Falco Builders Letter

Neville Langrick's Falco is now flying in England.

First Flight: Neville Langrick

Alfred Scott threatened not to put out the June Builders Letter until G-BYLL had flown. I can't give the usual "first reactions" because as yet I have not flown in it. The first flight was carried out by "Jacko" Jackson, the CFI at Sherburn Aero Club, Leeds, Yorkshire on the 7th of June, making it the sixteenth Sequoia Falco to fly.

The flight was uneventful and lasted twenty minutes with the undercarriage down. It flew left wing low and requires some trimming. Jacko flew it again two days later, but the weather was too rough and bumpy to carry out any serious test flying. The undercarriage was retracted and a couple of low passes were managed, showing the Falco in its most impressive form.

The only problem we encountered was that the overrun on the motor was insufficient to take the spring fully into compression and the last 2-1/2 turns had to be done manually. We anticipate difficulty in setting the down limit switch any finer

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Goings On at Sequoia Aircraft

We've had a spate of problems with nylon fittings in the brake system. Jim Shaw mentioned that he was taxiing his Falco one day, hit the brakes and suddenly he lost both brakes. He was on a long runway so it was not a problem. He had a nylon union fitting installed in each brake line, and the nylon tubes just pushed out of the fittings. He put the tubes back in and tightened things down.

Then in early May, Irek Mikolajczyk was landing Pawel Kwiecinski's Falco on a grass strip and one of the brakes failed. The strip was short and there was a steep drop at the end of the runway, so Irek

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Tony Bingelis has done some work on his Falco in the quest for greater speed. He already had a nose gear door installed, so he added the two clamshell nose gear bay doors. He said it was essential to put a stop on each door or one of the doors would close too far.

When he finally had the doors working properly, he flew the airplane and found that the speed of the plane did not change at all, nor did the CHT increase. Tony says he is not sure if he gave the doors a fair test and may try them again, but for now they are off the plane. This is strange, because covering that large an opening should have some effect on the speed of the plane, and in all other cases it has.

Tony had more success with the cowling air inlets. Tony made his own cowling and the inlets are, I would guess, about two-thirds the size of the kit-supplied cowling. The cylinder head temperatures usually run about 300-305° at cruise and the oil temperature is steady at 180°.

Tony closed up the air inlets by 1-1/8" on the top. He made a foam piece which he sanded to shape and then taped in place with duct tape. This made a noticeable increase in speed—something like 5-7 mph and the cylinder head temperatures increased to 320-325°. That's about what he wanted to accomplish, but on a cross-country flight, Tony watched in dismay as the oil temperature began a steady climb to 200°. Because of this, Tony made a precautionary landing and removed the foam insert. The oil temperatures were back to 180° for the rest of the trip.

Tony has the oil cooler mounted on the aft end of the left rear engine baffle, and we install it on the left front baffle. It is generally thought that you get better cooling at the left front. Some think this is because the air is heated as it passes over the cylinders—who knows. For us, I think the front is the best place, since

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Neville Langrick

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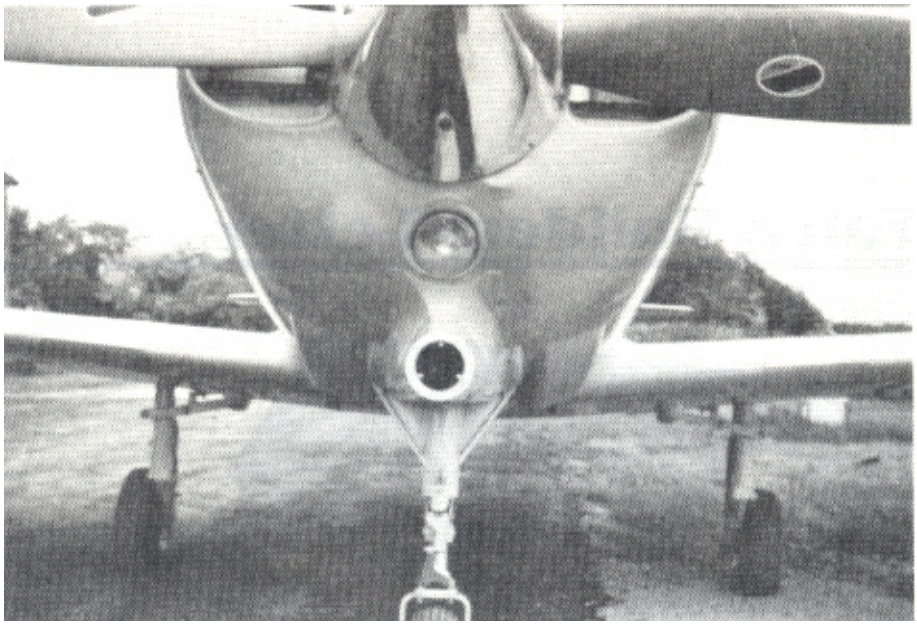
to overcome this. (*Neville is mistaken. There's no need for full compression of the spring.—Alfred Scott*)

Jacko will continue with test flying which in the UK is a minimum of five hours before application can be made for the Permit to Fly which our CAA grants to homebuilders. You may be interested to know that this prohibits IFR flight and therefore UK homebuilders are more restricted than Americans. Our homebuilt procedure is also slightly different in that we must have an approved Popular Flying Association inspector carry out inspections at about sixteen stages of the project with the completion of log books required.

The story of G-BYLL began about 14 years ago when a friend took me for a trip in his Falco (G-AVUJ—illustrated in the Sequoia brochures) at our local airfield, Crosland Moor, Huddersfield—which for car enthusiasts was previously the private strip of David Brown of Aston Martin fame. I had toyed with the idea of homebuilding but nothing had taken my eye till I saw the Falco advertised as a homebuilt in 1982. I was hooked.

The first delivery of spruce was in November 1982 when Bill Nattrass, friend and co-builder, decided to make a start on the wing ribs with the idea that if we were not happy with the project we could light the fire with them and very little would be lost. No chance. We had taken the bait.



The Falco has a ram air induction system for the carbureted engine.

Enough history. G-BYLL has taken five and one half years from inception to first flight and is a mixture of kit parts and homemade. The woodwork is all homemade with spruce supplied cut to section by Doncaster Sailplanes and much of the hardware has been made by Bill in his 6'x4' garden shed equipped with his vintage Myford 3" lathe.

The finished product weighs 1,280 lbs and is powered by an O-320-A3C. It has a Nustrini-style induction scoop with provision for ram air or filtered air. The standard canopy is fitted. It is equipped with one comm, ADF, RNAV, transponder with encoder and eventually marker beacon receiver. One could question the fitting of all this when IFR is strictly prohibited, but ah-well!!

Ray Holt came on the scene to help finish the aircraft and was responsible for the "rubbing and filling" and the paint scheme, which is a 1965/70 vintage General Motors "Stone Beige" set off with dark brown stripes. It doesn't sound as exciting as those "red Italian jobs" but it sure looks good. The interior is upholstered in leather in matching tan and cream with a spectacular open fan design on the rear bulkhead.

Maybe it would be interesting to mention generally some of the experiences during the construction stages to make up for detailed flight performance data which we don't have yet. Looking back we found the easiest part of the project was the manufacture of the timber compo-

Connolly leather, broadcloth and Wilton carpet—same as Rolls-Royce.

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Articles, news items and tips are welcome and should be submitted at least 10 days prior to publication date.

Neville Langrick at Meppershall.

nents which appear to go together fairly quickly and can easily deceive one that progress on the Falco is going faster than it really is. Even the main spar did not pose a problem—you just have to think bigger and make sure adequate clamps are available.

The hardware is more difficult and in my opinion most of it requires engineering skills and tools. I would certainly endorse that the Sequoia kits should be used as far as finances permit. We have had the experience with some parts, particularly some of the aluminum castings, that they cost more to make than they would have been if bought from Sequoia—despite the high transatlantic shipping costs, included shipments of "fine quality Virginia air" and our quaint value-added tax.

We have found some aspects particularly frustrating, and the ones that come to mind are the fitting of the seat runners—to get them parallel on both planes to allow smooth movement of the seats—and fitting of the canopy. I sympathized with Pawel Kwiecinski on his frustration and the need to open a bottle of champagne on its completion—how many hidden and discarded screw holes in the perspex?

We have been impressed with the general quality of the Sequoia kits and in particular the electrical kit—despite its cost. I am no electrician but by carefully following the electrical manual I had little difficulty. Don't forget to budget for expensive crimping tools and despite the warnings in the electrical manual that your local AMP representative won't have time to spend with a home-builder, ours was good enough to call in and translate all the crimping tool part numbers to the European equivalents and give me a lesson on crimping. I would suggest that two electrical kits should be available, the existing one and a simpler one for non-IFR builders.

I must endorse Alfred's advice to make sure everything on the panel works before installing it. Although it is removeable, it weighs close on 50 lbs fully equipped and becomes quite a handful. We let the avionics engineer take the panel to install the radios, etc. After getting it back and putting it back in, the undercarriage would not retract—after working previously. Tracing this back to a broken resistor and replacing it was little short of a nightmare. However we did learn that the panel can be unbolted and moved back 4-5" with the plugs still connected and will somehow hold itself on the top of the center panel.

As a sequel, G-AVUJ was burned out in a fire at Doncaster, but I think the engine was subsequently bought by Barry Mowforth for his Falco project and the remainder of the salvageable hardware by Mike Pepper and Peter Grist for their project which is now being completed by Bob Sothcott.

Old Falcos never die.—*Neville Langrick*

Around the Falco Patch

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we get plenty of cooling for the oil there (Karl Hansen frequently covers up part of the oil cooler opening) and even if you cut down on the air inlet size, the oil cooler will probably still get enough air because it's right in the throat of the opening.

Wendell Taylor and Dan Garn had their Falco on jacks much of the winter while they worked out little problems. The Ellison throttle body injector had not been putting out full power. Apparently, these devices are very sensitive to the flow of air—eddies and swirls can dramatically cut the power. They kept sending the air box back to Ellison for changes until finally they got it right. Wendell says the difference in power is dramatic and guesses that they are now getting about 20% more power on takeoff.

