

Falco Builders Letter



Above: Larry Wohlers and his Falco—now four years old

Around the Falco Patch

John Harns just returned from a month-long trip to Pensacola, Jacksonville, New Orleans, San Diego and then home to St. Maries, Idaho. John logged 43.2 hours on the trip—for approximately 8,200 miles.

The trip was to have started early on April 29, but there was a blizzard that morning, so John and Pat went back to bed. By noon the sky was clear, so they jumped in the Falco and took off and flew to Cheyenne, Wyoming. Next day about 1-1/2 hours out of Cheyenne and IFR, the engine went rough. John had been through this once before with a plugged injector, so he got vectors to the nearest airport, Hayes, Kansas—17 miles away and with a 45 knot quartering headwind on the landing. In 15 minutes the plugged injector was found, cleaned, and they were back in the air. With one stop in Greenville, Mississippi, they flew on to Jacksonville.

John attended the 75th anniversary of Naval Aviation in Pensacola, shooting his first actual GCA in 25 years coming in. The controller asked him to maintain 160 knots—John already had his gear down—until it was established that the

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Goings On at Sequoia Aircraft

The Falco Construction Manual is now done, at least through Chapter 25. It weighed four pounds and five ounces when I finished it—printed on one side only. Although the manual is not finished, all of you should benefit from having it at this stage. The fuselage assembly should be obvious since the key is to do most of the installation ahead of time. There isn't much left to install on the fuselage after the preliminary steps.

It is going to be interesting to see what effect this has on the speed of building the Falco. When we first started selling plans for the Falco, it was not uncommon to have builders take six to nine months to build the tail group, and we used to get a lot of questions. Since putting out the new tail group drawings

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Building a Falco: Part 1

The following article appeared in the April 1986 issue of *Pilot* magazine in England.

Unless I become unspeakably wealthy, it will forever remain my largest impulse purchase: \$50,000 worth of wood, aluminum and avionics with which to create a Sequoia Falco F8L, one of the most sophisticated homebuilt-airplane kits ever to be offered. And me, a first-time homebuilder.

I had never before imagined making my own airplane. A great deal of effort to reach a marginally useful goal, said I, accustomed to flying well-equipped production airplanes that were equal to any task to which I had the skill to put them. Homebuilts are amusingly limited designs built by people who couldn't afford proper airplanes, said I, forgetting that not everybody who flies can be an aviation-magazine editor or writer—in the one case being provided free with every variety of new airplane and in the other being able to tax-deduct flying as a business expense. Takes too much special skill and too many exotic tools, said I, ignoring the workshop with which I had built much of a house and all of a studio.

But I'm a kit junkie. Show me a raw block of spruce and I see firewood. A roll of naked 2024-T3 aluminum is tin waiting to become cans. But open a carton full of zip-locked whifflepads, cut-to-length muffler bearings, carefully tagged decompensator brackets, pre-drilled kanibbling pins and my hands begin to twitch. Insert Tab A in Slot B will be my epitaph.

Kits have been an affliction since childhood. Strombecker solid-pine B-25s as a little boy, balsa Guillow models as I grew older, Dynakit pre-amps and tuners in college, the six-foot-span R/C Stearman that still hangs at the top of a loop from my bedroom ceiling, garden carts, toolsheds, Windsor chairs, Shaker

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Above: Tony Bingelis's Falco

Around the Falco Patch

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Falco was not a jet. John parked the Falco on display with all of the big iron: Corsairs, Harvards, TBMs and Harriers.

After a few days in New Orleans, John and Pat headed west, stopping for lunch with Tony Bingelis in Austin and then on to San Diego. On the way home from Southern California, they shipped their luggage by UPS and loaded their seven-year-old grandson in the back. John had already installed seat belts, so they just plunked the young man down in some pillows and headed for home.

At some barren strip in Nevada, the temperature was 115° on the ground so John only loaded about 35 gallons, but the airplane took off and climbed out with no problems.

John mentioned that his No. 2 com antenna in the wing works relatively well at altitude and not as well on the ground, while the No. 1 com antenna in the tail works well all of the time. The nav antenna works very well, and he can lock on at over 100 nm.

John's next project is to install the wheel

well doors. John has a friend with a Glasair and despite all of the speed claims they found the 160 hp Falco and the 150 hp Glasair had exactly the same speed. The 150 has now been replaced by a 180, so he can pull away from John. The wheel well doors should correct that situation.

With his Falco now one year old, John Harns has put 180 hours on the airplane, and he guesses 30 to 50 of those are hard IFR. John plans to take his Falco to the Arlington, Washington, air show, but won't come to Oshkosh this year.

Tony Bingelis has now sold his Emeraude and is flying the Falco exclusively. Early on in his construction Tony made a bet with a skeptical friend that if his Falco did not do 200 mph he promised to burn his Falco. He put this in writing, but—as Tony is quick to point out—he never said *when* he was going to burn it. Tony is not yet making claims but we have it through the Falco grapevine that Tony is getting 204 mph at 11,000 feet, without the wheel well doors installed.

Tony is not a short man, and he is not comfortable with the headroom under the Nustrini canopy—he told

John Harns that choosing the Nustrini canopy was his one mistake when building the Falco. After flying in Jim DeAngelo's Falco, Steve Wilkinson wrote, "I concluded that anyone who puts a Nustrini canopy on that airplane is crazy, unless they fly solely for fun and on brief trips. It is claustrophobic, has inevitable windscreen distortions and glare from the extreme angle of the plastic, and makes it clear that Mr. Frati was just as good at designing canopies as he was at designing the rest of the airplane. The Nustrini canopy is a total victory of emotion over intellect."

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To which Jim DeAngelo says, “Yeah, but you don't notice those things when you drive a Ferrari.” I don't know that everyone would agree with Steve, but there is no question about the loss of headroom. The Nustrini makes for one sexy-looking-mother, and that's enough for lots of builders.

Jim DeAngelo is now in the process of installing the wheel well doors on his Falco and getting the nose gear to retract all of the way. Jim mentioned that he finds Karl Hansen's speed claims hard to believe. I told Karl about this, and he said his Falco was similar to Jim's in performance until he got the nose gear to retract to fully-horizontal, installed the nose gear door, and installed the hinge fairings on the inboard end of the flap. Karl thinks high pressure air on the bottom of the wing was coming up and hitting the front of the flap spar. He said these three things were like “taking the brakes off”. Before the changes he had trouble getting over 165 knots indicated and after these things he was able to get it up to 180 knots.

Watch the August issue of *AOPA Pilot* for an article on Jim DeAngelo's Falco. One of the editors had just returned from flying the SX-300 and said the Falco has much better handling—the SX-300 by all accounts is very sensitive in pitch.

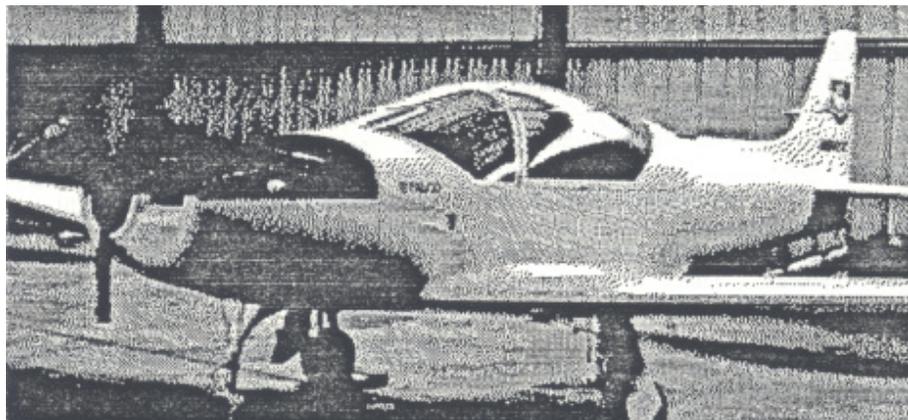
Before the editors from *AOPA Pilot* came up to fly and photograph his Falco, Jim got the nose gear up to where it is within a half-inch or so from being horizontal. Jim installed the nose gear door and made the hinge fairings for the bottom of the wing—glassing over a hunk of wax he carved to the shape shown. After the photo shoot he poured the coals to his Falco to see how

fast he could pass the AOPA's Cessna 210 a half mile or so ahead. Jim said it was surprising how quickly they caught the 210, and they “went screaming by them” indicating 170 knots. That was at 1500 feet and with 28” of manifold pressure. Jim was concentrating on watching the 210, and he thinks he was

still accelerating at 170 knots.

We now have Jim DeAngelo, John Harns, Karl Hansen and possibly Tony Bingelis working on the main landing gear wheel well doors. Those doors are going to be good for 15 and maybe 20 knots. Stay tuned.—*Alfred Scott*

Below: Tony Bingelis's Falco. Tony writes, “The Falco seems just as striking without the 'speed stripes.' The cowling separates along the thrust line—either top or bottom may be removed separately.” Tony's 'Lithuanian Logo' is painted on the tail. Bottom photo was taken in January enroute to Burnet Fly-Out.



Goings On at Sequoia Aircraft

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and after writing the section for the construction manual about building it, we have only had two questions about the tail group—and both of those were from builders that had not studied the new drawings. Jim Slaton was able to build the tail group in about 30 days and reported no problems—his only mistake was that he installed the elevator trim tab upside-down and had to replace it.

Dave Aronson took about 9 months to build the ailerons and flaps and said they were the hardest part of the airplane, a sentiment other builders have echoed. As I write this, Jim Slaton is building his ailerons and flaps from the new drawings and a preliminary copy of the construction manual. We'll see, but Jim and I think it will not take more than 2 weeks. There is progress in Falcoland—CAD-CAM *Falco-Eze!*

It is interesting for me to see the difference in the building progress for the latest builders, many of whom are going through the construction at a rate that seemed impossible two or three years ago. Jim DeAngelo spent four years building his Falco, and he worked his little fanny off to build it as quickly as possible. Builders like Jim Slaton, Richard Clements—and even Steve Wilkinson, who is making no special effort at building quickly—are progressing at a much faster pace than Jim DeAngelo did. It's all in what we now know about building this airplane.

