

Falco Builders Letter



Buzz Glade over the Florida coast.

Goings On at Sequoia Aircraft

There is hardly anything to report except that there is an absurd number of Falco builders who are ready to fly in "one month." Jim Slaton will probably fly around the first of the year. Tim Baker and his father started construction on a Falco in February and finished the airplane a month or two ago. They lack only a few radios, wing fillet installation (happening now) and then go fly. Terry Smith, who lives 30 miles from Tim Baker—the two have never visited each other!—is also in the final stages

Joel Shankle is just doing the final tidying up and is living under a fly-it-by-New-Years-Day ultimatum from Carol Shankle. Steve Bachnak has only to take his Falco to the airport and go fly. Syd Jensen is just fighting paperwork battles—his Falco is ready to fly whenever he gets the nod.

Ben Burgoyne was through here a month ago and said he could fly in a month if he pushed things, but he will probably stretch things out for a while.

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Around the Falco Patch

The Great Oyster Fly-In was a total bust. A monster cold front moved through Virginia on that Saturday. Rain and fog kept everyone away except those who arrived in four-wheeled vehicles. The Oyster Festival itself was a great success, since the weather cleared up nicely. It turned into a lovely day, but it was all too late for aviators. But those faithful few who came by car all had a good time, and I was forced to eat oysters for the next several days.

It was debatable whether the Corporate Disgrace would have been there at all.

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Aerolite

Gather 'round me builders, and a story I will tell, of Aerolite and molecules, and alkaline reactions. Of Englishmen, formic acid and urea-formaldehyde. If he had only known about it all, Woody Guthrie would have written a ballad!

We've all gotten so used to using Aerolite glue that it struck me strange that we did not understand the stuff. I became curious about all of this when some builders talked about thinning the glue slightly for laminating. What happens if you thin it? Is it all right to add water when it thickens over time? Why does it thicken like that—is it from evaporation or something else?

Fasten your mental seatbelts, because we're about to depart on a little journey into the world of organic chemistry, and by the time this is over, you'll know more about the urea-formaldehyde reaction than Mrs. Smith knows about her famous pies.

I received my information from Buzz Glade who sent along a page from a book describing the chemical reaction in layman's terms, some interesting historical information from Ciba-Geigy, but by far the most detailed information came from Falco builder Dave Gauger. Dave is a surgeon in Iowa City, Iowa, and by coincidence the Department of Chemistry and Department of Botany at the University of Iowa both share the same building and library.

And it was there that Dave found a book that explained it all: *Wood Adhesives, Chemistry and Technology*, by Antonio Pizzi and published by Marcel Dekker, Inc, 270 Madison Avenue, New York, NY 10016. Dr. Pizzi is an Italian by birth who lives in South Africa. He has a doctorate in physical chemistry of polymers from the University of Rome, Italy, and a Ph.D. degree in applied organic chemistry from the University of the Orange Free State, South Africa. Dr. Pizzi heads the Wood Chemistry Division of the National Timber Research Institute in Pretoria.

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Around the Falco Patch

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It was in the shop getting its annual and the mechanics had found very low compression in the engine. They pump it to 80 psi and then see what pressure the cylinders will hold. You are allowed up to 20 psi loss, so a reading of 60 would be the minimum. My engine produced readings of 54, 50, 40 and 58.

The engine has 1,710 hours on it, and I was not yet ready to overhaul it. When I do that, I want to change to a constant speed propeller. So we decided to pull the jugs and look at the cylinders. The cylinder walls were badly scratched, which is not surprising considering that I don't have an induction filter. The rings were completely worn out, and mainly on their sides—not on the face that seats against the cylinder wall. The mechanic said he had never seen any like them. So they honed the cylinders, ground the valves, put in new valve seats and put in new rings.

I also had a stain on the nose gear which I thought might be brake fluid. It turned out to be a fuel leak. A tiny amount of fuel was coming out of the carburetor and running down the nose gear. The mechanics thought this was from a bad gasket at the parting plane of the carburetor bowl. They replaced the gasket but the problem remains. We now think that the problem might be that the needle valve for the float is not completely closing, which would cause the carburetor bowl to over-fill and run out along the shaft for the accelerator pump. This is something we have yet to fix.

My Falco has always run overly rich, and I've had to lean on takeoff any time the weather is warm. The engine has also run fairly rough on the mag checks, but I just got used to that. I am beginning to attribute the rich mixture to a too-full carburetor bowl.

The mechanic told me to take it up and seat the rings. You do this by flying around for a couple of hours at relatively high power settings. The last thing you want to do is to baby the engine with low power settings. I took it up to 2,500 feet on a cold day recently and left the throttle wide open. One cylinder was substantially hotter for about ten minutes and then it settled down.

It was apparent to me from the time I started the engine, though, that things

were very different. The engine ran smoother and sounded better. On takeoff, instead of the old lethargic lumbering, the plane charged down the runway like I've never seen it do before. It was cold and there was a good headwind so maybe I'll later decide that the difference on takeoff isn't so great, but in the air it is substantial. For the first time ever I found myself staring at an airspeed indicator that bounced between 145 and 150 knots. The leading edges of the wing had all been repainted, so for the first time in a long time the Corporate Disgrace did not live up to its name.

Ever since I got the Falco, it has burned a lot of oil. This doesn't mean an engine is unsafe so I just put up with it and carried a supply of oil around with me. One thing I have always noticed is that the airplane would occasionally become pathetic on takeoff. When I took it out to the CAFE 400 some years ago, Hal Engel and I took off from Susanville airport. There was a long ground run and once we were in the air with the gear up, the plane would barely climb. After a minute or so of this foolishness, the plane was climbing strongly.

It had happened the day before when I stopped by to see John Harns. The St. Maries airport is located at the mouth of a valley surrounded by mountains. John and I flew by taking off down-valley. After a sandwich, I continued on my trip. The wind had changed so I took off up-valley. There is actually plenty of room to climb and circle but the Corporate Disgrace just didn't want to climb. I found myself with the cold sweats on a hot day as I gently banked and circled over the hills. I turned out to have plenty of room, but I thought it was strange that the plane would refuse to climb.

At Farmerville it did the same thing just as I was taking Curt Lopresti for a ride. The plane seemed to take forever to break ground, and it climbed slowly at first. Curt is a big man, but not that big!

This curious behavior has happened on and off for as long as I have owned the plane. I've never been able to figure out what it was caused by, but it is now painfully obvious to me that the rings were the culprit. It is a whole new airplane now. The sound and feel of the engine is completely different and the increase in power is amazing. I finally decided to note the speed with some precision, and I got it settled down to 145 knots indicated at 2,500 feet and 30°F.

Neville Langrick reports that now that his Falco is flying, he has once again taken up gainful employment and hasn't the time to devote to the airplane. He has a problem with the engine running overly rich and the cause of the problem is something he is working on. The carburetor and induction system are both getting the evil eye. I'll let you know what the eventual outcome is.

Buzz Glade reports that he developed a problem with his Falco. He was on a trip to the Patuxent River base when his engine started to give him trouble. He was on the aft tank and was able to get it running smoothly again on the front tank. He decided to head for home and once he was over home base he tried the aft tank again. Once again the engine started to stumble and quit.

After landing safely, he traced to problem to a fitting in the fuel line to the aft fuel tank. It was a bulkhead fitting at frame 6. I don't remember exactly what was wrong with it, but it was cracked, or had collapsed. Something like that. With a new fitting installed, the plane is back in the air, and Buzz reports no further problems.

The Chilean Air Force has had a series of problems with their exhaust system cracking. This is the only problem like this that I have heard about. They think maybe the problem is with the welding. I don't know, and neither do they. The exhaust was made some time ago by Cochran Aircraft, who always did nice work. In any event, they plan to replace the system.

They were also very worried about the wing. The skin between wing stations 3 and 6 is dished slightly between the ribs. They were concerned that this might be a

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sign of wood rot. Hardly. This is the old malaise caused by skinning a wing with the plywood too dry. My entire airplane looks like that. Chances are, the Falco was skinned during a humid spell in which the spruce framework took on moisture and expanded. The plywood would take on moisture more slowly and thus was still at a lower moisture content.

Karl and Shirley Hansen took a trip to England and Germany in September. By prior arrangement, they had a little gathering of Falcos at Meppershall. Neville Langrick, who was not yet comfortable flying his overly-rich running Falco, arrived by car. Derek Simpson's Falco is based at Meppershall. Peter Hunter flew in with his red Falco, and Brian McBride screamed in from Northern Ireland in his white Falco.

Brian has a reputation for below-the-hedges flying, but Brian says people exaggerate—there are no grass stains on his prop! Karl got a ride in the white Series II Falco with Brian. It was Karl's first flight in a production Falco; he noted little difference in the handling—just that his Falco feels a little more slippery and difficult to slow down for landing.

—Alfred Scott



Goings On at Sequoia Aircraft

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Also coming down the stretch are Perry Burholm and John Oliver who are a couple of months from flying. Or a couple of months from that magic state of being called "I'll be flying in one month" which can stretch on until the universe collapses.