Their experience, I'm told, is not unique and that it is now fairly well understood that you should expect some problems with the Ellison throttle body injectors until you fiddle with it to get the flow of air right. These things are not like a carburetor or injector which you can just bolt on and fly. The tweaking of the air box seems to be part of the installation, and Ben Ellison has been responsive on working out the problems.

Wendell had the right exhaust tailpipe support bracket (P/N 722-10) break in flight. The tailpipe, luckily stayed in the cowling, and the cowling was not burned. They made the brackets of .032" stainless steel. Wendell made a new support of the .063" stainless steel that we use, and then this one broke after ten hours of flight. He said there was no question about when this happened since there was a sudden increase in the noise level. He landed promptly and found the tailpipe in its usual spot.

It appears that with the 180 hp engine, this right tailpipe sets up in a vibration frequency that excites the bracket. The .032" support on the left side is still in place and has given no problems. My guess is that something must be done to de-tune the pipe or bracket. This kind of sympathetic resonance will probably not be cured by strength alone. In any event, you should firmly attach the tailpipe to the exhaust system so that it does not depend on the support to stay in the airplane. If the tailpipe is not welded in place, you should drill a 3/16"Ø hole, drop a clevis pin in the hole and then put a stainless steel worm clamp around the pipe to retain the clevis pin.

Dan Garn and Wendell Taylor in their official Falco-building caps.

Earlier I had mentioned that we had cured our lethargic landing gear motor problems by increasing the size of the wires to 12 gauge and moving the gear-up and gear-down relays to the front face of frame No. 5 so the wires would be as short as possible. Wendell and Dan had increased the wires in their Falco to 12 gauge and continued to have problems. They did not use our kits and had wired the landing gear according to one of Tony Bingelis's articles. Tony and I both made the mistake of ignoring voltage drop. In his circuit, the power to the motor goes through the limit switches and the squat switches. Wendell said the motor was barely able to retract the gear.

Voltage drop is a strange phenomenon. When you get a little of it with the landing gear motor, you get a lot. It's like pregnancy—either you is or you ain't. I advised Wendell to install relays for the landing gear motor. We use two single-throw double-pole relays, one for gear-up and one for gear-down, to reverse the current to the permanent magnet motor. When you cure the voltage drop disease, the current drops to only 7 or 8 amps to retract the gear, so you don't need monster relays. Wendell and Dan used four automotive starter relays and were amazed at the difference.

The Chilean Air Force has been through exactly the same experience. All I can tell you is that if you are wiring your own airplane, you have to use 12 gauge wires to the motor, and you must use relays. The wires should be as short as possible. Even two feet makes a difference.

Tony Bingelis is the next Falco builder who is going to install relays. He has the 12 gauge wires but reports that the gear takes nearly a minute to retract with his present arrangement—and yet it extends quickly so it can't be the motor.

We've had another close encounter with a seagull in England. My experience in flying down the Florida coast is that seagulls and pelicans do what you and I would do if we saw something very large coming directly towards us at a high speed. The stuff gets all over my airplane—but maybe they're just expressing their opinion of the Corporate Disgrace. Brian McBride was at full chat down low over the water when a seagull decided to come on board. It put a large hole in the windshield, fortunately on the passenger's side.

Pawel Kwiecinski's big excitement was in May when his brake failed (see "Goings On at Sequoia Aircraft"). The damage to the propeller was extensive and required a complete replacement. Richard Clements came to the rescue and shipped Pawel his prop. Pawel was back in the air by the end of the week. Just in time for Pawel and Mira to take a long-planned trip to Florida in the Falco.

I should mention that we've had lots of fun with the account of Pawel and Mira's

marriage. We put out a press release on Pawel's airplane and just to keep things lively, the headline was a tabloid-styled "Falco Completed in Record Time, Costs Builder Marriage." I told the story of the construction of the Falco and then closed with the line, "During the construction, Pawel spend so much time with the Falco that he shirked his domestic responsibilities. It cost him a marriage, not in the usual homebuilt airplane tradition of '5 years, $20,000 and a divorce.' The lady simply said, 'Marry me or go live with your Falco!'"

It was all deliberately misleading, of course, but I thought everyone would be able to figure out the punch line. Pawel and Mira got *married* because of the Falco, but you should have seen the letters and articles. A few people wrote that Pawel had certainly built a nice airplane, but it was a "shame about his divorce." A magazine in Italy simply ran a photo of the Falco and said it cost Pawel "5 years, $20,000 and a divorce." A midwest magazine had them divorced, but *Flying* got it right.

Anyway, Pawel and Mira now have a great scrapbook of their marriage/divorce as reported in the media. They spent a week in Florida tooling around in the Falco, and Pawel reported that Mira really likes travelling in the plane. "That's the last the airlines will see of me," he said.

When the nose gear collapsed, Pawel originally thought that something was wrong with the design of the nose gear drag strut, but it was evident to me that the gear was not fully extended, and Pawel now agrees with this. The drag strut must go slightly overcenter. In this position, the more you push on the nose gear, the tighter things lock. The screwjacks have springs in the ends, which hold pressure against the struts. The springs are pre-loaded to 40 lbs, so even if you only compress the springs one millimeter, the struts will be locked down. If the struts are not slightly overcenter, you're in for trouble—even with the springs fully compressed.

Pawel and Irek have been putting a lot of aerobatic time on their Falco and now have more inverted time in the Falco than anyone else. While most of us do mild, for-the-fun-of-it acro, Irek is really wringing the airplane out with airshow work, and they plan to fly a few airshows with it in July. They now have the rate of roll down to 3.6 seconds, not through any change in the airplane but in the seat belts. By straping the shoulder belts down, Irek is able to get a more authoritative push into the stick, and this has made the difference.

So far, they have not completed the aileron roll test. One day they put some masking tape and yarn on the ailerons but it blew off. They were getting ready to try it again when they had the encounter with the chuckhole.

(Steve Wilkinson was in Italy recently and visited with Mr. Frati. Much as I suspected, Mr. Frati said that ailerons on the Falco were intended to be flush with the wing and any increase in the rate of roll on the Corporate Disgrace is simply the happy result of poor workmanship. Renato Cairo had done some experimentation with a Pitts and found that increasing their size increased the rate of roll. They suggested taping the yarn to the inboard half of the aileron first, and also to try taping it on the wing in front of the aileron, to see if that would have any effect.)

Lately Pawel and Irek have been having a fight with the main gear wheel well doors. They made the doors originally of three layers of Kevlar on each side instead of the fiberglass we call for. After installing the doors, they found that the doors were not stiff enough and pulled open at the trailing edge by about a half-inch or so at 170 knots indicated. It's difficult to be precise about the exact amount because it was observed by flying in formation. Even so, the doors added about 4-5 knots to the cruise. They removed the doors and added three layers of carbon fiber to each side of the doors and declared them ridiculously stiff.

I don't understand the problem exactly, but they tinkered with the geometry of the linkage to get the doors to miss the tire more. They increased the length of P/N 862 so that the doors open much more than I planned for. This worked nicely on the ground but in the air the suction on the doors pulled them open even more—and locked them open.

As designed, the doors should open just slightly past vertical at their maximum opening. Pawel and Irek had them opening so much that the doors were about 20mm apart, so apparently the air pulled the doors completely together. This caused the angle of the door to increase to the point where the mechanical advantage of the linkage was completely lost. When they selected gear-up, the motor would bring the gear up smoothly until suddenly the whole thing would stop, and the circuit breaker would pop. Even with the hand crank, they were unable to retract the system any more.

Some of you may remember that when Dave Aronson first flew his Falco with the wheel well doors, the geometry of the system was all messed up just like this. The first thing that happened was that the fitting pulled out of the seat floor, taking a foot-square hunk of plywood with it. Dave rebuilt the seat floor and reinforced it. Then the rod end bearing started breaking. As a result of this, I redesigned the wood structure under the seat floor. Pawel has now proved, inad-

Jaap Havekotte of Blaricum, Netherlands, now owns this Falco, much to the delight of Bart van Steijn who is building a Falco nearby.

vertantly, that we needn't worry about the strength of the floor structure or the pushrods!

Pawel and Irek changed the geometry of the linkage to get more clearance between the edge of the door and the tire when they "cross". There is a point in the retraction cycle when the tire and door play a game of Chicken with each other. You are sure they are going to hit, but they don't. If you don't have the clearance you want, you absolutely cannot get it by changing the geometry. You have to grind on the door.

There are three critical angles in the geometry of the door linkage. You can see two of them on sheet A2. When the gear is retracted, the angle between P/N 860 and 861 is about 23°. (While the gear and linkage is shown in the gear-down position, there are also hidden lines and centerlines drawn for the gear and linkage in the gear-up position—look closely.)

With the gear down, the linkage is at its weakest. Draw a line from the axis of the door hinge through the center of the bolt attaching P/N 862 to the door and then extend the line on up. The angle between this line and P/N 862 is about 14°—the smallest of the three critical angles, and properly so.

You'll have to visualize the last critical angle. When the two short pushrods (P/N 861 and 862) are directly in line with each other, the door is at its maximum opening. The angle between these pushrods and a line from the door hinge to the pushrod bolt is 28° at the maximum opening. By increasing the angle of the door, Pawel and Irek had reduced this angle too much, and the wind locked it open. You can't do that! If you have a problem, you'll have to cut on the door.

Irek has done all of the aerobatic maneuvers in the Falco and reports that the Falco does them all well, except for snaps. He has tried snaps at every speed from 85 to 140 knots indicated and finds that they are best at 135 knots but that pulls 6-1/2 g's. In a snap, the Falco tends to raise the nose too high and then it falls through. The reason for this is the CG location of the Falco—too far forward for a competition airplane, which usually has an aft CG for better snap maneuvers.

