

# Falco Builders Letter



Modern times: *The Falco on the web.*

## Falco Lands on the Information Superhighway

Cyber-groupies rejoice! The Falco has made it, if a bit late, to the world of the Internet. You'll find us at [www.SeqAir.com](http://www.SeqAir.com).

I'll begin by admitting that I approached the Internet as a bit of a cynic. The world, it seemed, had spawned an entire generation whose answer to every question was "The Internet!". Only dandruff and a few unmentionable medical problems seemed to be beyond the capability of cyberspace.

But if it's true that motivation follows action, after spending a couple of weeks setting up the web page for the Falco, I've come to see the Internet in a new, and more constructive, light. In some ways, it seems to be a dream come true, as if the world invented the Internet just for us.

My previous experience in looking at the Internet was at odd times when I would log on and try the thing out. "Oh, it's great!" people would say, but then you would sit

there and wait, wait and wait some more for some page of 'information' to appear. And then when it arrived, I would think "I waited two minutes to look at *this*?" So many of these 'web sites' are vacuous, content-free exercises in bad taste. A corporate logo, a picture of a single product and an invitation to call and do business. And then there are all of the silly flashing and twirling gadgets that provide great amusement to the programmer more fascinated by being able to say "Isn't that neat!" or

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"Nobody's ever done that before!" than providing any useful function to the world. Tacky lawn ornaments on the information superhighway.

But when I started to put together a web site for the Falco, I came to see it all in a different way, and if you check in there, I think you'll see why. I see the Falco web site as a place that people can—in a figurative sense—come to and stop by our office, meet us, look at the kits we have, read a bunch of back issues of the Falco Builders Letter, then go off and visit Mr. Frati in Italy, check in with Stephen Friend in Australia and John Devoe in New Hampshire, ride through the process of crashing with Stuart and Vivienne Gane and then as they get it back in the air, check in with other builders who are in the process of building a Falco, and so on. In short, it's a place where people can take in the entire Falco experience, at one moment in time.

When Jan Waldahl finished his Falco, we had a nice article in the Falco Builders Letter about it, along with a few pictures in black and white. When we printed it, those of you who get the Falco Builders Letter read about it, and then it became yesterday's news. But when posted on the Internet, with color photographs, it lives on, for the entire world to read.

I've always wanted to be able to come up with a collection of 'the best of the Falco Builders Letter' and publish it. However the problem with those of us in the airplane kit business is that there just isn't enough volume to do this. Printing anything is expensive. For example, when we first came out with the Falco brochures, we spent \$50,000 on the initial design and printing run. And because of those costs, we're forced to charge for the information package.

At that time, we produced a 32-page brochure on Stelio Frati's various designs, because back then he was little known to the aviation community. Since then, Mr. Frati has designed and flown additional aircraft, but to include them means that we have to redesign the booklet, and either eliminate some parts or add pages. It hasn't

been worth doing, so we've just kept printing the same brochure over and over.

However with the Internet, we have unlimited, free color printing available. Adding a new page of information and color photographs is just a matter of a few minutes work, and then it's out there for the world to read.

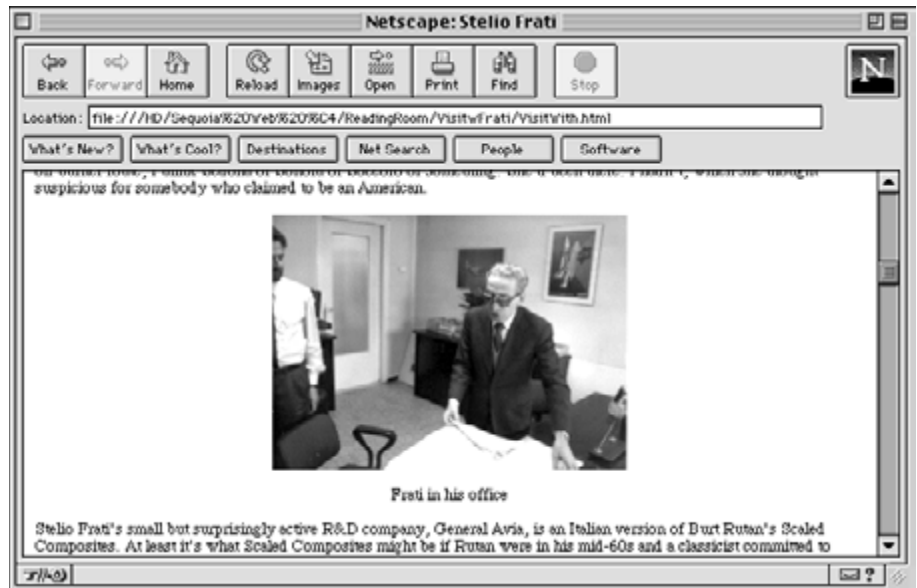
At this time, we have about 300 pages of information published on the web, and you can spend hours going over the articles. Even for those of you who have seen the articles in the past, you will probably find there's a new dimension in seeing the photographs in color, and I haven't felt any need to publish precisely the same set of photographs on the web that we used in our Falco Builders Letter. In our newsletter, we're restricted to a given space on the paper, but that's not the case with the web.

So it's manna from heaven for us. In the past, to get someone interested in the Falco, we had to advertise in magazines, persuade them to send an order for the information package and occasionally had to deal with people who were offended by the notion.

And I'm sure there are many of you who've come to dread that look of wild enthusiasm on a sudden new fan who is begging you to send him information on the plane. Gosh, I'd love to know something more about this plane! Can you send me something? Steve Wilkinson says he's probably mailed out a hundred letters to people who would like a copy of an article he did. So even Steve, who sneers at the Internet as the CB radio craze of the 90's sees something in it for him. Now instead of writing letters and copying articles, all he has to do is give them a web address, and he's *finished* with it.

Let me tell you something about where I plan to go with this. I see the Internet as simply another way to expose the world to the experience of building the Falco. The first step has been to publish the basics of our brochure on the Falco, the literature on the Falco kits, and a ton of articles on flying the Falco and all of the other things we talk about in our newsletter.

As it's up there today, I'm only part way through the process of getting 'first flight' articles posted. If you don't see your favorite Falco posted, please be patient, because we'll be getting all of them up in time. In many cases, I have a problem with insufficient photographs because we've returned loaner photographs. If the website article on your Falco has black-and-white photographs, that's because we no longer have color pho-



tos to work from. We'd love to have you send us color prints so that we can clear this up, and we can send them right back.

I'd also like to provide a way to have people 'visit' Falco builders who are in the process of building the plane. My thought is that we'll have a 'Falco Workshop' where people can go and check in with Falco builders. And if you have your own private website for your business or for your Falco project, then we can provide a link to that as well. But it will provide a way to show the projects to all the world. If you'd like to provide addresses, telephone numbers and e-mail addresses, then we can do that as well, but that will be up to you.

I am, however, going to insist on one rule in the Falco Workshop. I'd like to have a photograph of each Falco builder in at least one of the photographs. There's nothing so impersonal as a picture of a wing or fuselage frame alone. Having the people involved in the project be part of the display gives it a whole new dimension. Also, in the world of cyberspace, people tend to flame each other and forget that there's an actual, live human-being at the other end, and seeing the faces of the people at the other end has a great civilizing effect on everyone, and people tend to be kinder to each other. If you want to see the flame a-flying, just check into the AVSIG on Compuserve and watch as these cybergroups scream at each other.

I also plan to have a Falcos for Sale department, so if you have a Falco, you can advertise it to the world. There will be no charge for this, but initially we want to limit it to finished and flying Falcos.

We'd like to do anything we can to turn this into the center of the Falco universe, so we'll

have a calendar of events for Falco events in Europe as well as the U.S., and links to the Falco Club in Italy, and the like.

