Falco Builders Letter

Above: George Neuman's Falco.

First Flight:

George Neuman

I never quite understood why you should "beware of the Ides of March," and apparently George Neuman doesn't either since March 15 was the date of the first flight of his Falco at Langley, British Columbia. The first flight was done by "Gogi" Goguillot, a name many of you may know. For many years Gogi was the head of the EAA of Canada. Gogi owned Sport Aviation, a homebuilder supply house, but he sold it last year and is now semi-retired.

The first flight lasted about one half hour. George reports that the taxi test and first flight "went like a dream," and the airplane did not have any wing-heaviness. After the oil temperature came up, Gogi noticed that the oil pressure indication dropped to the yellow, so he brought it in for a landing. The suspicion is that it's a faulty gauge. Once that is fixed, they will be back in the air to continue the test flight.

Gogi landed to report that George's Falco is "the nicest airplane he has ever flown." After seven years of construction, George was prepared to listen to more such talk. "What you're

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Goings On at Sequoia Aircraft

This builder letter is going out a little later than normal. I am just back from a week's vacation in Florida, and I wanted to wait until George Neuman had flown.

On my way to Florida, I stopped by to see Buzz Glade and his new Falco. Buzz only had about 10 hours on the airplane, and the Falco was still restricted to solo flight. I took it up and spent about a half hour or so flying the plane. It was the third homebuilt Falco I had flown.

You sit quite erect in his seats, and the stick grip is up-and-forward to what I am used to, so it felt quite a bit different at first. On takeoff the acceleration was much better than my Falco. The propel-

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Spinning the Falco

Jim Shaw became the third homebuilder to fly a Falco in April of 1985. Two weeks after the plane flew, Jim was transfered to a temporary training assignment in California. Then in the fall, Jim, Sharon and baby Jeremy Shaw moved to Rapid City, South Dakota. At some point Jim ferried the "Bubble Gum and Baling Wire Falco" to South Dakota, where it reigned as the local hangar queen for the next year and a half, while Jim was on "temporary" duty assignments flying for the Air Force.

This winter Jim finally got enough time to get back on the Falco. He fixed all of the temporary get-it-in-the-air patches and painted the plane. The paint was hardly dry, and Jim was back in the air making up for lost time. Since then he has been having a ball with the plane. As an Air Force instructor, Jim Shaw has more time in spins than many pilots have total time. He recently did a series of test flights in his Falco. Here is his report:

I am enjoying flying so much that it will probably be years before my Falco is totally complete. The aircraft weighs 1,132 lbs *sans* gear doors and fairings. The Stits Aerothane finish is not as good as I would have liked, but I'm picky. Someday I plan on *lightly* sanding down the imperfect areas and putting on another light coat of paint.

My flight test program is nearly complete. I have 20.9 hours of my 25 hours flown off. Many of you may remember my exciting first two test flights where I had some difficulty with my prop governor. Just remember, flying's no fun if you can't make it interesting. That problem resolved, the rest of the flight test program has gone well. I have explored all the positive G portion of the flight envelope.

Having a rather extensive background in spins, I checked out the reaction of the Falco to varying control inputs. By far

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Spinning the Falco

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and away the Falco recovers from a spin faster than—or at least as fast as—any aircraft around. When using opposite rudder, the recovery is almost instantaneous. Positive forward stick (less that 3 seconds from full aft to full forward) will also result in a recovery in about one-half turn. It is possible to place the aircraft in a highly accelerated spin mode if this forward movement is not positive enough. In an inverted spin this cannot result in a recovery, so I would not recommend its usage as a primary spin recovery technique.

In the Falco the rudder is so effective that it is all you should use to recover from a spin. If you let go of the stick you will notice that it will automatically go to the full aft position due to the relative wind striking the elevator and pushing it up. This will give you the most exposed rudder surface. The spin will be flatter, and there will be less angular momentum due to the "ice skater effect"; that is, the mass is distributed farther away from the rotating axis. Because the spin is slower, the rudder will have less momentum to stop. I would not use aileron at all. They seem to have little effect in the Falco.

So much for spins. I also flight tested my Falco to +6 Gs at maximum aerobatic weight to see if it would stay together. She came through nicely—no chips, no cracks, no fractures. I did find some fuel lines here and there that needed to be tightened. And my alternator chewed a small hole through my cowling. My gear is still hanging down a few inches when retracted due to a clearance problem with my nose gear steering arm and my carburetor induction box, so my top cruise is only 170 mph TAS.

She flies real nice—once you get used to the *very, very* light controls. The rudder is the one control that is most sensitive. Nothing more than squeezing your toes is needed. At 6 Gs the aircraft will turn on a dime.

I don't recommend anyone pulling 6 Gs as I did unless they know they can handle it. Remember many pilots have blacked out while pulling 2-3 Gs. LOC (loss of consciousness) is not the same as greyout (loss of vision). If LOC occurs you may be incapacitated for up to 2 minutes. I've seen many accident reports on highly qualified military pilots that bought the farm because of LOC, and they were wearing G suits.

So take care, get some dual time in a Pitts and find out what your G tolerances are before going up. Have someone teach you the military M1 maneuver and practice it. So much for the lecture. And so much for the letter. There are unmolested clouds in an azure sky and green mountain canyons in which to fly. Clear Prop!

—Jim Shaw

To spin an aircraft you must have yaw and stall. Stop either one, and you break the stall. To test the "break the stall" method, Jim pushed the stick forward while still holding full with-spin rudder and the Falco recovered in a half turn. That's a surprisingly fast recovery considering the nature of the technique. While this is an interesting test, no one should use this as a normal spin recovery technique.

Using full opposite rudder, power off and letting go of the stick, Jim reported that it recovered almost instantly, and reported that the Falco has the most effective rudder on any airplane he's ever flown. He found spins in the Falco "somewhat occilatory" (the rotation rate varies as the angle of attack changes). Jim reported that the Falco recovered in about 50 feet from a stall.

Jim's description of his "flight test to +6 Gs" was particularly hairy. He said it was difficult to get to 6 Gs. He had to dive to get 200 mph indicated and then horsed it around. He said the horizon went by so fast it was all a big blur. I never thought about "testing the strength" of the Falco in this way. The airplane is designed for such loads so it really shouldn't be considered a test at all since it is flight within the operational limit. But I suppose that if you want to know if the plane is going to hold together, you might as well be solo. Jim did wear a parachute.

Jim's spin tests were "normal" spins in both directions and his description of the spin recovery is the same as John Harns's, but I don't think the aileron should be completely dismissed. I agree that the rudder stops a normal spin so quickly that aileron doesn't make any difference, but in accelerated spins I believe in-spin aileron will make a difference. Jim plans to do more spin tests to find out it this is true.

—Alfred Scott

"The red trim still needs to be painted on and the fairings and gear doors have yet to be installed. Pictured up front is myself (of course), my wife Sharon (she's got one in the hangar by the way) and my fascinated-with-aerospace-vehicles son Jeremy."—Jim Shaw

The Falco Builders Letter is published 4 times a year by Sequoia Aircraft Corporation, 2000 Tomlynn Street, Richmond, Virginia 23230. Publication dates are the 10th of March, June, September and December.

Subscriptions: $12.00 a year, $15.00 overseas. Available to Falco builders only.

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

Goings On at Sequoia Aircraft

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ler had been re-pitched to 68"/70" and "almost constant speed" is a reasonably accurate description. Buzz has a two-inch "Carr" electric tachometer which vacillated wildly between 2400 and 3000 rpm, so you only have a vague idea of the engine speed. Buzz is on the search for a better instrument.

Buzz built the Falco on a tight budget, and he bought some surplus oleo shock-absorbers of unknown origin. They are quite a bit bigger in diameter and prevent the complete retraction of the gear. "Gear up" on Buzz's Falco means that the gear is still extended a couple of inches. As a result, the speeds are a little low—I saw 143 knots indicated with full power and 3000 feet.

The thin Lexan windshield is slightly unsettling. At 150 knots indicated the center of the windshield begins to pulse, oil-canning about 1/4" at a medium frequency. It does not inspire confidence, but at least Lexan does not fail suddenly like acrylic. With no interior and apparently little soundproofing, I was interested in the noise level and removed my headset—Good Lord! It sounded like a thousand giant hornets circling your head. Only Nustrini has him beat for noise level.

Once you feel out the controls, it's the same old unmistakeable handling of the Falco—light as a feather and quick as a wink. The Falco always feels better when it is light and that is the one thing Buzz has on all other Falcos. When you roll to a steep bank and suck back on the stick, the plane comes around much quicker.

Buzz does not yet have stall strips installed. I did a few stalls and found the same stall characteristics of all other Falcos, but there wasn't any warning. One minute you were flying smoothly and the next you were into the wing-dropping and nose-bobbing of a Falco stall. My Falco starts to give you a buffet at 5 knots above the actual stall. I think all Falcos should have the stall strip installed.

I did a few rolls and was shocked at the slow rate of roll. I timed it and got 5.5 seconds to the left and 7 seconds to the right. That is almost half the rate of roll of my Falco. Back on the ground, I found out why. Buzz and I checked the aileron deflection by marking it on a piece of paper and then doing the same with the "Corporate Disgrace." It was apparent at a glance that my Falco had substantially more aileron travel than his.

Later back at my office, I found that Buzz's ailerons go 11° down and 17° up versus design specs of 16° down and 24° up. My Falco's ailerons go 16.5°(L)/16°(R) down and 28°(L)/25°(R) up. I have included an aileron protractor in the enclosed revision sheet. I had always thought that the slower rate of roll of homebuilt Falcos had to do with the slot, but now I wonder if everyone has full travel on their ailerons. I set the aileron stop based on 24° of up travel. It may be that the ailerons do not go down 16° with 24° up aileron.

I have not made the progress on the construction manual that I had hoped to since we have been experiencing an increase in kit orders, and it takes a certain amount of work to get all of that done. We are in the process of having nose gear kits made now, and I have taken the time to completely revise all of the drawings for the nose gear. These should be issued in June. The reason I've done the new nose gear drawings is just to get rid of the list of revisions—there are only a few tiny changes and none of them are significant. I have also done some new drawings for two Dynafocal engine mounts to reflect some of the very minor changes we have made over the years.

As you may notice from the price list, the Falco just got about $1,000.00 more expensive. I should explain that we raise prices only when we re-order a certain kit. We have no way of knowing what the prices of a certain part will be until we send out for bids. We only ask for quotes from a select number of suppliers that can deliver the quality. Recently while ordering another fifty nose gears, I wasn't particularly pleased at the price. It's in our best interest to keep our prices down as low as possible, but I've sometimes felt like a fire hydrant at a dog show when the inevitable price increases do occur.