Irek has also experienced a few propeller overspeeds when going to inverted flight. They are considering changing the governor to a new type developed by Woodward which has a small reservoir of oil to alleviate this problem. The so-called aerobatic propellers have counterweights and use oil pressure in just the opposite manner that our propeller does. Unfortunately, our spinner cannot be used with that type of propeller.

Syd Jensen of Kerikeri, New Zealand, has been ready to fly for several years now but lacks a medical due to a bypass operation that left him feeling better than when he was legally able to fly. Go fly that thing, Syd—to hell with the authorities!

Jim DeAngelo has been doing more baking than flying lately because his partner in the bakery left suddenly to go live in the mountains out west. Jim has had time to repaint the cowling and nose gear door, and he installed two small bumps on the cowling for the exhaust stack and one of the spark plugs. There is a good size crack in his windshield and he in thinking of fixing that, before he finds himself landing as Bob Bready recently did in "Suck and Blow" (his infamous Cessna twin)—with one hand holding the broken windshield in place.

George Neuman now has about 60 hours on his Falco. George and his son are both fully checked out in the plane and put in about three hours a week. George had a problem that he first thought was something to do with the wheel well doors, so he cut a hole for the tire and fixed them in the up position. Then he had a problem with the flap motor. It turned out that the problem was with the master relay—something about a less-than-perfect connection cutting the flow of current. George reports that his Falco is cruising at 175-180 mph at 2450 rpm, and the top speed is 195-197 mph.

Karl Hansen now has his Falco back in California. Frank Strickler said that since the October crash of the stock market, the airplane market is the worst he has ever seen. "You can't give an airplane away." In addition to the Falco, he also has an SF.260 and a T-6 in stock and can't get a nibble on them either. They may try again, but in the meantime, Karl thinks he knows where there are a few more knots of speed to get. On the way back to California, Karl did one speed check and at a pressure altitude of 6100' and 95°, the Falco indicated 169 knots at 24"/2400. Fuel consumption was 8.9 gph, and the DME was showing 193 knots, but when he landed Karl said the wind was slightly in their face. My computer calculates that out to 225.22 mph true at 74.3 percent power.—*Alfred Scott*

Goings On at Sequoia Aircraft

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turned into a field. Unfortunately the nose wheel went into a small hole and collapsed. This ruined the prop and required replacement of the nose gear screwjack. One of the brakes failed because a nylon tube at one of the master cylinders pulled out.

Karl Hansen said he had a problem with one or two of the nylon fittings when he first flew his Falco. He thought they took a set, and accordingly he waited a week or so and then tightened the fittings again. Since then he has had no problem.

Then Neville Langrick wrote to say that one of the nylon lines pulled out of the nylon fittings at the master cylinder during an engine run-up. He replaced the fitting with an aluminum Swagelok fitting and then had a nylon Swagelok fitting at the brake caliper let go.

In every case the failure was the same, the nylon line was pushed out of the nylon fitting by hydraulic pressure.

First, let's look at the numbers. The FAA requirement for the brake system is for a 200-lb load at each pedal. That's the design limit so the ultimate load would be 300 lbs. With our brake pedal designed the way it is, there is a 2:1 leverage, so an ultimate 600 lbs are put into the master cylinder, which at .625"Ø has .307 square inches, thus the pressure in the tubing will be 1,300 psi design and 1,950 psi ultimate. Translated into the force pushing the tubing out of the fitting, this would be 63 lbs design or 95 lbs ultimate.

This means that, while in real life normal braking pressures are 800-1000 psi, the tubing should be able to withstand a pressure of 1,950 psi, which will exert 95 lbs of pressure pushing the tubing out of the fitting. We know that some of the installations in the Falcos have held, while a number of others have not.

I called Tony Bingelis, who said he has always used brass automotive fittings and also purchased some 1/8" brass tubing from a hobby shop and inserted a 20mm length in the nylon tubing to support the nylon tubing. The restriction of the tubing is not a problem since we are dealing with pressure, not flow. Tony said he has many friends who have used this system with success for years. (Tony took particular pleasure in pointing out that his skinflint tightfistedness worked to his advantage in this case.)

It seems to me that the only logical thing is to go to metal fittings on the high pressure lines of the brake system for the higher coefficient of friction and steeper stress-strain curve of metal. And since Tony Bingelis's short length of tubing works and logically should greatly increase the pressure capability of the system, we should do that too. Those of you who have preliminary copies of our brake system drawing should see the note in the current revision letter. I am also changing the fitting at the brake caliper to a straight fitting for better routing of the tubing.

By the way, some of you have mentioned that your homeowner's policy does not cover your Falco project. I mentioned this to a friend who is in the insurance business. He said that it had nothing whatsoever to do with fear of flying, product liability or paranoia. Instead, he said that a homeowner's insurance policy is a standard-form policy that covers a residence, personal contents and a measure of public liability. These policies do not cover your airplane project for the same reason that they do not cover automobiles, boats, livestock or farm tractors. Insurance on the project will simply require a different type of policy and since the risks for the insurance company are no different than any other type of possession, a policy should be neither difficult to obtain nor expensive.

I have finished the molds for the main gear doors and we are waiting for the four builders who are serving as test sites to report in. If the doors fit properly, I would guess that we will be able to supply the doors in a couple of months.

I am in the process of making molds for the main gear wheel well doors from a pair of doors that Richard Clements made. As with the other doors, I am looking for a few test sites to check out the tooling.

I am a little worried about the stiffness of the wheel well door. Karl Hansen made the door of three layers of glass on each side. The door pulled open, and he has since adjusted the linkage to pull it shut. He is getting more speed, but Karl has not checked to see if the doors are not still pulling open. Pawel Kwiecinski made the doors of three layers of Kevlar on each side and his doors pulled open about 1/2" at 170 knots indicated. Kevlar is about twice as stiff as fiberglass. I am rapidly coming to the conclusion that we must make these doors out of carbon fiber.

Joel Shankle is now working on making a mold for the wing fillet. The goal is to make the fillet so that you will not have to do anything other than trim it and glue it on the plane. The fillet will wrap around the leading and trailing edge so that you will have one big fiberglass part to glue on. It is likely that we will put a joggled joint at about station 5 to accommodate slight variations in dimensions.

Curious if others had tried the scheme of oil breather line into the exhaust, I sent a letter of inquiry to *Light Plane Maintenance*. It was published in the February issue and brought a couple of responses in the May issue—both, oddly enough, from aerial photographers interested in keeping their belly-mounted cameras clean. One was considering it, and the other had been flying with such an arrangement. The only problem reported was fried oil accumulating at the connection point, which they solve by poking the carbon deposits out every 50 hours with a screwdriver.

By the way, if you aren't subscribing to *Light Plane Maintenance*, you're missing the best little magazine in aviation. It's directed toward those who are into nuts and bolts and who want to know more about the inner workings of their airplanes—and if that isn't you, then what are you doing here?

Lately I've been working on a new Falco brochure. It's time for a reprint and I've thought for some time that the brochure was in need of an overhaul. We are still in the layout stage, but look for an exciting new brochure. We will also be replacing the flight report with a booklet containing four flight reports. We will have these ready by Oshkosh and will have some extra copies available.

We have eliminated the alternator analyzer from our instrumentation kit since we were quoted a price of about $250.00 each for the next bunch. This is a shame, because I've always liked this instrument. I'm keeping one for my own use, and if we have any clever electrical engineers out there who want to see if we can clone it, please let me know. The device simply has an induction coil through which you pass the wire from the alternator. The needle on the gauge indicates the ripple current and as long as the alternator is operating properly, the needle stays in the green.—*Alfred Scott*