And then there is Richard Brown. He began work on his Falco last July, and his Falco is now in the paint shop. All upholstery and wiring is done. All that remains is to hang the engine, install the propeller and cowlings, hook it up and go fly. Granted, Mr. Brown bought Bret Miley's partially-completed project, but at the pace he worked, Richard Brown figures that saved him 1-1/2 months.

All of these guys—Richard Brown, Jim Slaton, Steve Wilkinson and Richard Clements—are “first-time builders”. So much for the old theory that you had to have previous aircraft construction.

We have been shipping the new construction manual in various stages of completion, and some builders were bothered by the ambiguity of parts of it. The reason is that I was suggesting a method of assembling the wing that had

not been done before, and I felt obligated to explain alternative methods until the method was tried. Now that builders have successfully and happily assembled the wing using my method, I have eliminated all of the wishy-washy discussion. I have also re-worked the section on glues to eliminate any ambiguity.

Revisions! Revision C3q is just a matter of my careful layout and then measuring things wrong. I just wrote down the wrong dimensions. Revision GG56b just corrects the wrong thread. Most of the other revisions have to do with the size of the conduit for the wiring in the wing. The 3/8" O.D. tubing is just not large enough for all of the wires. There are three solutions: use half-inch tubing, use two 3/8" tubing or permanently mount the strobe light wire in the wing and use the conduit only for the nav light and pitot heat wires. I think the half-inch tubing makes the most sense.

Richard Brown
He began work on his Falco last July, and it is now in the paint shop.

I've recently learned a thing or two about grease. I always thought that grease was grease, and that's all you needed to know. Actually, there is more to it than that.

The whole thing started with the problems some of the Falcos were having with the landing gear retraction system, which began to pop circuit breakers when the weather got cold. I cast about in ignorance until one day I called Kas Thomas at *Light Plane Maintenance*. Kas put me in touch with Eric Karnau of Aviation Consumables, whose business is... grease! Here is what I learned:

The ordinary greases that have been used for years are petroleum-based. Like oil, they thicken at cold temperatures until they freeze solid at about -25°F. In the last two decades, Shell and Mobil have developed synthetic greases which are relatively unaffected by temperature. Today, synthetic greases are offered

by Mobil, Shell and others for use on aircraft, in two types: diester-based and synthetic hydrocarbons.

These greases have a wide temperature range, Aeroshell 7 is a diester-based grease that is good for -85°F to 300°F. Unlike petroleum-based greases, these greases do not thicken with temperature changes: Aeroshell 7 has the same consistency at -60°F that it does at 250°F. Mobil 28, a synthetic hydrocarbon, goes even higher.

We will shortly put out some information on the lubrication of the Falco, as part of the maintenance manual. On the original production Falcos, the lubrication schedule was very simple: light weight oil on the elevator trim tab hinge, hydraulic fluid for the brakes and oleos, normal aviation oils for the engine, and grease everywhere else at 50 hour intervals, except for the very active parts of the landing gear which were greased at 25 hour intervals. One advantage of the newer greases is that the short intervals can be changed to 100 hours. There is also the problem that no one is going to want to put grease on his aileron hinges or elevator pushrod—you have to take things apart. Grease is the lubricant of choice, but no one is going to use it.

Here is what Eric Karnau recommends for the Falco: Aeroshell 7 in the landing gear motor gearbox, changed at 500 hour intervals. Aeroshell 17 on the exposed gears and screwjacks of the retraction system at 100 hour intervals, and Mobil 28 on the landing gear grease fittings, wheel bearings, torque links, side load struts, etc. at 100 hour intervals. I would rather keep things very simple and use one grease, but there are good sound reasons for using these greases—and these same greases are used on Mooney, Beech and other aircraft.

The synthetic hydrocarbon Mobil 28 is used on the landing gear since it is more dirt-resistant, and it stands solvents and detergents well—although you should relube the landing gear with grease after washing with high-pressure spray and strong detergents or solvents. Mobil 28 offers outstanding performance over a wide temperature range of -85°F to 400°F and is used in the engine compartments of turbine and turbocharged aircraft. Mobil 28 is red in color and meets MIL-G-81322D.

The diester-based Aeroshell 7 will sit in

a gearbox without oxidation, hardening and won't cake. It is commonly used in gearboxes with lubrication schedules of 500 to 1000 hours. Aeroshell 7 is used in most gyros, autopilots and instruments. Aeroshell 7 is tan in color. Aeroshell 7 meets MIL-G-23827B.

Aeroshell 17 is Aeroshell 7 with 5% molybdenum disulfide—"moly"—for extreme pressure. Moly is a crystalline lubricant like graphite, but moly can also be an abrasive in concentrations above 5%. Moly works best with steel and bronze and is not normally recommended for aluminum. It is used on extreme pressure situations because when a bearing surface is under high stationary pressure, the grease can be squeezed out. The moly provides the first lubrication until the grease film is restored by rotation. Moly does not make the grease any more slippery. Because of the moly, Aeroshell 17 is black. Aeroshell 17 meets MIL-G-21164D.

It is very important that the synthetic hydrocarbon Mobil 28 not be mixed with the diester-based Aeroshell 7 or 17, since the combination forms an acid. When in doubt, remove all previous grease if you don't know what was used before.

For all of the other lightly loaded steel-to-steel, steel-to-bronze and steel-to-aluminum joints of the Falco, Eric Karnau recommends Tri-Flow. Tri-Flow is similar to LPS-2 or WD-40, but it is generally acknowledged by experts to be superior in all respects. In the Falex test for wear and load, it failed at a pressure that was three times higher than WD-40 and 5 times higher than 3-in-1 Oil—Tri-Flow probably contains one of the common extreme-pressure additives. Like WD-40, Tri-Flow is a penetrating and water-displacing oil. Tri-Flow is about the same weight as 20-weight oil, but is mixed with a volatile solvent which allows it to be sprayed in an aerosol, assists in penetrating and quickly evaporates leaving the thicker oil. Tri-Flow has excellent corrosion protection characteristics, and it smells a little like Hoppe's gun oil. Tri-Flow comes in an aerosol can or squeeze bottle, and both have a tiny plastic tube which allows you to put the oil right where you want it.

Tri-Flow contains micron-sized Teflon particles. I had always understood that Teflon engine additives were snake oil remedies—Microlon's Bill Williams

once told me that he rubbed Microlon on the wing of his airplane, and it flew faster. Eric Karnau says that for engines, Teflon additives are snake oil, but for other applications they are not. Teflon particles do not decrease the friction or make the oil any more slippery. As long as oil is present, the bearing surfaces ride on the film of oil. Teflon has value only as a dry lubricant and a powdery residue of Teflon will continue to provide lubrication after the oil has been squeezed out. That's all it does. Teflon just provides a dry lubricant that will be there if the oil goes bye-bye, and that's why putting it in your engine won't make any difference.

Tri-Flow is sold at gunshops, hardware stores and is available from Aviation Consumables. You may purchase the greases mentioned above in 35 lb containers from Mobil and Shell, or you can order smaller quantities from Aviation Consumables which offers lube kits for a number of aircraft. See the F.8L Falco Kit Price List for information on the lube kit for the Falco.

There are a number of changes to the price list. The change to the cowling is because we had not previously counted in the shipping costs. The price change to the electrical kit reflects what has happened to the price of circuit breakers, switches and relays. The price of propellers is the craziest situation I've ever seen. Hartzell has recently raised the prices of their propellers, but as we are an OEM our price stays the same until the end of the year. We have now added a prop for the 180 hp engine and because of the fact that a number of other manufacturers use the prop and because of some crazy—but wonderful!—law our price is incredibly low.

And with a number of builders now planning to use the 180 hp engine, I have been getting a lot of calls that the IO-360-B1E engines are impossible to find. What you have to do is to buy an O-360-A1A or O-360-A1D and have your overhauler convert it to an IO-360-B1E. An overhauler such as High Performance Engines does not want to purchase the core, since if cylinders or the crankshaft needs replacing, they do not want to be held responsible. They will install the sump from an IO-320-B1A and purchase a run-out injector core and overhaul it. It is important that you explain to the overhauler that the engine must have the 45° elbow from an IO-320-B1A installed between

the sump and injector—otherwise the injector will hit the cabin heat valve. Also the longer governor studs are required for the Woodward governor. If in doubt, tell the overhauler to call me.

One long term project that I have been working on is a flight test manual. I don't know if anyone can put down everything that you need to know to do the first flight, but I hope to get a check list down and a suggested order for doing things. Another question is who should do the first flight. I've been working on Richard Brown to persuade him not to fly his Falco for the first time since he is a relatively low-time pilot. As long as everything goes nicely, almost anyone can do it, but you have to assume the worst will happen on the first flight. What if the airplane is so wing-heavy that it needs full aileron just to fly straight and level, and the engine quits on the first flight? It happened to a friend of mine, except that it was three complete engine stoppages. The pilot should be able to handle these things even in a new, unfamiliar airplane.

The other part of the flight test manual will deal with the performance testing of your airplane. It just is not enough to put out performance charts for "the Falco", when that could encompass everything from an airplane like the 170 mph "Corporate Disgrace" to 180 hp Falcos faster than Nustrini's famous plane. I have hired a specialist in this field, Fen Taylor, who has done performance flight testing at a number of companies, most recently at Mooney. Fen is writing the procedure that he uses to develop performance charts for flight manuals. I will then re-hash it until a dummy like me can understand all of the fairly rigorous math involved.

The first few Falco owners who do this will put in more work than those who follow. In time, we should be able to come up with a series of charts for Falcos of various speeds, and then you will only need to fly a few tests and then pick the charts which fit your airplane. We should be able to come up with a computer spreadsheet template so those of you who don't like math can plug in a few numbers and all of the calculations will be done for you.

A message to owners of production Falcos: If the bonded rubber shock mounts for the exhaust pipe need replacing, as mine did recently, the method we use on the kit-built Falco can be adapted and

works well. Details are shown on Sheet A10B. P/N 722-10 is made from .063" stainless—scale the dimensions off the drawing and drill the mounting holes to match what is on your airplane. P/N 722-11 is made from .050" stainless, but these should be made to fit on the airplane. At the exhaust tailpipes, modify the old steel stick into an eye-bolt by cutting it off and welding a ring on top. The P/N 722-11 straps must be made and bent to match what you have in the airplane, so you would be smart to first make them of thin scraps of aluminum until you worked out the length.