Charles Gutzman will follow shortly. His Falco is essentially finished and in primer. The remaining work is upholstery, painting and installing the nose gear door. He plans to take the plane to the airport in March and fly it by June. Charles is a fast builder. He has built a Skybolt and Stephens Acro before. He holds the record for the fastest installation of the cowling. Most builders take 12 to 14 hours, Charles did it all in 7 hours.

I've spent an enormous amount of time in the last quarter working on things related to the wood kits. The design of the "Gonzales" planer has taken much of this. My original intent was to make a machine that simply did a job. For a one-off you normally don't try to get the design of something to be elegant, but this has turned out to be surprisingly elegant. A number of people have worked on the design of the thing which is rapidly taking shape. Right now there's a large, rigid steel framework in the warehouse and most of the pieces should be in place and working within a month. I'll give it full coverage in a future issue.

Arnav Systems has discontinued the Silver Fuelgard so we have eliminated that option from our price list. Parts and service will still be available. Hoskins and Alcor both make similar units which will fit in our instrument panel, so there isn't any difficulty in filling that hole in the panel.

In a surprising development that recognizes the growing importance of homebuilt aircraft, Lycoming has sent a letter to kit manufacturers offering to sell engines direct at OEM prices. While it's a welcome gesture, at this time it doesn't look very workable for us because there is a sliding schedule of discounts depending on quantity ordered during the year. Few kit manufacturers operate on such a predictable schedule and the discounts aren't meaningful at the lower quantities. I suspect this will only work when and if Lycoming decides to give all OEMs the same price regardless of volume. That is what Hartzell and other suppliers do.

We are in the final stages of work on the wing fillets. Joel Shankle has the first set installed on his Falco. Steve Wilkinson installed the second set, checked Joel's trim lines and scribed the molds for the lower pieces. Tim Baker is in the process of installing and checking those. In the next month or so, we should have these off to our fiberglass fabricator and in production. I will have no idea what they will cost until I hear from our fabricator.

There is going to be a change in the way the exhaust systems are offered. Sky Dynamics wants to get out of the business of making one exhaust system at a time, as they presently do for our systems. They have also had a problem in getting consistent quality when they make a system, since they haven't yet made hard tooling for the system. It's difficult when you make a system to remember exactly how you did it the last time.

So what we are going to do is to offer the exhaust systems as one of our kits. Sky Dynamics will make them in quantity for us on hard tooling. The parts will all be the same, and we should get away from the minor problems that we have had in the past where some of the pipes were close to the cowling. Since they will be made in quantity, our price will be cheaper and we will add a markup to that. I have no idea what that price will be, so if you need an exhaust in the next three months, please let us know.

In the next six months, I am going to have my hands full with work on the wood kits and other things. I would like to make some more progress on the construction manual. There are some drawings I want to crank out. I plan to make new jigs for many of the wood parts, since I have my own idea of how the parts should be assembled. All this takes time, and I am finding myself increasingly stymied by the telephone. There are days that I can barely escape the thing. Please do continue to call me when you need help. I'll always be available, and I always enjoy talking to you. I would appreciate it if we could also keep the conversations brief and to the point.—Alfred Scott



Aerolite

Continued from First Page

It appears that he knows his glues. If you get the book, see pages 60-65, 80-94 and 102.

First, a little refresher in chemistry. You will all remember that atoms have a ring of electrons around them. The number of electrons varies with all kinds of things and we needn't worry about why, but some atoms (like helium) have a complete set of electrons and thus are happy all by themselves. Others don't have a complete ring, and this causes the atom to join with other atoms until the combinations of atoms have a complete set of electrons. The joining together of atoms is called a reaction. Molecules do it, too. When atoms react with each other and become a molecule, they do this by the mechanism of interlocking electron rings. In a compound, the electrons belong to and circle all of the atoms.

The degree to which an atom or molecule is missing a complete ring of electrons is called its valence, and a missing electron is called a "bond", which is a convenient way to keep track of how many of one element will join with another. Hydrogen (H) has one bond, oxygen (O) has 2 bonds, nitrogen (N) has 3 bonds, and carbon (C) has 4 bonds. When you have a complete match of bonds, such as in H₂O, the compound is stable and doesn't combine with anything.

What happens when the compounds urea and formaldehyde come together is an extremely complex reaction. The reaction can be catalyzed by an acid or an alkali and heat increases the speed of either reaction. When the acid catalyst is used, the polymer tends to be a longer linear chain with side branches that has good adhesive properties. When catalyzed with an alkaline agent, the polymer is less suitable as an adhesive.

The Aerolite powder contains urea, formaldehyde, a thickening filler (probably cellulose) and probably a few other things only Ciba-Geigy knows about. When you mix the powder with water, all of these things go into solution. They don't combine with the water, but the water lets the molecules swim around and join with each other more easily than if they remained in a dry powder state where the molecules can't move about.

The water never actually enters into the chemical reaction between urea and

formaldehyde, in fact, a little water is actually thrown off by the reaction. The acid doesn't enter the reaction either. It's a true catalyst, causing a chemical reaction but not becoming part of it. When Aerolite is cured, the hardened glue is composed of a variety of molecules which may vary from a few hundred to a few thousand atoms. The chemical descriptions of these compounds becomes very complex, but there is a repeatable pattern of links in the molecular chain and all this is well understood. This process of joining their tiny hands makes the substance into a cured resin that binds two pieces of wood together.

Aerolite powder, when mixed with water, is a slightly alkaline solution. The urea and formaldehyde molecules immediately begin to react with each other, but fortunately this process is a slow one. The thickening of Aerolite has little to do with evaporation; in fact, I've mixed some Aerolite and left it in an air-tight plastic container. It eventually hardened to a cheese-like consistency that you could easily break and crumble in your fingers. Just out of curiosity, I poured some acid hardener on this, and it hardened like any other Aerolite—but of course it was worthless as a glue.

Dr. Pizzi devotes many pages to the discussion of the control of the size of the molecules in urea-formaldehyde glue. The chemists working on these compounds operate in the world of molecular riot control, and they have no absolute control to force *this* molecule to join with *that* one. The size of the molecules has a lot to do with the properties of the glue. When freshly mixed, the molecules are very small, and the mixture will flow freely into the cracks and crevices of the wood surface. When the molecules are so long that the mixture is cheese-like, it will not flow at all.

In its pure form, urea compounds are thin and watery, and they tend to soak into the wood or run off—in short, they are terrible glues. A thickening agent is added to prevent glue starvation. Almost all glues have some sort of thickening agent, or "filler". Starch, cellulose, wood, wheat and corn flour, ground pecan shells are commonly used by glue manufacturers. Cellulose fillers are not only lighter in color than wood flour, but because of their fibrous nature, they impart to the resin higher mechanical strength and a surprising translucency, which differentiate them very clearly from wood-flour-filled resins.

This certainly sounds like a description of Aerolite to me, for Weldwood Plastic Resin glue (also urea-formaldehyde) is dark brown in color and does not adhere well to birch plywood. My guess is that the size and type of the filler plays a critical role in the performance of the glue. I'd guess that the Aerolite filler is a smaller fiber of strong cellulose while Weldwood uses larger particles of ground walnut shells.

There are many different acids that can be used to catalyze the urea-formaldehyde reaction. In the wood products industry, ammonium sulfate and ammonium chloride are two of the most widely used curing agents. Some are added just as the glue is mixed and spread on the wood. In Weldwood Plastic Resin glue, the catalyst is a compound that is a dry powder that doesn't become an acid until it is mixed with water. This makes the glue simple to use, but you should also be careful to keep the can tightly closed since the humidity in the air can cause the glue to harden.

Interestingly, Dr. Pizzi makes no mention of formic acid at all. It appears that Ciba-Geigy is alone in using that acid, but it's not hard to see why. Formaldehyde decomposes into formic acid by oxidation in the same process that causes alcohol in wine to turn to vinegar. Just by virtue of making formaldehyde, Ciba-Geigy is going to get a lot of formic acid anyway, so why not use it?

Dave Gauger says, "The only part of the formaldehyde/formic acid relationship that has stuck with me over the years as a physician is the fact that methanol is oxidized by enzymes in the liver to formaldehyde which is then oxidized further to formic acid. This is why you go blind if you drink wood alcohol." Formic acid is also one of the "active ingredients" of many bee stings.

The company, in their quaint British way, named the hardeners with the "GB" prefix, for "gap bridging". Ciba-Geigy touts the development of the 'gap bridging' hardeners as a major breakthrough. I found myself wondering if this was just marketing hype from an era that believed Standard Oil of New Jersey when it claimed that Esso gasoline was quite different from Texaco's brew. Truth in advertising has brought many changes in our understanding of the products we use.

And yet, when I read Dr. Pizzi's book, I find him discussing the advantages of

absorbant fillers to decrease shrinkage, improve gap filling and decrease cracking of the cured resins. There is so much magic in chemistry, that it's completely possible that the acid hardener does contain something that adds to the gap bridging nature of the resin. I'm happy to accept that the glue itself is gap-filling, and I don't care if the magic potion is in the glue or the hardener. We should all leave the manufacture of the glue to Ciba-Geigy and confine our discussion to the understanding of the glue.

