifting through level to left at approximately one degree every two seconds."

"The Falco has a good feel, and I felt quite comfortable with approach and landing. If landing was eventful, it was from the applause and cheers from all who watched. The rest of the day, I spent coming down off a very special high."

"The next day we troubleshot the airspeed indicator problem. The problem turned out to be that I copied the installation drawing exactly, but the pitot and static on my airspeed are reversed to the drawing. Hooking up reversed at the airspeed indicator caused everything to work properly except that the airspeed read backwards."

"I flew the Falco for 24 minutes on Sunday, but due to low ceilings, I wasn't able to explore stalls and slow flight safely, so I returned and parked for the day. On the following Saturday, I went up and retracted the gear. Low ceilings again prevented any slow speed work, so I just flew around for a half hour. I had set the limit switches too precisely on the ground, so the gear coast brought everything tight as verified by the emergency crank. When I put the gear down, the down limit switch was set so precisely that the switch didn't engage, so it popped the breaker. I landed and adjusted the limit switches."

"I was able to indicate 140 knots at 22 squared with the gear retracted, and I was able to fly for approximately 30 seconds hands-off with no tendency to turn either direction."

Larry reported that he developed an overvoltage problem, which turned out to be a bad post on the back of the alternator. Something was broken inside the alternator, and it caused intermittent operation.

This is now Sequoia Falco number 32, and it's christened N572AB in honor of Ann Black who put up with it all. It has a 160 hp engine with constant speed prop and weighs 1,292 lbs empty. The panel is equipped with dual nav/coms, glide slope, transponder, marker beacon and a II Morrow 602 loran.

Larry is now flying the Falco with a complete set of gear doors—everything—and is sticking with the A-model gear motor (as is Jim Slaton who also has full gear doors). He likes the seven-second retraction time and hasn't had a problem with a circuit breaker popping. He guesses that he picked up 8 to 10 knots with the doors, but he hasn't tried to get really hard performance numbers yet.

Based on the photos I've seen and from listening to people who've seen it, it's clear that Larry and Ann's Falco is right up there with the best Falcos. The airplane is white with black and brown trim stripes. As you might imagine from a guy who used to paint cars, the paint job is immaculate—you can sight down parts of the airplane and never see a jiggle in the reflections.

But the part I always like is hearing a builder talk about the handling and the way the Falco flies.

"Well, Larry, do you like it?" I asked.

"Oh God, I love it. It's just a delightful flying airplane, and I never felt anything that accelerated like that on 160 hp. That airplane just really, really flies nice. It's *so* smooth."

—Alfred Scott

How to Kill Yourself in a Homebuilt Airplane

Whenever there's an accident in an airplane, there's a natural tendency in all of us to dismiss the mistakes that others have made as something *we* would never do. We sagely recount the unfortunate pilot's error—he ran out of gas... tried to take off with... tried to do a roll—all things that somebody else did. And if it's in another type of airplane, then we sneer at that, too.

But there's a harsh reality we should all face up to, with so many high-performance homebuilts now flying, there's a pattern of accidents that's undeniably *there*, and any designer, kit supplier or pilot who tries to paint this problem as a 'Brand-X' problem—you know, that *other* design—is simply over-exercising his arrogance.

So let's take a look at the problem, see what lessons can be learned, and ask how all of us can make a difference.

In the case of the Falco, we've had three fatal accidents out of the first thirty or so Sequoia Falcos to fly. In two of these, the pilot was on literally his second flight in the plane. One took off with essentially no fuel in the tanks and then attempted to turn back to the field when the engine stopped. The other appears to have attempted aerobatics. In the third accident, the pilot was on his first instrument flight and ended up low on fuel, shooting a back-course approach from the right seat, on a rainy night that was right down to the minimums. They were obviously

quite scared and ran out of fuel right over the field, tried a sharp turn to the runway, stalled and crashed.

The Smythe Sidewinder has lost more than 30% of its fleet to stall-spin accidents, yet the airplane has a perfectly normal configuration and with no obvious flaws. But it was the Glasair III that finally got everyone's attention. With about 38 flying, during one six-month period six airplanes were totaled. There's simply no way to ignore such things.

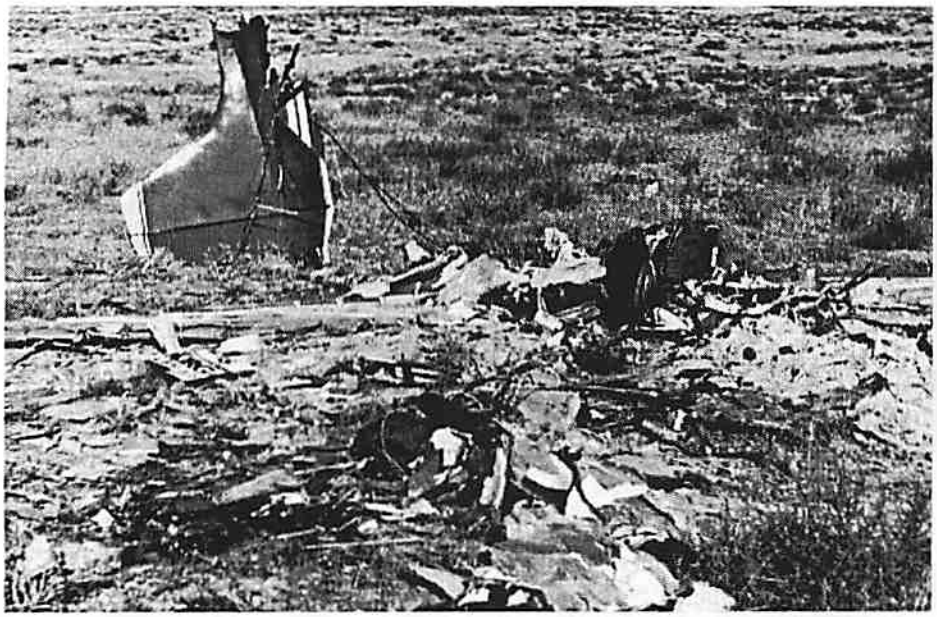
What got me started on this was a conversation with Dave Noland of *The Aviation Consumer*. We were talking about the accident rate among high-performance kitplanes, and Dave mentioned the experience of the Grumman American Yankee. Some years ago, he had done a story on the plane, which had a *terrible* accident rate—the worst of any production single by a country mile.

And when they looked at the statistics, one thing stood out: almost without exception, the accidents were occuring to pilots who had very little time in the Yankee. Total time in all airplanes made very little difference. It didn't make any difference if you had 100 hours or 5,000 hours in other planes—what mattered was whether you had only a little time in the Yankee. (By 'Yankee', I mean all of that family of airplanes, from the original stubby-winged Bede design to the LoPresti-cleaned-up 180-hp Tiger.)

The American Yankee Association did something about it, and the results are astonishing. About three or four years ago, they started a pilot familiarization program. There are about 20 to 30 check pilots, who must be CFIs, scattered around the country who take a pilot through a familiarization program. The curriculum is standardized and focuses on the peculiarities of the Yankee—the castering nosewheel, the sensitivity in pitch and roll, the need to be 'on airspeed' on approach (particularly with the early models), porpoising on landing, etc.—but there is no required number of hours for the program. It is up to the check pilot to say when the pilot is comfortable with the airplane.

Complete this familiarization program, and you will qualify for a 10% discount on your insurance. That's nice, but the real payoff is in the accident rate, which has gone to essentially nil since the program began.

Avemco's vice-president of underwriting, Jim Nelson, confirmed that this is the



same syndrome that they found with the Glasair III. Many of the airplanes were professionally built and then test-flown by the owner who found himself at the stick of a very high performance aircraft.

The Glasair III is a very-high-powered, high-wing-loading airplane. It was like jumping into a P-51 without proper training. Lose an engine, and you come down at 2600 fpm.

And worse yet, in the opinion of many experts, there was a lot of bad advice floating around on how to fly the plane. Pilots were being told to fly steep approaches which caused landing accidents. You fly the plane like a turbine corporate twin, say the experts, with a normal approach angle and carrying a bit of power right down to the pavement.

Avemco also became worried about the quality of the construction. Stoddard-Hamilton told *The Aviation Consumer* that one recently totalled Glasair was deemed unrepairable simply because the airplane had been too ineptly constructed to make restoration viable. There are concerns about contaminents in the fuel tanks, overall construction quality, and of course everyone is concerned about modifications.

In order to provide insurance, it was necessary to find a way to ensure that the aircraft was airworthy, repairable, and that the pilot was trained to fly it. The Sport Aircraft Manufacturers Association, Stoddard-Hamilton, and Avemco put together a program to make insurance available under certain conditions.

First, they require an initial inspection for overall quality. They want to know from the beginning it is built right and can be repaired if crashed—you can bet that Avemco has insured its last not-worth-repairing Glasair. This inspection is in addition to the FAA inspection, and it typically takes 30 to 40 hours of labor.

Second, they wanted to be sure that the pilot could fly the aircraft. Working with PIC (Professional Instrument Courses), they established an initial and recurrent training program. Pilots are required to take annual recurrency training. The training covers slow flight, stalls, problems with gear extensions, etc.

Do all this and Avemco will insure you. Don't comply, and you can buy your insurance elsewhere, thank you very much.

This approach is definitely the coming thing. The initial inspection will vary with the aircraft, and will probably only be required with certain aircraft where the insurance company has concerns about the ability to repair the airplane and to find someone who can do the work. The conventional methods of construction—steel tubing, fabric-covering, wood, and aluminum—are all things they've dealt with for years.

And the requirement for a formal training program will initially apply only to the Glasair III, but owners of other high performance, high powered airplanes—Lancair IV, Venture, SX-300, etc.—can count on it.

But just because an airplane like the Falco has a moderate wing loading and average approach speed is no reason to relax. The Yankee was considered 'real sporty' in its day, but the Falco has much lighter controls, a faster rate of roll and greater sensitivity in the controls, even though it may be easier to land.

Avemco would like to see a training facility for every high performance airplane, and you really can't argue with the benefits of a such a program. Insurance-enforced training already exists for a number of complex twin-engine aircraft, and we're going to see more of this sort of thing with high-performance homebuilts.

I love the idea, myself. Insurance companies make decisions based on their experience in the field. Some years ago when I owned an old Victorian apartment building, we found it was the insurance companies who really laid down the law with us on safety issues—not municipal building inspectors with their building codes. Insurance companies were free to lay down a new list of requirements each year, they were always tough on us, and I always found them to have good reasons. (In fact, I hold the opinion that if the FAA got completely out of the certification business and left it all to the insurance companies, we'd have safer airplanes.)

Overall the safety record of homebuilt aircraft is not greatly different from production aircraft. There are slightly fewer fatalities per aircraft (which is slightly deceptive because homebuilts have fewer seats on the average) and slightly more accidents. The mix is different: lots of low-altitude buzzing accidents, not many weather-related mishaps, and aerobatics are thought to be a factor contributing to the slightly higher rate among homebuilts.

But here's the predictable part: approach the transition to the Falco with the same rather cavalier attitude that's been practiced in the past, and some of you reading this will die as a result.

If that's not appealing to you, then here's what we can do. Let's start by recognizing that it's smart to get checked out in the Falco by an experienced pilot. Builders who have finished their Falcos have been quite good about giving people rides, but let's recognize that it's not just a matter of being nice—it's saving lives.

I think it's time we put together a familiarization guide for the Falco, a syllabus of all of the things that are different about the Falco, and a formalized curriculum to introduce pilots to the Falco. I'd love to have suggestions and contributions from any of you.—*Alfred Scott*

Accident Report

The following accident was reported in the Air Accident Investigation Branch Bulletin *of the CAA in England for an accident involving G-OCDS, an Aviamilano Series II Falco, on October 23, 1991. The pilot was not injured, and damage to the airplane was limited to a bent propeller and slight damage to the cowling.*

On returning to Gransden after an aborted trip to Leavesden, the pilot reported that when the landing gear was selected down, the main gear extended but the nose gear gave no 'down' indication. The motor circuit breaker also tripped, and it was found that the emergency handle could not be moved.