To install the cross-over system, as René Sterchi is now doing, you must have the oil cooler installed somewhere other than where the round bee-hive cooler was originally installed at bottom-front of the engine. Then, the method shown on A10B can be used and the P/N 722-11 straps must be made and bent to match what you have in the airplane.

As all owners should know, the tire used on the production Falco is an aircraft version of the 4.00x8 tire used on boat trailers and luggage carts at airports. The tire is now called 4.00/4.80x8 and will have a car-tire-like tread. Some brands are smaller than others and you must make sure that the tires have clearance with the wheel well walls, since they will grow with use and can cause the gear to be jammed up.

And for your nose gear, I understand the tire is getting impossible to find. The tire is essentially a 4.00x4 tire, and I suspect that some of the commercial 4 ply tires might work. A few suggestions to try: The Goodyear 4.10x4 tires have a 4 ply rating and can be purchased from Aircraft Spruce and Specialty. The 10x3.50x4 McCreary tire is made for tailwheels—ply ratings unknown—and is carried by Aircraft Spruce and Specialty. Keep your eyes open, and you will be amazed at what turns up. I remember being with Per Brüel with his Falco in Denmark in 1982. Dr. Brüel was saying that they could not find tires for his Falco, yet I was able to point out that his hangar door rolled on 4.10x4 tires while a dolly in his hangar had 4.00/4.80x8 tires! If you find anything that works, please let me know and we'll put something in the newsletter.

If all else fails, you can convert to the nose wheel and tire that we now use. Our nose gear fork is made to the same dimensions as the production Falcos,

except for 5/16" bolts at the top, and 1.00"Ø and 1.125"Ø holes in place of 25Ø and 28Ø for the axle. Thus it appears the fork can be reamed to fit our axle. For this conversion, you will need the following parts from Sequoia Aircraft: P/N 614 axle (1 @ \$19.98), P/N 615 axle nut (1 @ \$12.76), P/N 670 spacers (2 @ \$6.79 each), P/N 666 wheel (1 @ \$80.00). The tire and tube are the 6-ply-rating Lamb 11.4x5 tire and tube which can be ordered direct from Lamb Tire (see Falco Kit Price List) or Aircraft Spruce and Specialty.

I was paddling our canoe among the boats which dock in the creek next to our farm and noticing the colorful names given to boats. It's a shame we don't do the same things with airplanes—they would take on a personality of their own. If we can't reform all of aviation, then why not just tend to our own flock? Everyone uses "The Corporate Disgrace" rather than "N304SF", my old Messerschmitt was "Herr Kröta" which is Mr. Toad in poor German. If you agree, then let's give these birds some names that fit, so we can talk about something other than Jim's Falco, John's Falco, Karl's Falco, etc. Let's also agree that there should be no duplication — "Dago Red" and "Millenium Falco" are taken. Use your imagination: "Italian Stallion," "Birch Bitch," "Wood Chips," "Signor Rospo," "Spruce Moose" "Klondike Kludge", but not...—*Alfred Scott*

Construction Notes

In the last builders letter, I discussed a number of problems with the grease fittings which we supplied with the first production run of main landing gear fittings. Nobody could get a grease gun on the fittings since they are too close to the flange. A number of builders have discovered needle adapters. These things are designed for greasing those impossible-to-reach places such as universal joints. The end of the needle adapter is small enough so that it will fit inside the tiny hole on the end of the grease fitting.

Needle adapters are available at auto parts stores. Aviation Consumables sells its P/N 504 Needle Adapter With Locking Sleeve for \$4.60 and P/N 506 Economy Needle Adapter for \$1.35. Eric Karnau says he prefers the Economy Adapter.

John Harns mentioned that when he did the annual inspection on his Falco, he found a very small, hairline crack in the weld for the flange on the nose gear axle. It wasn't serious or dangerous, but it is something for other Falco owners to look for on inspections.

In discussing his plugged injector nozzle, John mentioned that the little tube from the spider had a very fine wire in it and didn't understand what it was for. I had never heard of such a thing, but I called Neil Hall, my favorite aircraft mechanic, who said that the wire is not supposed to be in there and is probably the reason the injector was plugged. Neil also pointed out that the size and length of the tubes is important. Lycoming cuts all of the tubes to the same length so that they will have the same friction and thus an even distribution of fuel to each cylinder—the wire will certainly not help. A recent Lycoming service letter warns against using primer lines for the injector. They are the same O.D. but different I.D., and the service letter tells you how to check this.

John Harns also mentioned that he had a problem with the lower wing skin where it glues to the fuselage skin. He did not install a spruce gluing strip as shown on Sheet B2, and just cut the plywood to the angle and glued it in place. He only had a problem in front of the front wing spar. On inspection, he found a slight blister in the fabric so he pulled off the fabric and found that the plywood had come un-glued. He re-glued the skin and then covered the joint with several layers of fiberglass cloth. Particularly at the forward end, the skin needs some additional support since it hits the fuselage skin at about 30°. If you use epoxy, you can reinforce the joint with epoxy and cotton flox on the inside.

Builders using Aerolite and Penacolite have sometimes asked about the dangers of using glues containing formaldehyde. I have not been aware of any problems, although builders have to be careful with Aerolite's formic acid which will irritate the skin. Because urea-formaldehyde adhesives are used so widely—chipboard, underlayment and some plywoods are made with urea-formaldehyde—the National Cancer Institute released an epidemiological study in March which concludes that low-level exposures of formaldehyde do not appear to increase the cancer risks in humans.

The study was conducted over a four-year

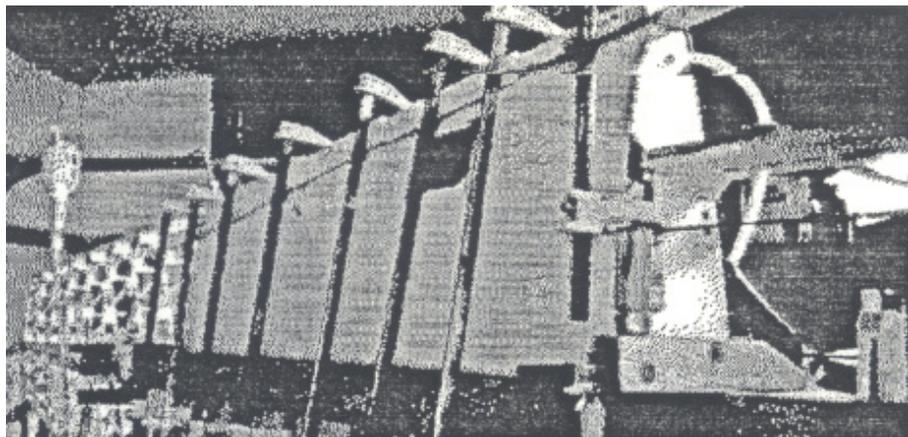
period at a cost of \$1.2 million. It traced the medical histories of 26,561 workers employed at 10 industrial facilities that produce or use formaldehyde, involving more than 600,000 man-years.

Formaldehyde, or HCHO, is a simple compound consisting of carbon, hydrogen and oxygen that is produced naturally by all plants, animals and humans. About nine billion pounds of formaldehyde are manufactured annually in the U.S. for a wide assortment of applications ranging from embalming fluid to permanent-press clothing to particleboard production. It is estimated that products containing formaldehyde or one of its derivatives account for 8 percent of the U.S. gross national product.

While it has long been known that formaldehyde vapor is an irritant to eyes, nose and throat, within the last decade the government has stepped up its risk assessment efforts to determine if it should be regulated as a carcinogen, and last May the EPA added formaldehyde to its list of "probable human carcinogens." This was based on a study in which rats developed nasal cancer when bombarded with formaldehyde over extended periods. For more information, see the April 1986 issue of *Wood & Wood Products*.

Terry Smith skinned the wing using the procedure spelled out in the new construction manual; that is, with the wing vertical and skinning both the bottom and top of a section of the wing before moving outboard to the next section. He used Karl Hansen's method of gluing the scrap piece of 20x20 pine to the plywood, but Terry said he found that bar clamps worked better than the rubber straps. After the bottom skin was glued in place, Terry clamped a two-by-four along the spar with Jorgensen clamps to give him something to clamp to. When he got to the wing tip, this method wouldn't work, so he had to build a little scaffold of board and clamps. Terry said the clamps pulled the plywood around the leading edge beautifully—the only way to go, he says. He says it is important that you position the 20x20 piece of pine within about half an inch of the bend or the plywood will pucker up and pull away.

As you will see, the new drawings for the fuselage frames show a number of mounting points for the Christen separator, breather tee, brake reservoir, etc.



Above: Terry Smith's method of clamping the wing skin.

on frame No. 1, and master relay, starter relay, altitude encoder, etc. on frame No. 6. If you have already closed up the frame and don't have the blocking installed, the best method is to use 3/4" dowels and a hole-saw of the same size. Cut a hole on the aft face only and glue in a dowel so that it is flush with the plywood and glue a round patch over that. Then drill through the whole sheebang for your installation bolts.

As most of you know, I take a very conservative view of epoxy glues, although it appears that an epoxy-built Falco has no greater probability of glue failure than any of the fiberglass airplanes. I am coming to the conclusion that if you are going to use epoxy, the West System is probably the best choice. I am very impressed with this company. One of the things that I am impressed with is the testing that the company has done. So far most of the testing has been on moisture protection and fatigue. Jan Gougeon, who is in charge of their testing, has just begun some work on the higher temperature performance.

While Jan is not yet ready to put out the kind of temperature performance specifications that I would like, we do know from tests run by others that West System epoxies outperform T-88 and FPL-16A, but not by any wide margin. Gougeon's current testing is for creep at 95°F and near-ultimate loads. All of the flexible epoxies exhibit some creep, but the harder West System epoxies do not. Jan actually agrees with my recommendations regarding epoxies, agreeing that it is difficult to recommend epoxies with their temperature performance being inferior to other proven glues. At the same time, neither of us are afraid of epoxy-built airplanes as long as they are painted white.