In some ways, this is like getting free time on television. On any given day, the readership of our web page is greater than the entire circulation of the Falco Builders Letter, and people who come there and spend time reading the material are attentive and are willing to invest their own time doing this. We're already getting brochure sales from the web that are greater than we get from any single magazine ad, and we're getting plans sales as well. And that is just in the first couple of weeks, before word of the web page has really gotten out.

I hope you'll all check in and see what it's all about, and also that you'll tell people about our web site. It's an easy address to remember, and we're getting some 'refrigerator-magnets' printed up with a photo of the Falco and our web address. We'll be sending you all a supply, and if you need more, please let us know.—*Alfred Scott*

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

## Another Falco in England, Well Almost!

by Alan Powell

I purchased my plans sometime ago in the mid 1980's. I had seen a small advert in something like *Pilot* and was taken by the appearance of the Falco. However, I made no start until about 1994. I had decided to purchase a spruce kit from Western Aircraft Supplies in Canada and build all the components myself. I found Jean Peters very helpful in getting the whole package sorted and shipped and the kit, in general, comprehensive. However as no cutting list was supplied, I had no way of checking if all the timber was there. I aim no direct criticism of Jean Peters for this as he has to protect his investment, but as I had no particular time scale to work to (it would get built as and when time was available) I found that 2 years later I had no timber for the wing cap-strips. These were easily obtained from Aircraft Spruce, who are my main suppliers for all the "bits" I need.

I also decided to build all the metal components for the airplane and to that end obtained the CAA Welders Certificate in chrome-moly TIG welding. This is not strictly necessary in England, if you are going to use all the components you make in your own airplane, but I fancied the challenge.

Our system here in Britain requires that you register the design with the Popular Flying Association (like the EAA in the U.S.) for approval and get a list of "Approved Inspectors" from them. You then negotiate with an inspector who lives fairly near where you are building to inspect, oversee and sign off the components and eventually the final structure in a construction log book at various stages. The Falco is an accepted design here in England so there was no requirement for approval to build.

I started construction on the fuselage frames. This may seem a little strange, but as I have worked with timber in the past, I did not feel it necessary to start on what you describe as the simpler components first. Furthermore, as the spruce laminations for the frames were very clearly marked, this became the deciding factor. Having said that, after building a frame by making a continuous "circle", I found it much easier to construct the rest using the "half C" technique.

For those readers not familiar with this system, you construct your frame jig and simply build the left-hand half of the frame first, ensuring that your laminations extend



beyond the centre line of the jig. Then take that out and build the right-hand half, again making sure that your laminations extend beyond the centre line of the jig.

When this is complete (having sanded the halves to the correct thickness) cut an angled scarf joint top and bottom in one half, clamp the uncut one into the jig and put the other in place so that you can pencil the scarf onto the other uncut one (this is why you have the overlap beyond the centre line to allow a decent 15:1 scarf) cut that one and place the two "half C's" back in the jig and glue them together. You can then add the internal blocking and framing. I varied where I put the scarf joints. On some frames it was at the top and bottom, and in others it was either side.

I then constructed the ribs. I found it very difficult to bend the forward ends of the capstrips and quickly came to the decision that it was simpler to get the best curve I could and put a small block of spruce in the nose end of the rib about the same size as the plywood gusset and then sanded the rib to its correct profile ensuring that the capstrip was the correct thickness throughout and reducing the block to its correct size, then adding the plywood gussets.

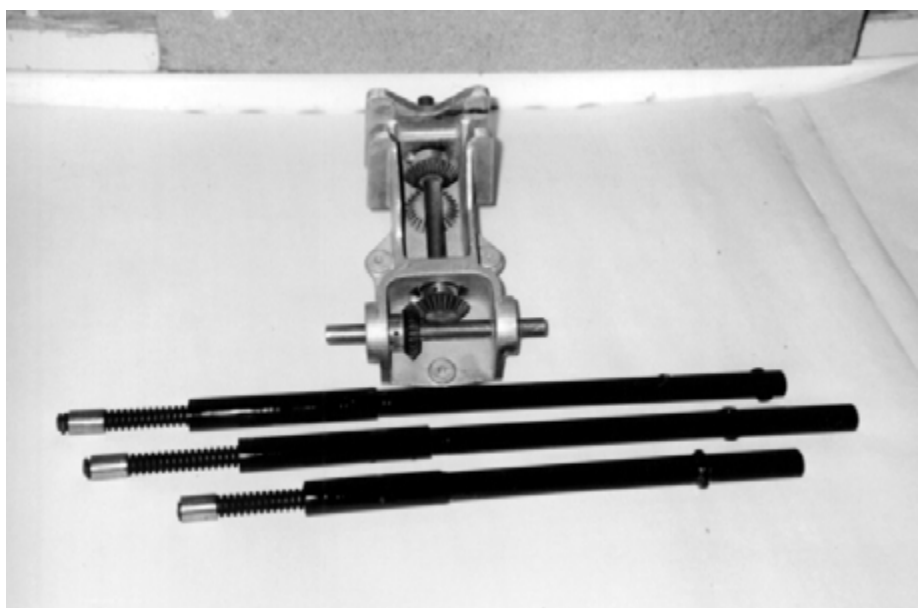
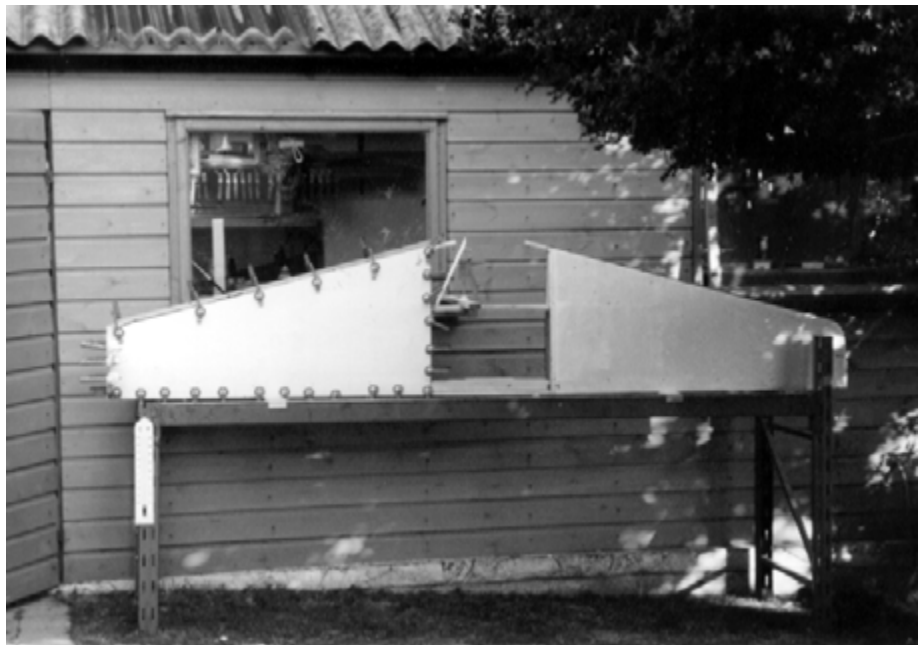
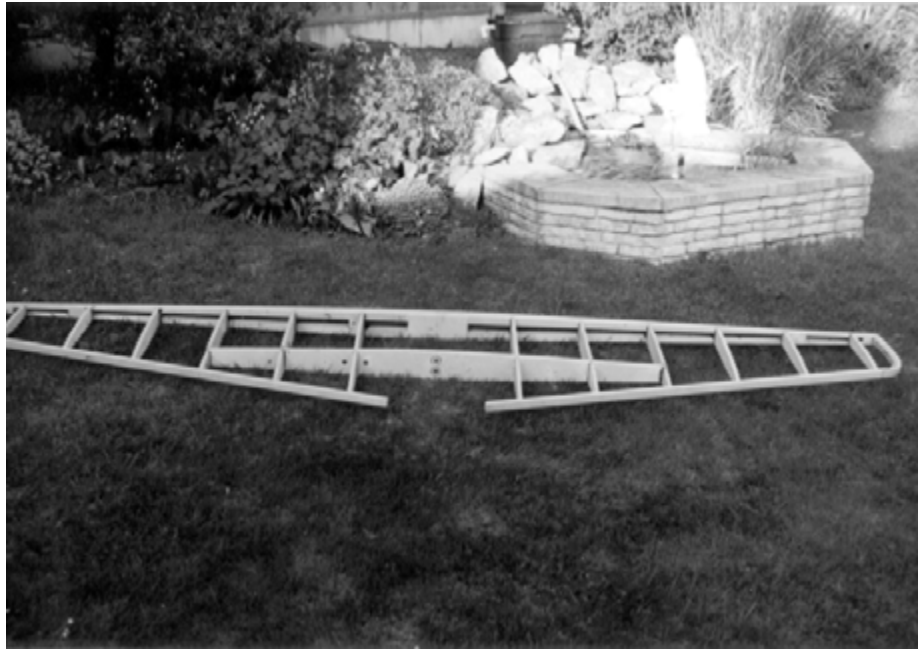
Next came the big one—the main spar. I told my wife that it would take me about a month to build and could I use the garage for gluing up. She agreed, but as she pointed out to me, we have two types of time in our household—Zulu and Falco!