The pilot made a number of fly-pasts to enable ground personnel to view the landing gear. They reported that the nose gear was extended but not in the locked position. A conventional approach was then made at minimum speed, the engine being turned off 100 meters before the threshold. Touchdown took place 100 meters after the threshold, the nose of the aircraft then being allowed to lower gently onto the ground.

On subsequent examination, the aircraft was found to have suffered failure of a universal joint in the drive between the landing gear motor and the nose gear operating screwjack. Four such universal joints are utilized in the total landing gear operating system of this aircraft type, one on each main gear drive and two on the nose gear drive. Motion is transmitted through the universal joints during retraction and extension, both when the gear is operated in the normal electrical mode and when the emergency manual system is used.

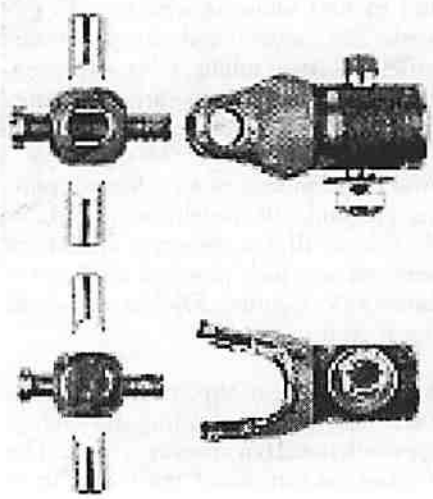
Examination of a similar joint revealed that the design utilizes a pair of pins passing at right-angles through drillings in a cube-shaped block. These two drillings are oriented in a single plane. The two exposed ends of each pin then form the pivot points of each of the two halves of the joint. Since the two pins are both oriented in the same plane, it is necessary for one pin to pass through the other at the mid-length position. This is permitted by manufacturing one pin of large diameter and drilling it at right-angles, thereby permitting the smaller diameter pin to pass at right-angles through it at the mid-length position.

It was found that in the failed joint, the larger diameter pin had fractured at this mid-length drilling. This had permitted its two ends to separate and come out of the block. The diameter of the drilling was such that it left a minimal material cross-section linking the two ends of the pin. The fracture faces were thus too small to readily establish the precise mode of failure.

Some years ago, G-OCDS took a seagull up the snout and landed on the beach.

The maintenance company which handles this aircraft (and the only other of the type on the UK register) reports that the remaining three joints in the system were all replaced during a previous repair after the aircraft had carried out an emergency landing with the gear only partly lowered. CAA approval was obtained at that time for a minor modification which was designed to prevent the two ends of a failed pin from moving axially should such a failure occur. This modification was incorporated in the three joints replaced at that time, but not in the joint which failed on this occasion. This latter joint was inspected at the time of the repair and found to be undamaged.

The company considers that the drive comes under load during takeoff and landing runs on rough fields. This appears to occur because the degree of over-centering of the nose gear mechanism is minimal when the gear is fully extended. The geometric lock appears as a consequence to break occasionally during such rough field operation. This has the effect of applying the ground-loading forces to the operating mechanism as well as releasing the limit micro-switch on the nose gear. The landing gear motor then operates to restore the gear to its correct position. Repeated motor operation is not unusual on rough surfaces. This sequence of events thus places non-design loads on the operating mechanism, including the universal joint in question.



A failure of the larger diameter pivot-pin will not necessarily manifest itself at once; it will only become evident when one of the ends of the failed pin disengages from the central block. Although the point of failure is theoretically unloaded even when transmitting high torques, in practice, wear, manufacturing inaccuracy and distortion under applied torque may all contribute to causing significant loading to be placed on that point, as will any applied end loading.

The maintenance company is proposing to seek CAA approval to carry out a modification to replace the universal joint with a standard aeronautical joint of similar dimensions but greater mechanical strength.

Production Falcos all used a universal joint of the design in this aircraft, and so far as we know, this is the first failure of this part in a production Falco. Sequoia Falcos are built with MS20271-B14 universal joints. The largest load on the universal joints occurs during 6-g maneuvers and results in a tension load of about 700 lbs. The MS20271-B14 is rated for 3,500 lbs in tension, thus providing a substantial safety factor.

—Alfred Scott

Transponder Antenna Problems

I've been hearing reports that a few of our Falcos have experienced marginal performance from their transponder antennas. Steve Wilkinson's Falco occasionally gets lost from Center depending on which way the plane is flying. Charles Gutzman reports much the same thing, and he moved the antenna to the landing gear access panel just outboard of wing station 2. Then in January, I got a letter from Bjoern Eriksen in Norway, which said:

"I have noticed that several builders have had problems with the transponder. So have I and the setup was as follows: All antennas were tested for shorts and standing waves (with the appropriate frequencies) before covering of the aircraft. All radios (brand new) were bench-tested before installation. When installed in the aircraft and connected to its antenna, the transponder appeared to drift off the correct frequency (2-4 MHz). The aircraft was flown with very short range on the transponder (2-3 nm). All other radios (all King) including the DME were operating normally.

"The first step was to bench-test the transponder again. It worked perfectly normally. Secondly, we tried to interchange the antenna with the DME. This gave no improvement, but we noticed that the transponder now drifted to the other side of the frequency band. This indicated that we probably had a problem with the length of the antenna cables. We made a cable that brought the transponder frequency just in the middle, and we test flew the aircraft. Negative results.

"By this time, more or less the entire Widerøe airline's radio staff was engaged in the problem, and the prestige was quite high. I will not tire you with all the solutions we tried, but finally we decided to put on a standard King transponder antenna. From that moment, everything has been working perfectly. The sensitiveness to the antenna cable length was also gone.

"Obviously, the King transponder wants a King antenna. Please don't ask me why this is not the case with the DME which works perfectly with the 'Falco' antenna. The transponder antenna is mounted externally on the inspection cover of the autopilot servo. This location gives a very light 'noise' from the transponder (when transmitting) into the audio system. Turning the David Clark intercom box 90° solves most of the problem. When I get time, I will try a different location for the antenna."—*Bjoern Eriksen*

Antennas are a complete mystery to me, and I sent a copy of this letter to Jim Weir, who designed the antenna. Jim said he didn't understand the problem. Our transponder antenna is the same as the antenna he designed for the Bellanca Viking, which passed a number of FAA certification tests, and it's been a popular antenna design used in many other wood and fiberglass airplanes. Jim is swamped with work, and he apologized for not having the time, but said something incomprehensible about running a gobbledegook test at fiddermajiddit frequencies and to get back with him.

I don't understand any of this stuff, but I remembered that at the Great Oyster Fly-In, Falco builder Michael Scaturo had brought along a bunch of computer analysis charts that he had done on our nav splitter. Michael is a microwave engineer at Hoechst Celanese, and he works on designing little gadgets that hook up on each end of a fiber-optic cable. It's some kind of a rectifying multiplexer gizmo that allows you to send lots more signals through a fiber. It makes the light waves happy, and these little babies catch a good wave as a result. It's good, and people pay money for these things.

Conversations like that give you a little taste of what it would be to have Alzheimer's when people start discussing complicated things, like toilet paper. So when Jim Weir mentioned this test, I thought of Michael Scaturo. Michael said he'd be happy to run some tests, and he quickly reported back that he had found the problem and had come up with a solution. So without further ado, I'll just turn this keyboard over to Michael to explain it all.

Michael Scaturo's Notes

When Alfred told me about the antenna problem and asked if I could help, I happily agreed—how often do work and play overlap so well. Now I could use all those neat expensive toys in my lab to make the Falco a better plane... to make *my* Falco a better plane.

I put the transponder/DME antenna in my kit together (the hole in the ground plane was 5/16" and had to be enlarged to 3/8" for the insulating washers to fit properly) exactly as in the plans and put it on the HP 8510 Network Analyzer for a look-see. The results are shown in Figures 1 & 2. I'll try to explain these in simpler terms in a minute, but first bear with me on the technical stuff. Figure 1 is a plot of SWR (Standing Wave Ratio) on the Y-axis versus frequency on the X-axis. Figure 2 is a Smith Chart showing the exact impedance of the antenna over the frequencies of interest. The frequencies we're interested are in between the triangles numbered 1 and 2, known as markers. Marker 1 is at about 1000 MHz and marker 2 is about 1100 MHz—transponders broadcast at 1090 MHz.

The Standing Wave Ratio is a measure of how much power goes out of the antenna and how much is 'reflected' back towards the transmitter. At these frequencies, radio waves start to behave a little like light, and they can bounce off things—this is how radar works. These reflected waves interfere with the waves going to the antenna and set up a wave pattern that stands still on the cable feeding it, hence the term Standing Wave. The "Ratio" part is just a measure of how big these waves are. SWR is expressed as a ratio with 1.0:1 being perfect—there's no reflection and everything goes out the antenna. 2.0:1 means that about 33% of the power is reflected back, 3.0:1 means about 50% of the power is reflected back, and so on.

On the SWR plot (Figures 1 and 3), 'perfect' is the second line up from the bottom. This is 1.0:1, the second line up is 2.0:1, the third 3.0:1, etc. The squiggley line, which is our antenna, can never go below the second line, but the closer it gets to this line the better it is. We can see from Figure 1 that in the best case, at 1100 MHz, the SWR is about 3.25:1. This means that only about 47% of the power is going out of the antenna, the rest is reflected back to the transponder. Down at 1000 MHz, only about 35% of the power is going out of the antenna. We can also see that the resonance dip is not very well defined, and it is shifted to the right. This is an indication that the electrical connection is not too good and that the center element is a little too short.

To the transponder, the antenna looks a little like one of those two-way mirrors at the police station where you can see the suspects but they can't see you. This is because some light goes through to your eyes but the rest is reflected back at them. We want to try to make the antenna look as if it's a clear plate of glass so we can see ATC and they can see us—except in the

case of busting the TCA, but that's another story....

The Smith Chart shows the impedance of the antenna, and we would like to match this as closely as possible to the impedance of the cable and the transponder. That way, we can minimize any reflections. In Figure 2, "perfect" is a point exactly in the center of the circle. That's a perfect match. We want to try to get the part of the line between the markers as close as possible to the center. We can see in Figure 2 that our antenna swings in an arc to the right of the center. This means that, depending on the length of the cable and the frequency of operation, the antenna may look like a capacitor or an inductor to the transponder. This is probably the reason for the shift in frequency Bjoern Eriksen experienced.

An easy way to think about this is to picture yourself standing at the end of a long hallway with a bucket full of marbles. At the other end is a doorway. You roll the marbles down the hall and out the door. You would be the transmitter, the hallway would be the cable, and the doorway the antenna. When the antenna isn't 'matched' to the system, there is a hill just before the doorway. Some of the marbles go out the door and some roll—reflect—back down the hill toward you.

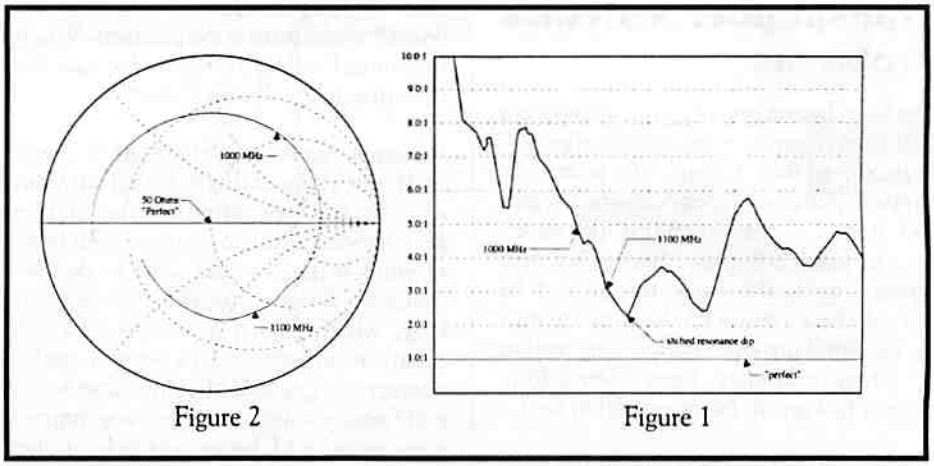


Figure 2 Figure 1

The marbles rolling back hit some on the marbles going forward and some come to a stop and stand still in the hall. When the antenna is well matched, this hill is small and most of the marbles go out the door. When the antenna is poorly matched, the hill is large and only a few marbles go out the door. There is always some hill though, because an antenna can never be perfectly 'matched'.