The Gougeon Brothers Co. has recently developed a new high-strength, high-density filler. They make a lot of wind turbine blades and the blades are fastened at the hub with steel "carrot studs", which are shaped like a carrot and glued into a matching hole. They have used asbestos as a high-strength gap-filler, but have been working on developing a replacement because of the health hazards of asbestos. The new filler is proprietary, but it is a talc-like powder which you mix with the epoxy.

The West System epoxies are a 100%-solids system. Thinners are added to get the epoxy to penetrate the wood fibers and still retain superior moisture protection, and these thinners become part of the chemical reaction and harden with the epoxy. They do not evaporate off like MEK or lacquer thinner; in fact, the use of such thinners has a disastrous effect on the moisture protection of the West System. Jan says they are working on improving the temperature performance of their epoxies, but it's a tough nut to crack. Every time they do all of the things to improve the temperature performance, other things start to go wrong which detract from the performance of the glue.

Richard Clements is using an epoxy called Bondmaster M666, which has been used on a lot of Steen Skybolt wings. Bondmaster M666 is made by National Starch & Chemical. I have called for technical information. The company's data sheet claims an aluminum lap shear test result of 2,000 psi at -67°F, 2,500 psi at 77°F, 400 psi at 180°F and "not recommended" at 260°F. If true, this would be substantially better performance than T-88, but you should always conduct your own tests. (Spruce has a shear strength of 990 psi parallel to the grain at 15% moisture content.)

—Alfred Scott

Building a Falco

Continued from First Page

furniture... the smart marketer could charge me extra for a kit product that sells for less fully assembled.

So it was with the Falco. One glimpse of the million dollars worth of parts stacked on shelves and catalogued in bins in the Sequoia Aircraft warehouse in Richmond, Virginia, and my lips began to go dry. A look at the blueprints Sequoia President Alfred P. Scott so casually spread before me—just a taste of the 125-odd sheets and hundreds upon hundreds pages of detail drawings—and it all came flooding back. Stop me before I assemble again.

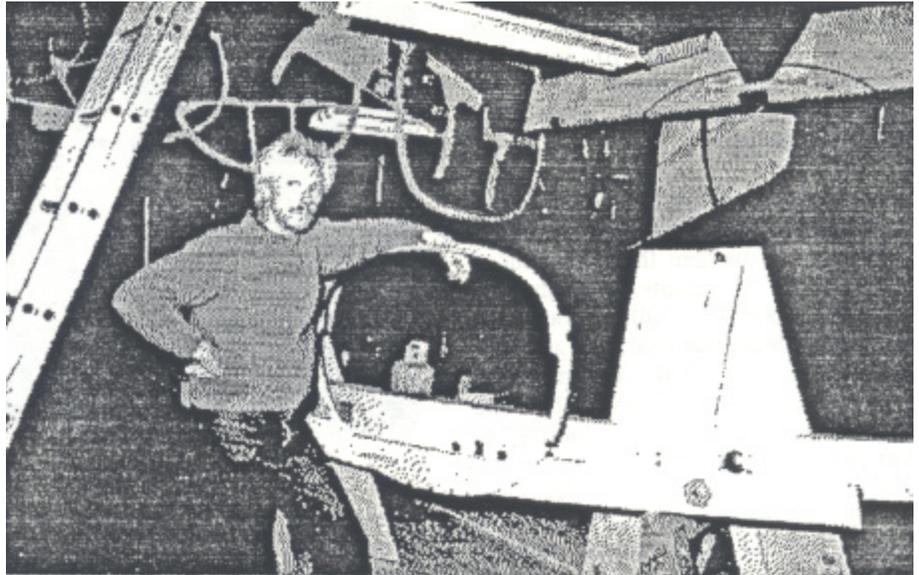
Too late. My Christmas gift from my wife in 1984 was permission to begin construction of one Falco. Either the cheapest or most expensive gift she'd ever give me.

The Challenge

The Falco has an undeserved reputation for being hideously complex—a project only the most experienced homebuilder should tackle. That would indeed be true of a totally plans-built Falco, for the airplane is an all-wood amalgam of curves and tapers. You'd spend hours building a wing-rib jig, and it would suffice for two ribs—one station on each wing. Next jig.

Ten thousand hours of skilled labor, craftsmanship and machining should suffice to convert one tall Sitka spruce, a grove of Finnish birch and a pile of aluminum extrusions into a flying Falco totally faithful to Sequoia's detailed plans. Sequoia Aircraft, however, has designed a series of kits that turn the Falco into not homebuilding but home assembling. Ribs. Brackets. Grease nipples. Cut-to-length and color-coded wires. Formers, longerons, washers, pins, post lights, instruments. A completed assembled, laminated, glued and tapered main spar that is alone the price of a used car but worth it.

There are three varieties of kits that go into a Falco: wooden parts, metal and hardware components, and ancillary pieces such as the exhaust system, radio antennas and instruments. The wood kits are all made by a large, gentle, slow-talking Wisconsinian named Francis Dahلمان, whose name will appear with mine on the airplane's data plate when it is complete. For me to say that I alone



Above: Steve Wilkinson in the Falco-berthing stall of his barn.

built the Falco would be to value the contribution of a craftsman as less worthy than the doggedness of an assembler.

The hardware kits are supplied by Sequoia itself, which has subcontractors produce finely machined brackets, hinges, cables and controls in cost-efficient batches of fifty or more; and accessories come from suppliers with whom Sequoia has struck deals. Every nut, bolt and piece of hardware is separated into hundreds upon hundreds of satisfyingly small, neatly labeled envelopes.

More important, the time to build an all-kits Falco is down to somewhere between a fifth and a tenth of what it would take to make one from scratch. Estimates vary: Sequoia claims an easy 1,500 hours, maybe 1,200 or less for a really well-organized builder with plenty of equipment and experience. Two thousand hours should cover even the most inept. The current record is a Falco built from kits in one month less than two years, accomplished by a wealthy father-son team with a well-stocked workshop amid the warmth of California.

But who cares? Perhaps the people who buy a book because it's a fast read—something that can be wolfed down during a single airline flight. But what do they know about the joy of actually reading, savoring structure and finely polished phrases? Perhaps the people who buy plastic homebuilts because it's said you can pour them out of a bottle and be airborne 400 hours later. But what do they know of the ruminative pleasure of sanding spruce to a cheeky

smoothness, or glorifying in a glueline as thin and tight as a silk thread?

No, for me, the Falco would quickly become a novel that I'd finish reluctantly, a vacation from trivial concerns that I'd end with regret.

Or—no pun—would it?

Cutting Wood

Falco builders go to school on the tail section, assuming they get past the stage of studying the fascinating plans trying to imagine how they could ever possibly build anything so large and complex. The tail is a microcosm of all the airframe construction, with spars to drill, hinges and brackets to carefully align and mount, jigs to make, spruce to glue, sheets of thin plywood to bend and clamp. It also costs little more than \$2,000 for all the necessary kits, which can fool you into thinking this \$50,000 airplane is going to be a bargain. (Admittedly, I'd also spent another \$1,000 on plans, small special tools, glue, jiggling table and other items before settling to work on the tail.)

The tail taught me that even cardboard-thin plywood doesn't bend against the external grain, no matter how long you soak it in the bathtub. That the choreography of gluing is a dance that moves quickly to an inevitable finale of thickening glue, sticky fingers and misplaced clamps. That ribs butt-glued against a spar break off with shocking ease while the assembly remains unskinned.

Sequoia's Alfred Scott, the man who

refined this 1950s classic for the '80s, is nonetheless a conservative when it comes to glue. The recommended glue with which to build a Falco is resorcinol, a traditional water-resistant woodworking glue of tremendous strength and durability that requires perfect mixing, warm temperatures and finely matched surfaces. Second choice—my first—is something called Aerolite, a glue classic enough to have been used by de Havilland in Mosquitos and considerably less demanding of technique. Aerolite is a fine white powder that could easily be used to cut cocaine, thus gluing shut the nostrils of an entire generation of addicts. It is mixed with water to make a stable paste that quickly hardens in the presence of a weak formic acid mixture: the glop goes on one surface, the acid is brushed on the other, and they are quickly mated and clamped or stapled.

The least desirable glue, according to Scott, is the epoxy that other homebuilders have come to depend upon. Powerful and user-friendly as they are at normal temperatures, epoxies have the strength of library paste when it gets hot. Use epoxy and you've no choice but to paint your airplane white lest the sun soften the glue, warns Scott, and what good is a Falco painted the same color as all the other flying appliances in U.S. skies? On the other hand, Scott admits that no matter what the shear-strength tests say, there has never been an epoxy failure in a homebuilt.

The traditional way to test aircraft glue—the purists do it every time they mix a new patch—is to glue together three small blocks of maple, the center one staggered about half an inch higher than the two that sandwich it. When the glue has set, you perch the assembly on a solid surface and pound the protruding block with a sledge. The result should be a break in the wood rather than the glue, the theory being that any glue stronger than maple will certainly suffice for soft spruce.

Gluing together a wooden airplane, which seems at first a simple process—mix and apply, clamp and dry—is actually fraught with opportunity for error. Assuming a metal structure is properly engineered in the first place, the rivets that hold it together generally make apparent their faults if misapplied. They rattle or move if loose, look squashed or asymmetrical if misplaced. But short of a joint that falls apart in your hands, the only way you can prove the integrity of

a glued wood structure is by testing it to something approaching destruction to conclusively prove its integrity, since the bond can cover a considerable range of effectiveness depending on technique, temperature and numerous other factors. Sticking together three cigarette-pack-sized blocks of hardwood is one thing; wrestling a cardtable-size sheet of skinning plywood into submission is another.

The pieces are bonded, that's obvious; there's the thin line of glue between them, here's some hardened exudate, the structure can be handled without collapsing... but was the clamping pressure hard enough? Too hard, perhaps, squeezing the glue from between the pieces? Did you get the assembly clamped quickly enough, or had the glue already set? Did the wood stay sufficiently wet with the formic acid catalyst during your fumbings, or were some forever-hidden areas too dry to spark hardening of the glue?