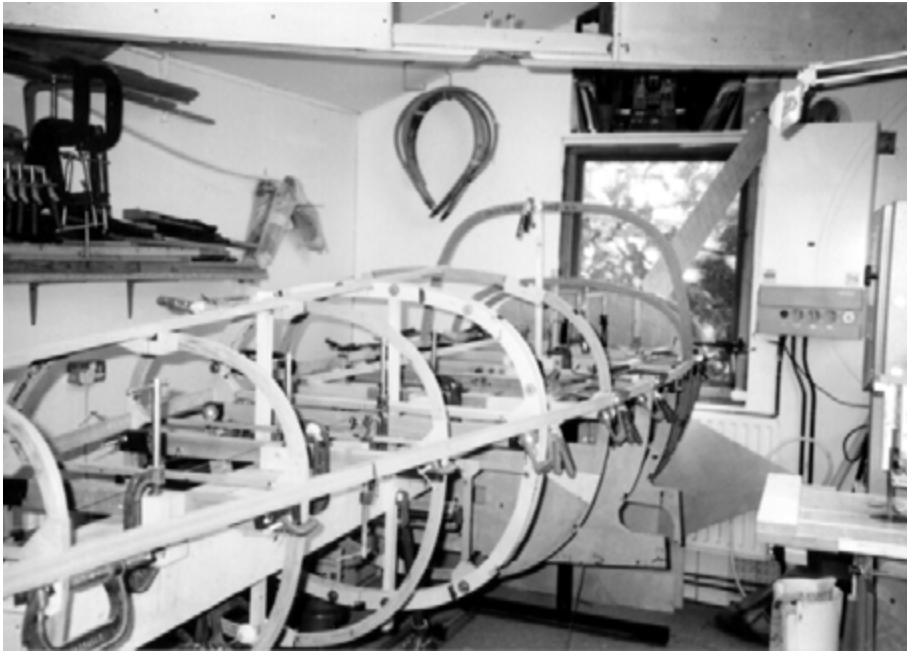
So when the spar was finally finished 2 months later, she was not too upset!

What can I say about the construction of the main spar? Get a solid table to work on. I used industrial "pallet" shelving cut down to 3 feet tall, with 4" x 2" steel connecting bars, topped with 1" thick chipboard. On this I laid out the dimensions of the spar, constructed fences to clamp the top and bottom booms to and just got on with it. The main problem with the spar, apart from its size, is just the plain and simple fear of undertaking the job. Once you take the plunge (and when your inspector congratulates you on an excellent job and signs the spar off!) you wonder what kept you from doing it. But that's easy to say once you've completed it. Then comes the minor problem of where to put it while you get on with other jobs! Mine is hanging in between the roof beams of my garage.

A word on adhesives. I pondered long and hard on what adhesive I would use. In the end I contacted Ciba-Geigy at Duxford (who make Aerolite) and spoke to their chief chemist John Bullen. He has years of experience in timber laminate construction, and he suggested I use Aerodux 500 and 501 hardener. This adhesive is 100% waterproof when completely dry and also resistant to most chemicals. This is a crimson, resin type glue to which you add a foul-smelling brown hardener in a simple 1:1 ratio. It has the advantage of looking like artery blood when mixed so you can clearly see exactly where it is and ensure that you have a decent glue line in your laminations. I use 20ml and 50ml plastic syringes to place it before spreading so I could be likened to the proverbial mad scientist slaving away in my workshop!

The squeeze-out drips are like glass when hard, so you don't run your fingers along them to knock them off! John also made the observation that as GL1 ply only comes up in 50" x 50" sheets here in England, it would be better if I made up a press to join the sheets together *before* I put them on the airplane. Aerodux is the adhesive used in the manufacture of GL1 ply and therefore any joint made would be as even and flexible as the original and of course the joining of sheets allows for less waste. Again a 15:1 scarf is the best. The press is simply like a large letter-box mouth made from 2" square tube with a gap of about 4" between the top and bottom tubes. The top tube is drilled to take 5 short 1/2" acme screw threads, and the ply is sandwiched between 2 pieces of 1" thick chipboard about 12" wide by screwing down the acme threads.





I purchased a digital “postal scale” (you can get them from places like Office World or similar in the US) to measure out the two parts of the adhesive. The advantage of this type is that you can put any size or weight container on it *before* switching it on and when switched on the readout starts at zero, then all you have to do is add any quantity of resin, then add hardener to double the number shown, thus ensuring an accurate 1:1 mixture (eg 15 grams of resin, pour in hardener until the scale reads 30 grams). The same scale can be used to mix epoxy resin for sealing the inside of the airplane in fairly large size batches.

John invited me up to their factory which is just across the motorway from Duxford Airfield Aircraft Museum where he showed me all the data they had on Aerodux, and we conducted various tests on the spruce under different conditions before I started any construction. All of this has resulted in a superb friendship and a number of very good lunches in the local country pubs!

Having built all of the wooden components, I decided to construct the fuselage first. This is due to constraints on the size of my workshop. Unlike you lucky Americans who seem to have vast garages, we Brits have more limited space. My wife finally agreed that a workshop at the bottom of our garden (together with a newly constructed patio for partaking of the evening sun) would be a good idea. So I duly set about construction and now have an almost complete fuselage sitting on a rapidly disappearing jig.

I intend to drill the undercarriage mount holes in the main and forward wing spars. Then as my workshop is just wide enough, glue the forward wing spar to fuselage frame 3 while the fuselage is still leveled and attached to what is left of the fuselage jig. I will then separate the tail section at frame 8 and store it. I can then turn the remainder of the fuselage so that the forward wing spar becomes horizontal to the floor and fit it all into the wing jig. The forward wing spar being attached to the fuselage frame will give me a good reference to getting the whole thing level and vertical and serve to locate the main spar properly. But, as they say, that is another story!