In the case of the nose gear, the machine shop who made the last ones readily admits they lost money on the job. The result is that those of you who have bought the nose gear got a relatively good bargain. In the meantime, the prices of everything have gone up, and we no longer have the benefit of an underpriced nose gear. To cushion the blow, we are instituting only part of the price increase now. As of June, the nose gear will increase another $200.00 to its final level.

U.K. builders take note! The Scott family is heading for England, Germany and Denmark in late May. On Saturday, May 30, we will hold The Second Irregular Get-Together of U.K. Falco Builders and Owners at 2:00 P.M. at Andrew Brinkley's private airstrip at Meppershall, Beds. (U.K. builders, please see enclosed flyer for details.)

Meppershall is home base for Derek Simpson's faster-than-a-pigeon Falco. Peter Hunter will bring his red Falco and we hope for others. It will be a chance to get together, discuss Falco building, make snide remarks about the "Corporate Disgrace" and what-you-like about Falcos. In case of rain, clouds or even sunshine, be prepared to seek solace in nearest pub following whatever-it-is-we-are-going-to-do. Bring photos, drawings, problems, excuses for not buying kits... and we'll make a great day of it. Anyone driving up from London who might offer a lift to a few miserable Scot(t)s?—*Alfred Scott*

George Neuman

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telling me is that it flies like a 172." To which Gogi said, "You're comparing a Maserati to a pickup truck." Gogi says he can't figure why Mr. Frati bothered to put a trim system on the Falco, but of course you do need one for changing fuel loads.

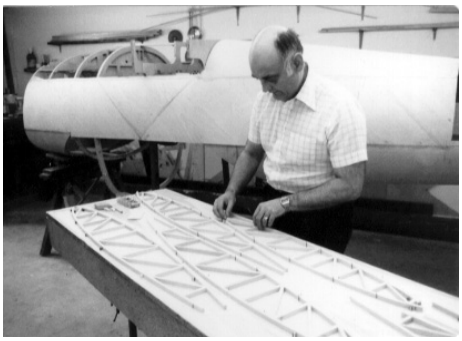
George's Falco has a 150 hp carbureted Lycoming, which swings a 69"/69" wood prop. It's too early to say how well the prop is matched to the airplane, but it's probably very good since it is so similar to the Hoffman prop on the production Falcos. The engine cools very nicely—the 4 cylinder CHT/EGT indicates that all of the cylinders are at very even temperatures.

George Neuman started construction on his Falco in November 1979. Woodworking had been a hobby for years, and George started by making all of his wood parts. At that time, none of the wood kits were available, and we were just starting on our kits. George kept a very accurate count of his time, and after "1700 hours and change" all of the woodwork was done. Thinking that he was nearly finished with the Falco, George stopped counting!

Although he had never worked on aircraft before, George found the Falco a good project, and he never had any problem with the woodwork. It was George Neuman who designed the box beam fuselage jig that everyone now uses. But if you ever have any doubt about the importance of installing the metal fittings early, you should talk to George. Imagine building the entire wood structure and then installing the fittings!

George's progress with the wood structure gained him a measure of fame among fellow homebuilders, and he soon found himself building the wings for a replica of a Sopwith Camel. That took six months, and since we did not have all of our kits done, George just put the Falco project aside for a while. In all, he took about a two year hiatus on the Falco.

As we got the kits going, George started back to work on the airplane, until one day he cheerfully told me he had "run out of money!" This roughly coincided with his retirement, so he went to work making the remainder of the things necessary. He made the cowling—"pecking away at it"—over a period of a year and a half. It was the engine installation that gave him the most trouble.



With a carbureted engine, George had to make his own carburetor air box. He says he nearly fell down when he was quoted the price to make the box, but then it *would* have been a full week's work, so he did it himself. The air inlet is just below the landing light, and a 5-inch length of 3-inch Aeroduct tubing carries the induction air back to the air box.

The Falco came in at 1,197 lbs empty, which includes about 50 lbs of extra paint. George ended up painting the plane three times. It was too hot the first time he sprayed, and the paint ended up with a terrible case of "orange peel". George sanded it down and shot it again. This time it was pin holes—diagnosed to be caused by incorrect sanding, so George got to practice sanding again. The third coat is still not as nice as George would like it to be. The paint is Endura, a Canadian brand of polyurethane, and it has plenty of gloss.

George used the Monza paint scheme, and the Falco looks very similar to John Harns's Falco. The top stripe is "Indian Red" and the lower one is "Flame Orange." C-GTUH has main wheel well doors. The instrument panel is right out of a Musketeer with all of its gauges. There is a single nav-com radio.

Before he retired a couple of years ago, George Neuman was the employee relations manager of Empress Foods, which is Safeway's manufacturing company. George says he is one of those guys who always wanted to fly and then realizing he wasn't getting any younger, he took some lessons in 1975. He now has about 120 hours, but while he was building the Falco, he stopped flying and plans to get checked out in the Falco.

Start to finish it took seven years and three months, but that's counting the hiatus. George calls it about 5 years and thinks the construction time was about 3,500 hours. And putting up with it all is Lillian Neuman... who wasn't *completely* sure that the plane would fly. But when Gogi took off for the first time, George said she got so excited "she just about flew without wings!"—*Alfred Scott*

Construction Notes

Karl Hansen sent Steve Wilkinson a letter with some tips on skinning the wing with Aerolite. Since all of you would benefit from this, we're including it below:

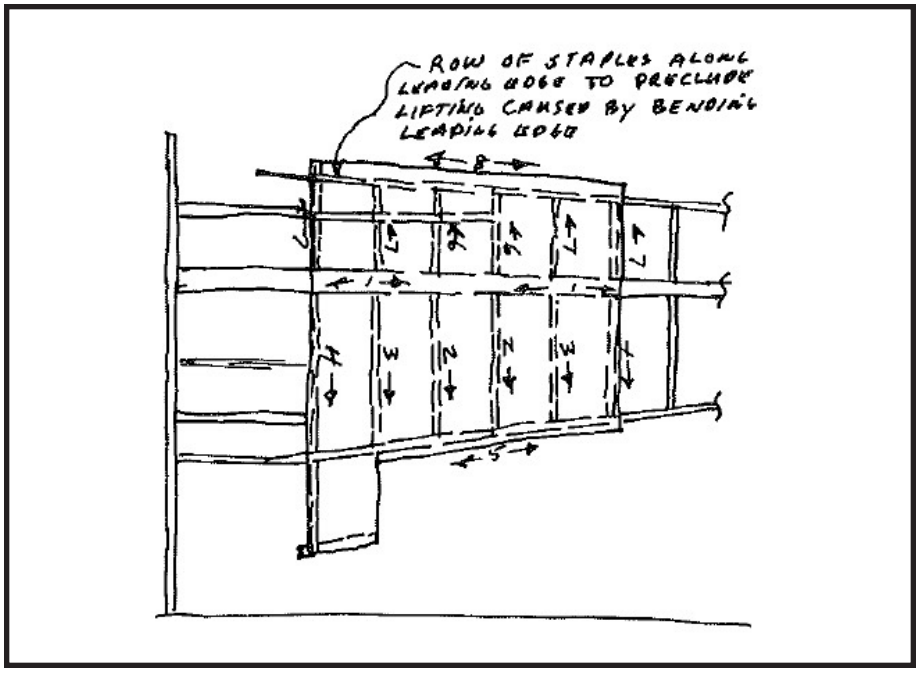
Dear Steve,
There seems to be many questions about using Aerolite glue, especially on the wing skins. I guess if the British could construct a Mosquito bomber with the stuff, it should be possible to make some simple small skin attachments. I admit I studied the problem a considerable amount before putting on the first skin, but as it turned out the dread was more in the contemplation than in the doing. I'm sure there is a better way, but this is the way I did it.

First of all, you should mark the rib and spar positions on both sides of each piece of wing skin, on the inside to locate the glue, and on the outside to know where to staple. I put the top skins on last because if I didn't have a perfect seal, I wanted it on the top side away from moisture. You have to seal the skins before installation. Only put the sealer up to about 1/4" from the glue joint as the sealer creeps in the wood, and you don't want any sealer in the joint. When the sealer is dry, you put the glue right out to the sealer and when it is catalyzed it becomes an excellent sealer.

You put the glue on the skin first and then the catalyst on the spar or other surface—a couple of coats so the wood is well-soaked. When you put the glue on the skin, extend outside the marks up to 1/4" to allow for misalignment. When the glue is catalyzed it will act as a sealer.

Don't do your gluing during the heat of the day. I usually prepared the day before and glued in the morning as it would get to 90-100° in the afternoons in the summer. There is quite a difference in catalyzing time from 65° to 75°. I never had any glue harden from proximity to the catalyst, only by contact.

The skin should be pre-indexed in several places to allow quick alignment and preferably some (2) nail holes on the first contact spot (spar) for "perfect" alignment. Be careful to only make contact at the initial spot, the main spar. Immediately staple down the main spar area. The skin will not touch the other catalyst as the skin is tangent to the curved surface. I stapled the rear of the main spar first including the nailing strips up to the main spar, then the ribs forward of the main spar, and start lacing the leading edge, then a row of staples just into the cap strip, then finish lacing down the leading edge. Not too tight—you can pull or break the leading edge plywood.



Above: Stapling order for a typical wing skin.

The first skins are easy to check, but the glue joints and the skins are enclosed after installing the second skin, and you cannot check in very far except with a mirror. With the medium-speed catalyst and gluing when cool, you will find the joints are very good.

The main thing with using Aerolite is you have to be prepared. You have staple *guns*, plural. I used two electric and two manual in case of jams. I did some alone, but my brother helped with most—a big comfort when you are concerned with time. You'll want staple strips, nailing strips (pre-nailed), Saran Wrap laid out, extra staples—everything you will need when you put the skin down. You can't put the glue on and have a cup of tea while you lay out the tools. Actually you have plenty of time. The leading edge always got the final treatment and the glue really runs out even at the tail end of the project. Leave the leading edge clamped (laced) at least 24 hours to allow for complete cure and strength as there is a fair amount of tension on the curved plywood.