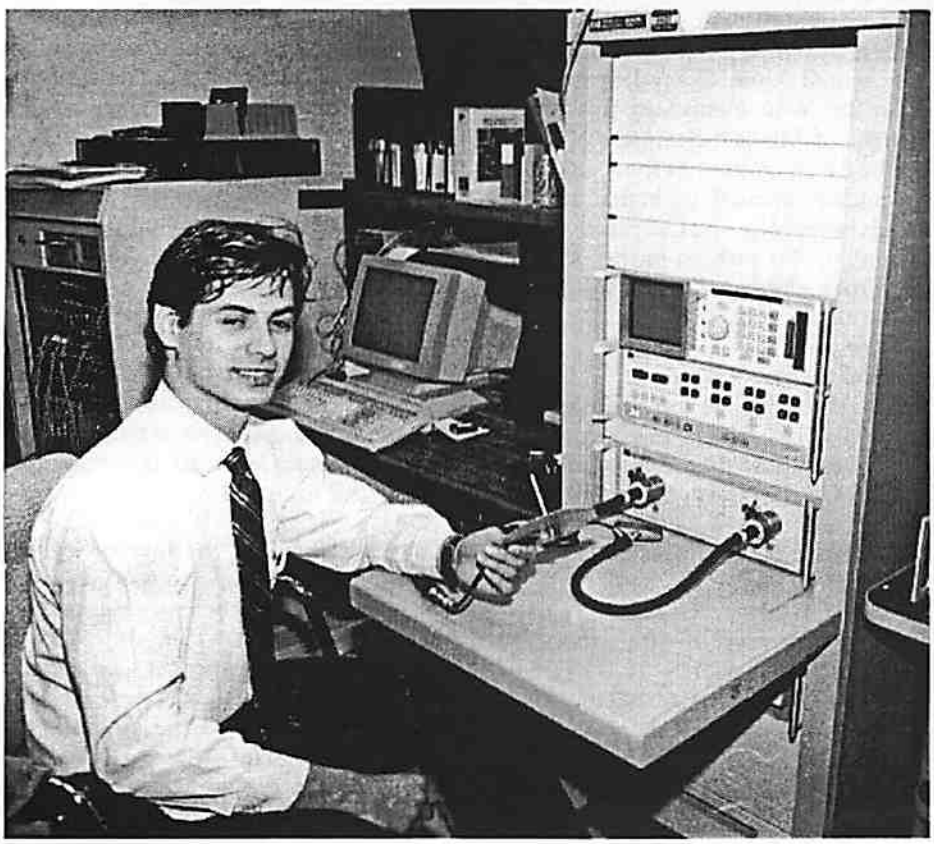
The reason for the poor connection in our antenna is the lugs that are squeezed into contact with the ground plane and the center conductor. While you can take an ohmmeter and read zero resistance at DC, the connection isn't that good at the frequencies where we want the antenna to work. I tried sanding, cleaning and tightening the nuts, but I eventually decided the connection would have to be soldered.

I made a new ground plane and center conductor for the antenna, put everything back together and soldered it. This corrected most of the problem. The resonance dip was still shifted to the right, though, but adjusting the length corrected this, and the new length agrees with numerical calculations. Figures 3 and 4 show the response of the new antenna. The worst case SWR (at 1100 MHz on Figure 3) is now about 1.48:1. This means that about 82% of the power goes out of the antenna and only about 18% is reflected back. On the Smith Chart (Figure 4), we can see that the antenna is more closely matched to the system as well.

If, after all of this, you find *your* marbles rolling downhill, don't worry. You don't have to understand all that to build a good antenna. Take a piece of copper-clad circuit board (single-sided, 1/16" thick, FR4 or G10 epoxy fiberglass—available from Radio Shack), cut it to the shape of the aluminum ground plane, and drill the center hole (3/8"). Get a piece of 1/4" bronze welding rod about 3-1/2" long and thread one end 1/4-28 about 3/4" to 1" down the rod. (Any brass, bronze or copper rod is fine; we just want something you can solder to and that's not possible with aluminum.) Assemble this as shown in Drawing No. 162, except leave off the lugs to connect to the coaxial cable.

The copper side of the circuit board should be 'up'. This puts it on the same side as the short end of the radiating rod—the back side of the antenna. Change the length of the rod from the 2.65" shown in the drawing to 3.10" (measure this with a dial caliper, *not* a ruler). Tighten the nuts—you can use Loctite if you wish, it won't affect the antenna.

Michael Scaturo with the network analyzer and the antenna. This is not the actual test because there is too much metal around the antenna.



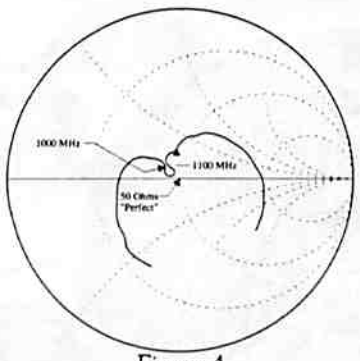


Figure 4

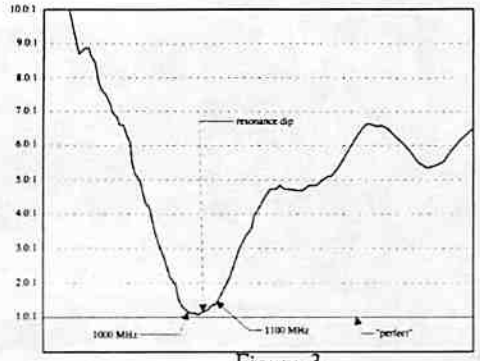


Figure 3

To connect the antenna, strip about one inch of insulation from the coax and separate the braided outer conductor from the inner conductor. Strip about 1/4 inch of insulation from the inner conductor. Try not to nick either conductor during the stripping. Next, solder the braided outer conductor to the ground plane, close enough to the rod to allow yourself enough slack to solder the inner conductor to the rod, but don't let the braided part touch the nut or the center element.

Solder the center conductor of the coaxial cable to the exposed threads of the rod. You will need a heavier iron to solder to the rod because it's a pretty good heat sink—I used a resistance soldering iron which is like a pair of tweezers with current flowing through the tips. All the soldering is done on the backside of the antenna. You *must* be sure you have a good shiny solder connections here, otherwise the antenna will not perform well. I sprayed a conformal coating of silicone on the backside of the antenna to prevent corrosion, but depending on how it's installed in the plane, this may not be necessary. You should probably pot the end of the coaxial cable in epoxy to keep it from vibrating.

Electrically, the antenna is very good now. The transponder should be delighted with it, but ultimately someone will have to install it to be sure. My Falco has not reached that stage yet. The new antenna is also very sturdy, at least as sturdy as the old one. The two are also about the same weight. The one thing I did not measure was the radiation pattern of the antenna, I think Jim Wier did this though, and it should be okay. I didn't change the overall shape of the antenna so any 'nulls' or 'blind spots' in the old antenna will still be in this one. I think the problem was with the 'match' though, and that's fixed now.

—*Michael Scaturo*

More Notes

I also talked about this with the head of a local avionics shop. He said that the transmitting operation of a transponder is a tricky business and that the transmitting cavity, the cable and the antenna is a tuned device. Any change in the impedance will affect the frequency, and anything tht pulls the frequency off by more than 3 MHz will result in the Center not seeing you. He said that seemingly insignificant things like a loop in the cable, or running a cable near a landing gear motor can screw up the works.

It seems obvious to me that the identification of the marginal electrical connection at high frequencies of the metal-to-metal contact is the primary problem and is what was screwing up the impedance. This is solved by changing materials and soldering the joints. Other than that, it's the same antenna we've been using.

Michael tuned the antenna to a transponder's transmitting frequency of 1090 MHz. By looking at the chart, he could see that the 2.65" length was too short. On the calculator, the length comes out to about 2.90" with an infinite ground plane, correcting for the finite ground plane brought it up to about 3.00". He then optimized the antenna on the Hewlett-Packard Network Analyzer by trial and error to work best with the transponder, and the length turned out to be 3.10" when he measured it at the end of the text.

Transponders receive at 1030 MHz, and I was worried if optimizing it to 1090 MHz would affect the reception. The avionics shop said to stop worrying about that, and that the transmitting was the critical thing. Fortunately, antennas are 'reciprocal', which means that antennas behave the same way when transmitting and receiving, thus any good transmitting antenna will also receive well.

Our DME antenna, which is identical to the transponder antenna, has worked wonderfully, but the improvements brought about by the change in materials and soldering will make for an even better antenna. The avionics shop said that DMEs use synthesizers, they're not load-sensitive and can tolerate a little SWR. DME frequencies range between 962 MHz to 1213 MHz, and the transponders 1090 MHz frequency falls in the middle of this band. You can see from the SWR plots that this band is better that it was before, so it appears to make sense to make the DME antenna exactly like the transponder.

I sent a copy of all this to Jim Wier for his comments. Jim said that he developed this antenna for Bellanca who sent him an entire wing, complete with all metal components, wiring, plywood covering and paint. He used the same methods and equipment that Michael Scaturo used, and Jim tuned the antenna for best reception in the Bellanca Viking wing. Nearby metal objects, carbon and aluminum particles in paint, and the like all have an effect on the antenna. The optimum length of the radiating rod will be different in free space than in a wing—and each wing is different.

Jim thinks that we must have some metal around our antenna that detuned the antenna. He didn't have this problem with the Bellanca Viking, and the plastic planes have not had the problem either.

As for making the antenna with soldered joints, Jim says, "I won't argue with that. I agree that it will make a better antenna. I used an aluminum ground plane and ring terminals because Bellanca vetoed the use of any soldering because it couldn't be assembled as quickly as the other method. Michael Scaturo did a professional job , and I applaud him for it."

Short of searching out loops in the coaxial cable and cables near motors, those of you with already-built Falcos have little opportunity to improve things without cutting into the wing. I was curious about those who, like Charles Gutzman, have put the antenna on the landing gear access panel—since you can't solder to aluminum, could you just solder to the rod and get an improvement? Michael said he first soldered the connection to the ground plane, and this gave him almost all of the improvement in the performance of the antenna. He thinks soldering to the ground plane is the really important thing.—*Alfred Scott*

A Canopy Caper

by John Brooks Devoe

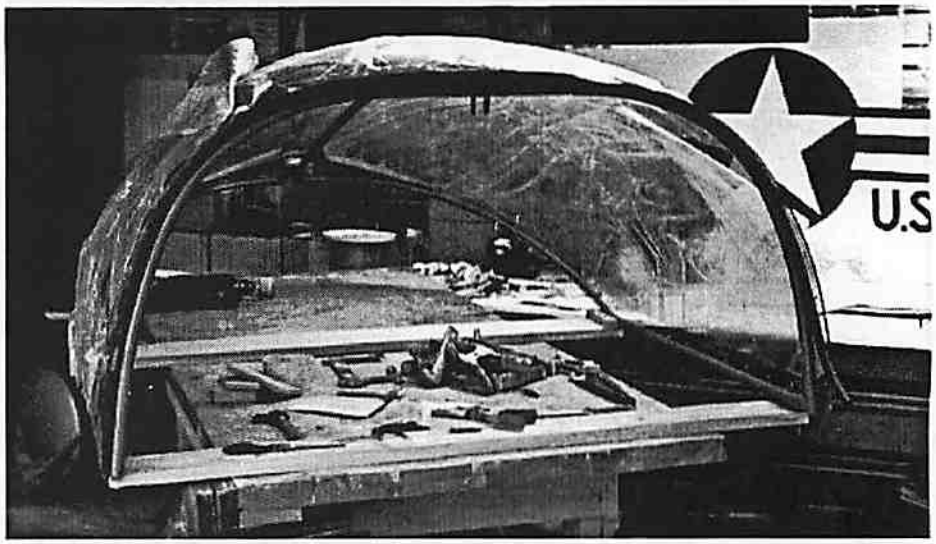
Shortly after my canopy arrived, I called the old master and pastry baker in Connecticut for some guidance. At some point in the conversation, I am certain I heard the words "piece of cake" from Jim DeAngelo. In retrospect, I must believe he was talking about something he had just taken from the oven.