In their instructions for the use of Aerolite (which we publish as Appendix D in our construction manual), Ciba-Geigy says that the recommended proportions of 1 part water to 2 parts powder by weight are approximate values and on vertical surfaces and for filling gaps, less water is preferable. For this they suggest 45 parts of water to 100 parts of powder by weight.

It is very clear that the proportions of water to powder are a result of experimentation by Ciba-Geigy to get a consistency for the glue that gives the best performance and that it is not related to any mechanics of the chemical reaction. I asked Ciba-Geigy about increasing the amount of water in the glue. They replied, "You are correct in your assumption that increased water content reduces the strength of a glue line. This is not only by dilution of the glue but also because a reduced viscosity will result in greater absorption of glue into the wood and away from the glue line. This is especially so with more absorbent timbers. Water content should be kept to a minimum and be increased only to adjust viscosity depending on the application. The consequence of extra water addition will be a reduction in glue line durability or resilience, and we would not recommend such a practice in your industry."

First, I'd like to express my appreciation to Ciba-Geigy for answering my questions, for in this crazy litigious country a lawsuit can hang on every word of advice from a company—it's a wonder they didn't pull their product off the market after hearing from an aircraft company in the U.S.! We should all realize that such answers may be overly conservative for just such a reason. You be the judge and don't try anything different without first running a complete series of tests.

Let's start with some hard numbers. *ANC-18 Design of Wood Aircraft Structures* lists the shear strength parallel to the grain at 15% moisture content as 720

psi for Sitka spruce, 1,630 psi for birch, and 1,830 for sugar maple. We all use maple for test blocks because it is so much stronger than spruce and if the glue passes with maple, you have an ample margin of safety for spruce. If you think about it, except for scarf joints in plywood, almost every joint in the Falco has spruce on one side of the joint. And since spruce is the weaker of the two woods, you need to achieve adhesion to both pieces and a glue line stronger than spruce.

Opinions vary, but I understand that Aerolite has a shear strength of about 2,500 psi, but this is difficult to test since few woods are that strong. In any event, it's safe to say that a properly made Aerolite joint is probably three times stronger than spruce. There is a considerable margin of safety in this system.

In the sixties, Jean Peters of Western Aircraft built about seventy Cavalier wing spars using Aerolite. That spar is very similar to the Falco spar, except that the laminations are made of 6mm spruce. To make the glue more acceptable for laminating, Jean thinned the glue to a corn-syrup consistency. His tests with spruce blocks showed the glue joint was of adequate strength. Just out of curiosity, Craig Bransfield tried thinning some Aerolite and used some spruce test blocks. He said the glue performed well.

If you do any experimentation with thinning Aerolite, be sure to use both maple and spruce test blocks—maple to test the strength of the glue and spruce to insure that the porous wood has not destroyed the strength. Most of you should never deviate from the prescribed methods. You should have a very good reason before you do that.

Now to the question of what to do with a thickened resin, Dr. Pizzi says that it is safe to add water to resins with decreased flow, but unacceptable to do this with resins that have totally lost their flow. Dr. Pizzi gives no guidelines as to how much water is too much or how thick the resin can get before you can no longer safely thin it out. You will have to be your own judge of this and run some tests before you actually use such glue on your airplane.

Dave Gauger took some thickened Aerolite that was still pourable and diluted it back to the thickness of freshly mixed Aerolite, and it worked just fine on some maple test blocks. Even so he said, "I was unsure whether or not this was a safe

practice so I discarded the stuff. Since Aerolite is the cheapest component in the Falco, I don't feel too bad about dumping out the glue that is too thick to pour. In terms of time expenditure, it is probably just as efficient to mix the stuff in small batches as you go, then to make one big batch and repeatedly try to resuscitate it."

Ciba-Geigy is very cautious about adding water. They say that the Aerolite powder mixed with water "will tend to thicken even without hardener addition. The reaction causing this (assuming no evaporation) is however the same and any thickened Aerolite should really be discarded as having started to gel. Addition of water is not a remedy."

The urea-formaldehyde reaction is a two-stage process. The first is the alkaline condensation to form mono-, di- and trimethylolureas. The formation of these methylolureas is what goes on when you let the glue sit in the bottle. This process can be slowed by putting the bottle in a refrigerator and most Falco builders keep their glue this way for about two weeks before discarding it.

The second stage is the acid condensation of the methylolureas, first to soluble and then to insoluble cross-linked resins. The soluble resins are formed during the stage when the glue becomes rubbery. Excess glue can be scraped or wiped off with a wet cloth. In the acid condensation, the products precipitated from aqueous solutions of urea and formaldehyde, or from methylolureas, are low molecular weight methyleneureas. Thus, the end product is the same in either case and the real question is whether the thickened Aerolite is still an acceptable glue that will flow onto the surface of the wood.

Ciba-Geigy is extremely cautious about keeping mixed Aerolite. "We would recommend that Aerolite 306 be mixed at regular (1-2 daily) intervals to ensure fresh resin is used."

When the Mosquito bomber was built, the Aerolite curing was accelerated by heating. The method used was electrical resistance strip heaters where low voltage, high current electricity was passed through metal plates embedded in the clamping fixtures. This is similar to the common practice of using an electric arc welder to unfreeze buried pipes.

Ciba-Geigy advises "The hardening of Aerolite can be speeded up by raising the

temperature of the glue line. However, the equipment for doing this is unlikely to be cost-effective for the large range of different joint sizes you have. There is also the additional problem of distortion due to the non-uniform drying action of this heating, with serious consequences for accurate engineering.”

Always check a new batch of glue before using it on your airplane. In all the time we have been dealing with the Falco, I have only heard of one incidence that seemed to be a bad batch of Aerolite. Richard Clements tried Aerolite and said it performed poorly and that the test blocks failed in the glue joint. He gave the batch to a Falco builder friend, Bob Cordray. Bob found the same thing, but he ordered a new batch, and it passed the same tests.

I always encourage builders to read the facts about all of the glues, then get some glue and try it. The simple fact is that there is no one perfect glue for an airplane and certainly not for every builder. But Aerolite has proved to be the glue most favored by Falco builders.

An interesting case is Gary Smith, who had built a Pitts using T-88 and recently restored an Aeronca C3 using T-88. Gary is a very experienced woodworker who has a large custom cabinet making shop just outside of Atlanta. He has one of every piece of woodworking equipment, thirty employees, and he took one look at the wood kits and bought them all. Anyway, Gary had never heard about the poor high-temperature performance of T-88 so he popped some test blocks in the oven. He didn't like what he saw so he got some Aerolite and ran some tests. That's all he uses now, and he says he is surprised to find himself using the glue.

Aerolite is the product of a romance with aviation that began fifty years ago. In 1931, Norman de Bruyne, a professor at Cambridge University founded the Cambridge Aircraft Construction Company in a workshop at the flying school at the Cambridge airport. He was the first pupil of the school, learned to fly and soon bought a Gypsy Moth biplane. Convinced that British aircraft design had 'got stuck in a rut', he and a friend designed and built a low-wing monoplane called the Snark. The project took three years, and he changed the name of the company to Aero Research, and moved it to Duxford, ten miles south of Cambridge and the site of the Ciba-Geigy plant that today makes Aerolite.

The Snark was an all-wood design assembled with casein glue which was the only glue available with even the slightest water resistance, and the plywood was assembled with blood. Dependence on biplanes was one thing, but flying on blood was another, so they set about the search for a better glue. Dr. de Bruyne had already struck up a relationship with Geoffrey de Havilland to act as a consultant with particular reference to the use of plastics in aircraft.

In 1937, Dr. R. E. D. Clark, a chemistry professor from Cambridge, produced an experimental urea-formaldehyde resin for evaluation. A pilot plant was built with a second-hand laundry boiler producing the steam necessary to make the product they called "Aerolite". Later that year Claude Rayner joined Aero Research and took charge of the project, and it was his discovery of GB or 'gap bridging' hardeners, incorporating formic acid, that made Aerolite a practical assembly glue.

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Dr. de Bruyne continued to work with other "plastics". A laminate of flax roving and paper soaked with liquid phenolic resin and cured under pressure was called Gordon Aerolite. This is the predecessor of today's phenolic sheet and was named for a friend called Gordon, whose family was in the linen business and who supplied de Bruyne with flax after he had been rejected by the glassfibre manufacturers since they did not see "any prospect for glass 'silk' being suitable for molded plastics" and did not want to be associated with a failure.

The tiny Aero Research company continued to struggle, but the glue started to sell. They repaired an delaminating 1929 Desoutter monoplane and made Miles Magister tailplanes for the Air Ministry. During this time, de Havilland's chief engineer began spending time at Aero Research discussing the concept of wood sandwich construction with balsa core.

This eventually led to the production of the Mosquito bomber.

As war broke out, the tiny company began to grow and developed the strip heating process to speed the assembly of wood parts. Morris Motors used Aerolite and strip heating to assembly Horsa gliders, as did de Havilland on the Mosquito as well as on other aircraft and in naval launches and patrol boats.