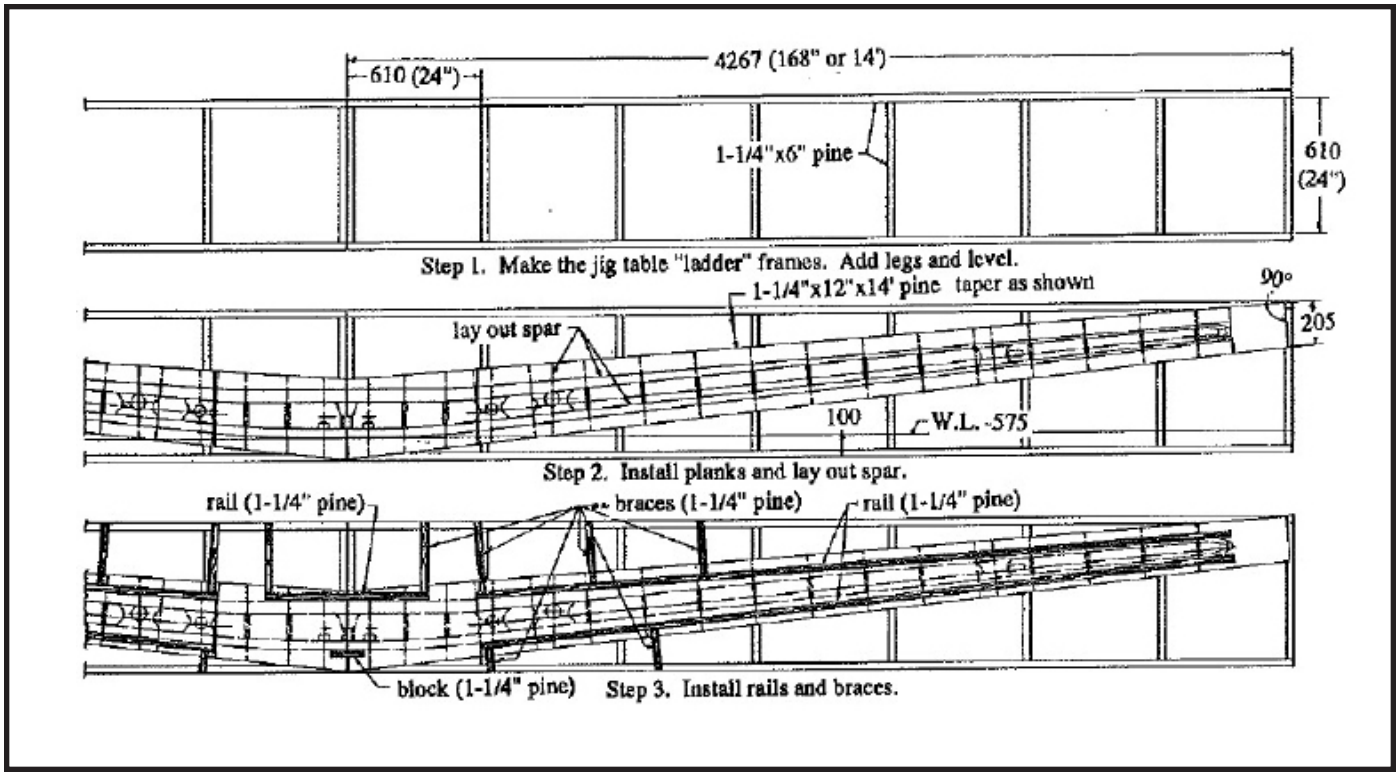
I used epoxy in a few places, the aft cover on the main spar and gluing the wing into the fuselage to allow adjusting time, and a few other minor places. But if I were to do it again, it would be Aerolite again. And I'd probably paint it jet black with white gold-edged strips. Good luck on your Falco. You'll like the way it flies.—*Karl Hansen*

As a builder, the most interesting thing to me was Karl's pointing out that Aerolite serves as a moisture-proof sealer just as varnish does, so you don't have to go to unusual effort to mask and varnish right up to the rib-and-structure line on the inside of the wing skins; just make sure you put Aerolite wherever you haven't varnished. Before he'd pointed it out, I'd always wondered whether each of my skins had an eighth-inch-wide line of untreated bare wood around each glue joint.

Another was his emphasis on getting all your ducks in a row—pre-nailed nailing strips, a spare stapling gun in case of jams, etc, etc. It's just common sense, but he has systematized it.

And finally, of course, his technique of gluing to the spar before concerning himself with rib-to-skin junctures. That's probably the way it would work for anybody using common sense, but he makes a point of the fact that you gain additional gluing "time" by preventing any glue/hardener interface until it's time for those surfaces to be joined.—Steve Wilkinson

Here is a quick-and-dirty description of the method Norbert Kramer used to make the main wing spar. Norbert is a



Above: Norbert Kramer's Main Wing Spar Jig.

woodworker from way back and managed to complete the spar in record time. This method is similar to the way many builders have built the spar, but there are a number of simplifications. It's the best method I've seen so far.

Norbert used 1-1/4" x 12" x 14' pine boards which he planed smooth and all to the *exact same thickness*. He used these boards for the jig table and for the jig itself. The jig table actually consisted of two 14'-long "ladders" and to make them he cut the lumber to a 6" width. The cross-members were spaced every two feet and the entire ladder affair was assembled with drywall screws. The two ladders were then joined end-to-end to make a 28'-long table. Legs were fitted and the table was carefully leveled with a transit, although a water level can also be used. It is absolutely essential that the table be level and flat, or you will have a bow in your spar.

The entire jig was assembled with 3-1/2" drywall screws. Drywall screws are a unique and extremely handy type of screw to have around for general jig building. The screws have a "bugle" head which is a flat head with a horn-like flare instead of the usual angular countersink. They use a Phillips screwdriver. Intended for attaching drywall to sheet metal "studs" without drilling a hole, the screws have a sharp point, deep knife threads, and they are case-hardened. It is nearly impossible to break one of these screws, and they get a better grip in wood than Israelies in occupied lands.

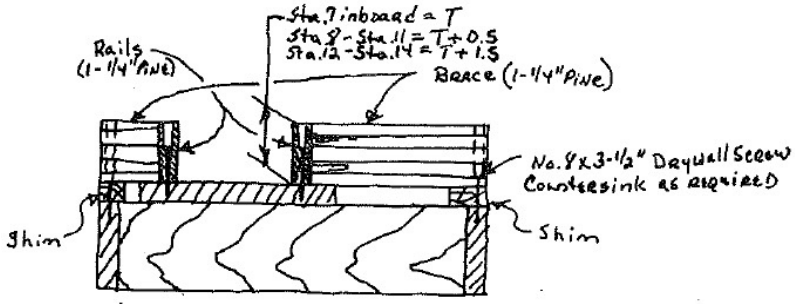
If you use a lot of these screws you will want to get a screwdriver attachment for your electric drills, so you can run the screws in easily. Norbert has an electric screwdriver with an adjustable clutch, but that is something he uses every day in his work.

Norbert used a nylon line to locate the base line (W.L. –575) on the ladder frame. Then, on top of the ladder frame, Norbert installed two boards. These were placed in a shallow "V" to comply with the dihedral. Taper the boards as shown in the sketches so that your clamps will reach. If you need more room, don't hesitate to cut a notch. One of the beauties of this "open" framework is the ease with which you can clamp.

Next, he laid out the entire spar. All of the station lines will be covered up when you make the spar, so the lines must extend to the edge of the planks which make up the top of the jig table.

The spar was built with the forward face up, and the booms were laminated against wooden rails attached to the jig table. The rails are made of the 1-1/4" pine which is cut to the thickness of the spar, plus a little to compensate for the thinner plywood on the aft face of the spar outboard of Sta. 7.

Norbert screwed the rails to the top of the table. At the inboard ends, he used several rectangular braces to keep the taller rails square. He used spacer blocks

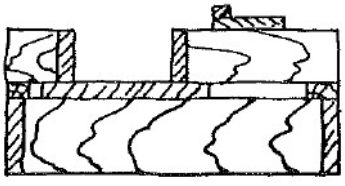


of 1-1/4" pine between the ends and the ladder frame. It's best to offset these braces a little from each station so you don't cover up the station centerline. All of the braces were the same height. This created a handy flat place which you'll understand in a minute.

The upper spar boom requires three rails, a short one in the center of the fuselage and one at each wing. There is a short opening at the bend just inboard of Sta. 1. You need the braces installed very close to the ends, or the laminations will take a "short cut". The bottom boom will take the smooth bend shown in the drawing, but it's a good idea to have a block in place so that you are sure you have the right dimensions.

Since you aren't likely to get any spar-quality spruce in 26-foot lengths, you must scarf and glue shorter pieces into long boards. Norbert assembled each board—one at a time—on top of the jig. He used a 15 to 1 scarf and the resulting 150mm is almost precisely the width of his 6" stationary belt sander. He clamped an angled block to the sander and used the "pencil sharpener" method—jamming the board into the sandpaper. Other builders have used this method for the laminating strips for the fuselage frames, but this is the first I've heard of anyone scarfing spruce this way. What the hey... it's quick.

Norbert used six-inch wide spruce. Although the spar laminations end up as about 3-7/8" clean, there's much less waste with six-inch spruce. Since the rails are the height of the completed spar, Norbert put the pieces in the jig and marked the pieces to match the height of the rails. This made the spruce a little too wide as is required for trimming and cleaning up—ideally you would like about 4 to 5mm of extra. After bandsawing off the extra spruce, the off-cut could be flipped over and used on the outboard end of the spar. If you used four-inch boards, the off-cut would be too small to be usable.



To insure that the scarfed-together boards were straight, Norbert screwed a very straight strip of pine on a five-foot-long board. He placed this on top of the braces and glued the scarf joints together there—covering them with wax paper and clamping. After scarfing, each board was glued together and set aside for assembly.

When all of the laminating boards were assembled, Norbert glued the upper spar boom together in the jig. To keep the glue from sticking, he lined the jig with wax paper. This can be stapled in place and after you finish gluing, rip the stuff out and replace it with new paper. It's important to get the wax paper smoothed out and stapled down during laminating—you don't want a crease to get caught between layers of the wood. The wax paper should not only cover the bottom of the jig but should also come up the sides.

Any time you glue, the glue will squeeze out. If the glue doesn't have anywhere to go, you will be fighting hydraulics, and the pressure of the glue will cause the bottom of the boards to be uneven. To prevent this, Norbert cut little strips of tempered Masonite, 1/8" thick by 1/4" wide, and put these under the wax paper. These shims raise the wood and give the glue a place to go, while still providing a flat bottom for the part.

Since he didn't have the temperature for Penacolite, Norbert used Aerolite and only glued one board at a time—but Norbert is fast with clamps! Most builders use resorcinol and with its longer working time you can glue all of the boards at once.

You don't have much time to work with Aerolite, so Norbert set all of his clamps up in advance so that they only needed a couple of turns. In all he used 72 clamps to make the spar. He bought forty six-inch clamps from Fine Tools. These are the slide-it-home and twist-the-handle type of clamp. He also bought 25 Jorgensen light duty bar clamps of 18" and 24" sizes.