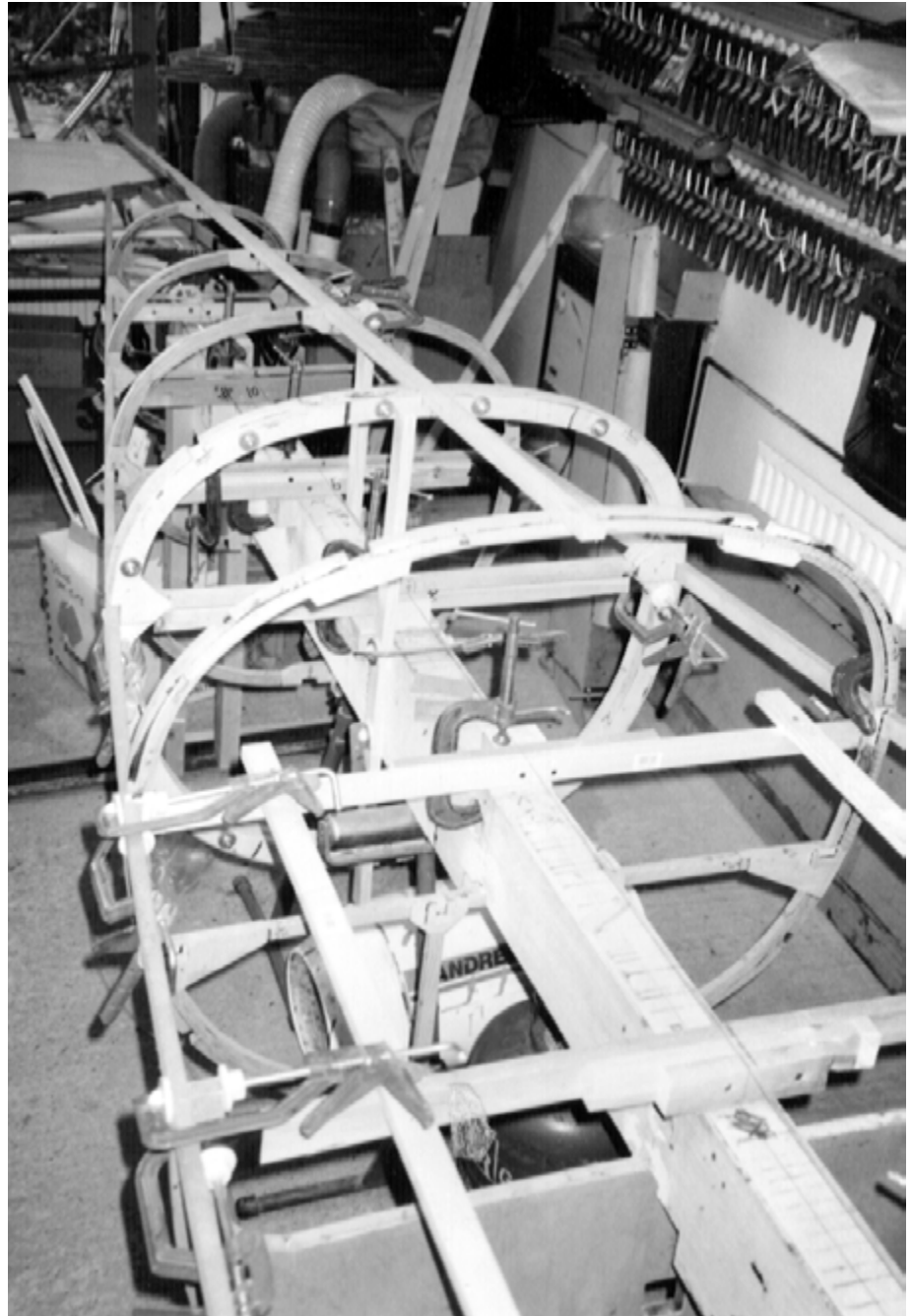
I used 4”x1” webbing ratchet straps to grip the ply onto the frames. These are simply a nylon webbing strap with a ratchet attached permanently to one end, you put the strap around the fuselage and feed the end into the ratchet mechanism and crank it up tight. It’s a bit fiddly to get the first

one in place, but boy do they grip! The advantage is that they take up the shape of the frames and apply even pressure all the way round, you can also staple through the webbing if you wish and add clamps where necessary. I got mine from a boat chandlers, but I think they are used as tie-downs on trailers, etc.

I had a bit of a mishap with the rudder—I dropped it! This caused the “fairing” below the bottom hinge to snap at the forward face of the vertical spar. Now I found this a most complicated piece to make and skin—there is very little to clamp or staple the plywood to. My building inspector looked at it and his first reaction was to build the whole bottom edge of the rudder again. I was not best pleased. But then he had a hard think about it (and having considerable experience in glider construction) came up with the following. He decided that this part is really no more than a simple aerodynamic fairing.

So he suggested that I purchase a large block of balsa wood, cut it to the shape of the bottom of the vertical spar, then using the rib below the bottom hinge as a template—cut it to that shape. Glue the rib to the balsa block, glue the rib with the balsa block to the forward face of the vertical spar in the correct position, sand to shape and finally skin with ply in the normal way. This was a really simple way of making that shape, and it does not seem to affect the balancing of the rudder. May I suggest this as an alternative to the method shown in the plans? Hint, if you can’t get a block of balsa the correct size, buy two (or more) and glue them together to get the correct size *but* use balsa cement to do this, not the ordinary adhesive you normally use in construction, as this will be harder than the balsa and difficult to sand.

Another minor modification made is to the filler necks of the fuel tanks. Whilst I was at the PFA Rally at Cranfield, I met Robin Voice, who is the manufacturer of the superb cast aluminum tank necks and caps that you see on some of the motorcycle superbikes nowadays. He now makes them with a 2-1/4” screw thread to fit the M142 weldable tank flange in the Aircraft Spruce catalogue. What this all means is that instead of having to frame up and cut access doors for the tank fillers, you just install the fuel tanks with the M142 flange and an aluminum spacer in place of the cap, cut a circular hole in the skin of the airplane and screw his complete neck and filler cap to the tank from the outside. The whole fitting snugs neatly down on the skin of the airplane on a thin layer of



sealant. The thread of the fitting is sealed with “Loctite” or similar when screwed into place and has a fair degree of adjustment due to the length of the threaded section on the fitting. The effect is a super smooth elegant aluminum tank cap which is lockable and completely waterproof and no problems with spilt fuel entering the airplane—think about it! He makes the fuel caps in both aluminum and modern ABS plastic and a same key extra lock can be purchased for the canopy. If you are interested, you can fax him on 44 (0) 45 383 6703, he’s a very amenable chap and will ship to you direct, or buy direct from Aircraft Spruce.

I’ve also had the fuselage frames and the canopy frame bows drawn as an outline

using AutoCAD, they print out on an AO+ Hewlett Packard printer. If anyone wants a set, I’ll either print and send them or copy the disk and send them that. It saves an awful lot of time in drawing them out yourself.

Oh yes, just as a closing aside. I had never flown a Falco until 2 months ago when I went up to Leicester and flew G-OCAD, the latest new Falco to be completed in England. All I can say about the whole experience is to quote my wife’s comment as I taxied up to the hanger which was “If your grin gets any wider, you’ll split the canopy!” This is a truly superb airplane and worth all the time and effort necessary to build it, whether you start from scratch or buy any combination of kits.

## Construction Notes

Glyn Russell asks, "I'm installing the McCauley governor. The studs on the engine mount are too short. It looks like the governor has an extra plate on the attachment and that has two screws and for dowel pins to hold it on. It is approximately 1/2" thick. Is it possible that this is removed at installation so the bolts from the engine will work? If not, can you give me a recommendation?"

Lycoming engines are supplied with two types of studs for mounting the governor. The standard studs that come with the engine are too short, and you have to ask for long studs which will fit the McCauley governor. That plate is part of the governor and you leave it where it is. This is covered in our advanced builder memo which includes a complete specification for the engine.



George Richards emailed, "I glued the forward tank mounting blocks onto frame 2 diagonal. Am I correct to assume that it is normal to have to remove quite a bit of that frame in order to make a flat face for the tank mounts to bolt on to? I have the frame 1 + 320mm station as being a little forward of the rear of the diagonal frame." George also sent along an emailed photo.

Something sounds quite amiss here. Normally, you don't have to remove any of the diagonal frame and the blocks that you glue onto frame 2 diagonal completely go around the frame. It sounds like the diagonal frame is in the wrong place.

