Falco Builders Letter

Marchetti Madness

By William G. Knight
Photography by Stephan Wilkinson
This article appeared in the January 1994 issue of Pilot *magazine in England.*

I first tried a Marchetti over the flat plains of north central Texas one day in late 1988. It all began so innocently—I did it just for fun the first time. After that, I only did it every now and then. Nobody warned me about the danger I was facing. I thought I could control it, but then I had no idea how strong the madness would become.

I'd gone to Dallas to do a part in Oliver Stone's second Viet Nam film, *Born On The Fourth Of July*, when, faced with some days off in that strange town, I called retired General Forrest Molberg in San Antonio, hoping he'd offer me a ride in his T-34 or a flight in the red-hot Swearingen SX-300 prototype he'd been demonstrating. But, after the usual pleasantries, Forrest announced he'd just sold the T-34A he'd lavished so much attention on in the years I'd known him. I didn't know what to say; I'd sold my own T-34 eight months before and was still getting over the loss. Had my friend fallen on hard times? I was afraid to ask.

"I bought a Siai Marchetti," he said matter-of-factly.

My first thought was of a boat or an antique motorcycle, perhaps some kind of ungainly Warsaw Pact liaison plane. But, Forrest was an ex-USAF and Texas ANG fighter pilot, a self-taught aeronautical engineer, and a damn fine stick. He wouldn't do that, would he?

"Sounds like some kind of pasta," I chuckled nervously.

"Are you kidding?" he asked, excitement suddenly crackling in his voice. "This SF.260—Lord, I've flown 'em all: the F-86, the P-51, the T-28, Pitts, the Phantom, you name it. You fly this plane, I guarantee you'll want to come down and throw rocks at any other airplane you've ever flown."

Now there's a fair amount of good natured bad-mouthing in the warbird community ("the T-34's only a glorified Bonanza" or "the T-6 is only good for groundloops and converting avgas into noise"), and everybody thinks his or her plane is the best, but this was different. Forrest sounded like he'd just found the one true religion, and it got my attention.

"Can we fly it?" I asked, trying to visualize what it looked like.

Unfortunately, his plane hadn't been delivered, but Forrest told me there was "a whole passel of 'em" at U.S. importer Fox 51's hangar in Denton, only thirty miles away.

The next morning I arrived in sleepy Denton, Texas, feeling the kind of excitement that you only get when something totally unexpected comes along and bumps you out of your usual rut. Owner Frank Strickler, senior American Airlines captain, former USAF fighter pilot (in Texas, who isn't?), A&P mechanic, and FAA Designated Airworthiness Representative, greets me in an office so filled with memorabilia that one glance around tells me this guy knows everybody.

Five minutes later we're walking around a deep blue SF.260 with less than 400 hours on it. It reminds me of a sleek, deadly wasp with tip tanks, an airborne Ferrari with gunpods. The wings seem incredibly thin, and from behind, it squats tensely on its trailing-link gear as if about to pounce on something. Sinister? Oh, yes, there's a strong military presence here. But this plane was not designed by a committee of colonels: there's grace in the soft curves of the canopy, a definite Italian machismo in the slashing lines of the vertical stabilizer, a confident elegance in the elaboration of the tip tanks and wing fillets, unmistakable panache in the way the nose pouts a bit upward.

On the walk-around, Strickler briefs me on the aircraft and its systems in a gravelly

In This Issue:

twang reminiscent of Chuck Yeager. Punctuated by numerous anecdotes and authoritative quotes from the FAR's and practical insights, the performance is so all-encompassing that I wonder if he's memorized everything. Strickler calls all other planes "Targets" and "Soggy Cessnas", but these aren't the remarks of a snob, just a colorful character who really knows his stuff.

He offers me the right seat, which, owing to the preference of most foreign air forces, is where the command pilot usually sits, and I strap in. The Marchetti's cockpit is snug but not small and feels like a well-made Italian suit. The right-hand seating feels familiar; like other military ships, my left hand controls the throttle, my right flies the airplane, and everything comes easily to hand. The SF.260's Lycoming O-540, which has a well-deserved reputation of being low-tech and nearly bullet-proof, fires up easily. The checklist is a snap, too; the only thing you really have to remember is the twenty degree flap setting you must use for every takeoff because the laminar-flow wing doesn't have a lot of muscle at low speeds.

On the roll, the first thing I notice is the extraordinary acceleration. Full gross with 62 gallons of fuel is 2,430 pounds, but today we're lighter with less than four gallons in each 18 gallon tip tank (the max allowable for aerobatics), and things happen fast when you've got 260 horsepower mounted ahead of only 2,200 or so pounds—that's just 8.4 pounds per horsepower, respectably close to the W.W. II Corsair's 6.98. The torque effects are fighter-like, too, and I have to initially add a solid bootful of right rudder to keep the nose straight because there's no cockpit rudder trim. Strickler had suggested rotating at 60 to 65 knots, but the airspeed indicator is a fast-moving blur. When everything feels right, I rotate, hit the gear-up switch when we've got a climb established, and, by the time the wheels are in the wells, we've reached 90 knots and it's time to bring the flaps up. I feel like I'm falling behind the airplane.

We keep the power levers full forward and hold 110 knots. At that speed and at our reduced weight, we're climbing at an initial rate of almost 2,000 feet per minute. We head north, away from the Dallas/Fort Worth TCA and level off at 3,500 feet.

Strickler suggests 75%, "25 square", which is the full-time power setting used by various military operators. The ASI quickly settles down just a hair short of 170 knots. The aerodynamic forces on this airplane are so well balanced that only two clicks of the trim wheel are required to shift from takeoff to cruise trim.