The upper spar boom was the easiest since the Aerolite didn't start to set until the boards were pulled together—something the boards won't do until you clamp them. The opposite is the case with the lower boom, and you *really* have to move fast.

When the spar booms were completed, Norbert took each out of the jig, turned it over and made a couple of passes with a Makita electric plane (he has two: a six-inch and a three-inch) to clean the glue off the aft face of the spar boom.

The next step was to plane the inside face of the spar boom to the correct taper. You must measure and mark the ***s*** and ***i*** dimensions, but note that the booms are not a straight taper. Use a straightedge or a chalk line to snap the lines. Draw the trim lines on both sides of the laminated boom and plane the inner face.

To do this, Norbert placed a board on some sawhorses. He cut and planed two tapered strips of pine and screwed them to the board on each side of the boom. These serve as mini-rails, to hold the boom from sliding sideways and to indicate the desired thickness. Because of the dihedral, you can only work on one side at a time. The other end droops to the floor—or is propped up, depending on which boom you have in hand. Using his six-inch Makita electric plane, Norbert planed the boom down even with the rails. You must clamp the boom to the board so that a section will not bow up, and this means you can only plane a section at a time. You can also use the router method described below.

The simplest way to cut a taper is to tack the strip to a wide board, but at a slight angle so that the trim line is parallel with the far edge of the wide board. Push the whole shee-bang through a table saw with the edge of the wide board against the fence—and there's your taper.

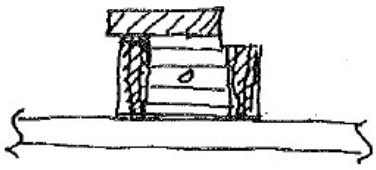
Next Norbert assembled the plywood for the aft face. He did this in the jig, between the two rails for the booms, covering up the plywood with wax paper and an extra layer of plywood and then stapling right through. Because the plywood is of different thicknesses, he used plywood shims under the wax paper to bring the "upper" face of the plywood to the same level. As you will see, the spar booms will be glued to the aft face plywood in the jig, so the plywood shims must cover the bottom of the jig—strips would result in uneven gluing pressure.

Norbert first cut the plywood slightly oversized and cut the scarf. Then he trimmed the plywood to fit exactly in the trough of the jig. This is actually a simple thing to do—you just place the plywood on top of the rails, and you reach under with a pencil and mark the underside. Then use a straightedge to draw the cut lines.

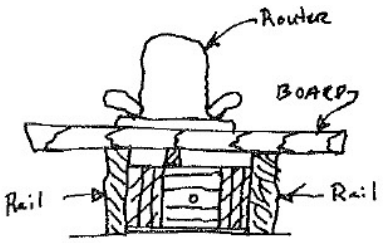
Next Norbert glued the upper spar boom to the plywood for the aft face. This was done in the jig, of course.

The next step was to cut and fit the blocks and braces that go between the upper and lower spar booms. He clamped the lower boom in the jig and fitted the blocks. It's simple to get the size, just take two rectangular pieces of plywood, jam one against the upper boom and the other against the lower boom. Clamp the two together, and you have an exact pattern.

Norbert removed the lower boom from the jig. He removed the lower boom rails and braces from the jig table, and glued the blocks and braces in place on the upper boom and aft face plywood. Finally, he glued the lower boom in place. Norbert then "varnished" the inside of the spar with West System epoxy.



The next step was to plane the forward face of the spar to the final thickness in preparation of gluing on the forward skin. Because the Makita electric plane will just chip up any cross-grain, Norbert clamped a board on the spar as a fence for the plane. This let the plane cut about 1/8" into the blocks, but that will not cause any chipping. After doing this for both spar caps, he used a hand block plane to cut the blocking down to match the booms. Finally, he cut a 6"-wide sanding belt, glued the strip to a board and used this to sand the face of the spar smooth.



Other builders have done this by using a router mounted in a board. The tapered rails on each side of the spar boom are an inch or so higher than the finished thickness of the boom. The router is adjusted to the correct height and with the board resting on the rails, you move the router back and forth. It is slow, but very accurate.

To assemble the forward face skin, Norbert picked the spar up and set it on the braces for the upper boom. The skin was assembled on the table, but this time there was no need for shims under the wax paper. The plywood needn't be cut to the exact size since it is easily trimmed after installation with a router and a laminate trimmer bit.

To mark the internal structure of the spar on the forward face plywood, Norbert placed the plywood on the spar. He made a little strap-duplicator of plywood so that he could hook it under and mark the outside—there was also a certain amount of lifting-and-peeking.

To varnish the interior, you have the choice of transferring the lines already drawn on the outside and masking or using the sticky-side-up method with masking tape. What you do is lay some 3M Fine Line tape, sticky-side-up, across the spar at each brace and staple each end to the jig table—like the treatment given to poor Gulliver. Then run tape down the spar booms and wherever else needed for masking. When you have all of the tape needed for the masked edges, gently place the skin on the tape. Press it down and cut the ends off the stapled-down cross pieces.

The tricky part is getting the plywood on to the spar in the exact position you want without scrambling the delicate tape. Thus, you need some method of precisely locating the plywood on the spar, and some method of getting the plywood to the correct location just above the spar without touching the tape and then lowering the plywood when you are ready. Remember that you don't have to put tape over the entire spar boom at this time—just the edges to be masked. This should leave some area of the spar boom available for little blocks. (Any suggestions on the best method of doing this?)

To install the forward face plywood, the glue was applied to the skin and the hardener to the underlying structure. Just as with Karl Hansen's wing skinning method, the varnish was only brought about 1/4" from the underlying structure. Norbert used little sticks to prop up the ends of the plywood to prevent glue/catalyst contact until he had finished clamping and stapling in the center.

I have heard a certain amount of discussion regarding the required freshness of the Aerolite acid hardener. Some builders brush on more hardener if it is not dripping wet. I've heard claims that as long as you can smell the catalyst it will harden the glue, but I'd have to see a lot of tests before I put my faith in that! Norbert ran a number of tests, applying the hardener and then waiting one, two, three and four hours before applying the glue to the other surface and clamping. He found that he had good joints in the first two hours, but "almost nothing" in four hours.

He also found that the moisture content of the wood was important. With Aerolite, the hardener has a longer "open" life when the wood is dry—the opposite of what you would expect. Penacolite is the opposite, you get the poorest joints when the wood is very dry. He is using Penacolite for the fuselage frame laminations. Because his shop isn't warm enough, he has made a box, put an electric heater in the bottom. It gets up to about 120°F in the box and the Penacolite sets up in a couple of hours.

Norbert Kramer designed and built a line of sailboats but sold that business some years ago. He has used all of the resins—epoxies, polyesters, polyvinyl esters, etc.—and has been very impressed with both Aerolite and Penacolite. He has yet to make a bad joint in all of his test blocks, even using maple. As for epoxy, he says "it's the most over-rated bunch of (bleep) around" and is using it only for varnishing. He started construction of an RV-4 but quickly sold the project to an acquaintance after finding the plans riddled with errors. The thing he likes best about building the Falco so far is the accuracy of the plans.

Steve Wilkinson noted an article in *Light Plane Maintenance* on strobes, and you might be interested in the following reprint of his letter as it was published:

You mentioned in a previous article that strobes deteriorate if left inactive. Does this apply to strobes even before they're installed and fired for the first time? I recently bought an entire Whelen package for the Sequoia Falco I'm building. The power supply was manufactured in December 1985. I'll be installing it in the Falco this summer, but doubtless won't be flying it for at least

another two years. My question to you is, should I be wiring this puppy to the Saab battery and frightening the deer away every few weeks?—S.W., NY

Yes. Power-supply capacitors need to be reformed after long periods of storage, so either operate your strobe every few weeks, or power-up the power supply (and leave it powered up for 30 minutes) every month, until you have the plane flying—and even then, continue to use the strobes often. During inactive periods the electrolyte in a capacitor will chemically combine with oxide from the foil layers, reducing the unit's capacitance and increasing the leakage current. (Electronics technicians also worry about something called "dissapation factor.") To some extent, the strobe manufacturers attempt to design out shelf-life problems by derating components (i.e., using over-rated capacitors, so that even after some deterioration, the component can be expected to perform reliably). But power up the strobes is still good perventive maintenance.

—Kas Thomas

In our last builder letter, John Brooks Devoe asked about the problem of the short shelf life of Penacolite resorcinol. Koppers typically sells the stuff by the tankcar lots. For such customers, they will recertify the glue for an additional year when samples are returned for testing. They test for (a) solvent content in the glue, (b) gel time and (c) shear strength. Since their glue is used for the most critical applications, Koppers takes a very conservative view. If you have kept your cans of glue tightly closed and open them only on occasions, the solvent content is certainly fine for two years. I would suggest you run some block shear tests on hard maple. If the glue joints are good, I would continue to use it.

One of the beauties of nylon tubing is that it is flexible, and that is also one of the problems with it! We use nylon tubing in the fuel system, and there are places where you would like to bend the tubing and have it stay in that shape. There are also places where the tubing doesn't bend to as tight a radius as you would like. John Oliver came up with a solution that is so simple you feel like a complete fool for not thinking of it yourself.

Nylon tubing is made by melting nylon pellets and extruding the tubing. As it cools it is wound on spools and takes the characteristic slight bend. It doesn't

hurt to heat and bend it yourself, and it doesn't take much heat. John just took a hair dryer, heated the tubing in his hands and dunked it in some cold water. The tubing now has a new bend. That's all there is to it.

This is handy for installing the fuel system, but don't get carried away and attempt impossibly tight bends. One of our newest Falco builders (we are approaching 500) built and wrecked an RV-3 because of this. The fuel vent line from the wing was bent into a very tight "S" to get from the tank to the fuselage. After sitting in the sun, the vent line softened, and one of the bends took a crimp. This effectively shut off the vent, and the unfortunate fellow put it down in a field.

The canopy is installed on the canopy frame with No. 4 sheet metal screws. Unless you get the pilot hole just the right size, the screws are very difficult to get started. Sheet metal screws are intended to "cut" their own threads, but in fact they just push the metal around. The 4130 steel is thicker and tougher than most sheet metal, and it doesn't take kindly to being pushed around.

I've been wondering if you can use drywall screws to "tap" the holes. I don't know if you can get a No. 4 drywall screw, or if the threads are similar. But a case-hardened drywall screw sure wouldn't take any lip from 4130!—Alfred Scott

Don Stark sent along the following notes on building the fuselage: "I read about elaborate fuselage jigs that require skids of plywood and tons of bolts only to be in the way before everything is stabilized by the skin. The simple way is to let the fuselage jig itself. Four things are necessary: a good water level, plenty of dry line—chalk line without the chalk, four straight 4x4s, six feet tall with heavy bases that can be sand-bagged so they will not move, and a plumb bob.