And if that isn't worrisome enough, much of a Falco's airy internal structure is delicate no matter how well glued until given the strength of its skin. Before learning this, I snapped ribs off elevator and stabilizer spars with terrifying abandon while sanding the structure, and even my small daughter was smart enough to say I'd never get her up in something held together with glue.

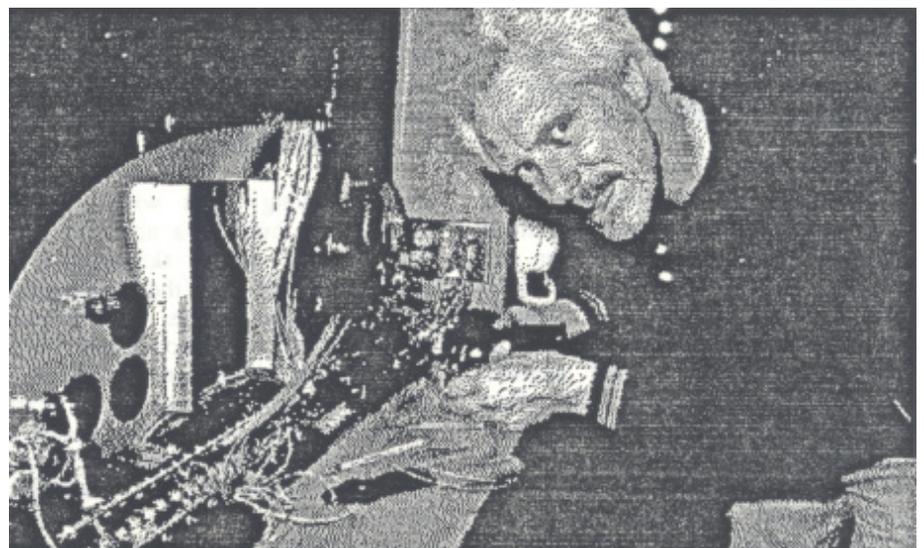
One of the delights of building a Falco, however, is the airplane's clubbish, intensely personal builder-support network. It consists of virtually every Falco-builder in the world plus Alfred Scott, in Richmond, Virginia, who is

instantly accessible any hour of the day or evening except for the times when his secretary says, "He's on the telephone shouting at Chile, Mr. Wilkinson. The Chilean Air Force is just about to fly their Falco." (Scott's illustrated and extensive quarterly 'builder letter' ranks as one of the better aviation magazines in the U.S.).

Scott soothed my fears and explained the massive strength of each box-section or monocoque component of the airplane and how vastly it multiplied the strength of the tiny area of glue holding the end grain of a single rib to a spar. John Oliver, a builder who knew his chemistry from years at Du Pont, sent a letter with gluing advice. Somebody else mailed a Xerox of the detailed Aerolite-use instructions I'd been unable to acquire through Ciba-Geigy, whose marketing department seemed unaware that they held the patent on a World War II glue.

I forged ahead with somewhat more confidence and soon had the tail finished. By mid-summer, the empennage sat temporarily assembled on a pair of sawhorses, and I was able to demonstrate The Miracle of Trim-Tab Movement by pushing and pulling on the end of a long Bowden cable that would eventually lead to the cockpit. My Falco investment stood at \$4,256.62—parts, plans, books, cable and wiring to electrify the barn... everything. (Like every homebuilder in the world, I'd assiduously logged my building time daily for about a month, then gave it up as a bore. I continued to count the dollars, however.)

Below: Top Gun—Brook says her daddy turns surly when he solders.



Spar Session

By taking a perverse pride in doing things alone the hard way that could be done in a trice by two working together, I assigned myself the job of fetching the main spar when the call finally came that it had arrived from Dahlman's shop in Wisconsin. It is one piece, of course, tapering to fine points thirteen feet in each direction from a central box the size of a railroad tie.

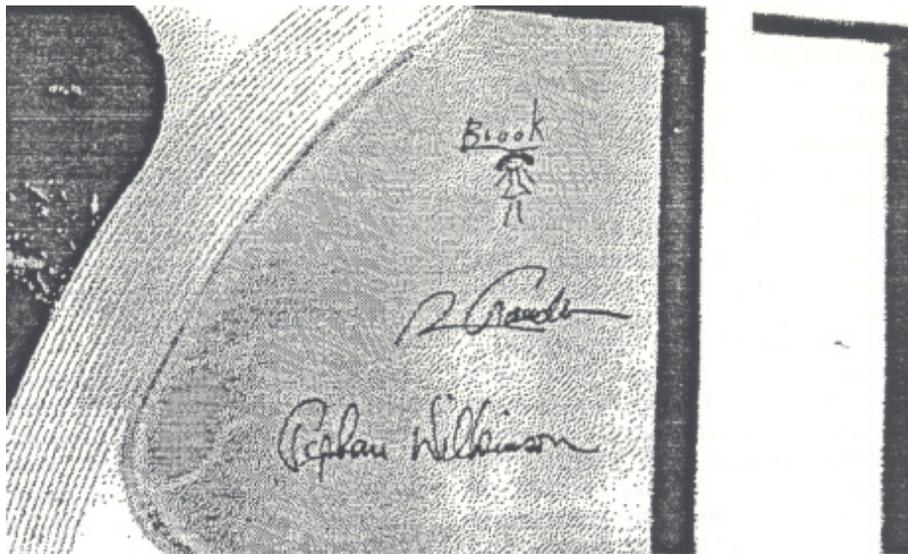
Other homebuilders have bandsaws and winches, engine stands and airplane jacks. I have none of them, but I do have a dead-serious 1967 Chevrolet four-wheel-drive pickup that makes today's little trucks look as though they should be wearing lingerie. With a beefy pipe rack erected atop the bed, the truck was ready for the transfer from shipping-company warehouse to barn, and after some serious prying, lugging, lifting and sliding, the 400-pound dihedral box that held not only the main spar but secondary spars and all the wing ribs was home. It cost me an endless, 20-mph trip during which I was entirely conscious of the \$4,475 value of the box cantilevered up over the cab and well out ahead of the front bumper.

Worse, however, was submitting the spar to a drill press to bore the boltholes for the main landing-gear trunnions. Faultless Francis Dahlman's placement of the two arm-sized holes through which the gear-mount beams would pivot were inexplicably off by about five millimeters, it seemed. I measured, remeasured, checked again, started over. Still off. Locating the main-gear fixtures is a relatively complex process of establishing a dead-centerline, laying out horizontal references, establishing angles and swinging arcs. Opportunities for error—mine as well as Dahlman's—abounded.

The hell with it. Let's drill. We can always shorten one wingtip. That's the nice thing about wood, isn't it? Isn't it?

The Right Stuff

As winter fell upon the Hudson River Valley, I shifted the Falco shop from unheated barn to cluttered cellar and built the Falco's ailerons and flaps. Some say they are the most difficult part of the airplane to make properly, in large part because as the stations progress outward along the aileron/flap spar, each rib is sanded and set against it at a microscopically greater angle, to create a trailing edge that gently washes upward some thirteen millimeters between flap root



Above: Steve, Susan and Brook sign each part before closing and aileron tip.

Sequoia's Scott persists in giving blue-print measurements in cases such as this in tenths of a millimeter. Some Falco builders construct complex jigs and clamping devices to achieve and maintain such exacting standards. I try, but clamping and gluing large pieces is like wrestling with a walrus: they are heavy and smooth, and it's difficult to get a grip on them. I content myself with knowing that the shape of the airplane will change by gross fractions of an inch as it absorbs heat and moisture on a humid summer day.

It is both remarkable and infuriating that Scott, who can see the entire construction of a Falco in his mind's eye, has himself never built one. He sometimes recommends assembly procedures that for me, at least, are interesting in principle but utterly impractical. To properly bend and clamp down the uncooperative leading-edge skin of a flap or aileron while the unit is held securely in the recommended jig, for example, requires either drilling large holes through the workbench or using specially constructed aluminum band clamps. Other builders can do it. I am too impatient.

Ten feet long (each wing's control surfaces are built as a unit and sawn apart only after skinning), the flap/aileron units were the largest pieces the cellar could handle. The frequent transfer of delicate spruce structure from cellar jiggling table around the oil burner and up the narrow stairs to the warm kitchen for good glue-curing became an infuriating journey—clamps clanking against obstructions, the paper-thin trailing-edge

strip becoming increasingly dented—and I needed a more manageable component to carry me through the rest of the winter.

It would be the electrical system and instrument panel, a \$5,700 leap of commitment. No longer could I convert the airplane into firewood if I became discouraged.

Wood is nice, but hardware—parts—is better. Wood is sticks, furniture. Hardware is instruments and bellcranks, pulleys and panels and lots of other airplane-looking things. When visitors see a carefully wrought aileron or disembodied tailfin, they're amused. "Oh, you're just starting," they say, which is almost as condescending as that other inevitable comment, "Is it an ultralight?" But let them see an instrument panel leaning casually against a living room wall, and they know you're a big-time operator. (As soon as my panel blank arrived from Sequoia, in fact, I stuck an old Comanche manifold-pressure gauge into it, so there'd be no mistake.)

The Falco's electrical system is a relatively complex one. Nothing unconventional, but the wiring harness is designed to run a complete IFR avionics kit, an excessive variety of indicator lights and upscale toys such as a combined four-cylinder CHT/EGT, an electronic outside air temperature indicator and an alternator fault analyzer. (Mine, however, will have a steam-powered OAT, and the alternator will have to be content with being either broke or not broke.) The harness consists of hundreds of tiny wires, many of them passing through three large multiple-pin-and-socket re-

ceptacles on the back of the instrument panel, disconnection of which supposedly means the instrument panel can be removed as a unit.

The electrical kit arrived in a coffin-size cardboard box with its own builder's manual and set of blueprints. It included everything from finger-thick battery cable to grain-of-wheat lightbulbs, transistors to microswitches. And miles of slick, expensive, Teflon-insulated wire, all of it cut roughly to length and color-coded. Yellow wires with red, gray and violet striping. Yellow wires with red, blue and violet striping. With brown, gray and violet striping. With every combination, it seemed, of nine colors and half a dozen thicknesses.