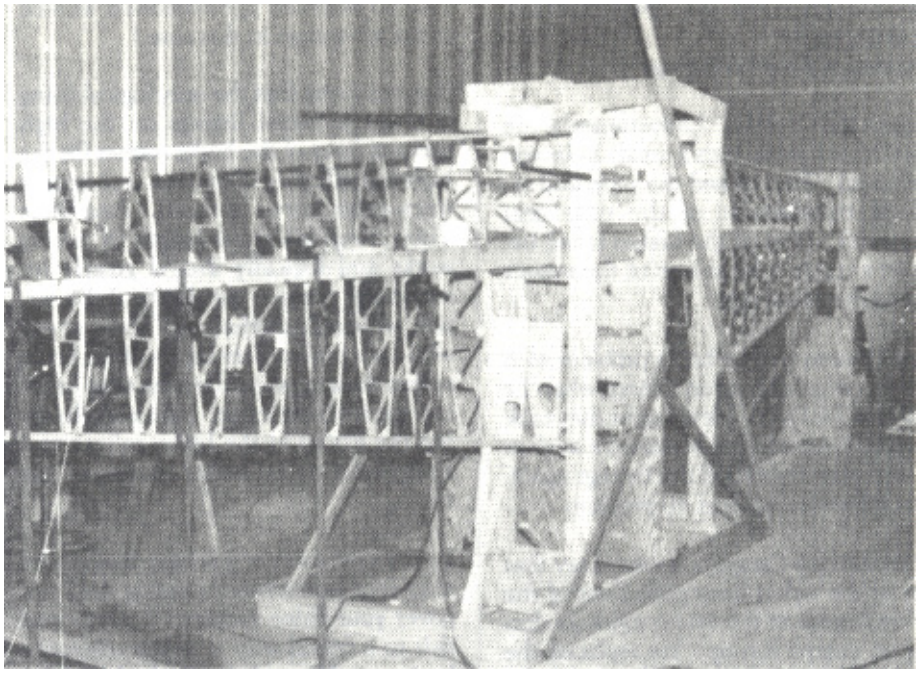
Construction Notes

Steve's Scupper

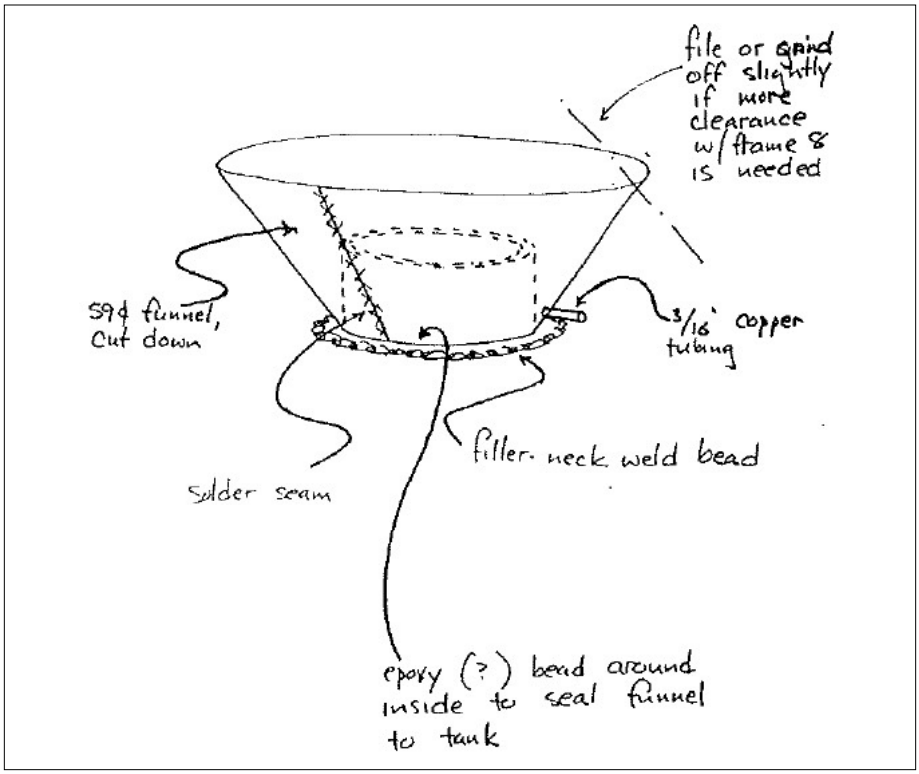
Having now temporarily mounted my rear fuel tank and snugged up the two restraining straps, it becomes obvious that the tank is not absolutely immovable. It doesn't move much—maybe an eighth of an inch or a little more—but I should think that under high G loadings, it's going to shift slightly. Therefore no overflow-catching "scupper" around the filler neck that is also mounted to the airframe—thus totally isolating filler-neck spillage from the inside of the tailcone—will work. It'll eventually crack or break loose, unless it's some kind of flexible arrangement such as a small sheet of neoprene or something attached to the filler neck, and around its periphery, to the filler-door framing.

So what I've done is cut down a small 59-cent hardware-store metal funnel and mounted it as a catchbasin around the filler neck, with a little piece of copper tubing brazed to it and a neoprene line leading from it overboard. When I mount the tank permanently, I'll epoxy the cutdown funnel to the base of the filler neck.

The funnel is the kind that has a max diameter of about 5". Stick it, intact, into the filler neck and draw a line around it where it butts against the I.D. of the neck. Hacksaw it off at that point and grind/file/sand it down a little farther for a snug fit around the O.D. of the filler neck. Braze or solder closed the funnel's seam, which is usually just a jam-fit narrow overlap, and solder a 3/4" length of 3/16" (or whatever) copper tubing as low down on the cutdown funnel as you can conveniently get it. Attach a neoprene line to that tubing and daylight it through the fuselage skin—either straight down and through the bilge, or out the fuselage side skin just above the side longeron if you want to run the shortest possible length tubing. Or hey, live dangerously and run it right into the battery box!



Tim Baker's Falco in the wing jig.



Incidently, your drawing showing the routing of the plastic lines from the fuselage-side static ports doesn't take into account the fact that the fuselage frame to which you're showing the lines Ty-Rapped is also the frame that supports the aft end of the battery box, thus making it impossible to Ty-Rap the line from the left static port in the manner shown on the drawing unless you drill holes through the battery box wall. It also necessitates reversing the orientation of the lateral lines, putting the shorter one on the right side of the airplane.—*Steve Wilkinson*

Production Falcos have an aluminum cup that is riveted with soft aluminum rivets to the fuselage skin. This crude, hand-hammered cup has a turned-up lip at the filler neck that fits loosely around the filler neck—with about a 2mm gap—and it is easily sealed with silicone rubber compound. The rubber is flexible enough to move with the tank, and I doubt that my well-seated tank moves as much as Steve's does—but maybe that's just the difference between rubber and felt cushioning. I can also tell you that if you have a scupper like mine, you don't need a drain line. When you spill fuel, you just flip the fuel out with your finger, and the thing will be dry before your gasperson has driven away.

The scupper that I keep thinking about is something like a wooden salad bowl. Cut a hole in the bottom to fit loosely around the filler neck, epoxy it to the skin, and seal around the filler neck with silicone rubber. And if you can't flip all the gas out with your finger, just con the airport cocaine addict into snorting the stuff.—Alfred Scott

Dave Gauger's Scarfing Jig

The scarfing jig I've devised may be the simplest and cheapest method I've come across so far. I began by taking a Ryobi TRU 30 laminate trimmer. When I bought this laminate trimmer several years ago, it was being promoted as a baby router and came with an edging attachment. I find that the laminate trimmer, when used with a straight bit with a pilot wheel on the end is the ideal tool for trimming aircraft plywood without it splintering. The edging adapter is basically a metal flange that is perpendicular to the base of the router and parallel to the cutting edge of a straight cutter, that allows you to precisely control the depth of the cut.

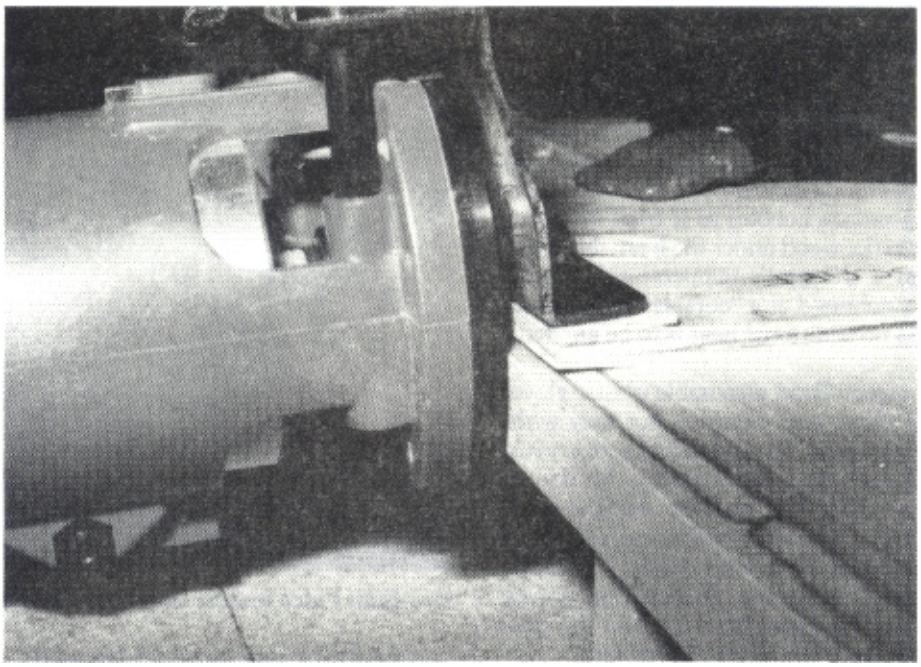
I have been making 10 to 1 scarf joints, so I took a piece of scrap 1/4" plywood and glued to one end of it a strip of aircraft plywood that had been scarfed by hand to 10 to 1. I bolted this to the flange of the edging adapter. This tips the laminate trimmer so that it cuts with a 10 to 1 slope. I use a Bosch 3-flute router bit with a pilot wheel on one end, which I chose because it has cutting surfaces that are over an inch long.

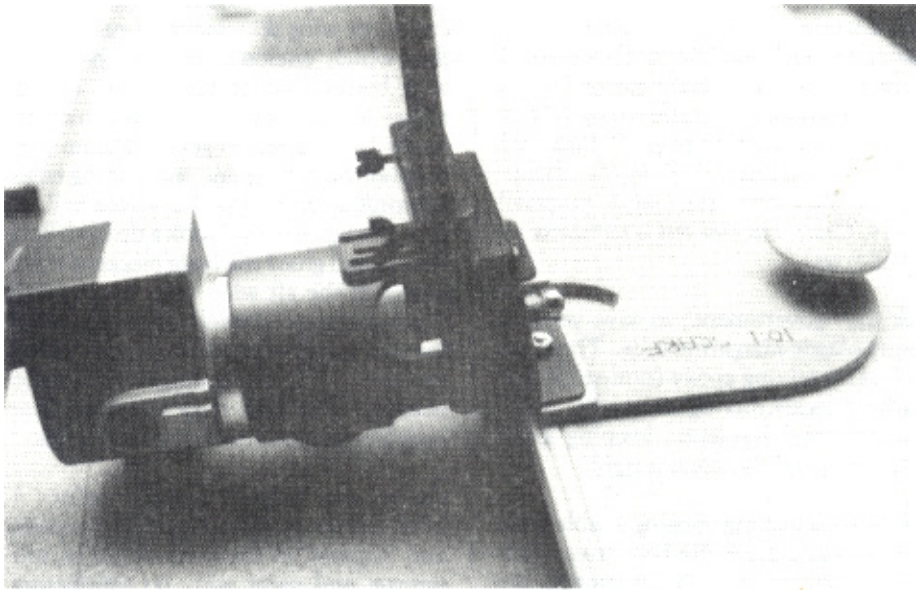
To use this contraption, I take the board that is going to be scarfed and measure how wide the scarf joint ought to be. I adjust the depth of the router bit to the width of the scarf joint, and adjust the depth of the cut up or down until the pilot wheel just barely contacts the surface of the board being scarfed.