"The wings are built vertical as per the manual and the No. 6 frame carefully clamped or glued in place. Set the wings horizontal with the tips level in relation to each other and the No. 1 ribs at their exact angle of incidence. Now, set one 4x4 stand about two feet ahead of the center wing and another where the main fin spar can be attached to it. Measure from the main spar to establish where the main fin spar will be. Weight the bases and stretch a dry line between the two stands.

By measuring and "bumping" the 4x4 stands, the dry line becomes both the water line and butt line. Be sure to measure from each wing tip to the forward and back end of the dry line to be sure the whole structure is square. You now have the perfect reference to set the No. 4 and 5 frames. When 4, 5 and 6 are set, the side longerons are glued and clamped to them. Clamp 1x2 cross-members on the 4x4 stands to support the longerons. The rear stand will support the ends of the longerons through the complete process of setting the frames. The third and fourth stands with their 1x2 cross-members are "leap frog" back as each frame is set.

"They are mobile so they can be slid from side to side and the cross raised or lowered to set the No. 7 frame exactly where it should be by measuring from the dry line. Use the plumb bob to set the frames exactly perpendicular. Set the No. 8 frame the same way and install the top and bottom longerons supported by the stands. Set each frame by the same process back toward the tail and the No. 3 and No. 2 frame forward.

"The negative side of this method is the continual monitoring of the dry line to make sure the reference line is correct, but this is more than offset because you don't have to work around a lot of garbage or worry about knocking it out of line while removing a jig. The two mobile stands are used whenever necessary for support. I found that it was important to maintain and use the reference line until all the of the upper skin was installed, and the results came out perfect."

—Don Stark

Aftermath:

Richard Brown

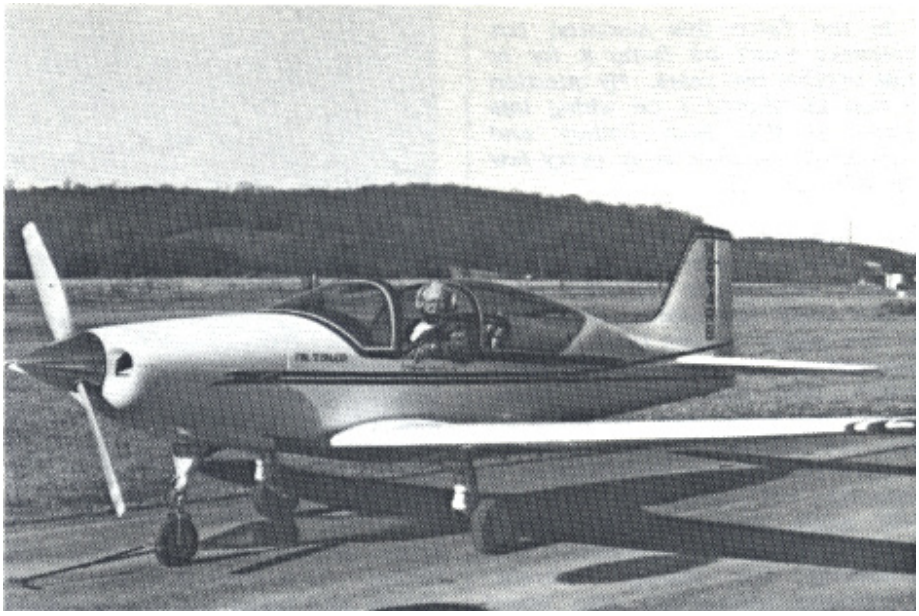
On February 13, 1987, Richard Brown and Wayne Coldiron died in a crash in Mr. Brown's Falco at the Vinton County Airport in McArthur, Ohio. The information we have to report comes from the FAA accident investigators and John Jewett, an electronics technician who helped Mr. Brown with the electrical system, avionics installation and engine installation.

On the previous day, Mr. Brown and John Jewett flew the Falco back to its home base at Portsmouth Regional Airport from a nearby field where the airplane had received its certification for IFR. When they landed, the airplane had about 5 gallons in the front tank and 8 to 10 gallons in the aft tank. As it was late, they decided not to take on fuel.

On Friday morning, Richard Brown and Wayne Coldiron took off at about 10:45 from Portsmouth Regional Airport and landed at the Vinton County Airport at 11:45. They returned a manifold pressure/fuel pressure gauge Mr. Brown had borrowed when the manifold pressure portion of his gauge failed to operate before the first flight. The original gauge had been repaired and was now operating properly.

They tried to buy fuel, but the FBO at Vinton Airport was temporarily sold out. The attentant offered to drain five gallons from an Aztec, but they declined the offer, stating that they had "five or six gallons on board," sufficient to fly the 14 miles to Ohio State University Airport. With Wayne Coldiron in the pilot's seat, they took off and at about 300 feet the engine stopped, the airplane entered a turn to the left, stalled and impacted the ground in a nearly vertical attitude. Both men were killed instantly. The aircraft came down about 500 feet from the runway centerline in a field just outside the airport boundary, having completed a turn of about 90°. While there were trees to the right, there was an open, marshy area straight ahead.

The two main tanks were ruptured by the impact. The investigators reported an absence of fuel odor or stains, although the soil was sandy. After a complete inspection of the wreckage, the FAA investigator reported that there was "less than half a teaspoon" in the fuel selector valve and forward: including the gascolator, electric fuel pump, mechanical fuel pump, injector throttle body, injector spider and associated fuel lines. The mechanical fuel pump still worked after the accident, and the absence of fuel in the throttle body confirmed that the pumps were working. (If the pumps had failed the engine would have stopped from the lack of fuel flow, but there would still be fuel in the throttle body and spider.) The inverted header tank was found to the right of the tail cone. It was not ruptured and contained "less than an ounce" of fuel. It was not possible to determine the position of the fuel selector at the time of impact due to the extensive damage and earlier arrival of the police and rescue squad.



Above: Richard Brown.

The left wing took most of the impact and was completely destroyed, as was all of the structure forward of frame No. 8. The right wing and tail cone were largely intact. The battery was torn loose from its mounting but remained in the battery compartment. Mr. Brown was found strapped in his seat. Wayne Coldiron was thrown from the aircraft. The Falco did not have stall strips installed, and the tachometer showed 27.2 hours.

The weather was VFR and 47°F at the time of the accident, and since the aircraft had already flown for an hour that morning, no one suspects ice in the fuel lines. The engine was completely torn down, and the FAA reports that nothing was wrong with the powerplant. The FAA investigators will complete their factual report of the accident and present it to the NTSB which is charged with rendering the probable cause report, however it is clear to all that the engine stopped from fuel starvation. It is more difficult to understand how the accident happened in the first place, particularly when you consider how avoidable it was.

Richard Brown was a student pilot. Most of his time was in his son-in-law's Piper Archer. If you think back to when you were learning to fly, you will recall the mental overload everyone experiences when they start out—the instructor tells you to watch your altitude, your eyes vainly search the panel for the appropriate instrument... and by the time you have found it you have put the airplane in a left bank and can't remember what altitude you really were supposed to have. John Jewett reported that Mr. Brown was still not comfortable with the complex panel and did not really understand all of the systems of the aircraft. He knew how to operate the intercom and could fly the Falco well in the air, but he was still confused by all of the gauges and had difficulty with landings.

As anyone who came within vocal range of Mr. Brown can attest, he loved that Falco. But beneath that garrulous exterior was an extremely intelligent man who knew his limitations although he was loath to admit

to them. Thus he always got someone else to fly the Falco, and he rode in the right seat getting all the stick time and instruction he could. He planned, he said, to "spend his time just flying the Falco around the country to air shows."

Mr. Brown was extremely safety conscious. He didn't like to take chances. Sam Griffith, who worked for Mr. Brown at East End Building Supply, reported that Mr. Brown didn't like to let the tank on his car get below half full. He'd taken many a trip with Mr. Brown, who always said "Let's fill it up" before they started off.

Wayne Coldiron was a 26-year-old pilot who worked part-time for Fisher Flying Products, the ultralight manufacturer. According to Mike Fisher, Wayne Coldiron was a quiet, careful pilot. While he only had 289 hours—primarly in a Piper Warrior and Beech Sundowner—most of those hours were recent. He had just gotten his commercial rating and a multi-engine rating in a Seminole. His CFI rating arrived on Saturday, the day after he died. Prior to the day of the accident, Wayne Coldiron had 1.2 hours in the Falco. He was scheduled to fly with Mr. Brown to Lakeland, but he wanted to get about 20 hours in the airplane and shoot some instrument approaches.

All of which makes this accident the more difficult to understand. John Jewett said that when they were checking the airplane out before the first flight, he filled the tanks one gallon at a time, checked the gauges and found them to be very accurate. In addition there was a Shadin fuel totalizer.

It may well have been that the Falco had 5 or 6 gallons. I suspect that they had a gallon on less in the front tank and the rest in the aft tank. The fuel outlet for the front tank is at the middle of the tank, so with the acceleration and climb angle of takeoff some of the fuel could have sloshed aft and unported the fuel outlet. All of the fuel is usable in normal unaccelerated flight, but unporting is a possibility. At the low speeds they were flying, it's also possible that the propeller might have stopped turning (the investigators believe the propeller was not turning at impact). If so, the mechanical fuel pump would not have continued to pump fuel, although the electric boost pump would have—if it was on. I would guess that they took off on the front tank and planned to switch to the aft tank once in the air. It is difficult to say if they used all of the fuel in the front tank or if it unported. If the fuel unported, you would think there would be some fuel in the lines or fuel selector valve, since the airplane would have nosed down and the electric boost pump was probably on. How well did Wayne Coldiron know the fuel system of the Falco? With two hours in the airplane, you would expect that he would know that the airplane had two tanks and that he had some idea of how much fuel was on board. But did he know how much was in the front tank and how much was in the aft?

At impact, the landing gear was in transit, and the gear switch appears to have been in the "gear up" position. I assume they had selected gear up before the engine stopped. John Jewett reported that the landing gear took 7.5 to 8 seconds to retract. Operating on battery voltage, the gear would have taken slightly longer—say ten seconds.

In training flights, we expect our instructor to pull the throttle so we react quickly, but tests show that a pilot's average reaction time after engine stoppage is 4 seconds. In a nose-high attitude and with gear and takeoff flaps down, the Falco would lose speed quickly. Without more experience in flying the Falco, it's unlikely that the pilot would have known how much to drop the nose for a power-off glide—it's much steeper than you would think. (Witnesses reported that the Falco was still in a nose-high attitude when it stalled.) Without stall strips, there would not be as much warning.