Other adhesives were developed, Redux (for REsearch at DUXford—get it?) was developed to box aluminum sheet to a balsa core. Fomvar was an early film adhesive. Aerodux was a resorcinol which to this day remains one of the company's most popular glues.

At the end of the war, the company's first efforts to market their products was to the Finnish Plywood Association. The marketing manager met the four-man committee who asked several questions, conferred with each other for a few minutes and then produced an order of 100 tons of Aerolite. The stunned salesman, terrified that they might change their minds, fled from the room.

This large order was a turning point for Aero Research, which spent the next five years working on a plan and financing for truly large-scale low-cost production of urea-formaldehyde resins. In the end, Aero Research was taken over by the Swiss Ciba company, a large multinational group of chemical companies that wanted to expand into England. Ciba had already invented the melamine resins and had produced the Araldite epoxy resins.

Today Ciba-Geigy is one of the largest producers of adhesives in the world. They are a major supplier of epoxy resins, which ends up in strange places—half of their epoxy sales are to paint companies, who use it to seal the inside of paint cans. They now ship their Aerolite resins in 100-ton-capacity tank cars. Most of their Aerolite urea-formaldehyde is shipped to the chipboard industry and those resins are supplied in a completely different form from the glue we use. The Aerolite 306 that we use is a specialty product with such a small market that Ciba-Geigy doesn't even have a U.S. distributor.

All this because a Cambridge Don decided British aviation was stuck in a rut, set out to reform things by building a plywood airplane, and ended up making goop. It sure beats blood.—*Alfred Scott*

Construction Notes

The canopy installation gets mixed reviews from builders. Some find it easy and others curse at the thing. The first thing you need to know is that if you drill acrylic with an ordinary drill bit, you are probably going to ruin the thing. The reason is that a drill will bite into the acrylic and cause it to split.

There are a number of ways to drill such a hole. The most common way is to use a drill that has been sharpened so that it has “zero rake”; that is, the cutting edge has no rake to it. This prevents the drill from digging in, and the drill shaves its way through the plastic. You can buy a drill already sharpened like this from Aircraft Spruce or your local plastics supply store, or you can grind a drill yourself—as most people do.

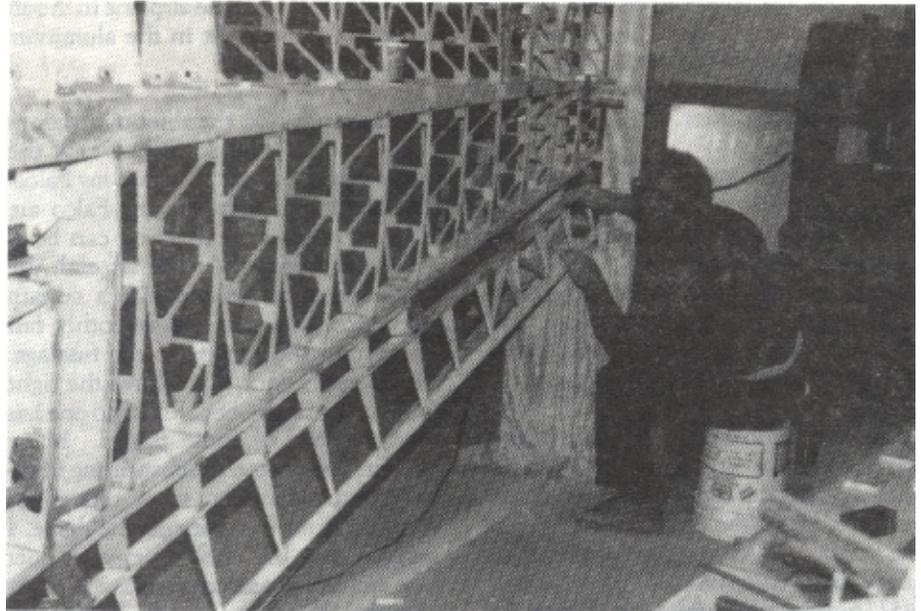
One very safe method is to grind a hole in the plastic with a Dremel grinding bit. They have a sharp-pointed burr that works nicely.

Perhaps the cleverest method, though, is to use a brad pointed bit. I’d never heard of anyone doing this, but John Oliver came up with the idea. He practiced with a lot of scrap pieces and tried to induce a crack with the bit. It never did, and John concluded he was safe. He did the entire installation with these bits, and had no difficulty.

John used a Makita cordless drill to drill the acrylic sheet because of the lower and more controllable speeds. He used a brad pointed, 3/16” drill bit for all acrylic drilling, and he backed the acrylic sheet with 3mm plywood to avoid “break out” of the final bit of acrylic and to avoid contacting the steel tubing with the brad pointed bit.

John also used the plywood backing when doing the final drilling of the acrylic windshield against the wood to avoid an oversize hole exit when breaking through the acrylic.

His hole-drilling procedure was a two-drill operation. John marked the hole location on a piece of masking tape on the acrylic, then he drilled one-third of the way through the acrylic with the brad pointed drill. Using the center (brad point) hole to center the hole in the steel tubing or wood, John used a No. 41 drill bit (cobalt) to drill through the steel tubing. He says to start with light pressure to avoid drill wandering. He used a 1/8” drill bit for the No. 8 screws in the wood.



Tim Baker's father, Bud Baker, working on the Falco wing early this spring. Tim and Bud began work in February. The airplane is now finished and will fly shortly.

After the smaller holes were drilled, John finished the 3/16” holes in the acrylic with the brad pointed bit and with a piece of 3mm plywood for backing. He used a 3/8”Ø Dremel rounded-end grinding bit in the cordless drill to smooth the edge of the hole on the inside and outside. John says that if any of the holes in the acrylic need to be enlarged because of hole wandering, you should use a small drill bit (say 1/16”) in a Dremel tool.

The canopy is held in place with No. 4 sheet metal screws, which screw into the tubing. Sheet metal screws are designed to go through very thin sheet metal. Typically, they push the metal around rather than cutting threads. The sheet metal screws and the 4130N steel tubing are not a happy marriage. The tubing wall is thicker than is normally encountered by a sheet metal screw, and the steel is hard and tough.

Falco builders have been looking for a tap to cut threads for a sheet metal screw for some time. It appears that no one makes such a thing, but John Oliver made his own. Self-tapping sheet metal screws are made with slots cut in them so that they cut their way into the sheet metal. John simply modified a few screws this way.

John bought some No. 4 hex head sheet metal screws and cut two self-tapping slots in the end of the screw with a Dremel cut-off tool. He then used a socket wrench to turn this homemade tap. He says that if the final screw will still not go in, to cut flats on one screw head and run it through

the tapped hole with a wrench.

In fitting the canopy to the steel frame, John marked all holes, then installed first those needed to bring the acrylic flush against the tubing. John worked from the centerline outward and across the bottom last. John had the wood forming strips in place along the bottom from the start. He rough-sized the canopy before starting and finished sizing it after the holes were drilled. John said he did not find the windshield/canopy installation particularly difficult.

Steve Wilkinson said he found the canopy installation to be surprisingly easy, particularly after reading the accounts of others who found it difficult. Steve used almost the exact opposite approach from that of John Oliver. He supported the canopy frame on two sawhorses while drilling the frame. Then, when he was installing the canopy, he clamped two 1x2's to the sawhorses. These were vertical and were notched at the top. The center tube rode in the notches, and the whole thing would sway as he worked on it—thereby giving the canopy a taste of things to come when Steve flies it.

Steve drilled the holes in the steel tubing first, estimating by eye the angle at which the canopy bubble would contact the frame. He miscalculated the holes at the top front and had to drill a few new holes there, but all others worked out well.

Steve's miscalculation does not surprise me, because until you put the acrylic

bubble on the frame, you will not realize how much the bubble is flexed to conform to the shape of the frame. In particular, it is pulled down a surprising amount at the top front center.

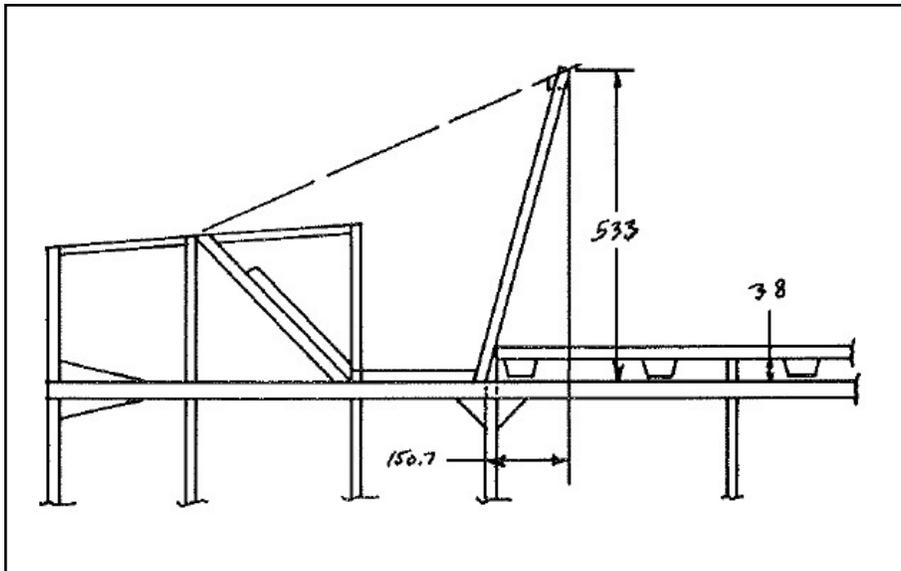
After the holes were drilled in the tubing, Steve put the canopy on the frame and started at the top front center and aft center and worked outward. One of the reasons that Steve used this method was that he was working entirely alone and could not take the bubble off the frame with every hole, as some have done.