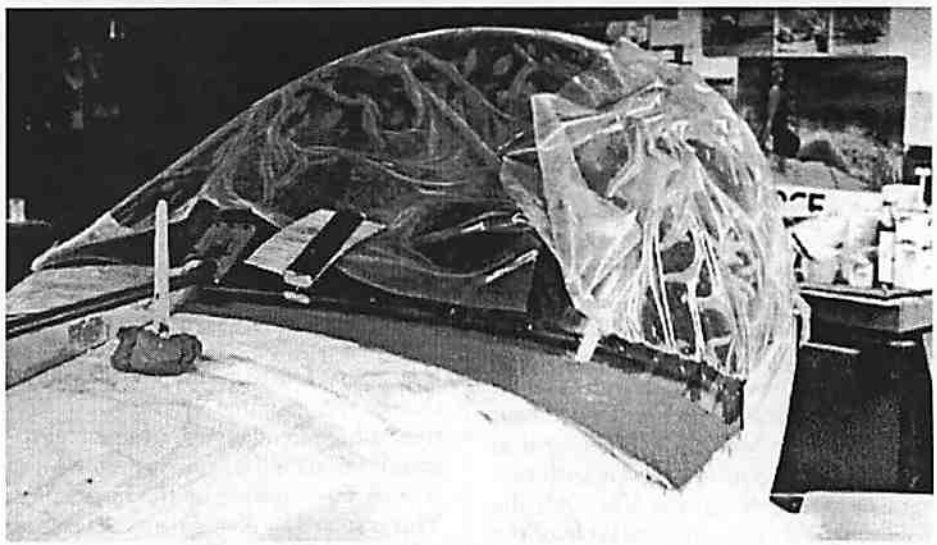
I re-read all the articles in the Builders Letter, checked in with Bob Bready, consulted the manufacturer of the plexiglas, clarified some matters with respect to the aft sliding tube with Alfred, and then began yet another learning curve. What follows is the sequence that evolved.

I began by fitting the frame to the fuselage with all its associated hardware—time consuming but not difficult—and then after ensuring that it slid well and true, I put additional primer on the frame and applied the final finish. Next I carefully measured the distance between the two forward sets of bolts/nuts and repeated the distance on a board which was fixed to a table somewhat narrower than the canopy, an overhang of some eight to ten inches on either side. The board's total length was some few millimeters shorter than the outer width of the canopy frame. Another board was prepared to be fixed to the table at the aft end of the canopy frame at the point at which the aft rollers are located in the canopy closed position. The length of this board also was short in length by a few millimeters of the canopy frame width at that point. No screws here, I glued two blocks to the board in a position that would be just inboard of the inboard side of the side rains. Thus the canopy would sit firmly and safely to the table (see photo).

I totally removed the protective covering from the plexiglas for a distance of about three inches from the rough—to be trimmed later—edges all around. I mounted the bubble on the frame favoring a forward position with sufficient overhang to provide for later trimming—in my case, it was not. This initial position should be done with the rubber weatherstrip installed, it should be in place when you drill, for it creates a different circumference than would the plexiglas alone against the frame.

And now the moment of truth, drill the holes. I remembered a caution given me by Jim: "Any time you're working with



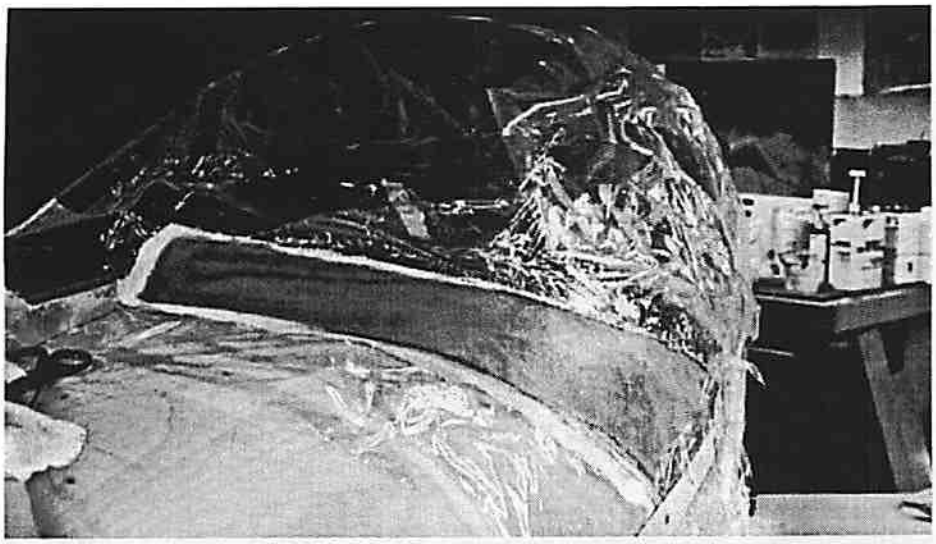


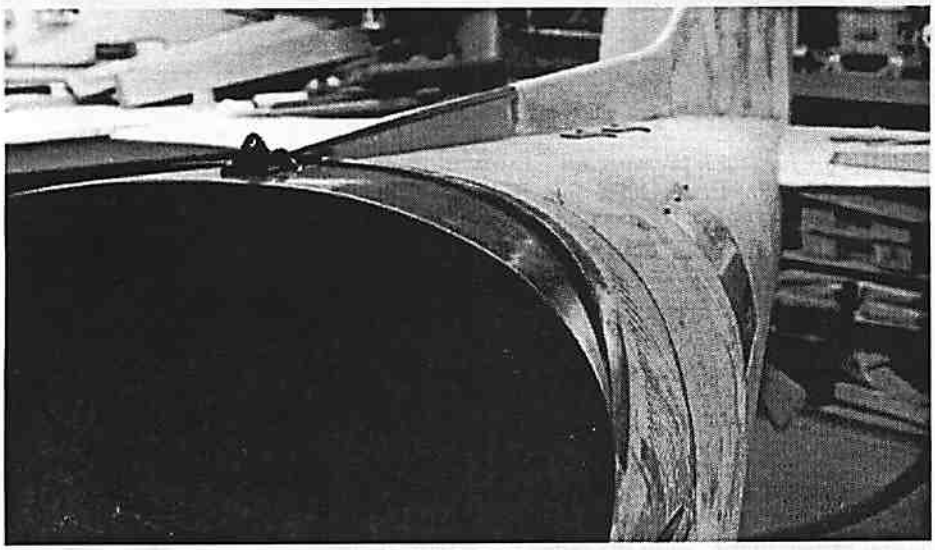
the canopy and especially when you are drilling, keep the temperature in the shop at at least 70° F." I cranked up the radiant heat panels. I drilled the first hole center top front and then went to the aft end, made sure things were aligned with equal overhang at each side and drilled a center-aft hole. I then drilled holes to the right and left of the first hole drilled at the forward end. I did not then go to the aft end but continued at the front, working my way down perhaps two holes at a time on each side and similarly along the sides towards the end of the canopy, and then up around the skirt area.

I used three drills for the process that worked for me. Two plexiglas drills (5/32" & 3/16") and one normally pointed drill(#40). The use of two plexiglas drills may not have been required, but it put me somewhat at ease for a reason I cannot readily recall. The first drill went through the 'glas, rubber and marked the steel of the frame. I then moved the weatherstrip away, placed small pieces of plywood on either side of the hole to create a space equal to the rubber and drilled with the larger drill, again using enough pressure to ensure a good mark on the steel. I next drilled through the steel with the third drill and installed the round head sheet metal screw, sometimes having to encourage it with a small vise-grip clamped to the head of a 'tool' screw of the same size. It is important to have an expansion space around all of these screws, and the method I used provided this in most cases. In the few times when it did not—observed during final assembly—I used a very small grinder in my Dremel tool to elongate as seemed necessary. I took the further precaution of countersinking, to a very slight degree, both sides of all holes before final installation.

At the half-way point, I returned the canopy to the fuselage to check for alignment and found no evidence of any problems.

After reading Steve Wilkinson's description of an aluminum trim/skirt approach, I cowardly decided on that other composite, fiberglass. I also checked out on the minimum pieces approach and made mine





Bottom: Gwen models the final product with a thumbs-up, but fortunately no one retracted the gear. Note the Canadian turn signals on the side of the fuselage.

in six sections, leading edge of canopy (2), sides (2), skirt (2) and a small far-aft section. This results in overlaps as can be seen in the photographs but for the purist, these could be joined at a later point in the process and reduced to perhaps a total of two pieces. I used six layers of 6-oz glass.

With the canopy back on the table, I replaced all the round-head screws with flat head phillips and gently screwed them in until they were flush with the plexiglas. I covered the edges with freezer wrap in a sufficient width to more than cover the width of the layed up glass. With this in place, I started laying up the glass, letting each two layers dry before adding the next two. While the glass was still not completely dry, I took an awl and pressed it into the glass at the center of the screw head, making a depression that would allow me to locate and drill the holes thorough the trim/skirt after it all was dry. On the front and sides, I then trimmed both the plexiglas and the trim and trimmed the plexiglas at the skirt area.

The canopy went back on the aircraft for the building of the skirt. This deals with the art of sculpture, and there are two kinds, additive and subtractive. That other Italian genius, Michelangelo, believe in the latter. He just cut away the waste marble and come up with the *Pieta*. I learned nearly a half century ago in a college sculpture studio that additive sculpture was a lot easier. Thus, rather than go through the foam round, I followed Bob Bready's lead and bought a dozen 4 oz sticks of Permoplast sculpture material—warm it and it is more easily worked—and formed that compound curve required to join the curve of the fuselage with the unlike curve of the canopy frame (see photo). I covered this with freezer wrap and proceeded much in the same manner as previously described. One of those multiple-pin contour guides was helpful in assuring that both sides of the skirt have a similar shape. I had to make a spruce wedge-like affair as a spacer at the aft end of the canopy to fit between the plexiglas and the canopy frame. When it came to the interior weatherstrip, I had to build a ramp-like affair to insure the weatherstrip was high enough on the fuselage to provide a good seal. Be sure to clamp the canopy, weatherstrip installed, to frame four during the building of the skirt. The frame should be clamped/braced to retain it in the 90° (standard canopy) positon. Trim everything and the piece of cake is complete.

I countersunk the holes in the fiberglass trim/skirt and used tinnerman washers beneath the screws. It had been my intention ot use flat head phillips screws, but ended up using the round heads that came with the kit, finding the end result, oddly enough—more pleasing to the eye.

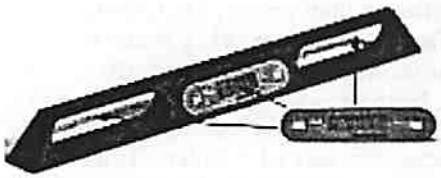
The most valuable advice I can give is to be patient, the most valuable tool a cordless electric screwdriver. You will remove and install those screws more times than I care to remember! □

Tool Talk

by Richard Clements

When he is not building his Falco, Richard Clements is busy at his printing business in Denver. Since getting this device, Richard has become compulsive about things being level, and he even parts his hair in the middle.

I want to tell you about a tool that has been a blessing for me and a lot of others, the SmartLevel digital inclinometer. This is a digital carpenters level made in two pieces: there's a sensor module that houses all the electronic guts, and you can use this by itself or snap it into a variety of handsome triangular aluminum-and-teak rails.