With 4 seconds reaction time, that leaves a maximum of 6 seconds from reaction time to impact, long enough for a perfectly coordinated, precisely flown 18° standard-rate turn assuming the airplane did not stall. We have all been taught the futility of turning after engine stoppage, but accident statistics show that "the impossible turn" continues to claim the lives of pilots *regardless of their experience*. High-time pilots attempt this turn with the same unhappy frequency as beginners.

Not every engine failure at 300 feet has to end in a fatal accident. Training is only part of the solution—it must take incredible courage to put it in the woods when there are open pastures beckoning to one side. Consider these excerpts from Marine Corps Aviation Arlington Annex Message Center (Major Breadling was the pilot, Mr. Rye was the instructor):

> 1. NATURE OF INCIDENT : AIRCRAFT MISHAP. 2. 1715Z, 24 FEB 1987 (1215 LOCAL EST). 3. LOCATION OF INCIDENT: BROOKHAVEN AIRPORT, MASTIC, NEW YORK... 11. MAJOR BREADLING WAS TAKING REFRESHER/REORIENTATION FLIGHT TRAINING IN FIXED WING AIRCRAFT AS PART OF THE MCFOP PROGRAM. HE AND A FLIGHT INSTRUCTOR FROM FLIGHTWAYS OF LONG ISLAND WERE FLYING A PIPER TURBO ARROW, SIDE NUMBER 8333A. THEY TOOK OFF FROM REPUBLIC AIRPORT, FARMINGDALE, NY FOR 4 HOUR HOP, 2 HOURS LOCAL FAMILIARIZATION, 2 HOURS INSTRUMENT. LANDED AT BROOKHAVEN, REFUELED, TOOK OFF. AT APPROX 300' ENGINE STARTED TO SPUTTER. MAJOR BREADLING NOSED DOWN, KEPT CONTROL. AIRPLANE IMPACTED IN WOODS SURROUNDING AIRPORT. MAJOR BREADLING CRAWLED FROM WRECKAGE THEN LOST CONSCIOUSNESS. MR. RYE WALKED AWAY GOT HELP IN VICINITY, THEN PASSED OUT. FIRE MARSHALL TOOK INJURED TO BROOKHAVEN HOSPITAL. FULL X-RAYS TAKEN. BOTH CONSCIOUS NOW. NO APPARENT INJURIES TO MAJOR BREADLING. BOTH ARE ALERT AND WILL BE KEPT OVERNIGHT IN THE I.C.U. FAA NOTIFIED. AIRCRAFT ESTIMATED TO BE A TOTAL LOSS.

In those few awful seconds after an engine stops on takeoff, all too often human nature takes over and training has little effect. Our confidence in things mechanical lulls us into a sense of well-being. We should all recognize that without some conscious mental effort, each of us may react to instinct, not training. Mentally gird yourself for engine failure on each takeoff— expect it to happen and be ready with an immediate nose-down straight-ahead glide. Then when nothing goes wrong, you can enjoy the flight all the more.—*Alfred Scott*

Tool Talk

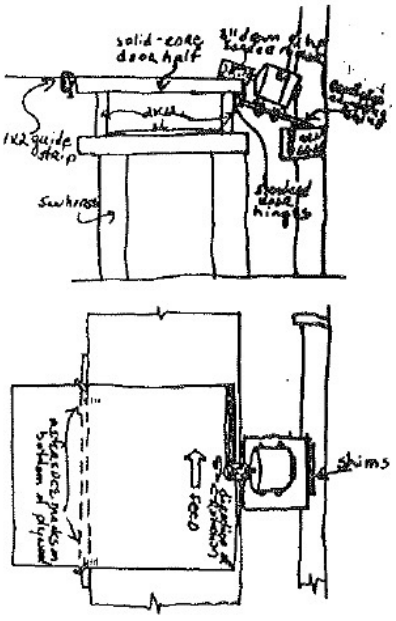
Steve Wilkinson's Scarfing Jig

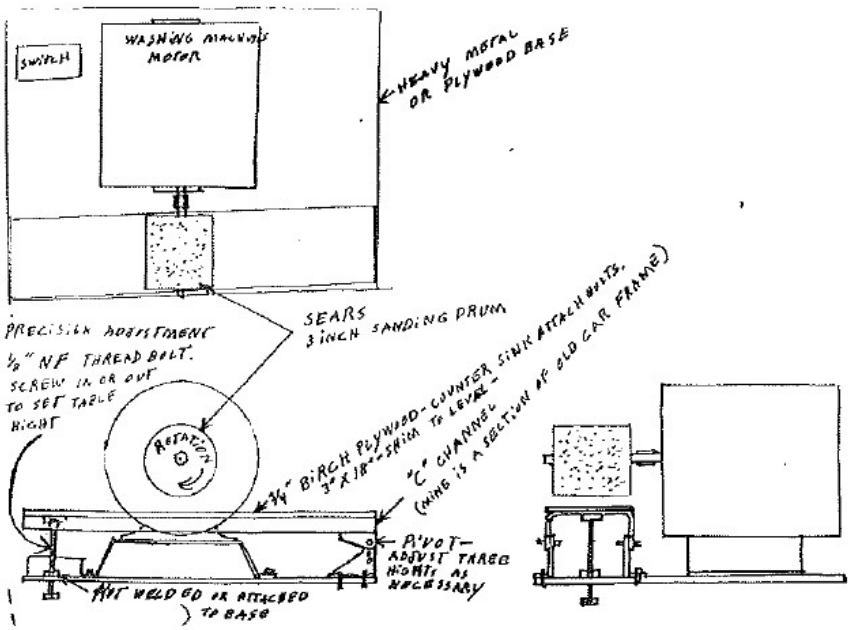
I've seen a lot of complex and expensive suggestions for scarfing jigs that involve such things as radial-arm saws, but I just made one based on Tony Bingelis's idea as shown in his first *Sportplane Builder* volume, and it works beautifully. Its major advantages—to me—are that it is a permanent emplacement that is part of the workbench yet is out of the way; that it uses the entire expanse of the workbench top as a support for the plywood sheet rather than having a small table-saw table as its "bench"; and that it was cheap to make.

The fact that it's a permanent emplacement means that there's no worry about set-up time or what the scarfing angle is. Once you get the thing built and adjusted to the proper angle, you never have to move, disassemble or change it, and every two scarf joints you make will be perfect matches. That to me is more important than whether the scarf is exactly 1:10 or 1:15 or something in between.

As for why I like having the entire workbench top as a support surface, I tried with varying success to feed 2'x4' sheets through a scarfing using my foot-square Shopsmith table, and it was awkward. Doing it with 50"x50" wing skins would be like trying to serve a pizza on a saucer.

My main Falco-building bench is a large, thick, solid-core door cut in half vertically, butted end-to-end and screwed to the top of a frame of 2x12s for stability. Small birch-plywood shims are used between the 2x12s and the door pieces to achieve absolute levelness of the table top, because I used the thing as a bench for building long tail and control surfaces accurately.





I've mounted an ancient 1,750-rpm 1/2-hp washing-machine motor that somebody literally gave me, on a board hinged off the back edge of this workbench, with a three-inch drum sander on the motor arbor and the assembly adjusted so that the lowest part of the drum sander actually bites into the workbench back edge to depth of 1/4" or so and from there on "up" forms an angle that sands a perfect 1:12 scarf off each sheet of plywood fed through it.

The board on which the motor is mounted is, fortuitously, supported by a horizontal structural member of the barn in which I work, plus a couple of shims to achieve the exact angle I want.

The drum sands the top rear edge of the sheet of plywood, and straight-line accuracy is easily achieved by C-clamping a five-foot piece of 1x2 to the bottom front edge of the piece of plywood being scarfed. There is no need to nail the guide strip to the plywood, because the workbench edge is true and is much longer than the 1x2 guide strip. (You could, in fact, simply use a block of wood at each side of the plywood sheet, but the guide strip is easier.)

I measure the distance from workbench edge to where the drum first contacts the sheet, and then mark off that measurement plus maybe five 5mm increments "outward" (away from the sander), at the left and right edges of the sheet being scarfed, and clamp and reclamp the 1x2 guide board at these marks in whatever increments experience shows is best for steady and easy feeding of the sheet through the drum. In other words, I find it easier to scarf a 2.5mm sheet in maybe three passes than to manhandle it through in one sawdust-spewing, motor-groaning feed.

My one problem is that the motor normally wants to rotate clockwise (when viewed from the arbor), and that unscrews the drum sander's internal tightening mechanism, flinging the ----er westward at 1,750 rpm. Fortunately, the motor is so old and loose that it can be made to run backward (CCW) by giving the drum a flip just as you turn the motor on. So if anybody does this and buys a standard sanding drum, you better either know how to make a motor run backward or get a drum with reverse threads, if there is such a thing.

You also have to be sure to mount the thing in a position on the workbench that allows you to feed the plywood *against* the drum's rotation rather than pushing it into the drum in the same direction in which it's rotating, The latter makes the drum want to snatch the sheet and jam.—*Steve Wilkinson*

Don Stark's Precision sander

Your last newsletter shocked me because something I have taken for granted from the beginning may be a problem to others. You said "The best method is to use a thickness sander, but they are quite

expensive." I don't know how a person can build a Falco without a *precision* sander. I built one for almost nothing and out of mostly scrap. It is crude and simple but very accurate. Most people would have to buy only one part from Sears Roebuck to be in business. That part is a three-inch sanding drum, catalog number 9GT25244 (on page 17 of Sears Specialog 1986-87). Attached is a crude—repeat crude—drawing but you get the idea of how it works. I use it to get exact thickness on parts including the 3mm laminations for fuselage rings, and it does the most beautiful job of scarfing you ever saw.—*Don Stark*

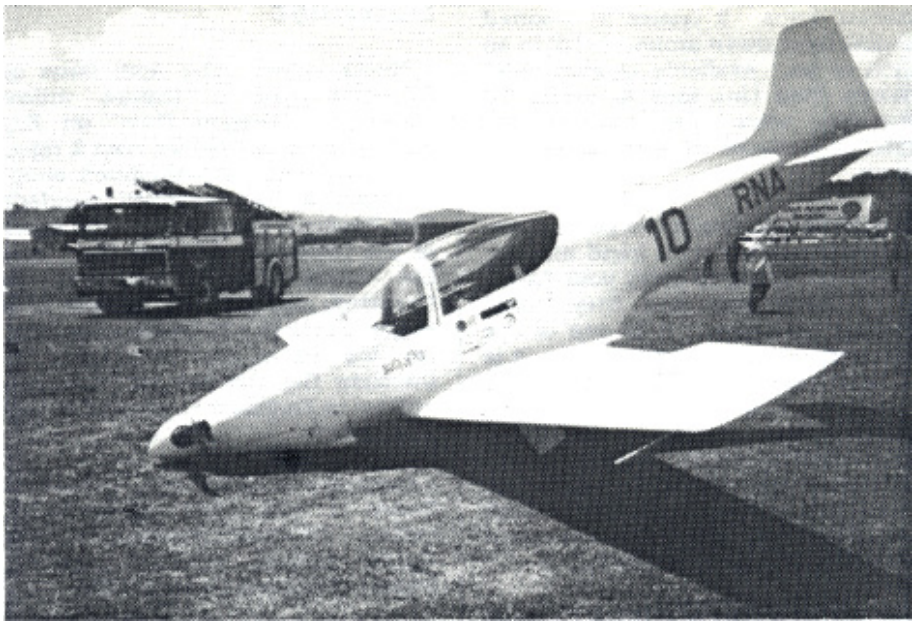
The thickness sander I was referring to will sand a much wider piece of wood—48" is the normal size. It is a huge, expensive machine that is used for sanding table tops, piano soundboards and entire Falco fuselage frames. Thus, the two sanders are not exactly comparable.