The *Weekly of Business Aviation* reports that the NTSB has urged the FAA to require inspections of all Lycoming IO-320-B1A engines with the thinner propeller mounting flanges of a type that was superseded in production more than 20 years ago. The action stems from a 1986 fatal crash in which a Lancair 320 lost its propeller in flight. Investigation revealed that the broken propeller mounting flange had suffered fatigue cracking between lightening holes. The NTSB believes this cracking may have been initiated by gyroscopic



***Fratis in production.*** General Avia's line of Stelio Frati-designed single-engine airplanes has entered production. Three of the five models of the F.22 have received FAA Part 23 certification. General Avia produced 25 F.22s last year, and will gear up to produce 105 airplanes per year by 1999. Certification flight testing of the four-place F.220 Airone (Heron) continues. General Avia is now looking for a U.S. distributor for the F.22 series after previous arrangements with the Loprestis fell through. General Avia expects to manufacture 50 Airones a year beginning in 1999.

bending loads on the crankshaft during aerobatics.

The NTSB is concerned that some of the engines used in Lancair 320 and other homebuilts may have the old-style thinner propeller flanges, and that these aircraft using the IO-320-B1A engines "could be flown in a manner that could initiate cracking of the flange."

Kim Mitchell asks about where to use the three types of grease specified for the Falco. Aeroshell 7 is tan in color and is to be used in the landing gear retraction gearbox. Aeroshell 17 is the same grease except it has molybdenum disulfide ('moly') added, which makes it a black grease. Use this on the screwjack threads. Use Mobil 28 everywhere else. Mobil 28 is red in color.

—Alfred Scott

## West Coast Falco Fly-In

by Blake Jessen

The ninth annual Falco Fly-In Napa turned out very well. The following people flew their Falcos: Ann and Larry Black, Pat and John Harns, Lena and Per Burholm, Karen and Cecil Rives, and Dave and Barb McMurray. Pierre Wildman flew in his freshly painted Seneca, and Dave and Tamara Nason flew in their Bonanza.

Friday morning, those that wished were able to fly the C-5 simulator at Travis AFB. This was quite a hit with those who flew it. The newly refurbished simulator had wrap-around visual and full motion. Realistic enough to cause motion sickness in one of the ladies.

For those who elected not to fly in the simulator, it was a spotless day to fly over to the Napa and Sonoma valleys. Friday was also the day to try and find some flaw with Dave McMurray's Falco. It was not until Saturday afternoon that a small crack about 2 inches long was found on the gunnel of the windshield support on the port side.

Saturday was used in the 'traditional' manner for a breakfast fly-out. The photos of John Harns' Falco are shown on our way out to breakfast. The air race/formation flight was back to Agwin. On the return however some 'queertrons' managed to invade Per Burholm's Falco, and he was forced to shut down all electrical power as his alternator would not charge the battery. After landing, the queertrons were scared off, as the problem would not repeat itself, once the entire fly-in had gathered around his plane.

The rest of Saturday afternoon was spent at the Calistoga pub. The winds kicked up in the afternoon making the approach into Agwin a bit tricky. As it turned out, the track to beat this problem was to land long and avoid the turbulent air kicked up by the buildings on the up-wind side. The temperature was also a bit warm at this point, also conducive for pub activities.

Saturday dinner included speakers Don Green from the FAA, and Moye F. Stephens, who is the son of the operations officer and chief test pilot for Northrop aircraft. In a nutshell, Don Green's recommendation was to find an FAA inspector to sign off your aircraft that you know is not going to hassle you (requiring all doors, panels, and ports opened or removed, etc.) In short, shop around for an inspector to

sign off your plane. But be warned, once you have 'your man' if he's a real stickler, you may not be able to get rid of him for another examiner. This will probably not be a problem with any Falco folks, but being forewarned.

The other discussion was by Moye on his father. He was one of the true pioneers in aviation, doing several firsts. One of the most interesting stories however was his flight from England to the jungles of Borneo. On the way, this included a slow roll over the Taj Mahal, which was photographed by the German aviatrix they rescued in Tehran. In Borneo, they removed a 'curse' from their airplane by returning the shrunken heads given to them by the local head hunters.

Jim and Jane Quinn of Dallas, Texas, have a home page for the Falco. I would like to get together with other builders and create

a builders' notes page. This would be an area where you can download information on different construction ideas, things others have tried, wished they had or had not done, etc. I will be working with Jane and Jim to put this together in sections. The first one would be on the construction of the tail. Such items would include: ways of making the tail light fairing, sanding techniques for a smoother finish, or it might be a good idea to put in triangular gussets in the trailing edge ribs of the elevator so the trailing edge strip doesn't keep breaking off (one of my ideas). If you can, please send in your comments via e-mail (or by fax as a last resort) to the Quinns or myself. Any and all input would be appreciated by your fellow and future builders.

The next fly-in will be hosted by Dave McMurray in Oregon. Thanks to all those who showed, and especially those of you who came with aircraft.



Top: The lineup of Falcos. Above: Look closely and you can see the crack in Dave McMurray's Falco. Opposite: John Harns.





# The Glider

## Part 16 of a Series

by Dr. Ing. Stelio Frati  
translated by Maurizio Branzanti

### Chapter 7 Design Plan

**33. General Considerations.** In the design process, it is extremely important to know in advance where the machine is going to be used. Poorly defined plans will always bring mediocre solutions.

Therefore in designing a glider, we should have a precise understanding of its use, and thus the desired aerodynamic characteristics and construction features. When defining these, the designer's biases are naturally present, and it is in this phase of the design that it is preferable that common sense be combined with lots of experience. A mistake at this stage will hurt the quality of flight or the overall production cost.

When the designer has little experience, it's a good idea to follow the example of existing designs and learn from the experience of others in this phase of the project. It is not a good idea to attempt something new if you have little experience. The 'new' always brings unknowns, even with expert designers.

And you should consider the practicalities of construction. It is better to build a well-constructed basic design than a poorly-constructed competition sailplane, which would be totally useless and would cost at least three times as much.

**34. Wing Span.** We have seen how the wing span is an index of the classification of gliders, which may be put into the following categories: (a) basic low-performance gliders with a wing span of 10 meters, (b) medium-performance gliders with a wing span of 15 meters, and (c) high-performance sailplanes with a wing span of 18 to 20 meters and above.

Another very important factor in classifying a glider is the wing aspect ratio.

The total weight of the proposed glider should be established using similar existing gliders that have good performance.

Knowing the wing span and the aspect ratio, we can then determine the wing area  $S$  and the wing loading  $W/S$ . We see therefore how the preparation of the design depends almost exclusively on the determination of the wing span and aspect ratio.



Practical considerations and economics also come into play at this point. You can achieve high performance with a long wing span, however this comes at the expense of ease of handling due to the inertia of the wings. Moreover, large dimensions are less practical when it comes to construction, transport, assembly, and especially with the difficulties that come with off-field landings.

And finally, any aircraft with larger dimensions will cost more to build, because of the size itself and also because of all the extra requirements a high-caliber machine requires, like retractable gear, special instrumentation, etc.

Thus we can say that various factors come into play when making the choice of the wing span, and the economics are determined by the conditions that the aircraft will be subjected to. For example, when designing a competition sailplane, greater importance should be given to the aerodynamic performance. A long wing span will certainly be called for, as this offers a large wing area with improved efficiency and sink rate due to the reduction in the ratio between passive area and wing area, as we have seen in the determination of the characteristics for the complete aircraft.

Thus, in a competition sailplane more importance is given to the aerodynamic characteristics, even if this results in increased costs, higher probabilities of damage while attempting an off-field landing, and handling difficulties. These inconveniences—excluding cost naturally—will be compensated for by the pilot's expertise, since this type of aircraft will not be entrusted to beginners.