The sensor reads out the angle to a tenth of a degree, and there are several display modes: degrees-of-slope, inches-per-foot rise-over-run, percent-of-slope, and a simulated electronic bubble display. The module alone cost $86.00, and I did not buy the rail. This little cutie is made by Wedge Innovations, 532 Mercury Drive, Sunnyvale, California 94086, and is sold through many woodworking catalogues.

What enticed me to spend the money for it was a presentation at my EAA Chapter by a local fellow who sells it. He is retired and was looking for something to do. He stumbled across the level and is now having a ball. One of the uses for the level that he 'invented' was for Formula 1 racing. The crews take an enormous amount of time determining the best angle for the front wing. If there is any small wing-angle change in the race due to a bump, it is impossible to reset it precisely.

He went to a car, located a substantial frame member in the same plane as the wing and took a reading of the member. He then took a reading of the wing. Now, he had a degree differential between the two. Then, to the horror of the crew, he kicked the wing—which of course knocked it out of adjustment. (Keep in mind that the adjustment was the result of hours of actual driving and adjusting.)

The crew threatened to lynch him. He told them to drive the car once around the track and return it. He would then adjust the wing to the exact level as before his booting it. They did, and he did. They were amazed and bought the level on the spot. No more adjusting problems. This, he claims, became a racing secret for a while until other crews saw what was happening. He sold a bunch as a result.

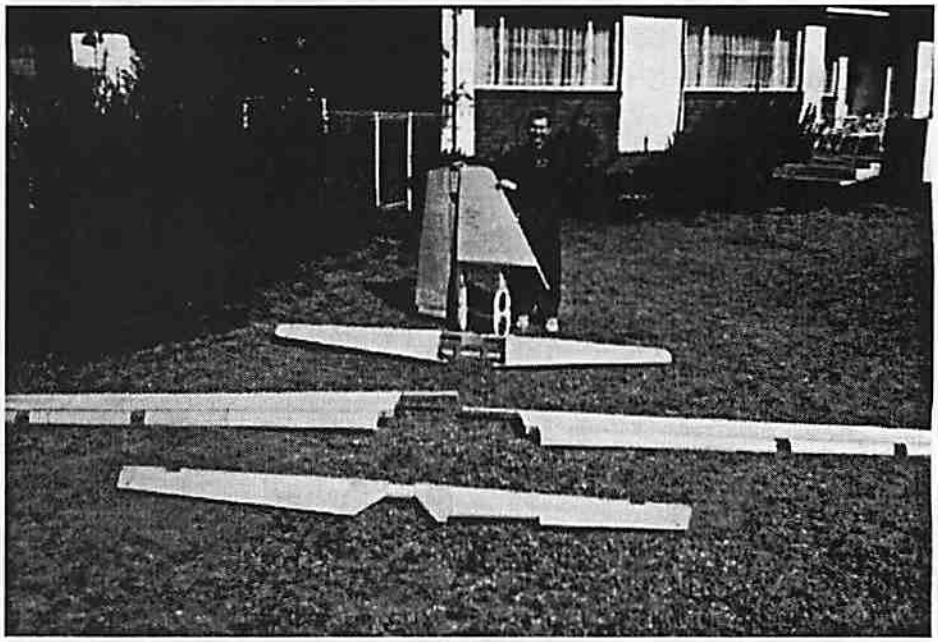
He also tells a story about submarines, but I will forgo that one.

I thought about the leveling possibilities in building a Falco and bought one on the spot. The most recent use of the level was constructing the mold for the cowling. How can one be certain the cooling inlets are parallel to the plane of the wing? Simple. Lay a bar across the canopy rails and take a reading. Then transpose that reading to the flat plate bolted to the crankshaft flange. This plate is the form for the propeller/spinner match-up to the cowling. Clamp a piece of angle iron to the plate with the same degree reading as taken on the canopy rails. You now have parallel planes and can sight in the cooling inlets.

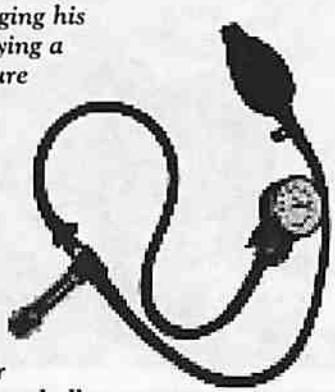
The possibilites for wing, fuselage, etc. construction are enormous. I wish I had it back when I was building. It would have done away with plumb bobs and all the other gyrations I did to insure parallelism, etc.

The only problem with the level is its one-tenth-of-a-degree exactness. You can spend too much time trying to obtain a tenth of a degree when before you would have been ecstatic to be within the meniscus of a bubble, which was probably a degree or so. I have especially encountered this problem in constructing things around the house.

Now, if all problems were of this nature, life would be like finding a bucket of money! □



Above: Brian Nelson poses with a few Falco parts.



Right: Our fuel tank pressure kit. I was surprised to read in Flying recently of Peter Garrison's account of damaging his altimeter to the tune of $300 and completely destroying a 700-mph airspeed indicator by using them as pressure gauges while leak-testing the tanks on his airplane. You typically pressurize a tank to 1.5 to 2 psi and then brush on soapy water and look for bubbles. The problem is finding a pressure gauge that will read such a slow pressure. By far the cheapest is found in a blood pressure test kit. They are sold at drug stores and other health care supply stores for people who like to take their own blood pressure to find out if they're going to pop off in the next few hours, or whether to go to the bingo game with their friends. Shown here is our rig which used the squeeze-bulb as a pressure pump. Our gauge shows the pressure in millimeters of mercury, but the conversion is easy: 1 psi equals 51.7 mm Hg.

Construction Notes

I've been getting a lot of questions recently about storing engines for a long period of time before putting them on your airplane. I quizzed Steve Wilkinson about this, because I remembered that he had done some research on the subject. Steve's method was suggested by a friend, and Mattituck said it made sense.

First, let's define the problem. The internal parts of the engine that are most susceptible to corrosion are the freshly machined surfaces. This includes the polished lobes of the cam shaft, the cylinder walls, and the main bearing surfaces of the crankshaft.

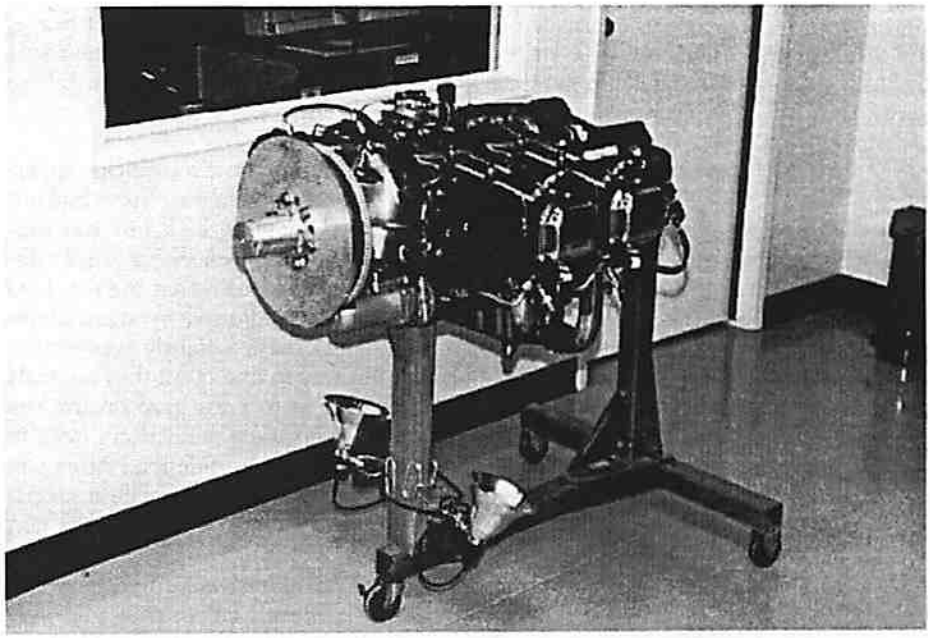
On the typical engine, the cylinder walls are a big concern. The freshly machined interior surfaces of the cylinders are very prone to corrosion until the engine is broken in. Once the engine is run for a while, the steel is coated with a varnish-like substance from the oil that protects it somewhat.

The typical protection against corrosion in the cylinders is to spray LPS-3 oil into the cylinders. LPS-3 is a medium-weight corrosion protection oil that comes in an aerosol can. It's much thicker than the WD-40 or Tri-Flo, and you can get it at shops that sell to machine shops. Call any local machine shop, and they can tell you where to get it.

The spark plugs are normally removed, and you install dehydrator plugs. These are things that screw into the spark plug hole and which hold a desiccant. The desiccant is simply a drying agent, which absorbs moisture from the air, thus preventing it from getting into the engine.

Most people pull the plugs out every couple of months, spray more LPS-3 into the cylinders and turn the engine over a couple of time to insure that the oil stays smeared over the cylinder walls. Steve said he didn't bother with this because his cylinders were Cermichrome cylinders, and there's no risk of the chromium corroding.

Now to protect the insides of the engine, Steve's friend suggested filling the engine with oil, as full as possible, with any kind of oil you can find—and then store the engine upside-down. This insures that the camshaft will remain covered with oil. If a little air space remains, then who cares if there's some corrosion on the inside of the oil sump? With the engine filled with oil and upside-down, the polished surfaces of the crankshaft, cam and the valve train are all bathed in oil.



Above: Craig Bransfield's engine stand is complete with bug lamps.

Steve bought a bag of desiccant from somewhere (Aircraft Spruce? Edmund Scientific? He doesn't remember) and made a sock-like thing from a rag, filled it with desiccant and stuffed it into the intake manifold. Every couple of months, he'd take it out and put the desiccant in the microwave until it turned blue again. All the other openings were taped over.

The only other thing you have to be concerned about is to keep the engine out of areas that have strong humidity and temperature changes. In Steve's barn, for example, sometimes the tools on the wall would gather dew when the air warmed up in the morning after a cold night.

Craig Bransfield just took delivery on his engine from High Performance. Craig adapted an automotive engine stand by having four adapter brackets made up from 1-1/2" x 5/8" mild steel. After consulting with Al Hadaway of High Performance, they decided to use one pint STP oil treatment blended warm with each gallon of Aeroshell 80, and filled the engine up with this oil.

The combustion chambers were sprayed with LPS-3, and all opening were provided with either their assigned accessories or Lexan covers and soft gaskets (made from our shipping foam sheet). Al Hadaway's recommendation was to roll the entire engine over periodically, and also to turn the crankshaft, always leaving it 90° off from its last resting place.

Says Craig, "Also, I built a small plastic 'tent' with a square 1x2 frame and weather stripping on the bottom, to cover the engine on the stand. Then I clamped a couple of 100 watt shop lights to the stand aimed at the bottom of the engine, with a timer. This way, I can make sure the engine is always 10 degrees or so above the dew point during foggy nights and mornings. The tent's plastic is black, to take advantage of any free heat from the skylights. This gives the box a purposeful look, but most people who see it seem afraid to ask what that purpose might be."

Stephen Friend notes that where the side load strut mounts poke through the wing bottom, part of the plywood is unsupported and wants to know if this is correct. That's right, but you can always epoxy some blocks of wood to the metal fitting and glue around it. That's what I would do.

Stephen also asks if it is strictly necessary to paint such aluminum parts that are buried in the wing. He's noticed that some larger aircraft are leaving nose gear forks and similar parts unpainted for easier crack inspection. My answer to that is that it is not strictly necessary but very foolish. Since the part is buried in the wing, you can't even get in there to inspect it, so why eliminate the corrosion protection? Also bear in mind that the lack of corrosion protection paint inside the wings of many metal airplanes is simply a cost factor—many aluminum 'spam-cans' don't even have zinc chromate paint on their wing spars.

There's an interesting new product on

the market for temporary repairs of oil and gasoline leaks. It's called Oyltite-Stik, sort of a styptic pencil for engines and fuel tanks. This thing is like an oversized grey crayon, and what you do is rub it into the crack or weeping hole. Dang if I know how it works, but it appears to be a kind of a waxy substance with a lot of clay in it. Apparently, it packs into the crack and stops the leak. It is advertised to work with all types of oils, gasoline, water, dilute acids and alkalies, and is intended to keep equipment running until a complete repair can be made.