I had soon created a trio of basic harnesses and carted the heaviest of them off to a nearby truck garage so they could crimp terminals to the main power-circuit wires. (It's often a help to be able to say, "It's for a small Italian aerobic airplane that I'm building." Specialized merchants who might otherwise ignore you drop everything to help, unless they are sophisticated about product-liability implications, in which case they throw you out of their shop. The ideal tire for a Falco's mainwheels is made by Goodyear for boat trailers, for example. "Do not say that you want it for an aircraft, or you will never get a tire," the Falco builder's manual warns.)

One of the pleasures—and dangers—of commitment to a project of such magnitude as an entire airplane is that as outrageous expenditures become necessary, moderate expenses become insignificant. The \$80 tool is bought as though it were a K-Mart screwdriver. Furniture-quality wood is converted to sawdust with abandon. And I barely

winned when the tiny white amperage numerals on my instrument panel's fifteen push-to-reset circuit breakers cost \$1 a piece. Because of the panel's design, the breakers must be positioned upside-down—a condition of which the breakers are entirely unaware, but it does result in their power-rating numerals standing on their heads. The builder's manual advises sanding the numerals off and restoring them right-side-up with tiny press-type transfers: \$10 a sheet at a Manhattan art supply store, plus \$5 for a can of spray fixative.

As the ganglia grew behind the instrument panel and the warehousing of semi-finished airframe components spread from barn to attic to dining room, I for the first time imagined flying the mechanism that I was creating. That violated by own overly cool approach to the project. "Oh, I don't care about flying the thing," I had been telling people, "It's the building that matters; I've already got a perfectly good airplane to fly."

"Aerolite is a fine white powder that could easily be used to cut cocaine, thus gluing shut the nostrils of an entire generation of addicts."

It also formented dark thoughts, and occasionally I had to switch off mental images of the very first kit-built Falco every to be completed. It was a stunning, glass-smooth little airplane completed

less than two years ago by a middle-aged Minnesota executive who only months later died amid its bloody splinters in Gainesville, Florida, apparently having run out of fuel during a night-time instrument approach. Automobiles and airplanes carry with them a certain cargo of danger. To walk into a showroom and buy a vehicle can certainly turn out to have been a momentary deal with the devil, but to have spent years lovingly assembling the instrument of one's mortality would be a dreadful indignity.

No Turning Back

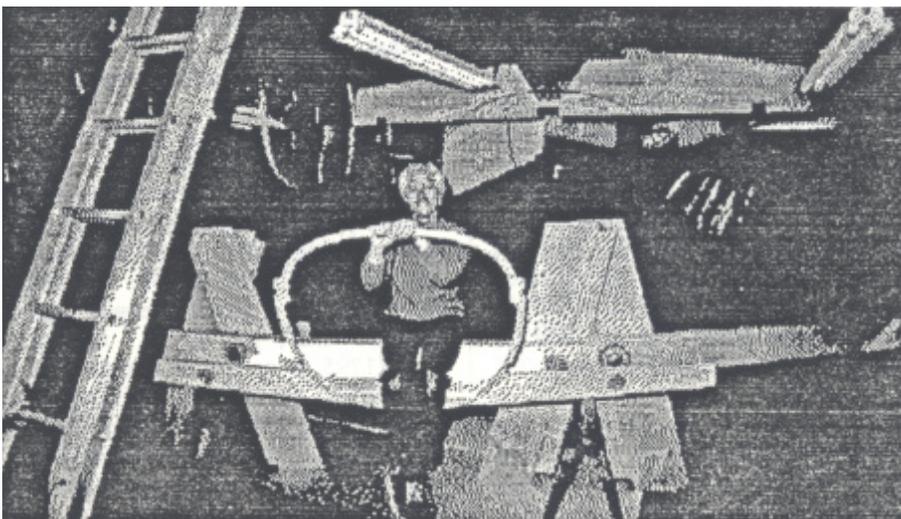
What more pleasant lessons have I learned from all this? That there's no turning back now, for one thing. I'm \$19,510.81 into this thing, and the tail can no longer be turned into a coffee table. Ownership of a Whelan strobe-light system that I blithely bought for as much as our entire stereo cost means the trellis of spruce to carry it must eventually be completed. Possession of \$9,150.59 worth of Dahlman-crafted spruce and Wicks Aircraft birch plywood sheets would supply our two woodstoves for... oh, maybe two days. Soon there will be an engine sitting in a corner of the barn to hurry me along as well.

I think I've also discovered the two ingredients necessary to make building an airplane a pleasure. One is that unless you desperately need an excuse to get out of the house, build it at home, no matter what sacrifices that requires. It allows you the option of spending fifteen minutes gluing a couple of ribs or dawn to dusk wrestling with a Medusa's-head of avionics wiring. It also provides easy access to all those things that can suddenly become a desperate necessity yet exist in few hangars: a kitchen knife, a roll of waxed paper, two dining room chairs, a stray length of 2x4, a plastic-coated playing card just the right thickness for a shim... for the casual homebuilder, tools are where you find them.

The other necessity is an open-ended schedule. You need an airplane to fly? Go buy or rent one. It'll probably be cheaper in the end anyway. When people ask me when I will finish the Falco, I tell them that my daughter has been penciled in to make the first flight, and since she's six now, that gives me a good ten years.

And finally, I've learned I can still get a rise out of my wife. All I need to do is tell her that I'm thinking of building a Swearingen SX-300 next.

—Stephan Wilkinson



Brenda's Corner

The time for our annual trip to Oshkosh is almost here. As in the past two years, I will be driving a van to bring the Falco exhibit. If any of you would like for me to bring a kit order, I will be happy to do it—as long as it's not for something like the canopy frame! Please give me a couple of weeks notice so I will have time to get everything organized.

I reserved several extra rooms at the Paper Valley Hotel in Appleton. If any of you are interested in staying there, we can probably accommodate you any night except for August 1. Just let me know if you are interested.

As you know, the builders dinner will be at 8:00 Tuesday night, August 5, at Martini's Restaurant at the Midway Motor Lodge in Appleton, and our private bar will open at 7:30 for early arrivals. I hope all of you who come to Oshkosh will be able to attend the dinner. It is a very informal affair, and your family is very welcome. Transportation is always a problem for the people staying at Oshkosh without a car. If you can help us out, please stop by the Falco booth and let me know. The same things applies if you need a ride. We will get you there, just make us aware that you need a ride.

The new wing drawings went out around the first of May. If you were supposed to get them and did not, let me know. Also, I had some extra prints of Karl Hansen's Falco made, so if any of you have decided you have to have one, we do have a couple left. If there are any left, we will bring them to Oshkosh, but they won't last long!

With the exception of some miscellaneous hardware, all backorders have been filled. We have had some problems with the company from which we used to order all of our hardware. We have just placed a big order with another company, so we should be able to get those nuts and bolts to you soon. Alfred has made a few changes in the hardware on a couple of kits. We will let you know what has been added and will get those new parts out shortly. Please notify me if you have something on backorder other than hardware, and I will get it out to you immediately.

If there is anything I can do to assist you, please let me know. See you at Oshkosh!—Brenda Avery



Tool Talk

“One accessory that I am finding increasingly invaluable is my miter box. By “miter box” I don't mean one of those maple racks with sawcuts in it that will locate a saw at 45° and 90° angles to the piece of wood, or a hardware-store item that is used with an ordinary backsaw, but a high-quality European metal miter box with its own dedicated saw and a dead-accurate swivel that will locate the saw at any of an infinite number of angles between 45° and 90°.

“I use mine constantly, and not just for mitering. They're terrific for cutting standard corner blocks, splendid for making odd-angled corner blocks like the ones where the spars meet the wingtip bows and just fine for making ordinary right-angle cutoffs—for one thing because the saw makes an absolutely square, perfect cut and for another because it's thinner and finer than any backsaw—it's sort of like a hacksaw for wood—and it goes through spruce like a hot wire through foam-core, to use perhaps your least favorite image. I never make a cutoff without using the miter box any more: it's safer than firing up the table saw and easier and more precise than putting a pencil-marked piece in a wood vise and hacking away with a backsaw.

“These miter boxes are almost invariably made either by the West German Ulmia or the Swedish Nobex companies and appear in virtually every fine-tool catalogue for anywhere from \$90 to \$150. Oddly enough, the usually overpriced Garrett Wade (161 6th Avenue, New York, NY 10013, 800 221-2942) has a good price right now (\$99.75 for the medium-size Nobex), but The Fine Tool Shops (20 Backus Avenue, Danbury, CT 06810, 800 243-1037) sells the same tool for \$89.75, which is the lowest price I've seen.

“Second verse: D. G. Products, the company that makes those Perma-Grit carbide sanding tools you recently recommended, has just come out with flexible 2" x 11" x .008"-thick steel flats with tungsten carbide grit brazed to them in

120 and 60 grit flavors. I haven't tried these units, but their regular tools are wonderful. They remove wood faster than any file or sandpaper of equivalent roughness, and these new units sound like they'd be perfect for indestructible, virtually permanent float-sanding units, especially ganged together end-to-end to create a 22" sanding surface that wouldn't be prone to the kind of torn edges and ripped corners that seem to afflict paper-faced float-sanding sticks. D. G. Products, Box 292443, Dayton, Ohio 45429. PXT-103 is the tool in 120 grit, FXT-104 is 60 grit. They retail for \$6.95 each, though they may still be available at the introductory price of \$4.95 each, two for \$7.90 plus \$1 per order postage and handling.”—Steve Wilkinson

For soaking the plywood for the leading edge bend—it is neither necessary nor desirable to soak the entire piece—most builders make a trough with lumber and plastic film. Steve Wilkinson found a neat alternative in the wallpaper department of his local hardware store. For soaking wallpaper, they sell plastic troughs that are about 6" wide, 6" deep and the length of a roll of wallpaper. Steve bought a couple of these dirt-cheap things, cut one end off each and epoxied them together.

Richard Clements reports that every Falco builder should have a Black & Decker Dustbuster—if only to keep your co-head of household happy.