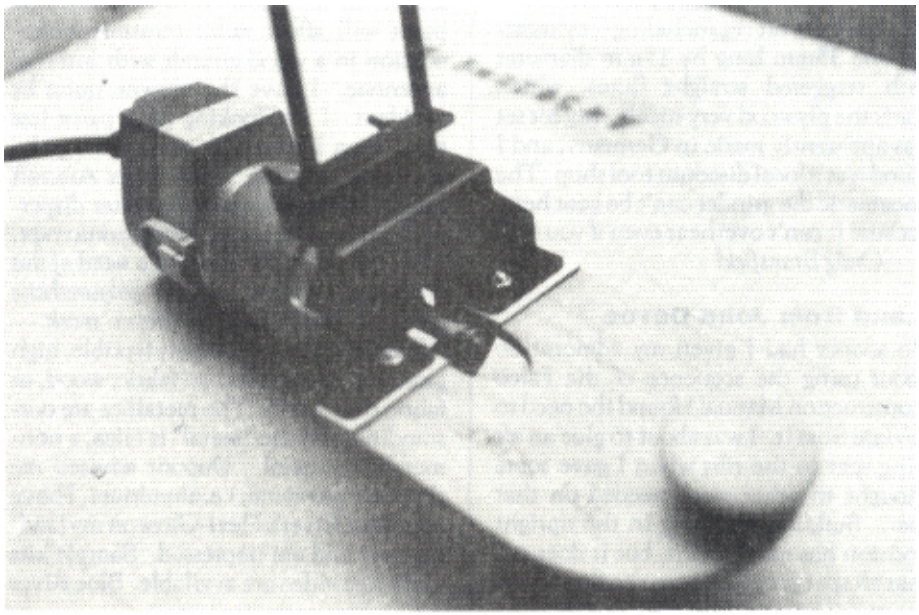
Basically what I've created is a narrow motorized plane that is tipped so it cuts a 10 to 1 slope. Because the edge of the plywood becomes fairly flimsy as you cut it, I clamp the entire piece of plywood that I am scarfing to a piece of scrap one-by-four so that the router base has something solid to bear against. Because the router base is tipped 5.7° from perpendicular (the arc tangent of 10/1 is 5.7°), I have beveled the edge of the one-by-four so that the fit is better.

Using this setup, I scarfed the four panels for my elevator in about 20 minutes one evening, after first making two passes on some scrap plywood. It seems to work better if you cut from right to left with this particular router combination. You can decide what slope you want to use for your scarf joints by simply changing the slope of the shims between the edger and the scrap piece of 1/4" plywood.

—Dave Gauger







Assorted Notes from Craig Bransfield

If using heat to cure epoxy surface finished in cold weather, be sure to preheat the parts for a day or two prior to spreading the resin. I had some trouble with (apparently) moisture in the wood causing surface bubbles as it tried to escape from the wood under the heat. No problem if the part's temperature/humidity are stabilized at a "curable" temperature and no additional heat is to be applied.

Gougeon Bros. disposable plastic gloves are cheap and plentiful, but they withstand almost no mechanical action without tearing out the fingertips. My dentist says that the heavier medical-grade gloves they use are getting very scarce due the the problem with AIDS. I think I'll try to find some dishwashing gloves, which have long cuffs to cover the wrist gap where your shirt sleeves end.

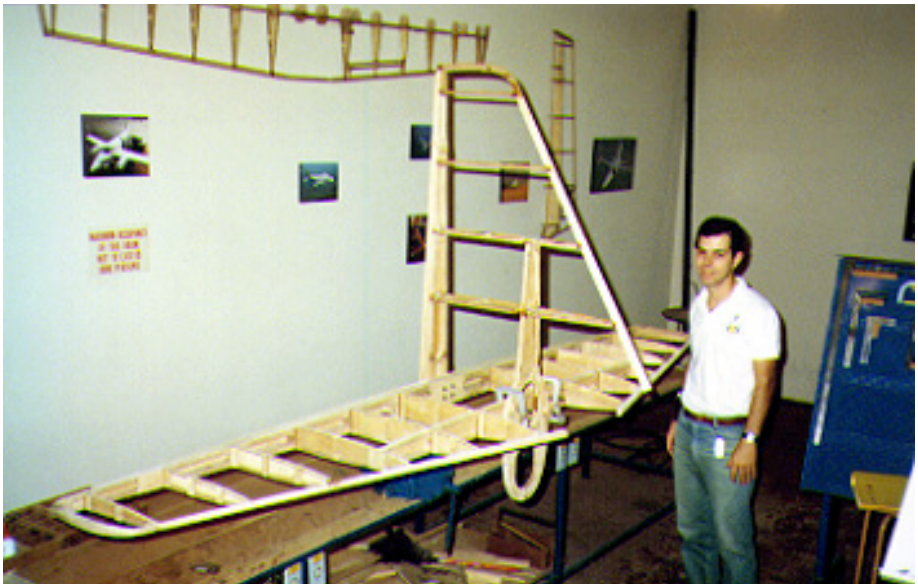
I made up some text glue blocks, but I was unable to break the joint with a vertical sledgehammer blow on the garage floor. I wonder if a simple "tensile strength" test such as that shown on page 60, Illus. 103 of Patrick Spielman's "Gluing & Clamping" would serve the same purpose? (*Sorry, Craig, but that test is worthless.—Alfred Scott*)

Ask the "government" to save you her empty plastic margarine tubs. These are perfect for mixing epoxy (non-stick, and can be re-used), mixing and storing Aerolite resin and hardener, keeping small parts, etc., and the price is right!

If anyone is making or using a table-style scarfing jig, I think the best driver-and-tool combination is a pneumatic die grinder and a metal rotary file bit. I was able to find a bit set including a cylindrical one 35mm long by 15mm diameter with staggered straight flutes, which scarfs the plywood very nicely. My bit set was apparently made in Germany, and I found it at a local discount tool shop. The pneumatic die grinder can't be beat here, because it can't overheat even if you stall it.—*Craig Bransfield*

...and from John Devoe

No sooner had I given my admonition about using the sequence of the Falco Construction Manual I found the need to deviate from it. I was about to glue an aft wing spar to the ribs when I gave some thought to other work needed on that spar. Building the wing in the upright position has much merit, but it does put that aft spar pretty close to the floor. The cutting, fitting, sanding which is required for the small pieces which support the aft end of the wing skin and the 1mm fairing skin which encloses those supports, is work better done on the bench. It also makes it easier to do whatever sanding might be required to get that 8mm gap betwixt the coving and the leading edge aileron/flap ribs. Do the whole ball of wax, then glue it on. I took a tip from Bob Bready and glued the little pieces at right angles to the aft wing spar, thus saving angle-sanding of the end which is glued to the spar and the curved angle required at the end. Only at openings is the angle needed. The skin does not know the supports are not lined up with the ribs!



Brazilian Falco builder Marcello Bellodi says "The progress makes me happy!"

On another subject, metallic paint. I have written dozens of letters to experts and "experts" in the fields of radios, antennae, and paint with no satisfactory answer to the question of how metallic paint will affect radio transmission/reception in a wood aircraft with internal antennae. I have the answer, quite by accident. I was looking for a paint less toxic than Imron and some of the polyurethane products. Blue River Aircraft Supply has a polyurethane water dispersable, non-toxic paint. (*Sorry to interrupt, John, but I would not believe a word of this "non-toxic" claim. It's a polyurethane paint, so please wear a proper mask.—Alfred Scott*) It is extremely flexible, high gloss and can be used on fabric, wood, or fabric over wood. The metallics are outstanding, and the "metal" is mica, a non-metallic mineral. Dupont advised me that they use metal, i.e. aluminum. I have used Blue River's Flexi-Gloss on my landing gear and am impressed. Sample kits and a free video are available. Blue River Aircraft Supply, Box 91, Harvard, Nebraska 68944. Telephone (402) 772-3651. They will send free samples.—*John Devoe*

Richard's Wheel Well Doors

Here is Richard Clements's description of how he made the wheel well doors:

I laid a large piece of paper over the opening with the gear inside and the aircraft upside down. I traced the sides of the opening and located the center of the wheel axle. I also drew radials 10° apart from the wheel center and measured the highest point along the radials that the tire extended above the skin. Next, I took the gear out of the well and inserted 3-inch thick foam. I laid the paper on the foam and inserted 2-inch finishing nails through the paper into the foam at the high points on the radials. The reason for the nails was to locate the high points during sanding of the foam. As I sanded, I would push the nails down farther into the foam so as not to lose their location.

Finally, it was merely a matter of sanding away the foam to the desired shape using the nails to determine how high above the fuselage skin the door needed to be to clear the wheel. I applied the fiberglass directly on the foam with West System epoxy. There are three layers of 10 oz. glass on the outside. The foam stuck to the fiberglass and no attempt was made to remove it. Instead, it was shaped to form the inside contours and three more layers of 10 oz fiberglass were applied.—*Richard Clements*

Richard also said he was not at all happy with the way the hinges of the doors

came out since he had to sand on the fuselage for clearance. He found you could make things easier for yourself if you reverse things so that the bulb on the door's half of the hinge is to the outside of the airplane, while the other half of the hinge is in the normal orientation. This only moves the center of the hinge about 3mm, but that makes a real difference on how much you have to sand on the airplane.

Duane Cutler sent along some photographs of a clever jig he has used to make his fuselage frames. He has used one jig to make all of the fuselage frames. The jig is a plywood-topped table which has been covered with white Formica. On this, he has laid out the curves of all of the fuselage frames. The laminations are held in position by 3/4" aluminum angle brackets. These are bolted to the table, and he has cut slots in the table top with a router so that the angle brackets are adjustable.

The jig can be used as a male or female form, and when using the jig, Duane forces Visqueen polyethylene film over the angle brackets to act as a glue barrier to the table top. The jig is also used to assemble the interior parts of each frame.

Brazilian Falco builder Marcello Bellodi sent us some photographs of his Falco project. The photographs show a number of variations on construction techniques—most of them production-style jigs.

The wing ribs were all made with a single jig—a plywood board with slotted blocks bolted in place. Marcello puts the drawing of the rib on the board, covers it with wax paper and thumb-tacks these in place. The board is pre-drilled for the bolts for the slotted blocks, so he pokes a hole in the paper and bolts the blocks in place. Because the blocks are slotted, they are adjustable.