In any case, a compromise has to be reached between the various factors that will determine the aircraft's characteristics, giving preference to one or the other depending on the requirements. A good rule therefore is not to push oneself towards extreme solutions. The middle road is always the best. Only in experimental designs can you try extreme solutions, with the understanding that it requires thorough knowledge. This was the case with the famous glider of the Center of Polytechnics at Darmstadt, 30 Cirrus, with an aspect ratio of 33. The aerodynamic characteristics are without a doubt very high, but so was its cost.

Considering the cost, which is the determining factor of the construction for aircraft to be purchased by individuals, we can say that as a general rule, the aircraft



with larger wing spans (18 to 20 m) are three to four times more expensive than the one with shorter span (10 to 12 m). It is clear that the cost factor is a decisive importance at the start of the project.

**35. Aspect Ratio and Wing Loading.** Having established the wing span, we can now consider the other factor that determines the aircraft's performance—the wing aspect ratio. We know that increasing the aspect ratio diminishes the induced drag, therefore we increase efficiency. However, with equal wing spans, when we increase the aspect ratio, the wing area is reduced and wing loading is increased.

But the wing span  $L$ , the aspect ratio  $AR$ , and the wing area  $S$ , are bound by the relation:

Having determined  $L$  and  $AR$ ,  $S$  is also determined and so is the wing loading  $W/S$ , which is always referred to as the total weight, pilot included. Pilot weight may vary within restricted set limits.

Going to the actual practice, we can give approximate values to these factors for the

gliders of the category we have discussed:

Low performance gliders:  $L = 10$  to  $12$  m.  
 Wing loading.....  $15$  to  $17$   $\text{kg}/\text{m}^2$   
 Aspect ratio.....  $8$  to  $12$   
 Wing area .....  $10$  to  $15$   $\text{m}^2$

Medium performance gliders:  $L = 13$ - $15$  m.  
 Wing loading.....  $16$  to  $18$   $\text{kg}/\text{m}^2$   
 Aspect ratio.....  $13$  to  $16$   
 Wing area .....  $14$  to  $16$   $\text{m}^2$

High performance sailplanes:  $L = 17$ - $20$  m.  
 Wing loading  $16$  to  $22$   $\text{kg}/\text{m}^2$   
 Aspect ratio  $18$  to  $22$   
 Wing area  $18$  to  $20$   $\text{m}^2$

This are nominal values for standard gliders. Of course, there are gliders with greater aspect ratios and modest wing spans, and others with modest aspect ratios and longer spans, but these are special cases for particular conditions.

The limits that the wing loading varies between is fairly restricted—on an average between  $15$  and  $18$   $\text{kg}/\text{m}^2$ —and this is restricts the sink rate and landing velocity. But since the wing loading does not influence the glide ratio, water tanks are added to serve as ballast on gliders de-

signed for long-distance flights to increase the horizontal velocity, and the water dumped in flight once the higher speed is no longer required and a low sink rate is desired to exploit slowly rising thermals, or to obtain a slow speed for landing.

**36. Fuselage.** The most important factor that defines the fuselage of a glider is its length, with consideration given to the aircraft's stability and handling ease, however many factors influence its dimensioning.

We can achieve the same static stability with a short fuselage and larger empennage, or with long fuselage and smaller empennage. The wing aspect ratio also influences the longitudinal stability.

In the case of a long fuselage, we have a smaller empennage area, and thus a lower weight and drag, but this is offset by the larger weight of the fuselage and the higher drag due to the increase surface friction. Under this condition there wouldn't be much difference between longer or shorter fuselages.

However, if we consider the dynamic stability, we conclude that a longer fuselage is preferable since the longitudinal inertia moments are increased and the empennage is less influenced by the wing turbulence because the wing is much farther away, and thus is more effective. However the fuselage cannot be excessively lengthened, or the glider will be sluggish.

As a good approximation, we can set the fuselage length with the formula based on the wing span  $L$ :

This is the total length from the nose to the tail in meters.

**37. Empennage.** In dimensioning the empennage, it is important first to determine the area necessary to maintain good stability. The area of the horizontal tail  $S_{ht}$  can be established using the formula in Chapter 4 (§ 21), as a function of the wing area  $S$  for the average wing chord, and the distance  $a$  of the airfoil from the aircraft's center of gravity.

We have:

where the coefficient  $K$  may vary between  $1.8$  and  $2.2$ . Also for the vertical tail we have seen in Chapter 4 how its surface can be dimensioned (§ 25).

## Goings On at Sequoia Aircraft

While I don't have any precise information for you as of today, I am working on getting some of the instrumentation made for us and into our kits. As you know, Instruments and Flight Research has been a frustrating company to deal with. Their prices were good and they were willing to stock the instruments, but we've also had a number of quality problems and unhappy builders.

Since they are no longer in the instrument business at all, we're either going to have to find another company that will offer instruments for the Falco, or we will add them to our kits. The latter seems to be the most probable course of action, particularly in the case of an instrument like the fuel pressure/manifold pressure gauge.

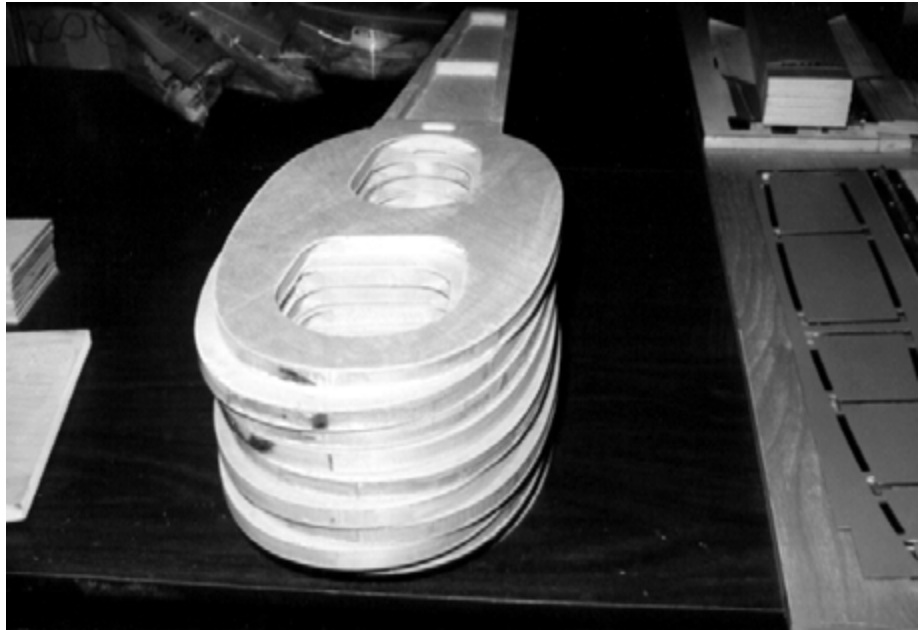
There's been a quiet spell in the past year for first flights of Falcos, but that is soon to end. Willard Hofler has his Falco at the airport in North Carolina and hopes to fly in the next few weeks. Charles Wagner has just moved his Falco to the Prestwick Airport in Scotland, and he's in the final inspection phase as well. Both of these gentlemen are likely to break all completion time records for pokey builders.

And coming up this spring we've got Kim Mitchell, Glyn Russell, and Bill Russell who are in the final stages of construction. In Italy, Giovanni Fulcheri is essentially finished with his Falco and should fly this year. In England, Stanley Harper is very close to finishing, although health problems will keep him from being the pilot in command. I think we've got a couple more in the same stage but not everyone keeps me apprised of their immediate progress.

Also in Italy, we have an interesting Falco under construction. Andrea Luca Tremolada has a small team a-working on his Falco, and he has recently taken delivery on the remaining kits. With the group he has building the Falco, it should come together at a very fast rate, though getting approval from the Italian RAI authorities is always going to be a challenge. But if the Italian authorities won't approve a Falco, what the heck will they approve?