Charles Gutzman found a good way to remove staples from his ribs. He is making his own ribs and on stapling the gussets found that he wanted something to follow the irregular pattern of the staples. He got some braided nylon cord at a local hardware store. It is about 1/8" wide and is used by brickmasons.

Charles simply ties a knot in one end and starts stapling over the cord, leading this-way and that-way as he moves around with the pneumatic staple gun. After the glue is dry, he puts on a face shield for eye protection and gives the cord a yank. The staples that don't fly loose have one leg in the air, and they are easily removed with pliers.

The Japanese have now done for electronics technicians what they previously did for music fans with the Sony Walkman—those tiny radio/cassette players that you strap to your belt and boogie down the road. Ishii Instruments Works, Ltd. is now making the "Checkman"—a volt/ohm/continuity "multimeter" the size of a pack of king-size cigarettes.

It has a LCD digital display, and a single rotary switch has settings for DC volts, AC volts, ohms, continuity and diode check. When you are checking ohms, you don't have to worry about the range of ohms since it is "autoranging." The continuity check is neat—it emits an audible "beep" when the circuit is made, so you don't have to glance at a dial.



Above: The one consistant problem with the production Falcos has been with the nose gear retraction system, and it is aggravated by attempts to retract the nose gear too far. This is the result of a beautiful two-point landing by Luciano Nustrini in January.

This little sucker does everything except measure amps and wordprocessing, and most multimeters don't do either. It's more expensive than a Radio Shack meter, but the compact size is very appealing, particularly if you want to add this to your flight tool kit. (My multimeter is actually *larger* than the toilet kit that I use for my airplane tools.) You've got to have one. The Model DM1000 Checkman Mini is $35.00 plus shipping and available from Eaglestone, 5 Landmark Square, Stamford, Ct 06901. (800) 221-5749 or (203) 967-4441. Visa/Mastercard accepted.

Lately I have been up to my elbows in epoxy making the tooling for the Sequoia 300 fuselage shells. I had been using a normal laminating resin, but I switched to West System epoxy just to see what it was like. You use a lot of epoxy when you make tooling—I've mixed and brushed on five gallons in a single night.

When you first pour that golden syrup, you would be excused for thinking that anything that looks like that would be good on pancakes. But the stuff is not good for you, in several ways. I know that you can buy rubber gloves—and I have a whole box—but I never seem to be organized enough to have them on at the right time. And even when you do have the gloves on, once they are well-lubricated with resin, I never seem to be able to get them off without getting some resin on my hands.

I rely instead on PR-88 hand creme, and gloves when I remember. I had tried PR-88 a couple of years ago at Oshkosh and was impressed, but now I'm here to tell you that you're out of your flipping gourd if you don't have a can in your shop—even if you don't use epoxy. It's great for paint as well.

Imagine spending the evening in a shop pumping and spreading gallons of epoxy resin. Despite your best efforts you get the sticky goop on your fingers. Then it's over to the MEK bottle, and you wash the resin off. The process repeats itself endlessly. When the session is over, you do one last cleanup with MEK and then head for the kitchen sink where you wash up in plain water. After all of this, your hands smell like Jurgens Hand Lotion! Any you don't have the slightest bit of dry skin from the MEK. Wicks and Aircraft Spruce both sell it. Get the big can and make it a habit to put a layer on every time you enter your shop and plan to glue or paint. Now, if I can just remember not to scratch my nose.

Does everybody know about 3M Fine Line tape? Nobody, literally *nobody*, uses crepe paper masking tape any more for laying out paint stripes and edges. 3M Fine Line tape is the only thing anyone uses. It is a green tape that's similar to the familiar Scotch tape, but it's slightly stretchy and you can maneuver around curves with narrow strips. It comes in assorted widths from down around 3/16" to an inch or so. Available at auto

paint stores, Fine Line tape is useful for masking when you varnish the interior surfaces of wing skins and spars.

And while you are in the paint store, consider picking up a hand masker. If you are going to paint your Falco, you'll need one and they aren't terribly expensive. It is one of the handiest devices I've ever seen. It is a hand-held device that dispenses masking paper with a crepe paper masking tape already on the edge. The masking paper is available in various widths—18" wide is a normal size. It is nothing more than a kraft paper in a roll. You shove the roll of masking paper on to a spindle.

The masking tape is pushed on to its own spindle, and the tape is fed on to the paper as you pull the paper out—half is stuck to the paper, and the other half of the tape is exposed. There is a long serrated knife to cut the paper with a yank at the wrist. Once you have put down the Fine Line tape, you can mask off an entire wing in minutes. I know you can also use newspapers and tape, but I'll take a hand masker any day.

—Alfred Scott

Balancing the Controls

It seems almost too obvious to mention, but I've seen some pretty complex glued, screwed and tattooed devices suggested for use in the balancing of control surfaces. Yet the simplest things to use—since they're cheap, can be erected and disassembled any number of times in seconds, take virtually no work to make and can even be applied to use as shelf brackets when you're done building your Falco—are exactly that: shelf brackets.

Buy four 89-cent sheetmetal shelf brackets in a hardware store—the eight-inch size is just right to get the aileron high enough to insert a typical postal scale under the trailing edge—and drill out the end-most screwholes to 1/4 inch. Clamp two facing pairs to the edge of your workbench with C-clamps, one pair at each end of the control surface with a gap of about an inch between them, and suspend the aileron from its own mounting bolts run through each pair of shelf brackets. You can align them nearly perfectly by eye, and though there might be an extra gram of drag hear or there if you have bad eyes, we are dealing with a ±2.5-ounce criterion here, after all.

—Steve Wilkinson

Sawdust

• Media watch. The April issue of *Kitplanes* had a feature article "Picking an Oregon Plum" on Ray Purkiser's Falco. Did we read it right, Ray, that your "well-equipped shop" included a "hand-cranked *sander*"? Karl Hansen's Falco was on the cover of the December *Midwest Flyer* and the latest *Flieger* Magazine in Germany, and it is the subject of a major article in a Brazilian magazine. Do we have any volunteers to translate the German or Portugese articles to English for inclusion in this newsletter?

• Aeromere Falco for sale. 1959 F.8L Series 3 with 1598 hours TTSN. Offers. Midland Aviation, Abbey-shrule Airfield, County Longford, Ireland. Telephone 044/57468.

• 180 hp O-360-A1A for sale. No logs but low time—"probably less than 500 hours." Bendix mags but no other accessories. $2,000 from Bayard Dupont (215) 268-8988.

• Hartzell Propeller has been sold by TRW Inc. to the Cleveland-based Lakeside Company. The Lakeside Company is jointly owned by the Horsburgh Scott Co. and James W. Brown. Horsburgh Scott is a privately held manufacturer of gears, speed reducers and custom gear drives that has been operated by the Horsburgh family since 1886. Hartzell plans no changes in prices, however it is common to see changes after the purchase of a company. If you are going to buy a prop in 1987, it is probably advisable to do it soon—just in case.

• The CAFE 400 will be held in Santa Rosa, California at Sonoma County Airport on June 26th and 27th. To order a "race kit", send $3.00 to Ed Vongehr, Race Chairman CAFE 400, 16466 Willow Creek Road, Occidental, CA 95465. Karl Hansen will enter again this year.

• If you are using a Shopsmith to build your Falco, Shopsmith Inc. would like to hear from you. They are looking for a plane to feature in their literature. Contact Bob Shields at (513) 898-6070 or at Shopsmith Inc., 3991 Image Drive, Dayton, OH 45414.

• Wakey, Wakey! Our Oshkosh forum on the Falco will be at 8:45-10:00A.M. on Tuesday, August 4. The Annual Falco Builders Dinner and Gathering of Stelio Frati Aircraft Owners and Admirers will take place that evening.

• From the Christmas issue of Marchetti Matters, the newsletter of SF.260 owners: "To satisfy numerous requests, we repeat our 'Italian Stew' recipe for the holiday season. Ingredients: 1 elephant (medium size), 2 rabbits (optional), carrots and potatoes as needed, brown gravy (to cover), salt and pepper to taste. Cut the elephant into bite size pieces. Add brown gravy and cook at 465° for 3 weeks. Salt and pepper to taste. This will serve 3,800 people. If more guests are expected, add the two rabbits but only if necessary as there are many who do not like to find hare in their stew."

Brenda's Corner

Even though I never met Mr. Brown face-to-face I felt like I had known him for a long time. From the very first time we talked on the telephone, it was obvious that the Falco project was going to be his number one priority. Everytime we talked he would be even more excited. It was like talking with a child on Christmas Eve, you could hardly get a word in edgewise, but you always felt good when you hung up the phone. His enthusiasm and excitement was contagious. We have all lost a friend.

It's not too early to be making plans for Oshkosh. This year the show runs from July 31 to August 7. We have reserved several extra rooms at the Paper Valley Inn in Appleton. We have extra rooms available for every night except July 31 and August 1. If you are interested in staying there, let us know, and we will try to accommodate you.

From time to time, we get requests from Falco builders for handouts to use at exhibits their EAA chapter is holding at malls, etc. We do have a couple of things we can send so let us know if you want to do some advertising for us.