All of the control surfaces for the tail have been built in a vertical jig, pretty much as described in the construction manual, except that a rectangular bar is positioned beside the structure to support little arms which in turn support the ribs, assuring vertical alignment. In the case of the horizontal stabilizer, Marcello used a center false rib to support the alignment string for the leading edge. This string is supported at each end by steel pipes.

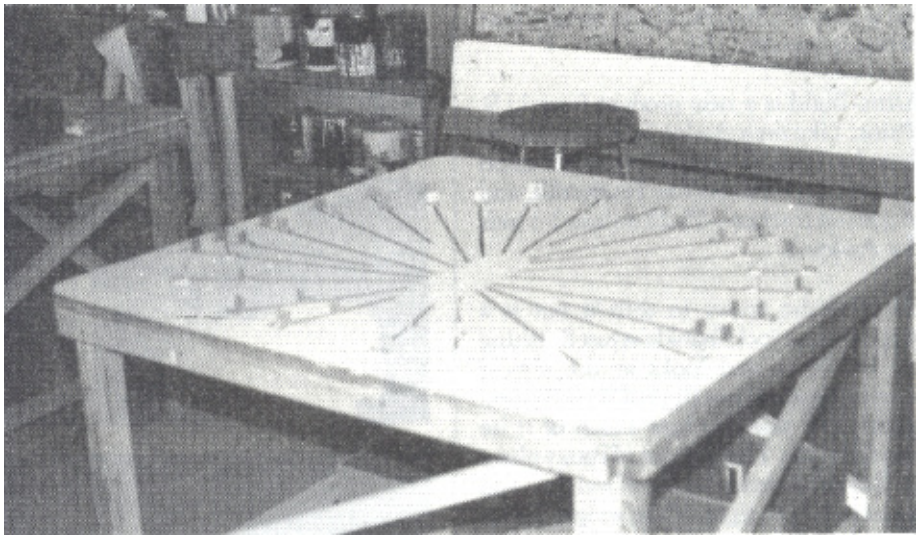
Marcello evidently has access to an aluminum foundry since many of the clamps are aluminum castings of his own design. The angle brackets for the aileron ribs are also cast from aluminum. The steel tables are all built of welded steel pipe. The top of each vertical tube has a nut welded in place so that a bolt can be used to secure and level the steel table top.

I stopped by to see Joel Shankle the other day and noticed a couple of very minor things that he had not seen. Our cowling is supplied with a little extra material at the propeller opening. Take a look at the cowling installation drawing, and you will see that the cowling has a flat area behind the spinner and a 45° flange at the center—but that's all. As supplied, there is some extra material on the inside, and you have to trim that off. Also, at the bottom, you will need to trim about 3mm off the 45° flange to allow for movement of the engine. In a loop, the engine can tilt down as much as .85", so you need that much clearance on the bottom.

The other thing is that the oil cooler lines should be threaded through the induction tubes—this puts them well clear of the exhaust pipes—and the outboard fitting into the oil cooler should be tilted inboard for greater clearance with the cowling.

Charles Gutzman recently painted his Falco. Even with the best workmanship, you will find that you have to use microballoons to get a really smooth surface. Microballoons are tiny glass or phenolic bubbles that you mix with epoxy and use as filler. 'Dry micro' is a mixture that has so little epoxy that it will stand on its own, like cake icing. This makes it very light, and it is easy to sand since it

Below: Duane Cutler's jig is used to make all of the fuselage frames. Bottom: Space is not Marcello Bellodi's problem. He is building the Falco in an old hangar, and he slipped the wing ribs over the spar just to see what things would look like.



becomes a rigid foam when the epoxy hardens. (You must be careful to use the right resin, or you will have a horrible gummy mess. West System or Safe-T-Poxy will work.)

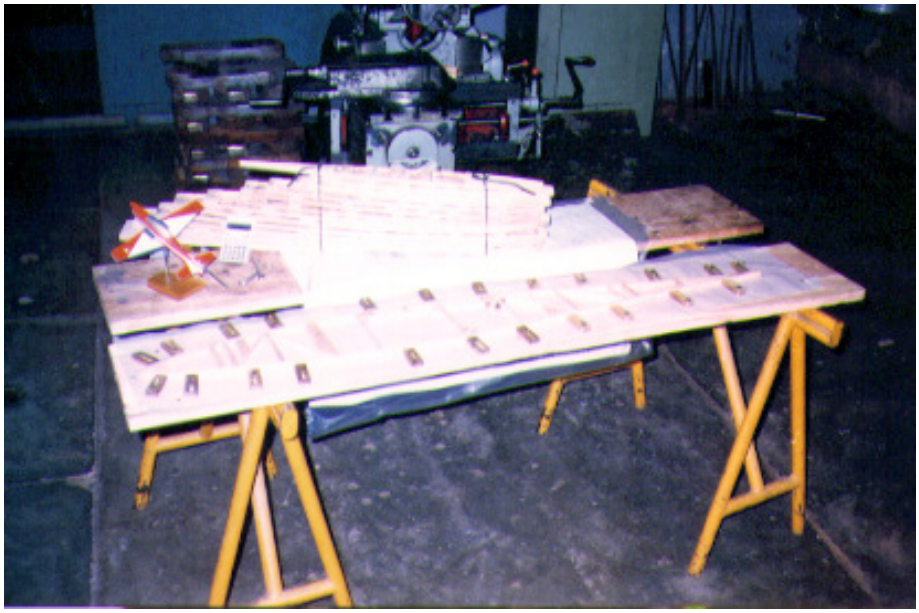
Because dry micro is so dry, it will not adhere to the wood very well, so Charles Gutzman first applied a coat of straight resin to the wood. He spread the resin with a brush and used a heat gun held in his other hand to heat the resin. The heat reduces the viscosity of the epoxy, so you can get a much thinner coat with this technique.

After the layer of epoxy was painted on the wood, Charles put on the dry micro. When it was hard, he sanded it down with board sanders and sanding splines. When this was finished, he put down a layer of 1.5 oz fiberglass cloth and epoxy, using a squeegee to get the excess resin out—and I suppose he used the heat gun again to thin the resin. When the epoxy was hard, he squeegeed on a layer of Ultra-Build to fill the weave, let it dry and then sprayed on a coat of Ultra-Build and sanded that when it was dry.

Ultra-Build is a new product from U.S. Paint. Like their Awlquik, it is an epoxy-based primer, so you get better adhesion than with polyesters like Featherfill, and it goes on thicker—15-20 mils vs 2-3 mils for Awlquik.

Heating the epoxy to thin it out is a capital idea. Joel Shankle is just finishing up his Falco and looks at the almost empty 5-gallon container of West System epoxy and wonders how much of it he sanded away. Five gallons of epoxy plus a gallon of hardener is a lot of weight. You can easily lose sight of the weight added by paint. I'd venture a guess that we've had at least 5 Falcos fly with 70 pounds of paint on them. And there's an equal amount of area on the inside that must be protected as well. Aside from avionics, it is the weight of varnish and paint that makes up the difference in the weight of our Falcos.

If you are looking for a lightweight fiberglass cloth, Wicks carries a 1.5 oz cloth, or you can get a 2 oz cloth from Fibre-Glast Developments Corp., 1944 Neva Drive, Dayton, Ohio 45414. Telephone: (800) 821-3283. If you are doing a lot of fiberglass work, like making your own cowling, you should look into Fibre-Glast. They have a complete line of materials, equipment and tools. They have an excellent catalog, and they give prompt service.—*Alfred Scott*



Top and center: Marcello Bellodi's tail surface assembly jig.
Bottom: Marcello Bellodi's wing rib jig is adjustable and is used to make all of the wing ribs.

Tool Talk

In 1968 I bought a Buck knife for a hunting trip to British Columbia. It was one of those folding knives that was just big enough to be considered a concealed weapon, but I've always carried it in my pocket anyway. For the past twenty years, I've used that knife for every imaginable task. Skinning a bear in Alaska. Digging weeds in the yard. Hammering small nails. Changing a tire. Cutting down little saplings. Cleaning fish. Opening paint cans and boxes. And once as an intemperate bachelor I used it to pin a note on a neighbor's door to explain my position in a territorial dispute.

It was a beautiful thing with a brass-and-rosewood handle. The blade locked open with an authoritative click, and it took a hefty push to release the lock to close the blade. The blade always kept an edge well, but the thing that I always liked best was that it was just big enough to be useful for the heavy-duty nitty-gritty work. Then in February, while prying something apart, the blade snapped. I was really leaning on it, and I should have used a crowbar. Suddenly, I realized how much I depended on that knife.

Funny. I'd never before thought much about the old workhorse knife. It was one of those tools, like a hammer, that you just take for granted. Of all the tools in my shop, it was the one I picked up most often, and it was always readily available. I can't remember ever putting the knife in a drawer.

I don't know where I got the knife and had no idea where I could buy one, but I did find the address for Buck Knives in a Thomas Register. I sent them the broken knife along with a note to please send me the nearest equivalent and to charge it all to my credit card.

Two weeks later, I received a mysterious card with a number on the front and instructions to please refer to the number "when inquiring about your knife" and to "please allow four to six weeks." For what? They couldn't possibly be talking about repairing that knife. Could they?

Then three weeks later, a package arrived from Buck Knives. In it was a shiny new knife—almost exactly like my old one—and a note from the president of Buck Knives, Chuck Buck himself: "Please accept our apology for any inconvenience that may have incurred during the absence of your Buck product. We strongly believe that Buck manufactures the highest quality product available. We are always prepared to rectify the problem when one does not measure up. Thank you for allowing us this opportunity to correct this unforseen error."

My God. I beat the hell out of this poor knife for twenty years and then they apologize for the inconvience of being without my knife. They send me a new free knife and thank me for the opportunity to correct the error. And the whole thing was handled as a routine matter. I ain't never seen nothing like it!