As you may have heard, G-OCAD had some minor damage to the nose gear and propeller on takeoff this summer, but Clive Garrard, David Nowill and Gordon Blunt now have the Falco back in the air, and they are building up hours in the plane.

—Alfred Scott



## Susan's Corner

Here we are in 1998. I thought as we got older, things were supposed to slow down some, but that doesn't seem to be what's happening. Everything is moving faster!

And speaking of moving faster—I love being on the Internet! I'm still learning how to navigate, but it sure is easier answering e-mail.

Alfred has put together a pretty snappy looking web site, and I hope everyone will check it out. We're at [www.SeqAir.com](http://www.SeqAir.com). I can be reached through 2 different e-mail addresses—[seqair@richmond.infi.net](mailto:seqair@richmond.infi.net) and [susansti@aol.com](mailto:susansti@aol.com). I check them both every morning, so whichever one you want to use is fine with me.

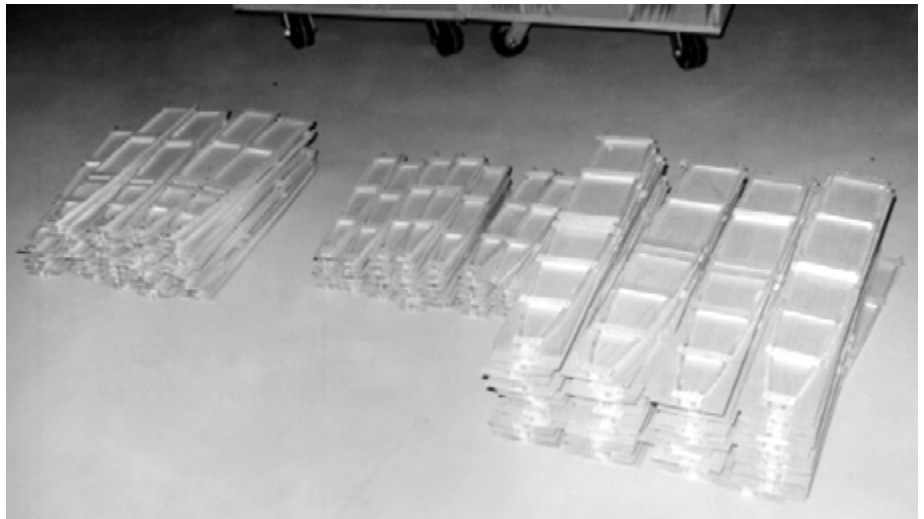
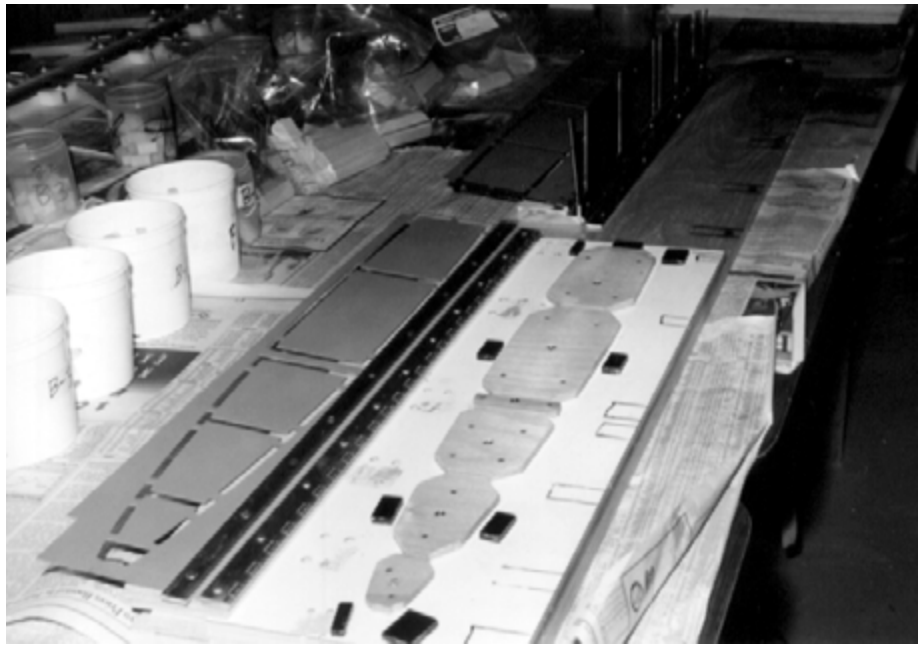
This fall and winter we've been through one of those 'quiet but steady' phases—nothing loud and exciting happening but parts and kits steadily going out and builders steadily building.

One thing I do want to mention, though, goes to all you overseas builders. Frequently you'll ask me to declare a much lesser value on the commercial invoice than what the merchandise is really worth because your customs and import taxes are so high.

That is fine with me, but I want to relate a recent incident to you so you'll be aware of what can happen. I recently sent a large order overseas, the value of which was well over \$25,000. On the commercial invoice, I was asked to list a value of \$1500, which I did. Several of the boxes were lost (albeit temporarily), but had they not been located, the most the builder would have been able to recover would have been the \$1500.

And in another instance, we shipped a box with a commercial value of \$100.00. When it was received by customs at its destination, they decided to open it and inspect the contents. When they did, they could see the value was far greater than \$100, and the builder had to ask me to send another commercial invoice showing a value much closer to the actual value. Please just keep this in mind when asking me to declare a lesser value on the commercial invoice.

Alfred and I were both out on vacation the last week of December, Alfred in Florida, me in Gatlinburg, TN. We've had some catching up to do since we got back, and I hope he's doing better than me—I'm



still buried in paper! Vacation was nice though, and a good way to start the new year.

That's all for now. Send me those e-mail addresses, and I'll see you all when the spring thaw hits.—Susan Stimmitt

## Sawdust

- Congratulations to Jonas Dovydenas for Second Prize in the General category of the 1997 Aviation Week and Space Technology Photo Contest.

The winning photo is from the tail of his Falco while over Lake Powell, and it is very similar to the one printed in "The Five Hundred Dollar Burger" (June 1997 FBL). The awards will be announced in the December 22/29, 1997, issue of *Aviation Week*.

- It's a small world. No one was more surprised to see the Versace ads on the pages of the September Falco Builders Letter than Andrea Luca Tremolada of Milan, Italy, where he is a Falco builder at night and Versace advertising manager by day, in charge of an \$88 million advertising budget.

Andrea's Falco is taking shape quickly (he has a few helpers), and he also also owns an SF260 and a Stampe. He's just sold his production Falco which will be replaced with the Falco he's building now.

- U.S. Health policy. Legislation introduced by Democrat Rep. Fortney "Pete" Stark of California (H.R. 2784) would amend the Social Security Act to limit the ability of physicians to demand more money through private contracts during periods in which the patient is in an exposed condition.

As the bill puts it, "To produce equality in the negotiation of private contracts, the Secretary of Health and Human Services shall issue regulations prohibiting the discussion or signing of private contracts at any time

(a) the patient is buck naked and the doctor is fully clothed;

(b) the patient is wearing on of those short, flimsy little hospital gowns that don't close in the back;

(c) during any sigmoidoscopic or proctoscopic examination of the gastrointestinal tract or a digital rectal examination of the prostate;

(d) during any testicular examination;

(e) at any time the patient's legs are in a stirrup device;

(f) at any time the patient is using a bedpan or in the middle of the administration of an enema;

(g) at any time one has been asked to give a urine or stool sample; and

(h) at any other time that the Secretary determines that a normal human being would find it awkward to negotiate a contract."