Steve had the foam strip in place at the top front, but he would pull it out just far enough so that he could sight through the acrylic to locate the center of the hole in the acrylic. He used a leather punch to put holes in the foam strip. Steve drilled 3/32" holes in the frame, then reamed the holes with a No. 40 drill, and he said he had no difficulty getting the screws to go right in.

Although it must be obvious to everyone, the correct procedure is to first install the canopy on the canopy frame, then you fit the windshield to match the canopy. Because the windshield frame is wood, you sand on it until you get the smooth transition you are after.

The canopy has an aluminum strip which is installed around the periphery and through which the screws are installed. The aluminum strip serves the function of a washer, and it spreads the load of the screw over the plexiglas. On the French CAP-10, the canopy is installed with washers under the screws and if you like you can do that. John Oliver is doing

The windshield bow for the "High Nustrini" canopy installation is installed on the forward side of fuselage frame 4.



precisely that to get the airplane in the air quickly, and he'll put in the aluminum strip at his leisure.

The drawings show the aluminum strip as 2024-T3, but I should confess that the Italians used no such thing on my Falco. The aluminum strips on my Falco are dead soft aluminum that you can bend with your fingers. At the aft end, the aluminum strips will require a certain amount of convexity to smoothly fair down from the canopy to the fuselage. This is easily done if you have the right tool—a shrinker—but almost no one has access to one of those things. Many builders have taken to substituting fiberglass for the aluminum strips, though it's not clear to me how they get the shape. I suppose they use masking tape or duct tape and cardboard, cover this with fiberglass and then rip out the tape and cardboard.

Many builders have used fiberglass around the periphery of the windshield. If they are after a smooth, flush appearance, they install flat head screws and Tinnerman washers and then cover the whole thing with fiberglass. This has the disadvantage of not allowing the windshield to be easily replaceable without repainting, but once you resign yourself to that in the unlikely event, it makes for a simple and attractive installation.

Falco builder Pete Greenslade writes, "If you have any information on the 'raised Nustrini' canopy idea, then I should be glad to hear about it, since the appearance of the Nustrini is very appealing and if it can be made to give more headroom without too much difficulty I would like

to go for it." I've done a little sketch of what is involved and included it here.

The woodwork is fairly simple. You extend frames 5 and 6 up by 38mm (that's 1.50") and then put the canopy 'gunwale' strip on top of those. The windshield bow is installed on the forward face of frame 4 and tilted to match the canopy frame. By doing this, you close up on the area of the windshield and allow the windshield that we supply to be fitted. It is not a perfect fit, but it's close enough so that you can fit things by filling in with strips of spruce.

You will also have to jack the dorsal fin up by 38mm so that the canopy roller will have something to roll upon. The biggest headache, though, will come in extending the fiberglass canopy skirt fairing. This is what Pawel Kwiecinski cursed the most. He did this by sighting down the skirt fairing to the fuselage to find the intersection, and then he used cardboard and masking tape to build the shape. To keep the fiberglass from sticking to the canopy, he put shoe cream on the acrylic bubble.

You would expect that the appearance of the airplane would be dramatically different with this change, but it really isn't. Take a look at the pictures of Pawel Kwiecinski's Falco on page 11 or in our new Falco brochure.

Dear Ms Avery: Ask Alfred if he has any ideas on how to mill the 3/8-inch radius groove in the dorsal fin. So far the only good way that I can think of would involve a router bit, but I can't find one of the proper size. If Alfred doesn't have a ready method, forget it—I'll claw that groove with my finger nails. It's a real pain in the dorsal.—Allan Hall

The only way I know to make this is with a router. First, use a Porter Cable 43651 (high speed steel) or 43147 (carbide tipped) bit to cut the groove in the edge of a board of sufficient width. Then taper the sides to the proper angle on a table saw, and finally cut the bottom at an angle to fit the fuselage. Without a cutting jig, this last step is most easily done by drawing on both sides of the wood, cutting it close to the line with a band saw and then sanding to the lines.

If you have never used a router, a good book is *Router Handbook* by Patrick Spielman. This is one of the all-time best-selling woodworking books. Those of you who have the book can take a look at the C. R. Onsrud Model 2003 inverted router on page 179. That's what we have

to make the solid spruce ribs in the wing and tail. Patrick Spielman's latest book on the subject is *Router Jigs & Techniques* which I've ordered. If you can't get them locally, you can get both from Highland Hardware at (800) 241-6748.

Steve Wilkinson asked about the proper procedure for setting up the retraction for the nose gear. In the construction manual, we already have the procedure for getting the main gear screwjacks properly synchronized with each other. What you must do on the nose gear is this:

First, crank the main gear down so that the screwjacks are fully extended but not yet pushing on the springs. The best thing to do is to take the nuts off the bolts and turn the crank until you can just slide the bolt in.

Second, adjust the height of P/N 605 Nose Gear Adjustment Screw to a height of 127mm as shown in the sketch below right.

Third, screw the nose gear screwjack into the screwjack sleeve. Install the rod end fitting and spring, and then bolt all of that to the nose gear adjustment screw. Turn the screw out until it fits into the universal joint. Then drill for the taper pin to fix the screw in place. This will properly synchronize the system.

A Falco builder asked me a question the other day about a small detail of reading the plans. I realized that I had never explained this point and so will do so now. Some of our drawings have part numbers and assembly numbers shown inside circles—or "balloons" as they are sometimes called. A good example of this is Drawing No. 864—sheet GG48b. The flat plate is the "-2" part, and the tubes are the "-3" part.

Balloons for part numbers are used only for the part numbers that originate on that specific drawing. Thus the -2 part has the full part number description of P/N 864-2. This is a convention that is used on almost all drawings in the U.S. and one that I have adopted wherever it was appropriate. On the wing and tail ribs I use "dash numbers" to identify the part numbers which apply to individual ribs.

Sometimes it is necessary to show an assembly number, which is just a part number that applies to a part made from a number of other parts. An assembly number is indicated by surrounding the dash number with a double circle—see

sheet E2e for an example. For the most part, I have avoided that sort of thing since our drawings are very clear to our builders and showing the every last piece as a part number might be technically correct, but you would find it confusing. For example, a rib is made up of lots of pieces of wood. To be correct, every capstrip, brace and gusset should have a separate part number, and the rib should have an assembly number.

We are changing the fuel selector valve to a variant of the type used by Mooney. The valve that we have used in the past has worked nicely, but the company that makes it now wants a small fortune for the valve. The new valve is just as good and has three positions instead of the four of our previous valve (which had two Off positions). The valve handle will now have the long part of the handle pointing toward the selection.

There is a minor change in the mounting of the valve. The two screw holes will remain unchanged but the hole for handle moves .25" to the right. Our next series production of the pedestal will be correctly machined, but there will be many of you who will have to fudge things. There are a variety of methods that can be used, none of them very difficult, which I will describe in a later memo. I'll also have a few drawings for those of you who will need them. In the meantime, I would suggest that you do not install the rub-on lettering for the fuel selector valve until you have the new drawings.

Buzz Glade reports that he found the tires for the 5.30x6 wheels available from

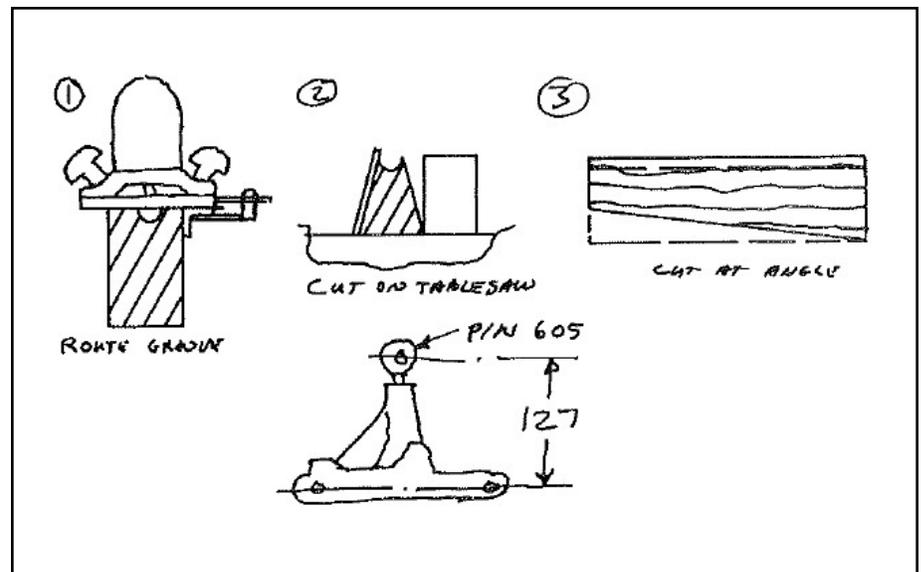
Carlisle Tire & Rubber Company, P.O. Box 99, Carlisle, PA 17013. Telephone (800) 233-7165 or in PA (800) 222-1876. They carry the tires in 6-ply rating and call them a 5.30/4.50-6 tire with saw-tooth thread. Buzz says the 4.10/3.50-6 tube will fit, will not pinch, has the right valve stem and is easier to obtain. These tires are always available from Desser Tire and Rubber Company per our listing in the price list.