All I can say is that my knife is better than your knife—unless yours is a Buck knife, too. The one I have is Catalog No. 382/Model No. 110, and if they can handle my problem, I'm sure they can handle your order—it's Buck Knives, Inc., 1900 Weld Blvd, El Cajon, California 92020. And if you don't need to skin a bear, you will still find it will add a subtle touch to your notes that even yuppies will appreciate. For genuine Rambo-grams, you'll need one of the larger models.

This is just too remarkable to fail to mention. With everyone using a water level to build the Falco, you may be delighted to know that you can now buy an *electric* water level. There is the familiar clear plastic tube filled with colored water, but there is a little yellow box that beeps at you when you reach the proper level. No mention of RS-232 is made, so apparently there is no way to interface this with your PC, but you do need to buy your own 9-volt battery. Catalog number SS62010 Electric Water Level is $29.95 from Trend-Lines (800) 343-3248.

Fly behind an injected Lycoming and sooner or later you are going to encounter dirty injector nozzles. Even if grit doesn't get you, gum will. Karl Hansen has a neat little tool to clean the nozzles. It's nothing more than a short length of solid copper hookup wire with about 1-1/2" stripped of the insulation. When the engine runs slightly rough, Karl just chunks this thing down into the nozzles to clean them, and the engine runs smooth again. Because it is copper, it's too soft to hurt the nozzles—for that reason, you don't want to use brass or stainless steel wire. Karl thinks it is 20 or 22 gauge wire which he got at Radio Shack.—*Alfred Scott*

To straighten out wood parts that take on warps over time, I found that the least expensive clothes steamers available at department stores (around $20.00) work best. I got the kind that does not have an electrically heated sole, on the assumption that I would get controlled temperature provided by the steam only and would avoid scorching the wood surface by hitting it "hot and dry". This should also work well for bending tip skins, etc. Be sure to use a kitchen mitt on your free hand!

The Micro-Mark Tool Catalog (800-225-1066, or 340 Snyder Avenue, Berkely Heights, NJ 079022) features the #15119R "Multi-Saw", which is a small reciprocating table-top jeweler's saw. If you put in the very fine "metal"-type blade included, it cuts plywood very cleanly and fast enough to be satisfying. Price was last shown as $99.00.

The Gougeon Bros. glue syringes do not come with any kind of stopper, which you'll need for Aerolite resin. You can use plastic 'wire nuts' for this, but first remove the copper or steel spring inside.

Your local hobby shop which caters to the model airplane crowd will have a number of useful items, such as:

The Applied Design Corp. "Tee-Bars"—very flat aluminum extrusions in either 10-7/8" or 21-7/8" lengths. It so happens that two of the flat steel carbide abraders mentioned in the construction manual can be attached semi-permanently to the face of the long bar with 3M #77 spray contact cement, making a very nice long, straight sanding block that is easy to handle. For float sanding, you can put a piece of masking tape over the "tail" end, or you could easily attach the assembly to a longer board with a slot in one end and still remove it quickly if required. Cost is about $4.00 for the long one.

An X-Acto knife with the No. 11 small triangular blade is unbeatable for cleaning up notches for stringers, etc. Very sharp, strong enough to do the job on spruce and plywood, and totally ubiquitous. They also make nice small razor saws, etc.

For quick bonding of jigs and non-structural woodwork, try the high-viscosity cyanoacrylate glues such as "Zap-A-Gap" or "Super Jet". Expensive, but a little goes a long way. They also have an accelerator spray which will assist difficult bonds, and will even cure a fillet of the glue. Permanent bonds in 10-30 seconds after pressing parts together, so line them up well! Best results when wood is scuff-scanded, just as for Aerolite.—*Craig Bransfield*

Brenda's Corner

Recently, Allan Hall took delivery of the cowling which has to be shipped by motor freight. As is our custom, we sent the shipment freight prepaid, but the truck driver charged him $25.00 before he would unload it from the truck. I was outraged when I found this out and immediately called the trucking company to see what was going on, and after being transferred to three different people and a promise that a fourth would call, I found out nothing.

Then Alfred proceeds to inform me that home deliveries have a $25 drop charge. Apparently most of the time truckers have to make three or four trips and according to them they lose money, so two years ago the ICC said they *had* to tack on this charge. But that's not all folks. If you request that they call you before they attempt delivery, there is an additional charge of $16.64 for the telephone call, plus if they keep the freight for more than 24 hours they start charging you storage on it.

There is a way around all of these additional charges. If the shipment is delivered to any type of business that's open during regular business hours, none of the above applies. So, if you are planning to order the cowling or canopy kit (which are the only two which we ship by motor freight) you may want to makes friends with your neighborhood druggist or service station owner. Both the cowling and canopy frame are very light and you should have little difficulty in getting them to your shop.

Recently we had to reorder the housing for the landing gear retraction motor. The foundry overran our order, so we have a few P/N 520 castings available for $56.70 if any of you are interested. Remember, these are just the castings. They have not been machined or had the bearings installed.

A few reminders about Oshkosh. I will be leaving Richmond on July 26 and will not be back in the office until August 8. Please keep that in mind if you are going to order anything in the next few weeks. Also, I will be happy to bring any reasonable size orders with me for you to pick up, just give me a few days notice please.

All of the rooms at the Paper Valley in Appleton have been spoken for, but if you have just found out you can make it to Oshkosh after all, we can get on a waiting list. In the past we've had very good luck, and they have always come through with the rooms.

And don't forget to stop by the booth and let us know how many you will be bringing to the builder dinner. Hope to see you at Oshkosh!—*Brenda Avery*

Sawdust

• Builder to watch is Tim Baker who should set a new completion record. Tim and his father started construction in January and were threatening to bring an unpainted Falco to Oshkosh, but recent events have conspired against them. The ailerons and flaps have been the hardest part so far—took them one week.

• Buildaholic Tony Bingelis faced a crisis recently. He was finishing up an RV4 and had to decide what to do about the Falco. Tough decision for Tony, who really likes his Falco and doesn't need two airplanes. In the best Texas tradition, he punted. Tony sold the RV4 and started an RV6. He'll worry about which one to keep when he finishes *that* airplane.

• How 'bout those girls! Did everybody see Sara Scott, Kakee Scott and friends in the July issure of *Town & Country*? Aren't they something? Neat girls, huh? Yeah. Did'ya ever see anything so neat? Wow!

• It looks like a good Oshkosh coming up. The Air Force is bringing the B1 bomber. The Russians are bringing the Sukhoi 26 aerobatic aircraft which will shortly be sold in the U.S. by Pompano Air Center. Kermit Weeks is bringing his DeHavilland Mosquito and plans to fly it in the air show. And, of course, the Concord will be there to shatter your ear drums and disturb the Wisconsin dairy cows. Heinz Wallerkowski is still planning to fly his Falco from Germany in July, visit friends around the U.S. and show up at Oshkosh. Luciano Nustrini is arriving from Europe, having spent a month in Italy and a couple of weeks in England. The annual Falco/SF.260 dinner will be on August 2 at Martini's restaurant at the Midway Motor Lodge in Appleton. Our private bar opens at 7:30 and dinner is at 8:30.

• The 8th annual fly-in of Stelio Frati-designed aircraft will be held on August 13-15 at Schaffen-Diest in Belgium. Always a popular event, The Old Timer Fly-In is organized by the Belgium Veteran Aircraft Federation and has been perverted into a Frati event by former Falco owner Guy Valvekens. For details, contact Guy Valvekens, Hasseltsestraat 49, B-3290 Diest, Belgium.

• The latest idiocy in the liability crisis concerns a student pilot who read an article about one of the grand old taildragger trainers. He bought one, tried to teach himself to fly it, and then got a couple of hours of dual. The instructor refused to sign him off without more practice, but our hero flew it anyway and racked up about 50 hours without incident. But then he attempted his first landing on a grass strip—without the owner's permission and after a heavy rain. He got stuck in a mud puddle, then by gunning the engine, he managed to flip the plane on its back. Our brave boy then released the seat belt and fell on his head, cracking several vertebra, and the unfortunate pilot was required to wear a neck brace for a short period. Obviously, this was not the pilot's fault, so he has sued the private airport owner, the flight instructor, the previous owner of the docile two-place rag-wing, the local maintenance shop, countless other parties and the writer whose article got him started in the first place. At last count, the writer is $5,000 poorer, and the legal process grinds on.

Tony's Falco is safe for another couple of years.

Mailbox

I'll second your thumbs down on the Porsche engine. If you note Mooney's data on the new engine/airframe combination, they don't say anything about useful load. Tell Howard Batt to take an IO-360 Lycoming, send it to High Performance Engines for their magic treatment and then cruise it at 2700 rpm and get the speed he would like to see with the Porsche with one quarter the cost and infinitely more reliability. I'd cross the ocean with a Lycoming but would worry about crossing a river with the Porsche!

My prime reason in writing is to give you my opinion on where the Falco should carry extra fuel. I strongly feel the fuel should go into removeable tip tanks. Dave Thurston's *Design for Flying* makes an excellent case for putting the fuel far out in the wings. What I envision is a tank that slips over the standard wing tip with several vertical attachment bolts preventing the tank from slipping off. It may have to overlap the aileron to insure enough contact area on the wing to transfer the installation and fuel loads to the wing. The fuel line and electrical connections could 'plug in' as the tank slips on. I'd be interested to hear what Thurston says.

Gar Williams
Naperville, Illinois

I am intrigued by your idea of adding hard points to the wing for slipper tanks or drop tanks to increase the range of the airplane. I must confess that I too indulge in the pipe dream of long distance flying in the airplane when it is finally done. Two thoughts come to mind when I think about your idea. One is: wouldn't it be easier to increase the size of the aft fuel tank or design an auxiliary bladder tank that can be dropped into the floor of the luggage compartment? This way, a person could have the option of deciding whether he wanted to carry baggage or fuel with him on a long trip, and all the plumbing is accessible.