By now, every Falco builder should know about brad point bits. I don't know that you need them, but now a company is offering 10" long brad point bits. Catalogue No. 71886 is a set of 5 bits, 3/16"-1/2" for \$24.99. Catalogue No. 71746 is a regular length 7-piece set, 1/8"-1/2", for \$9.99. Catalogue No. 71795 is a regular length 4-piece set, 5/8"-1", for \$29.99. DRI Industries Work Shops, One Work-Shops Center, Box 28114, Warrensville Heights, OH 44128. (800) 372-5282 or (216) 831-0283 in Ohio.

—Alfred Scott

Sawdust

- It's a girl. Congratulations to Jim and Anita DeAngelo for Jamie Marie DeAngelo, a lovely 6 lb. 7-1/2 oz. young lady who was born on May 6 at the civilized hour of 1:46 PM. Mother and daughter are doing fine. The father is recovering as well as can be expected.

- The annual Wright Memorial Trophy is awarded each year to the ten most significant homebuilt aircraft at the Dayton Air Fair. One hundred and fifty randomly-selected EAA chapters vote on the airplane types. This year the Falco came in third in the voting. Karl Hansen will attend and accept his trophy. The show is on July 24, as always the weekend before Oshkosh. Eight out of the ten chosen are made of steel tubing, wood or aluminum, and only one was a Tupperware Sternwheeler.

- Fox 51's Frank Strickler is working on the EAA to provide a parking area for Falcos and SF.260's. Please contact us just prior to Oshkosh for instructions.

- A California company has announced the Falco 500. "The spectacular productivity machine. You're looking at a model that's about to reshape your image of a computer terminal. Sure, it's got eye-catching looks. But more than that, it combines some of the most dazzling specs you've ever seen." Wonder where they got the name? Even the type face used in the

ads is similar to what we use. Falco Data Products, 1294 Hammerwood Avenue, Sunnyvale, California 94089, (408) 745-7123 or (800) 835-8765. "The Falco 500. We think you're going to admire its body. But we know you're going to fall in love with its mind."

- Stelio Frati's Jet Squalus is expected to fly in June and make its debut at Farnborough '86. Fox 51's Frank Strickler reports that Rockwell International has signed a design and production contract for the aircraft. This is not public knowledge yet, but Frank says he has seen the signed contract and has held it in his hand. With the Fairchild T-46 trainer now cancelled and Cessna proposing to fix up the T-37, Rockwell apparently hopes to go after the USAF business—and there are lots of other countries that can use a trainer.

- There are now two SF.260 formation airshow teams in the U.S. "Team America" consists of Frank Sanders, Chuck Lischer, Barney Register and Errol Johnstad. Scheduled performances are June 15 & 16 at Redding, CA, June 21 & 22 at Truckee, CA, June 28 & 29 at Huron, SD, August 7 or 8 at Oshkosh, WI, August 16 & 17 at Moffitt, CA, August 19 & 20 at Rancho Murrietta, CA, August 9 & 10 at Detroit, MI, August 23 & 24 at Billings, MT, September 20 & 21 at Shearwater, Nova Scotia and October 4 & 5 at Salinas, CA. The "Redhawks" are a three aircraft team of Harry Shepard, Bob Gandt and Carl

Pascorell. Opening airshow is June 28 & 29 at Wilkesbarre, PA.

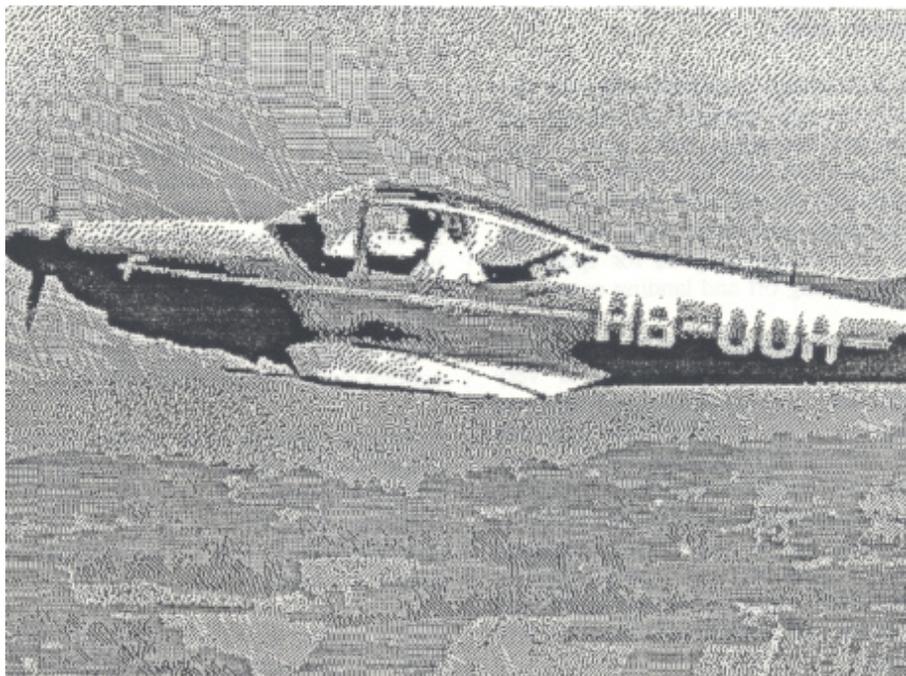
- Sequoia Aircraft and Fox 51 announce the first annual Frati's Finest Fly-Off—a balls-to-the-wall race between a Falco and an SF.260, to be held during the Oshkosh air show. Karl Hansen will take on an SF.260 this year. It should be a close race—best guess is that the SF.260 will have a slight edge, unless Karl gets all of the gear doors installed.

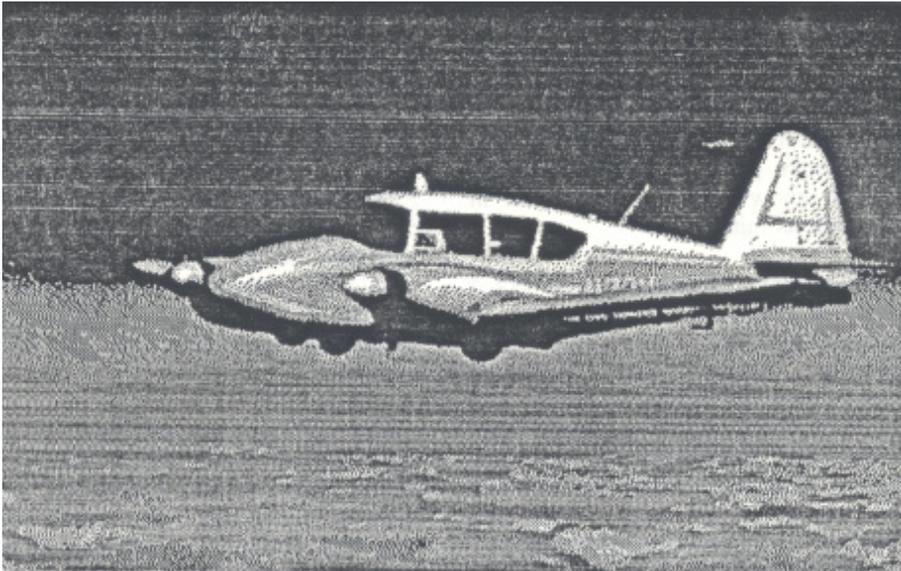
- Start making your plans now for the Great Oyster Fly-In and Gathering of Stelio Frati Aircraft which will take place on November 1 this year. Even with bad weather the Urbanna Oyster Festival drew about 40,000 people last year. Rosegill Farm Airstrip has been relatively inactive this spring to allow peace and quiet for a pair of nesting Bald Eagles, but the two baby eagles have now flown so things are back to normal.

- Wanna see your Falco on the silver screen? We've had a request from an independent movie producer that makes aviation films for some of the major companies. They are making a movie called "Flight of the Tiger", about an old combat pilot who imports a tiger in his Helio Courier and who is building a homebuilt airplane in his hangar. Shooting will be in September, near Spartanburg, South Carolina. They prefer a Falco that has not yet been skinned but may accept a partially skinned one. What they are looking for is a prop that is obviously an airplane under construction, and they believe an unskinned airplane would be a more interesting prop for the movie. Rental is negotiable, but expect \$300 to \$400 per day for about 5 days of shooting. The studio will cover all moving costs and will be responsible for any damage. Contact Sequoia Aircraft or Bob Davis, Artistic Director, Film Inc., 914 Wynnewood Road, Suite 2N, Pelham, N.Y. 10803. Telephone: (914) 738-6674. Include a photo of the Falco project.

- The annual International Frati Association Dinner—the "Falco Builders Dinner" until we teamed up with owners of SF.260s and other Frati aircraft—will take place at Martini's Restaurant at the Midway Motor Lodge in Appleton, Wisconsin on Tuesday, August 5 at 8:00. Our private bar will open at 7:30 for early arrivals. Please, please, *please*, let Brenda Avery know how many to expect.

Below: René Sterchi is his all-red Falco over Switzerland.





Above: Tightest Falco formation flight—see below

Mailbox

I thought you would like to see a picture of the tightest Falco formation anyone has ever captured on film. The left engine with some imagination is pulling N212SF while the right is Steve Bachnak's. Two months ago I finally located and purchased the Apache—a very late one with O-320-B3B's—and after getting two multi-engine ratings (one for my instructor and one for me, the airplane will now be dismantled. Also got a full panel of almost-new late-style flight and engine instruments along with a new King ADF and good to excellent Narco nav-coms (with glide slope) and transponder. Add enough post lights to light two panels and many other goodies like relays, fittings, and other miscellaneous things, the deal really added up to a cost effective purchase.

Work on my Falco has slowed down while I worked on the Apache to keep it running through the multi-engine training effort.

*Gar Williams
Naperville, Illinois*

An interesting idea. Falco builders looking for foam for wing fillets might consider dismantling a Vari-Eze or Glasair. If you need a good lubricant, you could dismantle a Prescott Pusher for genuine—CAD-CAM!—snake oil squeezings.

Luciano Nustrini sent us a copy of the following letter to Karl and Steve Hansen, along with a note that he is now flying ZK-RNA under New Zealand regis-

tration. He said "Keeping in touch with other Falco owners is a great pleasure to me." Luciano Nustrini is planning to stop by at our offices around July 10th for a visit.—Alfred Scott

Dear Karl and Son,
Your Falco is fantastic, and I am sure when you will complete the cleaning up it will fly faster than ERNA.