*Top: Sheesh! Falco builder Andrea Luca Tremolada spends \$88 million dollars a year promoting Versace clothing and that dummy Scoti doesn't even know who or what Versace is! Center and above: John Harns and friend over Napa Valley.*

## Mailbox

News of my Falco, F-PBEC (ex F-BNAS). When I find the necessary motivation, the construction of the Falco continues with several modifications: carbon fiber longerons (frame 8 to 6); some carbon fiber on the wood; gear doors of carbon fiber and Klegecell sandwich construction; fuselage sandwich of CTP/Klegecell/CTP with some monofilament carbon fiber; new ejectable canopy; 0° dihedral on the wings; full span ailerons, etc.—for the improvement but always with the spirit of the Falco.

I hope to fly in June 1998. I salute you for your work and for the Falco Builders Letter. I hope that the modifications that I have done will be understood by you and that the result will permit us to have a good Falco.

Xavier Beck  
Nevers  
France

*Xavier Beck is rebuilding a production Falco following a takeoff accident a few years ago.—Alfred Scott*

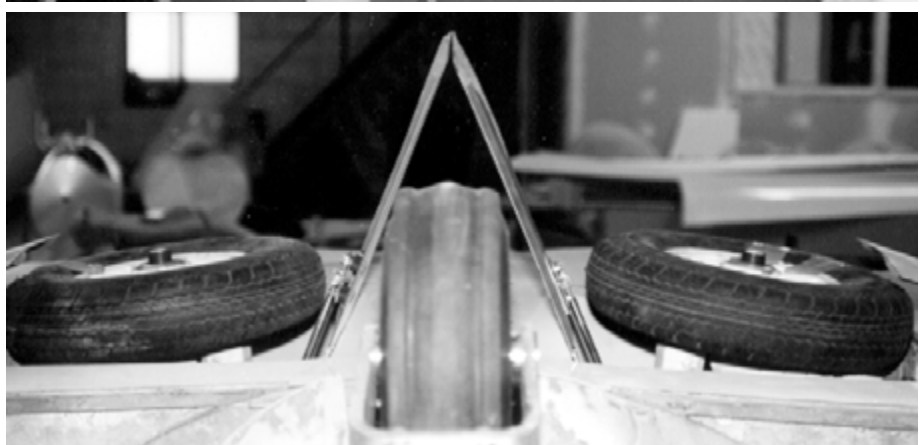
Even though I'm not a Falco builders, I'd like to share my experience with you. I own a production Falco, Series II, from 1958. After buying the Garmin GPS/Com GNC250XL (which, by the way, is nothing short of excellent) I had a problem with both com transmitter and receiver range. After checking the com unit, antenna and wiring, I decided to try a different antenna, even though everything was found to be okay.

I followed Jim Kennedy's suggestion and bought an AAE VHF5T antenna. Obviously, I was not able to install it in the fin, which would probably be the best location, nor was I able to install it vertically in a straight line, because the fuselage is too small. So I did the somewhat less ideal half around the fuselage installation, which according to the manual is not the best way, but it made quite a difference.

The transmitter range and reception improved vastly. As I'm not a professional on this subject, I cannot discuss why my performance improved so much. I can only report what I did and what happened. So now you builders out there can find out which is the better antenna!

Oliver Barth  
Hamburg  
Germany

I too am pleased that you've got a handle on your bout with depression. Not a fun time, whatsoever.



*Xavier Beck's Falco rebuild project in France.*

Progress report: when I first made the decision to commit myself and my household to this project I set priority No. 1 as domestic tranquility. The second priority has been to enjoy the process and challenges that are part and parcel of building this beautiful bird and to that end I set no deadlines. So... I've heard all the friendly jibes, jabs and jokes that are bound to spring from the fertile minds of my associates, and—you know what?—that, too is fun. I must admit that from time to time I sit in the cockpit in anticipation of the day it will be in the air, but I restrict that activity somewhat since I've discovered that drool tends to strain birch plywood—although one wag suggested installing a sump pump as a countermeasure.

Presently, I am completing the installation of all controls, the actuators for the flaps, trim and gear as well as the autopilot servo and so on prior to skinning the remainder of the fuselage inside and out. Question: how have others handled the flap actuator interference with the seat belt anchor?

Again, thank you for your excellent support for builders—and as Red Skelton used to say—“God Bless”.

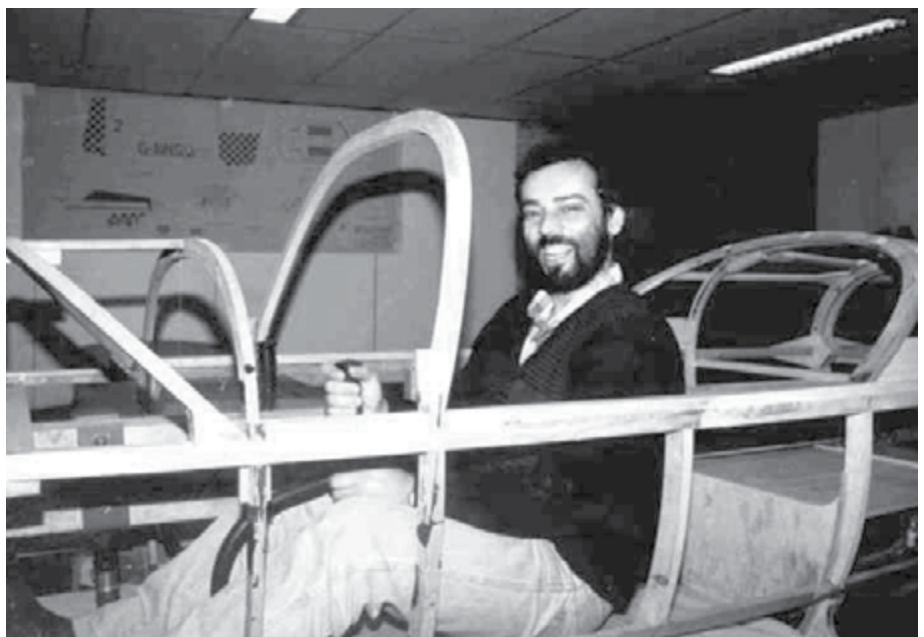
*Bill Roerig  
Kaukauna  
Wisconsin*

*I believe the ‘interference’ of the flap actuator is simply a matter of looking at a drawing that is slightly out of date. Turn the actuator over so that the motor is outboard and the problem will go away.—Scoti*

I regularly receive the Falco Builders Letter, it is very well done, and I want to congratulate you on the very good job on the Falco. Since the first of November, I am retired from the university and now I have much more time to fly my ERNA, which is in very good health, still fast and, in a word, wonderful!



**Luciano Nustrini**



**Top: G-OCAD on approach. Above: Mario Domingues gets some practice time.**

A few days ago I met George Richards, the Falco builder who lives in Auckland. He showed me his workshop, and I was very surprised to see the construction at 50%, and very well done. About the engine, he told me that the program is for 180 hp, but I suggested the 160 hp IO-320, the same that is on the Twin Comanche.

It is time for wishes, so: Merry Christmas and Happy 1998 to you and to all the Falco Builders from Luciano, Giuliana and ERNA.

*Luciano Nustrini  
Titirangi, New Zealand  
nustrini@ihug.co.nz*

Greeting from my new home in Doylestown, PA. After living on the west coast, the mid-west and the south, it was time to sample living in the east. My previous employer kept getting out of electronic/software related businesses until I began to think I would

have to turn out the lights. I am now working for Sarnoff Corporation, in Princeton, N.J. developing test equipment and software for digital television.

The move slowed me down a bit as I had to put everything in storage while a new house was built. The good part is now I have a three-car garage and a walk-out basement that will provide better facilities for building. I just moved the Falco parts, wood and tools into my basement, and I hope to be making sawdust again over the holidays.

I miss Tony and all my EAA friends in Texas, but I am making new friends here. Please let me know of other Falco builders in the Philadelphia-Washington-New York area. I would like to get to know them.

*Dean Malmstrom  
Doylestown  
Pennsylvania*