If you have to add external tanks, the obvious question that immediately leaps to mind is why don't you use tip tanks like the SF.260? The idea behind the tip tanks would be that they could be designed so that they generate enough lift to offset the weight of the fuel that you are holding. They would also look, as my 4-year-old would say, "neato-keeno."

Actually a set of hard points under the wing might be fun to have. If you weren't planning to fly to England, you might be able to load up some bombs or Sidewinder missiles and get rid of your hostilities. Perhaps as a later project, you might be able to design a composite-seeking missile of all-wood construction.

Dave Gauger
Iowa City, Iowa

An in-cockpit ferry tank belongs on the CG, thus rendering the plane a single-seater. I considered tip tanks and have rejected them for several reasons. I don't believe there is sufficient strength in the spar to support a lot of weight in tip tanks—and my goal is not to add a marginal amount of fuel. I want to carry a lot of fuel. Tip tanks produce less drag, but the objective of these tanks is to provide transatlantic range for occasional use—who cares if they knock 10 knots off the cruise?

Tip tanks affect the torsional resonant frequency of the wing, and that is a flutter consideration. That is a very difficult engineering problem, and I'm not willing to do anything that affects flutter without proper engineering and testing, so you can count me out on tip tanks on that reason alone.

Tip tanks also introduce complications in the fuel system and changes in the strobe lights. It seems to me that tip tanks would be a good thing for a permanent installation, but not for a temporary solution. I've been over all of this with Dave Thurston on the Sequoia 300, where we put 20 gallons on each tip and up to 500 lbs under each wing for really long range. Frati did the same thing with the SF.260, putting 18 gallons on the tips and then adding more under the wing.—Alfred Scott

Project slow due to work, incipient marriage, etc. but interest still high. Even thoughts of the Falco keep me sane lately.

Michael DeLong
Coldwater, Michigan

Always look forward to the Builder Letter. All rib skeletons for horizontal stabilizer and fin now complete. Only started actual construction at end of January 1988 having first built a 10m x 6m workshop.

Brian Nelson
Randburg, South Africa

I find Bon Aero, 7688 Summit Road, Parker, CO 80134 a good source of standard aircraft hardware. Their kits of assorted lengths of AN3 and AN4 bolts are nice to have on hand when a bolt is a little too long—or a little short.

Allan Hall
Vista, California

I have the extrusion parts made. Getting ready to make the tail group wood parts. It is slow—the tortoise is way ahead at the present time.

Roman Wasilewski
Spring Valley, California

Progress steady-by-jerks but right on the long schedule. I am enjoying every minute so far and am enthusiastically looking forward to the next steps. An Italian fantasy come to life.

William Roerig
Kaukauna, Wisconsin

Fuselage going in the jig. All wood parts complete. Will be ordering hardware kits soon.

Gary Rene
Edina, Minnesota

I am in the process of ordering wood out of Calgary. Wish me luck.

Christopher Stepovich
Fairbanks, Alaska

Thank you for taking the time to notice and comment on our project. Your comments are well taken but there are a few areas that I would like to touch upon. Your inset about carbon fiber really hits home as to how elastic-plastic behavior effects material failure. It is true that all composites lack any notable plastic deformation but this does not rule out their use. It does though add another level of design/analysis complexity when stress concentrations or local damage are considered. A design factor most often overlooked when using a composite is that environmental effects are very important. High temperatures, and high humidities greatly reduce the strength.

No matter how you slice it, our plane is light for its size but we used a single graphite weave (370 g/mm) for most of the plane because it can be bought in rolls at a good price even though the numbers said to use less. Economics forced this. Analysis of changing to the actual types of materials would reduce the weight another 35 lbs. This is significant and considering how heavy our landing gear is, we believe the empty weight could drop to about 950 lbs. That is a fact! Oh and by the way, our 'fanatically light' paint job is Imron and there is no way to get a shine like that without putting it on and buffing like crazy (then we shot clear). I think 40 lbs for the paint is about right.

I hope to share that beer at the Road Kill Inn because I too would like to see the

winglets—*go*! But Steve thinks they're neat. They do help the stall, but keep watching, I think one day they will be gone. I enjoyed reading your news letter and if I can cross with Wendell Taylor, I would like a ride in his new red Falco.

Brian Lundy
Midvale, Utah

Brian Lundy is co-designer of the Graflite carbon fiber Falco clone.

I haven't done a lot of flying this winter. I went to Florida in the latter part of November and after the speed mods I was up to 210 mph cruise. I averaged 188 mph from chock to chock with 2 approaches.

I had an interesting electrical problem that about drove me nuts. I developed a fluctuating amperage as well as voltage which was very noticeable in the radios. I could not isolate it to any circuit (by pulling breakers) and it occured with all breakers off, so I suspected the alternator. I had it gone over by a shop, and they found a bad bearing. I put it back in and still had the same problems. I tried the voltage regulator on a bench test, and it seems it didn't want to put out 12 volts—it would cut out at about 9-10 volts output. I got a new one, installed it and still had the same problem. After running the circuits for about 2 hours with a multimeter, I isolated it to the alternator switch. I hard-wired the switch on and end of problem!! Has anyone experienced any problems with the switch?

I had a blind encoder put in last week, and it works like a jewel. I got a new ACK A-30 (under $300) and the radio shop boys said it was right on. I had already written my letters about FAA's proposed rule change, but even with today's ATC system I can't go where I want so....

John Harns
St. Maries, Idaho

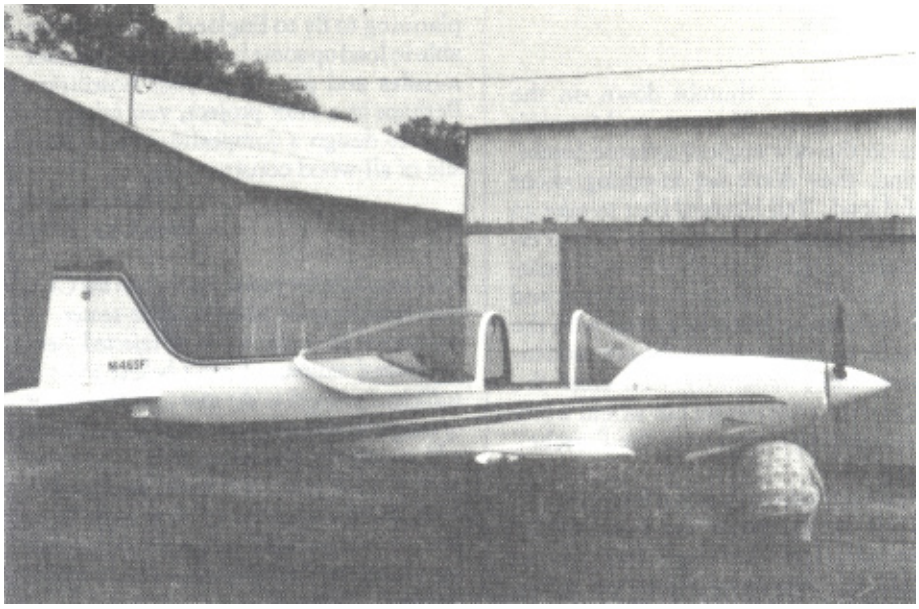
So far John Harns is the first to report a problem with the alternator switch. I'm not sure that the voltage output of a voltage regulator is the definitive test—what's important is that the regulator send enough voltage to the alternator field so that the alternator puts out the required voltage.

—Alfred Scott

The local Goodyear dealer (Sullivan Tire, Portsmouth Avenue, Stratham, NH 03885, telephone 603 778-0156) has tracked down the catalogue number for the 90° valve tube for the main gear tire as Product Code 199-154-70001-415, saying that the last three digits call for the proper valve stem for our use. The manager's name is Jim Allen. He is not a wind machine builder but is a Cessna pilot and would be willing to ship either tire or tube to Falco builders.

John Brooks Devoe
Stratham, New Hampshire

Desser Tire and Rubber only ships the angle valve tube with the tires, so builders who have been ordering tires from them have not run into this problem.—Alfred Scott



Jim and Gail Martin's Falco should fly in July. Look for it at Oshkosh.

I started making jigs for my Falco on February 15 of this year, after studying the plans for some time. My business is outdoor advertising and as such is pretty much self-perpetuating with minor supervision. Therefore I plan to devote 95% of my working time to the Falco. So far I have made two each of the parts completed, with the thought in mind of constructing two identical aircraft. I realize an additional fee will be due you on assembly of these parts.

In the September '86 issue, you mentioned 'professional' builders and the inquiries you have received. It has occurred to me that I could very well perform such a service. Building two aircraft wouldn't be much different than three or four given the space and available kits. I would welcome correspondence from interested parties.

In 1974 I completed a Piel Super Diamant which is now owned by a gentleman in Louisiana. This aircraft, I believe, was the first of its kind to be completed, registered and flown in the U.S. It is a scratch-built larger version of the Emeraude, all wood, 150 hp Lycoming and cruised at 143 mph. Not bad on a fixed pitch prop and fixed gear. The Falco, however, is in a different realm as Tony Bingelis will agree. I'm looking forward to making my two a work of art, using all the knowledge *we* have acquired as builders of wood aircraft. I appreciate so very much your dedication to an excellent set of plans and construction manual, not to mention the ideas and follow-ups in the newsletter. Thank you very much.

Duane Cutler, 236 South 3rd, #284
Montrose, Colorado 81401

Still hanging in there. Not much headway. Too many interruptions right now but working on small parts in between. A Falco landed at the Decatur airport for fuel, I have been told. Made a great impression on some of my flying friends who had not seen one before. I haven't been able to find out who it was yet! Color was white and blue. Really enjoy the newsletter, very complete.

Bill Dixon
Decatur, Illinois

I first received complete installation drawings of the Porsche aircraft (?) engine about two years ago. Took one look at the size of the thing and the complexity of the accessory drive system and quietly filed the data in a bottom drawer. Only a French group would put that engine in an airplane; I haven't noticed any release covering a Fatherland installation.

David B. Thurston
Cumberland Foreside
Maine