As builders approach the completion of their Falcos, they get their main gear struts pumped up. Most aircraft struts are pumped up with high-pressure nitrogen bottles. Most FBOs have such a bottle and can easily put the required pressure in the struts. Unfortunately you will find that you will not be able to get exactly the right amount of air in the struts until you have the aircraft on the gear. Taking the struts to the bottle will not do.

The reason is that you will inevitably find that you need just a little more pressure than the 600 psi specified. My Falco usually ends up around 650 psi. Frankly, I regard the 600 psi as a rough guide. I crank the handle on the regulator until about 600 psi is showing on the gauge. Then I bounce the wings of the plane to see how it feels. I add enough so that the struts are fully extended with no one in the plane and so that they will still compress when you lean on the wing. Imprecise perhaps, but that's what everyone ends up doing.

I also hear Falco builders worrying about the weight and balance before they fly the airplane for the first time. Inevitably the center of gravity ends up rather far for-

To make the dorsal fin block, mill the radiused groove with a router, then saw the taper. Finally, trim the bottom. Bottom: P/N 605 Installation.



ward. As it turns out, the Flight Manual does not specify the empty weight center of gravity, only the center of gravity in flight. Obviously that it all that is important. It is your responsibility to load the aircraft with pilot, passenger and fuel so that the center of gravity is within the specified limits.

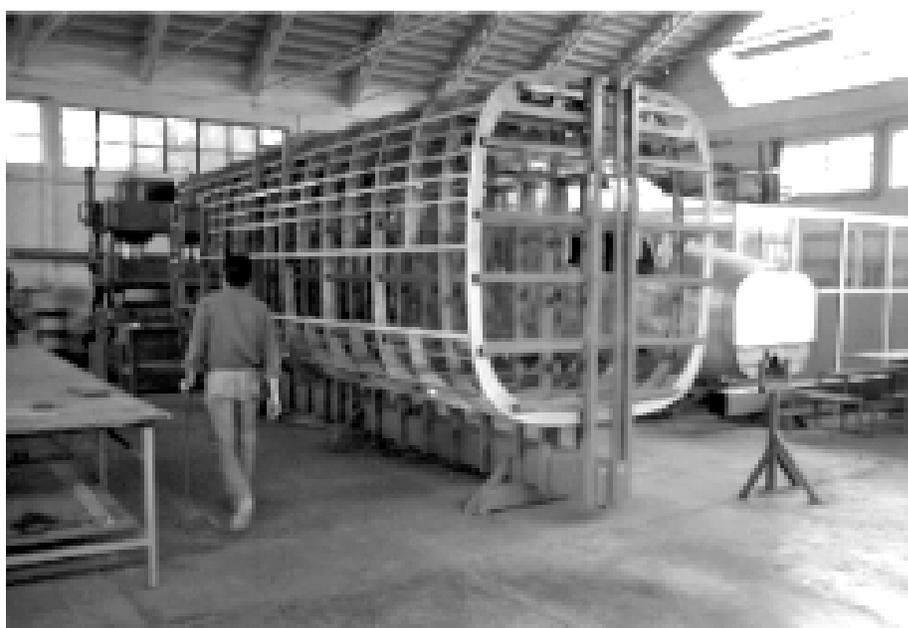
Almost all Falcos end up with their center of gravity such that in certain loading conditions, the center of gravity will exceed the forward limit. The forward center of gravity is determined by the ability of the airplane to do a full stall in ground effect with the gear and flaps down. It is a measure of elevator power, and it is not desirable to have an airplane that will nose down on you while you are landing. You should always be able to hold the nose off while landing.

When I was in Italy in 1982, I made a point to ask Mr. Frati about the center of gravity limits. The Falco was originally built with a smaller engine and a light-weight wooden propeller. The Series I and II Falcos also had slightly smaller tail surfaces—although I don't know the measurements. With the Series III Falcos, the tail areas were increased and then on the Series IV, a 160 hp engine and constant speed propeller were installed.

On all other aircraft that I was familiar with, such a growth in engine and propeller weight always required the addition of some weight to the tail of the plane. I had seen nothing in the Falco drawings or flight manual to indicate any adjustment. I asked Mr. Frati about this. He said that they had originally thought that they would have to add some weight to the tail, but found after flying the airplane that it was not necessary.

I've never spent any time exploring the forward CG of the Falco, in part because my Falco has the lighter fixed-pitch propeller. But I have a suspicion that the forward CG limit might be moved forward slightly since the Falco has a very powerful elevator. This can only be determined by flight testing, but I doubt that anyone will bother. My experience is that Falco builders worry themselves sick about this until they fly the plane. Then they get a feel for the handling of the plane and just go fly it.

But if any of you out there have any opinions on this, or have done any testing, I'd love to hear what you have to say. Has anyone had the nose fall through on landing with a forward CG?—*Alfred Scott*



Top: Stelio Frati and his first aircraft design, a torpedo bomber done for his master's thesis in 1942. Center & bottom: The latest design is a fanjet commuterliner which consists of one model and this "mobile home" framework.

Tool Talk

The Gougeon Brothers have a series of new products for their series of West System coatings and adhesives. The only one of any interest to Falco builders will be the 410 Microlight Filler which they claim is superior to microballoons. The ultralight fairing compound is said to be superior to microballoons because of its butter-like consistency when mixed with epoxy, even when mixed very thick. It is not prone to trap air, and it mixes more easily than microballoons. It is easier to sand and 30% lighter. I've not seen the stuff yet, but my experience is that Gougeon's products do what they say they do. If anyone tries this, please let me know what you think of it.

You can't beat the carbide-grit sanding sticks and sheets sold by D. G. Products for carving on spruce, but a neat little item are the Eversand hand sanding pads. The sandpaper is something called resin-bonded which is apparently longer lasting than ordinary sandpaper, and each pad consists of a 1/8" closed-cell foam core with sheets of different grit sandpaper on opposite sides. Highland Hardware—(800) 241-6748—sells a pack of 6 pads for \$9.50.

I've mentioned this before, but lately I've gotten a number of calls from builders looking for a strut pump that they can use with their shop air. The pump is the 1500psi oleo strut pump, manufactured and sold by Aviation Products, 114 Bryant, Ojai, California 93023. Telephone: (805) 646-6042. The price of the pump is \$195.00. It is a big piston/little piston affair that boosts the air pressure by a factor

of ten, so 65 psi of shop air pressure puts out 650 psi of pressure to the strut.

I'd seen them in catalogs and hardware stores for years, but not until I picked up all the stuff from Francis Dahlman did I realize what a nifty device the Jorgensen bar clamp is. The clamp has a multiple-disc-clutch arrangement that is truly wonderful, and I wonder if I am the last person on earth to discover their benefits. I've owned other clamps which are built around the same idea of quickly sliding the clamp closed and then tightening the screw handle to put on the pressure, but they never worked as advertised. These clamps really do work well. The clutch holds any place on the bar without slipping and releases instantly with just finger pressure. So if you are getting tired of screwing, screwing, screwing your "C" clamp until you finally get it down to the workpiece and then discover that something won't fit and you need another clamp, take a look at these clamps. They come in every conceivable size from tiny to huge and are sold all over the world by hardware stores and mail order companies.

Does anyone know where to get a carbide grit sanding disk for a table saw? I've used them before and you would think you should be able to go down the the local hardware store and get one, but no one seems to have one. It is nothing more than a ten-inch diameter disk of steel that has been covered with a dusting of carbide grit which is brazed to the plate. They are inevitably coated with copper plating, and they sand soft wood like there's no tomorrow.

—Alfred Scott



A French Mother Writing to Her Son

My dear French Canadian male son Claude,

Jus a few line to let you know dat hi ham still halive. Hi ham writing dis letter slowly because hi know dat you cannot read fast.

You won't know de house when you come home... we move. Dere was a washing machine in de house when we move in, but hit ain't working so good. Last week hi put 14 shirt hinto hit, pulled de chain and hi ain't seen de shirts since.

About you papa. He has a new job. He has 624 men hunder him; he his cutting de grass in de cemetery. Your sister Pauline had a baby dis morning. We haven't found out wedder it's ha boy or girl, so hi not know wedder you ha aunt nor hunkle.