No ferry pilot should be without one of these things. It's make my La-Co Industries in Chicago, and you can get it from Aviation Consumables, P. O. Box 27205, 4000 Red Bank Road, Cincinnati, OH 45227. Phone: 513-561-9977, Fax: 513-561-9550. List price is $6.01 each, and they're having an introductory sale for $4.33. Aviation Consumables says they've found the product works well on Lycoming and Continental casing halves seepage.

We've had a couple more problems with the landing gear. Steve Wilkinson took off in a crosswind and then was unable to retract the gear. He landed without difficulty and found the right main gear screwjack was bent very slightly. It was exactly the same thing that had happened to Jim DeAngelo some years ago, and neither Steve nor I could figure out how it could have happened.

The only way the gear could have folded was if the side load struts did not go over-center, and the kick test will prevent that from happening. "Did you do the kick test?", I asked. "Oh, sure," said Steve. "Did you have the screwjacks removed from the side load struts when you did the test?" "Well, no..." Oh dear.

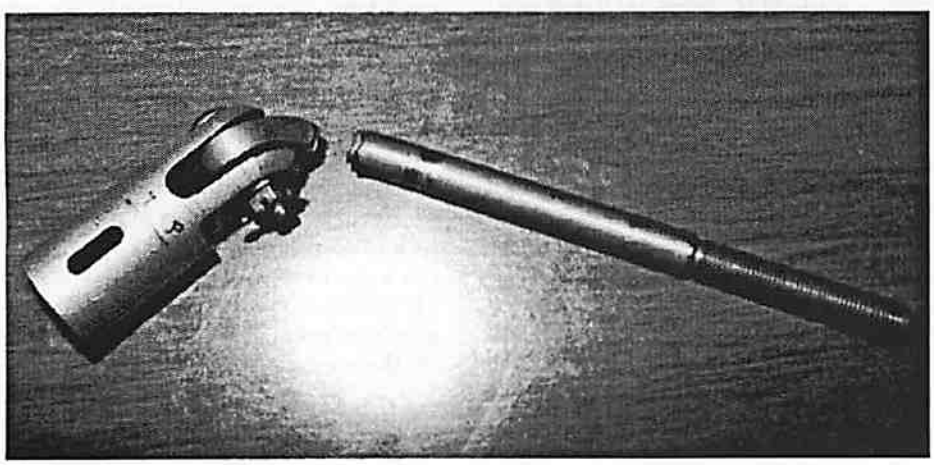
After talking it over, it was quickly apparent what the problem was. Steve had not understood that the kick test was supposed to be done *with the screwjacks disconnected.* The idea is that the side load struts should be adjusted—you just file on them—until they go slightly over-center. The best way to find out if they are truly over-center is to press hard on the tire with your foot (you really don't need to kick) and see if the side load struts will stay locked without assistance from the screwjacks.

If they're not quite over-center, as was the case with Steve's Falco, they fold very easily. You're just asking for trouble if you don't do the Kick Test with the screwjacks disconnected, and Steve asks that I emphasize this point. As it turned out, he was able to remove the screwjack and bend it straight again.

And Jonas Dovydenas had a problem of a type I've never heard of before, nor has anyone ever speculated on it. He took off one day, and flew around for a while. On approach for landing, he lowered the gear and something was definitely not right. Initially, Jonas was very confused about what had happened. The gear went partially down and then there was a 'clunk' sound. The nose gear was down, and there was a green light that the gear was down. But Jonas still was able to crank the gear about 5 more turns down.

He landed without incident, and after he shut the plane down, he was surprised to find that the nose gear screwjack was completely disconnected from the nose gear upper drag strut. The long custom rod-end bearing was broken off at the top.

Below: Jonas Dovydenas's nose gear retraction pieces that failed.



It didn't make sense to me how that could have happened. When the gear is down, that bearing only has about 40 lbs of side load on it to keep the gear down. That's nothing, and when the gear is fully up, there's about 700 lbs of tension on the screwjack when you do a 6-g loop, but the rod end bearing is lined up with the screwjack. That puts it all in tension, and the part is certainly more than adequate for that load. It was a real puzzlement.

But when Jonas took it apart to put in the new pieces, it was abundantly clear what had happened. There's a jamb nut at the base of the bearing, and this had been working loose. When the gear came up and the screwjack was lined up with the rod end bearing, the torsion of the landing gear motor was starting to turn the rod end bearing. The shaft of the rod end bearing showed clear signs of rotating in the upper drag strut (see photo).

What had happened was that each time Jonas retracted the gear, this thing would turn slightly, then turn back straight again when the gear was extended. Each cycle would loosen the jamb nut a little more. Finally, it reached the point that it had turned completely horizontal, so that when the gear was extended, the thing was turned completely sideways.

This problem would not happen, obviously, if the jamb nut is tight. Everyone should check this on their Falcos and tighten the nut down snugly. You can also put a little dab of red paint on the nut at its base. This is a standard method of marking a nut so you can see at a glance if the nut has moved because the paint would be cracked.

Hans Sonntag from Germany stopped by recently. It was interesting to hear him tell of his difficulties of trying to find out the meaning of a few words. It's so easy for us to lapse into jargon that we forget that there are plenty of people, particularyly those in other countries, who haven't a clue what the words mean. What tripped Dr. Sonntag up was "dry flox" and "reamers".

If you're similarly confused, a reamer is a cutting tool that's very much like a drill bit, and it's used to enlarge a hole just a little. A drill doesn't produce a hole of high quality, so if you want a very accurate hole in metal, you drill it slightly undersized with a normal drill bit, and then use a reamer to finish off the hole.

But it was 'dry flox' that really drove Dr.

Sonntag up the wall. He consulted with innumerable aerospace engineers, pilots and mechanics, and no one knew the term. Finally, he stumbled across a Varieze builder who knew all about the stuff and explained it to him.

Sorry about that. Dry flox is one of a number of terms that grew out of the Rutan series of fiberglass airplanes; there's also wet flox, dry micro, and wet micro. What we're talking about here are various mixtures of epoxy and a filler material—'micro' stands for microballoons, and 'flox' stands for flocked cotton.

Microballoons are microscopic glass or phenolic bubbles, originally developed as ping-pong balls for sports-crazed ants, but California weirdos started using them as a very light filler to mix with epoxy. When the mixture hardens, you have something similar in weight to styrofoam. Great stuff for filling low points on a wing.

And flocked cotton is just a bunch of loose cotton fibers, rather like what you'd get if you shaved a couple thousand white rats and then put all the hair in a bag—that's probably what they do. You mix this stuff with epoxy when you want to have a little strength to the goop.

The 'dry' and 'wet' part of the phrases simply means how much epoxy is mixed in. Wet micro is a soupy mixture while dry micro will stand up on its own like cake icing. Same precise engineering standard is used for wet and dry flox.

I was surprised to have a builder ask me a question the other day about something that had long since been covered in a revision. I hope he is the only one, but somehow he had missed out on how our revision list is handled. Because he's an engineer, he thought our drawings followed the standard practice of noting all revisions on the drawings, and that our revision list was just a record of all that.

The way we handle revisions is very non-standard, but with the number of builders we have out there, there is no other way I know of that's practical. Our revision list shows revisions that *you* are expected to note on the drawing, and they are not a history of what we have done. They are extremely important, and every builder should keep up with them.

In fact the other day George Barrett called with a question. Something about a screw in the electrical kit. "Have you checked the revisions, George?"

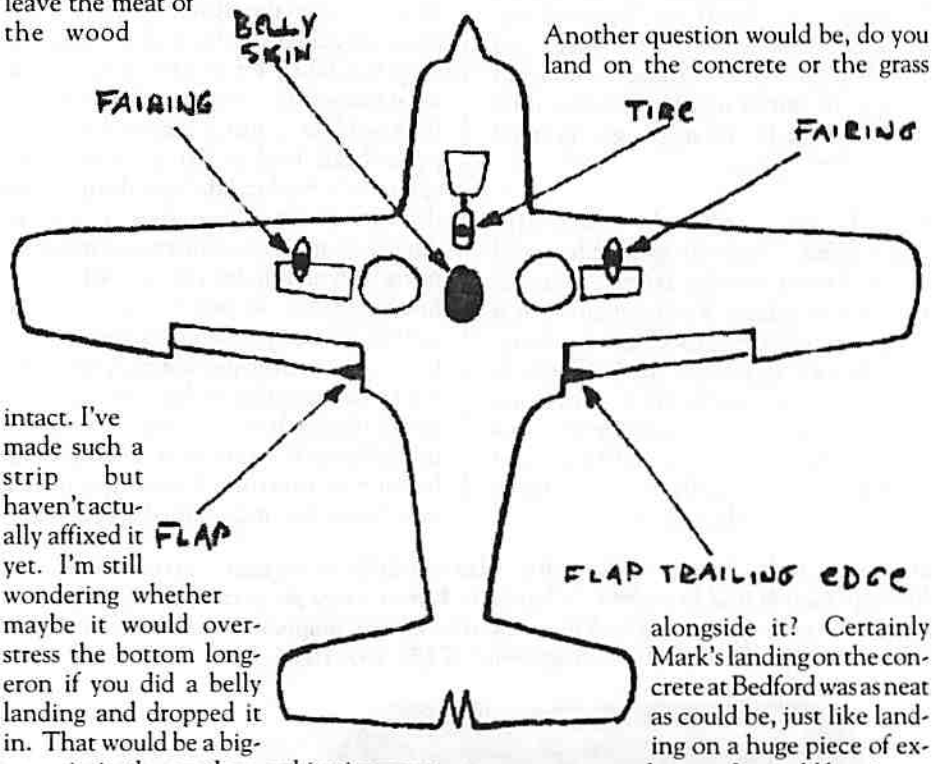
"Oh, yes!" said George, and as I explained the situation I flipped through the revisions and came up with the appropriate entry. George was very embarrassed to have this pointed out to him, and a few days later I received a check from him for $5.00, his self-imposed penalty for asking such a question. Damned if I know what I'm going to do with that check, but so far I'm just enjoying that fact that his checkbook doesn't balance!

—*Alfred Scott*

My Belly

If anyone cares, I think the effects of a gear-up landing can be mitigated by the addition of a 20mm-square oak or hard maple strip, 420mm long, beginning 75mm aft of the rear end of the nosewheel bay and affixed longitudinally to the outside belly skin along the bottom longeron.

The hardwood strip has to be fitted to the slight curve of the belly, of course—it won't bend—and can be tapered somewhat as long as you leave the meat of the wood intact. I've made such a strip but haven't actually affixed it yet. I'm still wondering whether maybe it would overstress the bottom longeron if you did a belly landing and dropped it in. That would be a bigger pain in the ass than reskinning some of the belly.



The diagram appended shows the points of contact of my airplane when Mark belly-landed it—the black areas—and I've tried to make them in scale and proportionate: the nosewheel tire, the belly itself, the tops of the flaps and a small portion of each fairing blister as shown.

It would seem that out of this experience we might develop a procedure for intentional emergency gear-up landings, now that we've had at least two (mine and Jonas's) mechanical problems with the gear itself.

Level the prop, certainly, though I wonder if you can slow the Falco enough to get that to happen. My thought is that extending the flaps fully means you're certainly going to have to repair them and possible splice-repair at least one cracked flap spar, as I did, but that the consequences of saving the flaps by leaving them up are worse. The extended flaps act as outriggers—they're remarkably strong—keeping the airplane erect and supporting it somewhat, saving more extensive damage to the belly and sparing the bottoms of the wings, gear doors, wing tips and—most importantly—those heavy aluminum plates fastened to the wing spar that act as a pivot point for the landing gear retraction mechanism. (In fact, one of mine was smoothly sanded down about a quarter of an inch. Any more and I'd have had to dig into the wing to replace it.)