Congratulations. According to what you are doing, I think the nose gear door is much more important than the complete retraction of the wheel—I think your Falco will be very good for speed. Better yet is the complete coverage of main gears, but I suggest you proceed step by step, so you will have the record in percent of the improvements.

For pure speed, I covered with very thin fabric the gap between the aileron and flaps with the wing, and I glued a tape in there such that the stream of air is completely closed from the bottom part to the upper part of the wing. However, this last solution is good for speed but not for taking off and landing speed.

One other important consideration is the smoothness of the airfoil: it is very important. Twelve years ago I removed from the wing of ERNA the materials and applied microballoons over it, and with very accurate templates I made a perfect surface in respect to the airfoil. I am sure it is the most important improvement that you could make to your Falco. I am sure your Falco will fly faster than ERNA, and I will be very happy.

Now I live in New Zealand, a very quiet

country, but for ERNA it's too quiet. Here there aren't any races and my house is 50 km from the airport, therefore I fly rarely, but when I do fly ERNA with my wife, I like to leave ERNA in full speed close to the ground or the sea, or to do some *capriole* into the air like a crazy dart.

I did not give you many suggestions, because your Falco is already very clean and beautiful. Congratulations again. I enjoy having correspondence with all other Falco owners, especially if the Falco is as beautiful as yours.

*Luciano Nustrini
186b Woodlands Park Road
Titirangi, Auckland 7
New Zealand*

Have horizontal and vertical tail structure built. Plan to have all structure aft of fuselage frame No. 8 built by late summer.

*James Quinlan
Marlton, New Jersey*

I constructed a 14 by 40 foot workshop in 1984 to assemble the Falco. In 1985 I had open heart surgery (valve job). When I have fully recuperated I will be continuing on with the assembly of the Falco.

*Frank Leahy
Peterborough, Canada*

Thanks a lot for the new drawings, which arrived today. I honest to heaven don't know how you do it all, unless you're twins. So far I haven't had a chance to study the new drawings, but a cursory scan makes me think they are just what the doctor ordered.

Of course, I wouldn't write this hasty note just to present kudos—so here comes the sour grapes—wouldn't you know it?! If you are trying to confuse the troops with the number system on those new small drawings, you've succeeded, as far as one soldier at this outpost is concerned. Example, Sheet EE5 showed P/N 503 axle, while Sheet EE5A shows P/N 520-6A vertical drive shaft. Several of these small sheets contain similar "powerful" revisions.

Strangely enough the above system doesn't bother me any—I can *still* find what I'm looking for—and there is little occasion for me to refer to these drawings—especially if I have the actual part in my hand.

That's a good looking brogan on Sheet A2! I recognized it immediately as be-

longing to my old first sergeant.

*Alan Hall
Vista, California*

Perhaps I should have enclosed a word of explanation about some of the new drawings. In the past, many builders have found it difficult to have to flip back and forth for details. The new drawings consolidate the details—thus the details for the axle can now be found on the drawing for the landing gear arm. One way of eliminating a drawing is to “write over” it with a new one.

The object that I am working toward is to turn the E, F, and G series into a reference section for you kit builders so that you can spend all of your time working on a particular series of drawings. From a designer's standpoint, it's convenient to have the engine installation and Lord mount installation shown as a detail on the engine mount drawing, but a lot of builders don't find it. Thus, I will move that detail to one of the A-series drawings at some time in the future.

—Alfred Scott

Metal parts about 85% complete. Since retirement in June '85, I hoped to have more time—in addition to the above I've almost completed my wood shop and will start on all wood components soon. More enthusiastic all the time and although I've enjoyed every minute of my time so far, there are occasions when I wish I could afford the kits so I could get into the air sooner. Keep up the excellent work—it is much appreciated by all concerned, I'm sure.

*William E. Roerig
Kaukauna, Wisconsin*

Maybe I jumped too soon, but I don't think so. I planned to return to the states in late '85, however my company asked me to stay another 2 to 2-1/2 years—that will take me to 1988. I'm still going to build my Falco.

*John Case
Le Havre Cedex
France*

I would like to commend you on the quality of your newsletter. I think it's great. I am looking forward to seeing the new wing drawings as I am getting close to assembly of the wing. I'm enjoying the project very much. After having discovered how much work building any airplane is, I'm glad I had the good taste to choose a thing of beauty instead of settling for a lesser machine.

*Rick Fitzwater
Van Nuys, California*

Enclosed is my check for the large “Fastest Falco” photo. It will be framed and hung up at the office so everyone can see what I'm building and provide incentive to me to get to work, or back to work as the case may be.

At this time all vertical fin and rudder ribs built and boxed. Horizontal stabilizer and elevator ribs built. Many small sheet steel parts cut out and filed to shape. It's slow, tedious work, but interesting and fun. I have learned a great deal about woodwork and sheet metal work since I started. It's gluing temperature again, so back to work for now.

*Richard Dickerson
Ft. Worth, Texas*

Please find enclosed my cheque for the colour picture that appeared in *Flying* magazine. The Falco looked magnificent in spite of the badly registered printing.

Progress with my Falco project is proceeding much faster than I anticipated. I am sure this is due to the easy-to-understand plans and very helpful manual. Since starting on January 1st, 1986, I have completed making the wooden tailplane components, cut all of the aluminium brackets to size, turned all of the bronze bushes and during this last week I have been drawing the fuselage rings in preparation of the jigs.

The Pound is beginning to move in the right direction to the Dollar, long may this continue.

*Stuart John Gane
Northleach
England*

Below: Joel Shankle—the sign on the barn says, “This is Falco country, completion date 2000.”



All ribs are completed and all spars but main wing and stabilizer spars. I have finished the fuselage jigs. I will be doing those as soon as the weather warms up a little more. My metal work is in good shape. I hope to start assembly in the spring of '87, as I may have to relocate, and I don't know at this time where. I may be coming down to North Carolina as the shop I worked at closed—well, so much for that.

Keep up the good work. The newsletters are just great.

*Carvian Brumfield
Massillon, Ohio*

Not much progress to report on my project, so I'm consoling myself with thoughts of how much time it would have taken me to build all those pieces for the tail group.

*William Slaughter
Webster, Texas*

I wish the newsletter would be monthly!

*Jim Kennedy
Archbold, Ohio*

Slow so far, but tail group nearly complete. Things should speed-up from now on. Old drawings were the best I had seen, but the new ones are even better. Wing next—then fuselage, to fit in with new drawings.

*Keith Morris
Powys, Wales*

I got an oxygen bottle for the trip (one leg at 15,000) so I thought I'd test the service ceiling—19,000 in 31 minutes. I kept the climb at 95 kts and still had 2-300 fpm, and 16” manifold pressure. I could only get 120 kts IAS for about 160 kts true.

In terms of best TAS, it seems 11,000 is optimum altitude for cruise. Finally got the EGT working, with complete new system, and it appears I've probably been running too rich on cross-countries. Will let you know specifics after trip.

I have had a problem with intermittent glide slope since installation and after much playing by dealer finally installed a new Nav set—end of problem. I have not installed the new wheel well doors because of time limits—so I lose 5 to 10 knots on the trip.

I'll put a placard on the bird for static display and only charge you 10% on new orders.

*John Harns
St. Maries, Idaho*

Congratulations—you did a fine job in reworking the landing gear and wing rib drawings—if I had such when I was going at it I dare say I would have saved several months building time on those items alone.

Finally had my propeller problems solved after two prop shop trips and a governor overhaul. All the problem was—was a wrong high pitch stop. The prop shop put in a too-long sleeve. Jordan Propeller in San Antonio spotted it immediately—a shorter sleeve and my problem evaporated after 25 plus hours flying around at low manifold settings and high rpms.

My figures approximate those I've been reading about but since my gauges are not yet calibrated I choose not to be making any special claims. So far the only annoyance is the sparse head room—I keep banging my head on the canopy if rough air. Getting this thing slowed down for gear extension is a long drawn out process—especially if you are letting down.

I haven't been on any long trips—weather too bad, and I've been too busy. I just turned in the manuscript for my third book, *Sportplane Construction Techniques*. It will make its debut at Oshkosh '86. Now, maybe, I'll be able to relax a bit.

All I meant to say was I am very pleased to see the remarkable detailing in your newly revised plans.

*Tony Bingelis
Austin, Texas*

I had my Falco at Stockton for their fly-in last weekend. I took it down because the



Above: John Shipler of Huntington Beach, California, and his two-car garage in which he is building his Falco. It's a tight fit, in fact, the Falco will not fit entirely into the shop.

4 SF.260's were there. I had the Falco parked between a couple of them. I had several people say it was the prettiest airplane there. It looked really good alongside the SF. 260s—like a race horse with a couple of others. Before I took it down, the guy that invited me to the fly-in said the SF.260's might want to race. I was talking to one of the drivers, and he said they got 175 KIAS at sea level. When I told him I was seeing 180 KIAS at 2500', I never heard any more chat about a race. Allowing for some discrepancies in airspeed, I believe the Falco is at least in the ballpark with 100 hp less.

I had an interesting return from Stockton. I taxied to the runup area and a Bonanza taxied in front of me and took off. A temporary feeling of irritation. I ran up, took off and cruised at 4500', 157 kts indicated and 23"/2200. With the density altitude about 7,500', true

airspeed by my calculation was about 202 mph. I detoured around Lake Folsom to come into the controlled airspace from the southeast and landed at Lincoln. Turning off the runway I heard a call on the downwind leg, and there was the Bonanza. I wasn't racing, but I have to admit he finally made my day.

I haven't really run checks at all power settings and airspeeds. It's hard to be detailing an airplane and have it flyable. It looks like I've picked up 15-18 kts on the top end, and the 157 kt cruise would be about 7 kts over what I was getting at that setting. The CHT is up some, about two-thirds up in the green on cruise and three-quarters on climb. Oil temperature is about up to one-third to one-half of the green—a bit on the cool side but better than too hot. All in all, it's running fine.

*Karl Hansen
Roseville, California*