Your hunkle Pierre drown last week in a vat of whisky in Tree River Quebec. Some of his workmate dive in to save him, but he fight dem hoff bravely. We cremate his body and it take tree day to put out de fire.

You papa did not have much to drink at X-mass. Hi put a bottle hof castor oil in his mug of beer. Hit kept him going till New Year day.

Hi went to de doctor on Thursday and you papa come wit me. Da doctor put small tube in my mouth an tolt me not to hopen hit for 10 minutes. You papa offer to buy hit from him.

Hit only rain twice dis week. Firs for tree day, and den for four day. Munday hit was so windy dat one of hour chickens lay de same hegg four time.

We got a letter from da undertaker. He say if de las payment not paid hon you granma within seven day, "hup she come!"

Your lovin mama

P.S. I was goin ta sen you \$10 but hi had already seal de envelope.

Sawdust

Correction: Mr. Frati sends word that he misunderstood Steve Wilkinson when he said that for the \$3 million that Piaggio spent on Avanti wind tunnel tests, he could pay for the entire Squalus program—development, two prototypes and all. Mr. Frati thought Steve had said \$13 million. The Squalus engine alone costs \$500,000, there are expensive ejection seats, and Promavia executives might read the article and wonder if they were overcharged.

“Daddy, how come they put it together with chocolate pudding?” asked Craig Bransfield’s young helper, mystified by the resorcinol glue on the wing spar.

Gary Smith did not properly tend to his domestic relations when he headed out for the Great Oyster Fly-In in his truck. Sharon, left behind fuming, called Brenda Avery and said “When Gary gets there, slap him upside the face for me.” Poor Gary arrived to be greeted by Brenda with “I have a message for you.” *Smack.* “That was from Sharon!” So remember, never go the Great Oyster Thing without taking your lady, and watch out for Brenda if you do.

After much thought and study of the Falco brochures, LeRoy Moore had to see the warehouse of parts before he made the final decision. When he saw it was all for real, he decided to go ahead with the project. As he filled out the forms, Martha Moore—his wife of 46 years—read the brochure, then suddenly looked up, pointed at the red Falco on the cover and said “What I am looking at is The Other Woman, isn’t it?”

In a bizarre incident, Guido Zuccoli’s Fiat G-59 and Falco kit were nearly lost at the Singapore harbor. The dockworkers had loaded almost all of the containers on Friday afternoon on a ship bound for Australia. When they returned on Monday morning, the ship had listed nearly 90 degrees to one side and was prevented from sinking by the ship’s cranes, which hit the dock. The ship was loaded with containers of cyanide, which caused a bit of consternation. The container with the Fiat and Falco were next to be loaded. They rode out the weekend on level ground and are now safely in Australia.

Aviation Week and Space Technology reported that at the Farnborough air show that “The only untoward incident during the entire eight days of flying came

on Saturday, when Georges Belot, pilot of the Promavia Jet Squalus trainer, was banned from further flying after accumulating three warnings for failing to maintain his display within the show limits.”

According to *Air & Space* magazine, for \$7.95 the UFO Abduction & Casualty Insurance Company of Altamonte Springs, Florida, will sell you a \$10 million policy that provides coverage if you’re taken for an otherworldly joyride. Assuming you return, your benefits include psychiatric care. Sarcasm protection is limited to immediate family members. A double-indemnity clause provides \$20 million in the event: a) aliens refuse to practice safe sex, b) encounter results with offspring being referred to as ‘the missing link’ and c) aliens refer to abductee as a nutritional food source. The frequent flyer exclusion limits benefits to one occurrence per policyholder. The policy is the creation of Mike St. Lawrence, who reports that over 2000 clients have signed on, “mostly from California, as you might expect, but there’s a monastery in Greece with full coverage.” St. Lawrence’s previous foray into insurance was the Future Life Insurance Company which offered a \$10 million reincarnation compensation—\$20 million if you return as a lower life form.

The British CAA magazine *Airway* reports the following exchange on the radio at the Aberdeen Airport. Pilot: “There’s a hare on the runway.” Tower: “What do you expect? This is a hareport.”



Brenda’s Corner

Since the announcement of Mr. Frati’s and Mr. Nustrini’s return visit to Oshkosh next summer, we have already had some requests for reservations in the block of rooms we have reserved at the Paper Valley Hotel in Appleton. This year the show will run from Friday, July 28 through Thursday, August 3, and the Falco builders dinner will be on Tuesday, August 1.

If all of our rooms at the Paper Valley are spoken for, we can always ask to be put on a waiting list for additional rooms. We have had good success with this in past years, but we should do this as soon as possible. I know it’s not even Christmas yet, and here I am talking about Oshkosh, but it will be here before you know it.

Speaking of Christmas, we do have a good supply of Falco garments, caps and patches for the Falco enthusiast in your life. Just give us a call, and we will get them right out to you in time for Christmas.

There seems to be some confusion regarding the subscription to the builder letter. The Falco builder letter is published four times a year. When you purchase a set of plans, you receive a two-year subscription at no additional charge. Each time you purchase a complete kit, your subscription is extended two years. If your subscription is getting ready to expire, we include an expiration notice with your builder letter and send a follow-up notice to you before we remove you from the mailing list.

United Parcel Service now delivers to most countries in the world, and it is economical and fast for small shipments. Delivery time is two days to most places, and they deliver to your door. They will also accept collect shipments so that may make it easier for you since you would not have to get a check drawn on a U.S. bank. They will accept as payment the currency of the country the shipment is delivered in or a check drawn on a bank in that country.

Best wishes to you and yours for a joyous holiday season.—Brenda Avery

Left: The Wilkinson Falco looks out over a grassy bowl at Steve, Susan and Brook’s house and their “tacky above-ground pool”.

Mailbox

The gear is in, and I'm ready for the second (pre-cover) inspection by the D.O.T.

*Dwight Lapeare
Clearwater, Ontario, Canada*

I purchased the Falco hardware from Michael Webb and hope to start work on my Falco soon. I enjoyed seeing you at Oshkosh! Keep up the good work on the builders letters.

*James Farriel
Hammond, Louisiana*

I have been making glue test blocks lately, and the Aerolite is super stuff. It sure gives a builder confidence in glue joints. I am waiting for some T-88 so I can try that. The elevator is now framed and sanded ready to skin with plywood. Progress has been slow but steady. The wing ribs arrived the other day and the workmanship is impeccable. I hope to start the wing sometime in mid-1989, July or August. Having a good background in model airplane building has sure helped. Building the Falco is the same construction, only on a bigger scale. And spruce and birch is more forgiving than balsa wood.

*Bob Brantley
Santa Barbara, California*

Thanks very much for the quick action. I received your excellent Flight Manual and Test Flying sections almost before I hung up the phone. You have come a long way with the Falco. Sure wish I was building one now!

*Tony Bingelis
Austin, Texas*

Lots of woodwork which I am enjoying every minute of.... No projections. I took time out to go to the Reno Air Races where I saw the 3 Siai Marchettis perform. Beautiful birds!

*Duane Cutler
Montrose, Colorado*

The soundproofing manufacturer E.A.R. will happily deal with individuals, but only if the minimum order is \$200. I therefore bought \$210 worth of the recommended half-inch-thick E.A.R. sound-dampening foam (3002-50-PSA) which means I have enough to do five firewalls with slight wastage. It comes in a 4.5-foot width, and they sent me a 13-foot-long roll. So I have enough left to cut into four 31"x54" squares—ample for anybody's firewall—and will sell and ship them for

my cost (\$42 apiece) plus what I'll guess is \$4 to ship each. Or if anybody wants more of it than just a firewall's worth, tell them to call me at (914) 534-7601. It's the half-inch thick foam with a pressure-sensitive adhesive backing and without any kind of aluminum or other protective covering.

I just noticed that in an early-summer newsletter you said that insurance for Falcos abuilding should be easily obtainable even though it won't ever be part of a homeowner's policy. My broker looked far and wide, but every company he talked to refused to touch it. (Oh, sure, they'd do it at a 10-percent premium, but nobody was interested in providing a normal policy of any sort.) I thus bought one of Avemco's homebuilder policies, which they provide specifically for not-yet-flying homebuilts. It covers the total, actual, receipted value of kit, components and materials—not tools, plans, ancillary stuff, labor or anything else, just what's in the airplane itself. The annual premium is two percent of that value, which my broker said sounded reasonable to him. Since we live in the Land of Vandals during the Age of Trashing, it does to me too.

*Steve Wilkinson
Old West Point Road
Cornwall-on-Hudson, NY 12520*

For those of you who may have a preliminary copy of the advanced builder memo on sound-proofing, I have settled on the EAR foam Steve bought. I would use it not only on the aft face of frame 1, but also on the cockpit sidewalls and floor back to frame 2 and extra layers around the exhaust port boxes.