Now that the value of the dollar has moved downward we are getting a lot of overseas orders. To get money out of their country, builders in Italy and Brazil need a pro-forma invoice from us first which causes delays. The easiest thing to do (and in the interest of time) is to supply those builders with a supply of our letterhead, and they can prepare their own invoices! If you would like to take this shortcut, drop me a line, and I'll send you a supply.—*Brenda Avery*

MailBox

I was saddened, for us all, to hear of Richard Brown's death. Given my own personal experience, my mind goes to his wife. The death of a spouse is the greatest of agonies. As pilots we think why? It wasn't the Falco, again. Prevention? When in doubt, stick the tanks; when the single engine fails on takeoff, land straight ahead. Judgement can be more valuable than experience at times. May Richard rest in peace and may the Lord sustain his wife.

John Brooks Devoe
Stratham, New Hampshire

Sure sorry to hear about Richard Brown and his friend. It's like losing part of the family, and to be a victim of incompetency (inexperience?). I just don't know what to say except that we've lost two airplanes from lack of fuel in a plane that will fly 1000-plus miles on a tankfull.

A couple of comments: (1) My favorite aircraft-dismantler/parts-supplier, says 6-7 out of 10 of the aircraft he gets are lack of or mismanagement of fuel. (2) Being able to build a Falco in two years is fast enough. You can't build most of the competition in less time. I feel that you should stress "zero" defects more, or maybe dependability more than quickness in building. A person will finish in about the same time, but the "attitude" of care in building will carry over into operating practices later on. Hurried pre-flight, hurried checklists cause lots of problems. We miss items even when we are careful.

Karl Hansen
Roseville, California

I am still building fittings and welded assemblies in my now cozy shop. The spruce kit from Western Aircraft Supply came in and the wood is beautiful and the dimensions are accurate. Builders in the Southeast might be interested in knowing that Alexander Aeroplane Co. in Griffin, Georgia (800 831-2949) has increased their line of homebuilt supplies. They now have metric birch GL-II plywood. Their crating charge is reasonable, service is fast, and their catalogue is free.

Those of you who are attending Sun & Fun and need help or just want to visit: we are on Leeward Air Ranch, a N/S 6000' sod strip 11 DME on the Ocala 117° radial. Those driving, exit I75 at Ocala and call me at (904) 245-9086. We have one spare bedroom, motel transportation, a fair set of tools, an 80 lb boxer who is very friendly, hangar room for Frati airplanes only, and the bar opens at five. Has anyone come up with a bill of materials for plywood, and did Albert get his bonus yet?

Ralph Braswell
Ocala, Florida

I bought the Falco project in 1984, knowing that I would only be able to really start working on it years later, due to a lack of space. Well, the time is almost ripe, as we are nearing completion of our new house, including a work area (Falco) of 230 sq.m., must just finish the cabinetmaking and woodwork of the house (do-it-yourself). Then I'll start on the Falco. I have already built the wing ribs, made all the hinges and metal parts.

The stage of progress of my Falco project is as follows: fuselage—completed and top skinned, tail group—completed and skinned, metal parts—all hinges completed and most of the rest. The wing spars and ailerons to be built and then all to be assembled.

I plan to skin the control surfaces with plywood. As it is impossible to get 1.2mm plywood in South Africa—only that available in 1mm and 1.5mm—what do you suggest. At the main wing spar, the needed 3.5mm is not available. I have been thinking of laminating 1.5mm and 2mm. What is your opinion and maybe you have another solution?

Fanie Hendriks
Transvaal, South Africa

Everyone seems to be unable to get 1.2mm plywood, so use 1.5mm instead. No problem on laminating two thickness of plywood to get a thicker layer.—Alfred Scott

Wing and tail ribs complete. Fuselage frame timber purchased. Work to start on frames this spring.

Robert Dell
Melton Mowbray, England

I am not quite certain if I should thank you or hate you for the wrath you have inflicted on my mind. Whatever the case, I do feel that your company should be illegal—Falco fever is most certainly an addictive drug! I am eagerly waiting, rubbing my hands together like a lecherous old person, for the set of plans. I think that they will arrive tomorrow. After that time, I fully anticipate being incapable of all coherent non-airplane oriented thought.

During the weekend I had the pleasure of driving up to Pleasanton to examine Dennis Moore's Falco parts. He has constructed a most enviable workshop. Dennis considered building an Osprey II at one time, and I was very impressed with the differences between the Falco plans and those of the Osprey. Whereas the Osprey plans looked like a pile of 11 by 14 sheets with hand drawn pictures, the Falco plans were a designer's guide to heaven. They seemed to depict every single aspect of the plane. As a person entranced with how things work and how they go together, I imagine that the plans must have been quite an enjoyable, although large, task to draw.

So here I sit, very impressed. And all this without even getting a chance to browse through that construction manual that everyone seems to rant and rave about. What will be next? And one certainly cannot pass up the opportunity to talk about the newsletter. It certainly beats reading *Flying*!

Alan Hantke
Santa Clara, California

I own the Falco D-EKMK. Because of my work, I'm living in Ruanda, Africa. We were doing a lot of work on the airplane and also made many flights between Finland and Spain. At Soest-Salamanca Airfield also stays another Falco of Horst Futter and a Siai Marchetti 260 D-EDDG.

Jabst Peter Jahn
Soest, West Germany

I have recently purchased the bare bones of a Falco, a tail unit skinned, a fuselage unskinned and jig removed. There is a rudder and elevator and wing ribs. My first job it would appear, it the main spar. Could you kindly supply a cutting list for the timber, plus a rough guide of my approach to this structure which unfortunately is my very first attempt—not prehaps the best place to start. Help!!

Sydney George Clifford
The Coach House, The Grange
Whitley Nr. Melksham
Wiltshire SN12 8QN England

The best description was a series of articles by Tony Bingelis. Unfortunately, I've misplaced mine. If anyone has them, please make copies and send to Mr. Clifford. Please see "Construction Notes" for a quick description.—Alfred Scott

Although my chief ambition is to build this beautiful plane, I am also determined that when I start, I will be able to devote all my time to it so that building time will not be protracted. I enjoy your letter with

its valuable and interesting information. Many thanks for your trouble and your time devoted to helping me.

Peter Hatcher
Iver Heath, England

In the December 1986 Builders' Letter you mentioned the lower wing to fuselage fillet could be made with plywood. Please be advised that I had already done so, and it came out very nicely. I also made the upper wing/fuselage fillet of plywood. I figured the Italians did so, so why not me. I have the plywood glued in place but still have some fill and sanding to do.

My airplane is standing on its firewall at present. Makes it easy to adjust main gear and paint bottom of wing. Will finish the fillet when I put the wing on the gear. I don't like fiberglass and am trying to keep as much as possible off the plane. I presently have two coats of Stits Polyspray on everthing except top of wing and forward fuselage. No engine or cowling yet.

Next problem is landing wheel well doors. I made my doors last winter of aluminum just like your original drawings. Of course they wouldn't fit after the gear was retracted without cutting a big hole to clear the tire and wheel, which I did in one door. The linkage worked good as set up to your dimensions. Reading the last Builders Letter, I have come to the conclusion nobody has been successful with your design and installation. I don't think it is the door flexing at high speed. I would say the problem is in the geometry of the retract linkage.

I think you need to take another look at this and come up with an adequate solution to keep the doors closed at high speed before we builders waste any more time and material to solve a design problem.

Rex Hume
Williams, Oregon

The Italians made the upper wing fillet of wood using the cold-molded method. They made a wooden female mold and then made the fillet with criss-crossed strips of veneer. Richard Brown, John Shipler and a few others have used plywood for the upper wing fillet.

I don't agree at all about the gear door linkage. I don't think the system that Mr. Frati designed can be improved upon. It is beautifully simple and quite strong. Nustrini has used it for years, as have a number of others. The geometry of the linkage was never well-defined, and all I did was tweak it to optimize the mechanical advantage of the device and to work out some precise dimensions.

All we need now is a stiff door. If you make the doors as designed and they still flex, then you will have to reinforce the doors with more fiberglass or carbon fiber. I don't think Karl Hansen had quite the sandwich structure that we show. I have seen the doors that Joel Shankle built from our drawings, and it's difficult to imagine that they are not stiff enough.—Alfred Scott

My son is a design engineer employed by General Dynamics working on such goodies as the F-16, F-111 and the ATF along with whatever I am not allowed to know about. He and some of his engineer buddies have been real interested and active in my project. During lunch hour my son and his friends like to "play with ideas" and one of their favorite "toys" is the computer aided design.

It seems that they designed a joy-stick control for the Falco complete with redundant power assist that would require minimum wrist action and is located on the center console. It must have been quite a system with circuit boards, servos, etc. For some reason I do not understand, they "lost" the whole works in the General Dynamics computer and haven't been able to call it back and cancel it. It is quite a joke among them about the response of whoever finds it. One commented that it may be labeled "Super Secret" because whoever finds it won't know what it is. Great, Alfred Scott's Falco —Super Secret. Talk about snob value!

Donald C. Stark
Willard, Missouri

A computer that eats modifications to the Falco? I gotta get me one of them!
—Alfred Scott

I want to thank you for the ride in the "corporate disgrace" on Sunday. As you see from the enclosed order, that ride was all it took for me to finally make up my mind to proceed with the building of a Falco!

Kenneth A. Jones
Deerfield Beach, Florida

Alfred, really. Unless a builder is an experienced machinist, or a masochist, or has access to a fully equipped machine shop, it is crazy to attempt the construction of anything but the simplest ironmongery. I must admit I've wasted an awful lot of time.

Our *Pilot* magazine published a report of an accident investigation which stressed the dangers of... I am not quite sure if it was drink or other associated perils. At least the man died with a smile on his face.

Charles Wagner
Glasgow, Scotland

Never fly with a drunken bagpiper, Charles. The rest of you see below.

Below: Reprinted from February 1987 Pilot magazine:

Intoxicated

The pilot and his passenger were killed when the Skyhawk crashed into a slope not far from Las Vegas, shortly past midnight on a clear night with a nearly full moon.

The 57-year-old pilot had obtained his private license in 1980.

The plane had taken off sometime before 11 p.m. from Las Vegas. At midnight, a fisherman observed the lights of an aircraft flying very low over the water. The plane was located not far away the next day, having struck fifty feel below an escarpment.

Lab tests showed the pilot's blood alchohol level was 0.18 percent, and the level for his female passenger was 0.14 percent. In most U.S. states, drivers are considered intoxicated at a level of 0.10 percent, and Federal Aviation Regulations now limit pilots to 0.04 percent.

Police reported that, as evidenced by the position of the bodies and certain injuries to the pilot, the passenger was performing an act of oral sex at the moment of impact.