Another question would be, do you land on the concrete or the grass alongside it? Certainly Mark's landing on the concrete at Bedford was as neat as could be, just like landing on a huge piece of extra-coarse sandpaper. It would be nice to think you could land on dewy-wet grass with a surface like a putting green, and perhaps get away with no damage at all—in such a situation, I'd even leave the flaps up and figure I'd get nothing but grass stains on the belly and wings—but one unexpected rock or stone hidden in the grass could do a lot of damage.

—*Steve Wilkinson*

Sawdust

• The Commies are Coming. Emergency! Emergency! Everyone to get from sky! Tired of hearing your Lycoming engines decried as obsolete technology? Well, the very latest engine to appear on the general aviation scene is just a wee bit *older*. Now that the iron curtain has crumbled, you can buy factory-direct Czechoslovakian Walter engine. They're all thirties-technology 4- and 6-cylinder inline engines that have powered Zlins and a host of other eastern-block airplanes. They won't fit in a Falco but, heck, they're cheap, and they look *purrfect* for fiberglass airplanes.

• Spin-doctoring the learning curve. The first known performance of an eyeball-lomcevak took place at Oshkosh '91, but the only problem of recording this remarkable bit of ocular history was determining who did it first. Ya see, the thing is that about 20 pilots did it all at the same time. They were the airshow pilots getting a safety briefing by Verne Jobst, the EAA director who only the year before nearly killed himself and five women passengers when he wrecked the Foundation's Lockheed L-12. Said Jobst, "As you know I had an accident in the Lockheed last year, but that's okay because nothing but good came out of it." Hey, maybe if he wrecks the B-17, he might get awarded the Collier Trophy.

• The future is... still in the future. This year's Bozo d'Mountbatten Memorial Award for outstanding aviation bozoism has been awarded to FAA Administrator James Busey by SAB, the Society of Aviation Bozos. According to *US Aviator*, when addressing the Aircraft Owners and Pilots Association convention in New Orleans, Busey said it would be at least the year 2010 before the FAA considers wide-scale use of the GPS system.

Sign here, mister. Aviation's wildest bunch is the Reno Air Race gang that gathers each September for a weekend of racing, brawling and drinking. It's the nearest thing to an Evel Kneivel Grand Canyon Jump scene that aviation has to offer—witness this gal getting one of her Dow-Cornings autographed by one of the race pilots. Hmmm. Maybe we need to enter some Falcos in that race.

• CAD canard. There's a series of full-page ads running these days in engineering and computer magazines featuring aviation's own Burt Rutan. It's for a CAD program called Ashlar Vellum, and the ad is too funny for words—if you know what to look for. First there's a picture of Burt holding in mock-seriousness a propeller-head leather flying helmet, but apparently Ashlar didn't get the joke and thought it was a great shot of "one of America's most thought-provoking engineers"—which indeed he is. Ashlar has just finished its second round of venture capital financing, having burned up the first round in over-promoting a very gimmicky program that techno-weenies love and draftsmen hate. In a way, it's a bit odd using Rutan to promote a CAD system, because as everyone knows, Rutan is a very bright guy and a skilled aerodynamicist, but his drafting skills have been the subject of insider-jokes among engineers for years. And Rutan openly admits he uses the program only for layouts and working out geometry and doesn't use the program for finished drawings. At the bottom of the ad, there's an example "engineering drawing courtesy Burt Rutan"—an astonishingly crude drawing of a quarter-scale model airplane. It's called the 'SU-25 Roar', probably a model of a Sukhoi jet, with all straight lines and a tail on the back, scarcely resembling anything Rutan has designed. A bit deceptive on Ashlar's part? Consider this, a jury in Texas recently awarded a mere $250,000,000 in damages for various civil fraud and financial charges against Ashlar president Q. T. Wyles and others for their actions in a previous business, MiniScribe, that went belly-up a few years ago.

Here's the Falco logo in a silver pin. Also available as tie tacs, earrings, cuff links, pendants and bracelets. Thanks to Karen Rives for getting this going. Contact Nancy Conrad, The Village Smith, 1000 Campbell Road, Suite 208-644, Houston, Texas 77055, telephone: (713) 467-7696.

• Falco for sale. Aviamilano Series II. Contact Paul Collins, 7 The Green, Upper Calderote, Biggleswade, Beds SG18 9EX, England or telephone 0767 315708.

• Go for it. Aircraft Spruce & Specialty, with *Flying* magazine and King Schools, is sponsoring the Great Cross Country Flying Race of 1992 from Palm Springs to Chicago for a distance of 1660 miles. There's a $10,000 prize for getting there first, and there's a Corinthian category for single-engine aircraft with 320 cubic inches or less. That's perfect for the Falco and with a ferry tank and balls-to-the-wall engine settings, Karl Hansen or Jim Slaton could be tough to beat.

Goings On at Sequoia Aircraft

The wing rib kits are slowly inching toward completion. Almost all of the spruce pieces are now cut up. The remaining work includes making bending jigs for the capstrips, cutting out the plywood gussets and final preparation of the jigs for gluing. Once all of this is done, the actual process of making the ribs will be very simple and will go very quickly.

At this time, it looks like it will be about one month before we will be able to ship the first of our wing rib kits. In the meantime, just so you don't think I not doing anything, I lined up the boxes of the cut-up spruce pieces and took a picture of them.

We've been forced into another design change. The fuel selector valve that we've been using is the same one used by Mooney, and it's a very good valve. Unfortunately, the manufacturer of the valve has become a problem. It takes a long time to get an answer on price quotes, and delivery is promised in six months—but Mooney reports that they don't even meet their promised delivery schedule and that screws up their production cycle.

We could live with that, but the last price quote was two-and-a-half times our last purchase of only two years ago. I don't mind paying for quality, but the problem here is that we would be faced with paying exhorbitant prices simply because the manufacturer was not producing the parts in quantity. Mooney is switching to a new manufacturer who is making a 'Chinese copy' of the old valve. We talked to them. Nice folks, but their price is three-and-a-half times our last purchase price.

I thrashed about a bit and studied the possiblity of making our own valve, but it ended up that the most sensible thing was to adapt an existing valve. So what we are doing now is using a standard commercial valve and adapting it for our use. It's the same Weatherhead valve that's been used in all of the Glasairs, and it's a well designed valve that uses a Delrin spool. We adapt it for our use by replacing the shaft and putting on our own handle. Somehow the idea of having a valve that worked differently—say Front-Off-Aft instead of our present Off-Front-Aft arrangement—seemed repugnant and potentially dangerous.

This way, it drops right in the panel at the same location, and the handle is exactly the same as before. The only way you can tell if a Falco has this new valve is if you use a mirror to look at the back side of the panel.

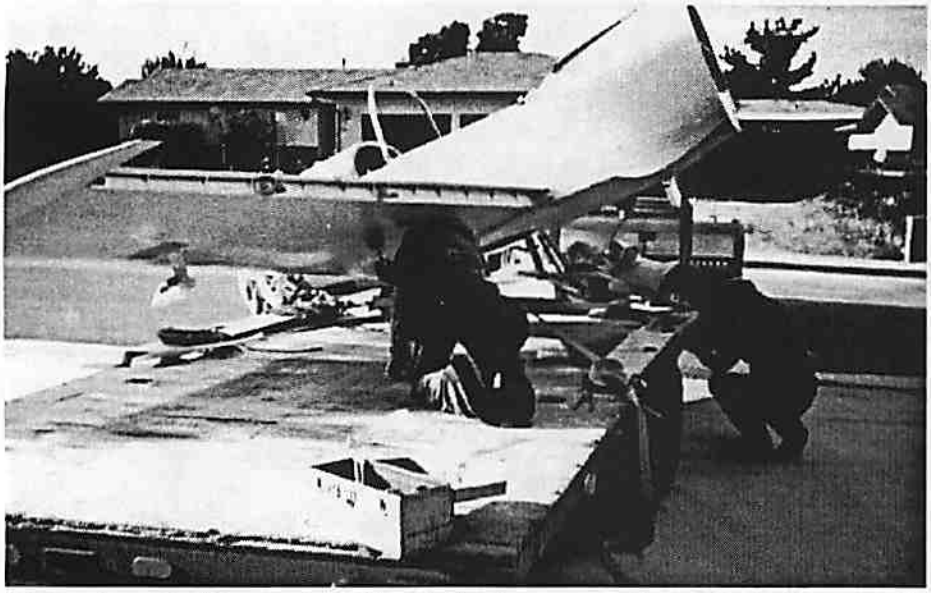
Top: Here are the spruce pieces for the wing ribs for 50 Falcos.
Above: Larry Black's Falco.

One thing that I've been spending quite a bit of time on lately is a project that has to do with how our manuals and drawings are produced. Unfortunately, because of some non-disclosure agreements we've signed with other companies, I can't go into specifics. But I can tell you that, for me at least, some of the most exciting developments in computer graphics have been taking place right at my desk.

There are several problems that are being overcome and all of this will make a dramatic difference in the publications, construction manuals and engineering drawings that we put out. Our drawings have been widely praised for their quality, and I've been unwilling to make the switch to CAD until I could produce a drawing of equal or better quality. That moment is almost here, and I expect to be operating in the 'new age' in a couple of months.

The quality of the drawings is only one of the problems. Another major hurdle has been the inability to completely merge high quality line drawings with text. Our construction manuals are presently assembled by separately printing out line drawings from one program and text from another program, and then pasting the graphics in place with rubber cement.

This makes a minor change to a chapter in the construction manual a major project. A year or so ago, we somehow lost the master sheets for the construction manual, and it took a week for me to



Moving day. You'll recognize Allan Hall, of course, as the one in the foreground.

generate a new set. As of right now, I can print out the same thing in a couple of hours—and all while I'm spending my time working on something else.

This is major stuff, and you can expect dramatic improvements in our manuals and drawings. We will have illustrations in our manuals that will look like photographic reductions of our best ink drawings. You will also see a lot of three-dimensional views—isometric drawings—in the manuals.

One of the things that I've noticed is a surprising increase in the number of questions that I get about various aspects of the construction of the Falco. Some years ago, I sat down and wrote the construction manual section on the tail group, and this also required a complete new set of drawings to illustrate the things I was talking about in the manual. I already had heard all the questions that builders asked, and I knew what was confusing them. So I heavily illustrated the blueprints with the answers to these questions.

When we put out the manual and the new drawings, there was a dramatic, deafening silence. The questions just *stopped.* I think it was three years before anyone asked me a question about the tail group construction.

But lately I've been getting peppered with a whole new set of questions, and the reason is that our builders are increasingly less knowledgeable in the basics of aircraft construction. Our earlier builders knew all about scarfing plywood, but it's all new to many of you. And builders also vary widely in their ability to visualize things in three dimensions.

To accomplish this, we've added some new hardware. I now have the lastest and fastest Macintosh, something called a Quadra with a sixteen-inch color monitor. As a result, I am now a 'gentleman of color.'

We've also added a flatbed scanner and photo-editing software. This allows us to scan photographs, crop them, touch them up and put them in a document. It's a very useful capability, and you can see the results in this newsletter, in which every photograph has been scanned in.

I've started to re-write parts of the electrical kit manual, specifically chapters 6, 7 and 8 are now changed so that each instruction to hook up a wire not only gives the wire number but also the wire color. We've also added some illustrations to chapter 6 to illustrate the little 'package' that you make of the coil suppression diode on the three relays on the right side of the instrument.

There's no point in asking for this unless you are right now in the process of working on that section, because it is likely to be continually changing. It's best to request the latest version only when you are ready to use it.

Many of you have discovered the unbelievable usefulness of using a fax machine to send us your questions. Not only is it a convenience for everyone, there's another unexpected benefit. We keep copies of the faxes. When I'm working on a section of a manual, I can now go through the files and pull out your faxes about things that confused you.—*Alfred Scott*

Brenda's Corner

Over the years I have had my suspicions that my little part of the builder letter was not widely read. Well, the December issue was proof. Not a single person called and asked for one of Alfred's old license plates (I know, you'll have to go back and read the December issue to see what I'm talking about).