My friend who told me that the insurance would be readily available points out to me that insurance companies base their premium on the building, which they rate in many different categories of risk. In Steve's case, the combustible airplane is stored in a wooden barn located at the end of a long twisting dirt road through the woods—and thus not easily reached by a fire truck.—Alfred Scott

Not much progress. Being president of Chapter 45 for the last 4 years while keeping 3 other airplanes flying for myself and two sons has limited the time I can put on the Falco. Hopefully, this is my last year as president, and I should have time then to get started seriously on the Falco.

*Ernest Lanyi
Elizabeth, Pennsylvania*

No progress (other than mental) but your plans are superb and the construction

manual is excellent! Keep your builders letters coming and any drawing updates. Will keep you informed as soon as I start cutting wood.

*Charles Witherell
Pleasanton, California*

G-BYLL now has 36 hours and flying well enough for a few teething troubles. It is also a bit slow, though gear doors are not on yet—140 knots at 75% cruise which for the 150 hp engine is 24-1/2" and 2400 rpm. I've still not had the confidence to land without winding the gear down a bit further.

*Neville Langrick
Huddersfield, England*

Please send me a complete information package about the undisputed flying beauty-queen in the sky worldwide. Your Falco is my love.

*Helmut Margreitter
Lech, Austria*

Just a couple of lines to tell you I'm still around! My job of late has kept me tied up 12 to 14 hours a day, 6 or 7 days a week. However, that is changing and now I'm back to a more normal schedule so will be continuing with the Falco.

*Gordon Cook
Surrey, B.C., Canada*

Progress on 'Falco' is slow this year. I aimed to have all woodwork and skinning finished for 1988 but with one wing top to go I feel I've slipped behind. Pressure from work here and buying and selling aeroplanes has limited resources somewhat.

*Bob Sothcott
North Humberside, England*

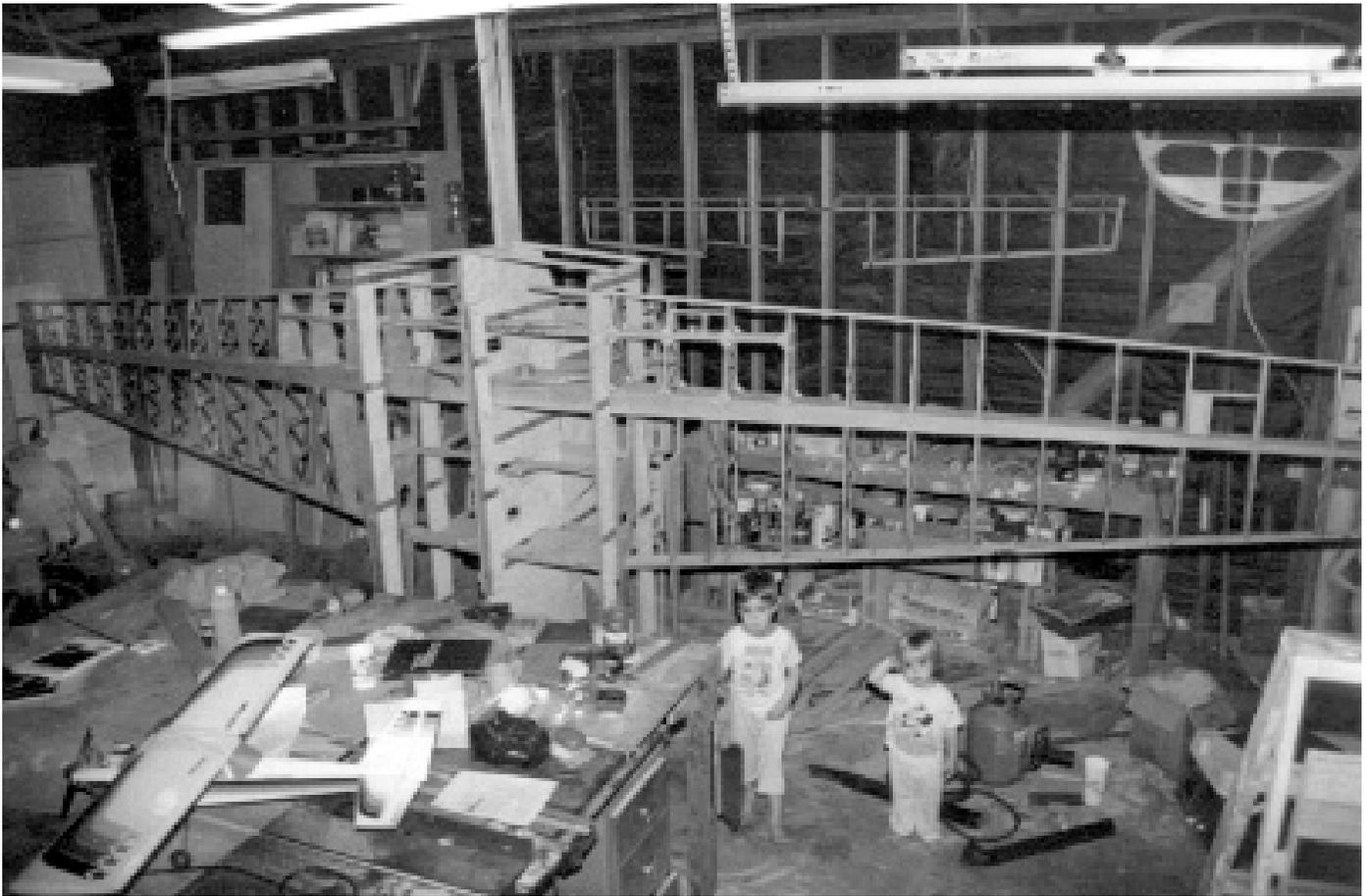
The fuselage frames are complete and the tail group is complete and assembled. Thanks for the good service.

*Jerry Farhat
Escondido, California*

I have suspended work on the wood parts until October. I got down the building the main spar and didn't have enough room. A new company building has a 40'x50' space reserved for Falco construction. The metal parts are well underway in our machine shop. I definitely will build more than one aircraft.

*Bob Cordray
Broomfield, Colorado*

I have been transferred to Germany for the next few years with Hughes International. Before I left I had completed the elevator spar and most of the ribs for



Ricky and Elise Fitzwater are our youngest Falco builders. Daddy is allowed to watch—as long as he does not talk too much, interfere with the construction or suggest modifications.

the tail section. The parts are now in a friend's garage for storage until I get back. I can speak from experience that the only sane way of ever completing a Falco is from kit purchases. It takes too much time to purchase, cut and make the parts. Especially if you are making one Falco.

I look forward to traveling into Italy and possibly hit a few airports down there. I really like the Italian airplane designs. Last month I went to Ramstein Air Force Base to see the Italian *Frecce Tricolori* aerial demonstration. As you know there was an accident. I was there with my wife about 100 yards back from the flight line when the plane hit the crowd. The explosion was strong enough to knock us over. My wife and I will never forget the things we saw. Since then I have not flown. I am hoping to get my feet off the ground soon.

Jim Nicholaou
APO, NY

If you do any drafting on the Macintosh, you may be interested to know about an obscure 2D drafting system called *PowerDraw* which is offered by Engineered Software (Computer Shoppe) in Greensboro, North Carolina. I've done considerable evaluation work on all the

Macintosh drafting systems, including *VersaCad* and *AutoCad*, and *PowerDraw* is far superior to all of them for serious 2D drafting. It's a great system.

Frank Christensen
Jackson, Wyoming

Frank Christensen, whose Christen Industries produces the Christen Eagle, Husky and Pitts Specials, is a friend and one of a very few people in the kit aircraft business that I admire. We trade notes from time to time, and while this letter might be unrelated to the usual Falco stuff, there are a lot of Macintosh computer users among our eclectic band of weirdos who might be interested in this.

I have also looked at every CAD package on the Mac, and many on the IBM PC, Apollo and others, and I have yet to see a CAD program that I like. I love the concept but in every case the system has been designed by a programmer or CAD consultant who has never sat on a drafting stool. I have yet to probe the program to its depths, but so far I agree with Frank. My initial assessment is that it is much better than all of the big-name CAD programs. It has all of the same features, but it is so instinctive that it makes your head spin. I haven't yet decided to use the system for our blueprints yet, but if you

are looking at CAD on the Mac, you owe it to yourself to take a look at this one with a Hewlett-Packard or CalComp 1023 (my choice) plotter. Try to get the demo disk, it's a full working program with plotting and saving disabled. Engineered Software, P.O. Box 18344, Greensboro, NC 27419. Telephone (919) 299-4843, Fax (919) 852-2067.—Alfred Scott

Just a note to let you know that the Fitzwater Falco is alive and well and progressing nicely. The wing is assembled in the jig—I mean *fixture* (I was informed that manufacturers now use the term "fixture" because jig could be racially offensive!)—and almost ready for skin. It really looks like an airplane now—exciting! My two helpers are Ricky and Elise and are both experienced fliers (we own a '46 T-craft). Keep up the good work. I'm glad you haven't been a flash in the pan like some others involved in this business. I really loved your article on the Porsche engine. Do techno-weenies really squeal?

Rick Fitzwater
Van Nuys, California

Indeed they do. Read any Sport Aviation article on Burt Rutan.—Alfred Scott