I couldn't believe it. I thought they would be gone as soon as the builder letter reached your mailbox. Then the truth hit me like a ton of sitka spruce—they don't read my corner. I'm not trying to make you feel bad, I just want you to know that *I* know!

Falco builder Bob Stout sent us a fax recently saying page 17-3 was missing from his construction manual. We checked the others in stock and found that there had been a printing error. If you purchased your plans in the last six to nine months, check your manual and if you need this page let me know.

In response to "complaints" from a number of builders, in January, we moved P/N 724-2 Bracket and P/N724-3 Guard along with the necessary hardware from Kit 802, Fuselage Equipment to Kit 801-1 Tail Group Equipment. If you have purchased the Tail Group Equipment but not the Fuselage Equipment and would like these parts now the cost is $40.88 plus shipping.

Australian Falco builder Stephen Friend discovered that the Antenna Kit did not have enough copper tape. The amount required is 16.5 feet, and the amount we have been shipping is 13.5 feet. We must have counted only one comm antenna. Anyway, we have additional copper tape in stock if you need it. By the way, we order the copper tape from a stained glass window shop.

You might have noticed that the new price list contains a pretty big jump in the price of the McCauley Governor. They did not warn us of any upcoming price jump until we ordered a governor a few days ago for J. W. Hofler. The acknowledgement they sent back reflected an increase of $200. I called to see what was going on. They said they had been loosing their shirts on the governor, and they decided it was time to do something about it. We're sorry we were not able to give you some notice, but it is beyond our control.

Even though we are not having an exhibit at Oshkosh this year, we do have a block of rooms at the Paper Valley Hotel in Appleton. We would like to release the rooms back to the hotel as soon as possible, so if you would like to stay there, please let me know by June 1.

—*Brenda Avery*

Mailbox

I'm writing in hopes that you may have time to put a notice in the newsletter about the Third West Coast Falco Fly-In. Many things may change but initial plans are for the event to occur at Coeur d' Alene, Idaho, the weekend after Labor Day (September 12 & 13). Pat and I will host, and I will send an info letter early summer. It will be open to all builders, flyers, interested parties, etc. Roughly the same format, very casual, lots of flying, informal bull sessions, hangar flying, initial get-together Friday evening, dinner Saturday night and available tours/non-flying activities. Hope you can make it again, even though the vote was close.

John Harns
St. Maries, Idaho

Gee, I don't know. I had been expecting a formal bull session.—Guaducci

Some time ago I wrote complaining of a malady resulting from the use of Aerodux, and I have to correct that assumption and inform you that it was no such thing. In fact, after some five years of suffering, I have discovered that my 'bugging' was self-inflicted. Happily, I am well again, and I no longer use the hot tap (fawcet) to clean my teeth where no doubt the bugs lurk! You may well ask what the hell has this got to do with the Falco, and the answer is simply that I have made more progress in the last three months than at anytime. I am aligning the flaps and ailerons to the wings, having skinned the leading edges only to discover that I am short on some of the hardware. It is surprising how single-minded one becomes when building.

Sydney G. Clifford
Whitley, Melksham
England

We sold our house so hopefully we will get a house with a garage. (I prefer to call it a hanger, but my wife, for some reason, doesn't.) I am also still trying to find a Falco project which is fairly complete in terms of hardware which someone is unable to finish and wants to sell. I intend to take the endurance record for the longest building time. So far, I am in a good position.

Alan Hantke
Sunnyvale, California

I have now flown my Falco LN-LCA for about a year (100 hours), and I think it is time to sum it all up. There have been no problems with the aircraft or its components except for the fuel tanks, which have been quite a nightmare. I have found approximately 15 pin holes in each of them, but no cracks. The tanks have been out for welding three times during this period. Eventually, I found that I had to test them with fuel in the tanks and then put on a light air pressure. When spraying the seams with white developer from a crack detection system, all the pin holes showed up. A very messy job, but the soapy water method simply doesn't work on those small holes.

I have noted that some builders have problems with the landing gear. I think you should point out loud and clear that the kick test is very important and that the Falco is not a rough field aircraft. The nose wheel must not be rigged above parallel to the aircraft waterline. When talking to fellow builders, I have noticed that very few have a good understanding of the fact that it is the wind pressure on the nose gear that gives the amount of compression on the springs in the retraction screwjacks. This is very important to understand to avoid wrong rigging of the micro-switches and perhaps bent screwjacks.

During my visit to Wroughton this summer, I noticed that the production Falcos had a provision for lubricating the retraction links. I think you should consider this or make bushings in them.

The problem of bottoming screwjacks I think will not happen if the aircraft is built correctly. Put a note to cross-check the measurements of the landing gear attach points into the construction manual. In my opinion, the Falco is very demanding of keeping to the drawings, and this cannot be said too often.

My Falco will be repainted (same color) this winter, and also will have some improvements to the upholstery. I'm looking forward to the next season, but I have to do something to keep up with Jan Waldahl's LN-JAN. He is about to start his engine, and that aircraft is very good looking indeed.

Bjoern Eriksen
Bodoe
Norway

Our earliest fuel tanks, which includes Capt. Eriksen's, were welded with a slightly different inert gas mixture and thus were prone to pin holes. His comment about using the developer of a dye-check system is interesting. Also, as it happens, I just received a sample of a leak sealant which would be perfect for anyone with pin hole problems—see "Constuction Notes".—Scoti

I just got all the graphics for the Falco's military paint scheme—a complete set of lettering and legends—and it occurs to me that some builders might not be aware of the capabilities of current vinyl-letter-cutting technology. With what's available out there, I don't know why anybody bothers to paint N-numbers any more.

I got a whole raft of stuff—small "benzina 100 oct" labels for the gas-cap doors, N-numbers, "fluido di freno DOT 3", "Sperimentale" labels, "Aeronautica Militaire" for the tail, my name in Italian for the cockpit coaming, a pair of big 14-inch-high "SW 47" legends to bracket the Italian roundels, and a bunch of other stuff—and it cost about $180.

The material is the same very thin, sticky-backed 3M vinyl that all the car manufacturers use to apply everything from fake woodgrain on vans to pinstripes on Cadillacs, so it's durable and proven. It ain't gonna blow off.

You can get it from companies that advertise in *Trade-a-Plane*, like Aerographics, but why bother? They're overpriced, and you can get the same thing cheaper, and just as good, from somebody right in your hometown (look under "signs' in the yellow pages; you'll find dozens, if not hundreds). I bought mine from a young couple in a mobile home who'd fallen for the dream of getting rich making signs and had bought the necessary computer, cutter and software. It's just an X-Y plotter with an X-Acto blade in place of the stylus, and the only talent required of the signmaker is being able to spell, type and pick a font.

You can get lettering in just about any font that exists, and in any color. If all you need is a set of two-inch N-numbers, it'll probably cost you about $10.00, and will take about as many minutes. Everything comes out lined up and proportionally spaced, so you apply the legend or N-number as a complete unit, not letter by letter.

A trick for applying these, which I've learned from the sign-cutter: they'll stick permanently the instant they're pressed in place, so what you do is first spray the surface, or the adhesive backs of the letters, with Windex. You can then slide the unit around like a wet decal, get it exactly where you want it, squeegee the Windex out, and it'll stick. The application becomes permanent when the residual Windex evaporates from between letters and paint.

Want to change N-numbers because the DEA is on your trail? Hit 'em with a hairdryer, and they'll soften and can be peeled off, though not reused.

Something else, about which I'd love to get builder opinions via the Builder Letter: How have other builders made the crankcase-breather-into-exhaust-pipe work? I have a 5/8" stainless steel inlet pipe for a breather hose welded into the left tailpipe, entering it right back near the exhaust hanger, i.e. about as far aft on the tailpipe as I can get it. The inlet pipe is four inches long, and that's as long as I really want to make it. I don't think it's a good idea to have a lot of metal cantilevered off the exhaust pipe back there, since I remember one 180-hp builder had trouble with tailpipes breaking off.

However, any kind of breather hose that I clamp onto that inlet pipe melts and burns right off. I even put a four-inch aluminum extension onto the stainless-steel inlet pipe, and the breather hose still burns off. Is there any kind of hose that will resist the heat? What are other builders using. Right now, I've reverted to the normal breather outlet onto the belly and have capped off my stainless-steel exhaust-pipe extension.

Stephan Wilkinson
Cornwall-on-Hudson
New York

Wendell Taylor and Dan Garn had a problem with the right tailpipe on their 180 hp Falco hitting a resonant frequency and vibrating so that the exhaust hangar bracket cracked clear through (Jonas Dovydenas reports his is starting to do the same.) This would leave the exhaust pipe to just lay in the cowling until they found it—amazingly, they never lost the tailpipe, which was not fixed to the ball-joint in any way. They cured the problem by making the right hangar bracket of thicker steel, but this problem was not related to a breather hose since there was none on that tailpipe.—Scoti

Sorry it took so long to get back to you about the info on that gas furnace I used to make steam. The compay is called Gross, Inc, and they're in Glenshaw, Pennsylvania. The model number I have is FP540, and it works great.

I came up with a great way to remove those broken staples. Take a soldering gun and heat up the broken staple. It then removes easily.

I'm starting to skin the ailerons and flaps now. Slow, but I'm making progress.

Al Dubiak
Bartlett, Illinois

Your first Falco (or at least, bits of tail) has made its first low altitude crossing of the Atlantic, albeit at an average speed of 13 knots and strapped into an empty swim-

ming pool on the back end of this yacht. Carried home for the most part in plastic bags from the port of Nice, they are now safely home in the workshop.

Should you ever offer prizes for various categories of workshops, I claim the prize for the most beautiful. Open on one side, it is situated in a terraced olive grove, overlooking a Provencal valley towards a walled Medieval hilltop town. It is surrounded by creepers and vines whilst lizards and birds are frequent visitors. I am also accompanied by our famous jumping, boxing spiders who seem to enjoy joining in the general activity although I am having difficulty training them to hold the other end of a tape measure. All this in the fabulous South of France climate.

I have been lucky enough to have had my first two holidays in two years, so I am very happy with my progress. Workshop was equipped and benches and jig table built in four long days. All the tail, including elevator and rudder structure, are now complete, intending to skin all at one time. No great difficulties so far, just some silly mistakes, all remedied easily thanks to your advice. Skills that I thought I had forgotten soon came back, and I enjoyed the learning of new ones so the boxes were soon being checked off.

It is impossible to convey to you just how happy and thrilled I am to have started at long last and how grateful I am to you for being the cause of it all. The kits are unbelievable masterpieces, so beautifully packaged and labelled that it seems sacrilegious to unpack them. I am particularly impressed with the fact that you seem to have used a special fading ink for the part labels so that, with time, the numbers disappear. This is a marvellous incentive for rapid progress. If you don't install the parts in five weeks, you won't know in the hell what they are or where they go. Typical Sequoia brilliance.

I am also pleased with the way that all the imagined problems of building in France are falling away. Drills and reamers are easily available, aviation-licensed plywood in every thickness, and glue off the shelf thirty minutes away and all sorts of labour-saving tools in the local shops. I particularly like the Black & Decker electric file and the Sandvik metal sanding stick, whilst the adjustable Black & Decker electric stapler is marvellous.

I am also lucky to be five minutes away from an airfield where they maintain, amongst other things, several wooden K6 and K8 gliders that spend about 300 days a year in the open being flown winter and summer. They are in excellent condition in spite of taking a hammering, so I am using the same resorcinol glue and interior wood perservative that they use. (Do *not* ask a Frenchman what sort of preservative he uses in his airplane—you get funny looks; *un preservatif* in French is a condom.)

They will be helping me with skinning, since they have considerable experience. They regard skinning as the easiest thing. They pre-cut, chamfer, fit and bend to shape extremely accurately so that the ply almost holds itself in place whilst gluing. Their K6s almost look like plastic.

Peter Jago
Fayence, France

Englishman Peter Jago is the captain of a 250-foot private yacht whose owner insists on anonymity. He still has a job, so evidently it wasn't Maxwell. Our magic disappearing ink is just a standard ribbon on our dot-matrix printer. I blame it on the spiders.

—Alfred Scott