Forrest was right. The controls are truly effortless in both pitch and roll, and I try some easy wingovers. It's a clear, crisp Texas day, and I can see for maybe forty miles. The feeling is just plain, no escaping it, glorious. "My mind...", to paraphrase Anne Morrow Lindberg, "...wakes, comes to life again...begins to drift, to play, to turn over in gentle careless rolls like the waves on the beach". My hands soon follow, and I make slow, easy aileron rolls to the left and right using just my thumb and forefinger to control the stick. Things are so perfectly balanced I don't need any rudder, and the drag coefficient is so low, very little airspeed is shed as we maneuver. On impulse, I slam the stick sideways and quickly discover this sweetheart can snap your head around (and against the canopy, if you're not prepared), but I'd guess she prefers more leisurely, less abrupt love making. No wonder Strickler is so forthright.

I pull up into a great swooping loop that I change into a Cuban eight as we're coming down the backside. Throughout, only my

The Falco Builders Letter is published 4 times a year by Sequoia Aircraft Corporation, 2000 Tomlynn Street, Richmond, Virginia 23230. Telephone: (804) 353-1713. Fax: (804) 359-2618. Publication dates are the 10th of March, June, September and December.

Subscriptions: $16.00 a year, $20.00 overseas. Available to only Falco builders and Frati airplane owners.

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

hand moves; my right elbow and forearm rest easily on my right thigh, the result, I'm told, of hiring the Pinin-Farina design firm to work on the cockpit ergonomics. Hey, aren't they the people who style Ferraris and Lamborghinis?

Strickler tells me to haul the nose up into a deep power-on stall. The airspeed bleeds off and, at what has got to be 18 to 20 degrees nose-up attitude, a terrific hammering starts beating the empennage. You'd have to be in a coma not to recognize a stall in this plane. I keep the stick back and check the airspeed indicator, but it's vibrating so badly I can't see the numbers; the vertical speed indicator seems pegged at about 2,000 feet per minute—down. The stick is pulsing in my hand and Strickler points out the small winglets on the inboard side of the tip tanks and explains they direct high velocity air over the ailerons at high angles of attack. Roll it left and right, he says, and I go from 30 degree bank to 30 degree bank with no problem. I didn't try it, but I think there might have been enough aileron authority left to roll the plane a complete 360 degrees.

Strickler takes control and demonstrates a perfect eight-point roll then a loop with an unexpected snap-roll on top which gets me completely disoriented. Even so, watching someone else fly the SF.260 is almost as much fun as doing it yourself, like watching Al Pacino do the tango in *Scent of a Woman*. Strickler gives the stick back and tells me to spin it. I dutifully chop the power and pull the nose up and a moment later, stick full back, kick in right rudder as we get a true break in the stall. The left wing comes up and over, and we're there. There's a heck of a sink rate in a spin, though, so I quickly take standard spin recovery action—release the stick and kick left, anti-spin rudder. The spin stops, just like that, in less than one-quarter turn. A classic recovery. Does this plane have *any* bad habits?

"The bad news," says Strickler, "is the sink rate that sets up with power back and gear and flaps down."

What's the good news, I ask?

"You'll never overshoot a forced landing," he says with a grin.

We head back to the airport and Strickler has me do a few touch and goes. His recommended procedure is to arrive abeam the numbers on downwind at gear speed, 109 knots, drop the gear and then full flaps, reduce power to 18 inches, and then turn base. Following his instructions, I find that if you keep the nose down, the airspeed will stabilize on 95 knots throughout the turn to final, but you do get a serious sink rate—very much like a North American T-6—characteristic of the SF.260's high 22.3 lb./sq.ft. wing loading and wing design. We're down to 85-90 knots over the numbers and landing the SF.260 reminds me of the Piper Twin Comanche. Like that airplane, the SF.260 sits low, and its wing quits flying with no warning in the flare. After three or four competently flown yet embarrassingly abrupt arrivals, Strickler suggests we head back to the barn. I feel like I've just danced with the most beautiful woman in the world and then tripped on the way back from the dance floor. Still, the air somehow smells cleaner when we crack the canopy.

I've got to be back on the set by late afternoon so there's time for a quick lunch in a place full of truckers who punch 18-wheelers through Texas blue northers for a living. Unaware that my whole life has been deeply affected, I barely pick at my chicken-fried steak as Strickler fills me in on the SF.260's lineage.

It started with Italian designer Stelio Frati's all-wood, two-place Falco F.8 first introduced in 1956. A total of 110 of these fast (the later models hit 212 miles per hour) and aerobatic aircraft were produced in succession by Aviamilano, Aeromere, and Laverda through 1968. Shortly after the first batch of Falcos were produced, work began on a four-seat version, the F.14 Nibbio (Kite Hawk). First flown in 1958, this speedster managed 220 miles an hour on only 180 horsepower and featured a 120-degree-per-second roll rate. But the cabin was tight, not a place for four people after lunch if Alfredo had used a lot of garlic in the pasta. So Frati came up with the larger, four-place, but equally fast F.15 Picchio (Woodpecker) series introduced by another manufacturer, Procaer, in 1959. Also aerobatic, these aircraft featured aluminum skins bonded to an inner wood structure, and, depending on the model, 160-to-260-horsepower Lycoming or Continental engines.

But the market wanted all-metal planes, so in 1964, Aviamilano and Frati created the all-metal F.250, which featured the Falco's wing and sliding canopy and the F.15's larger fuselage, tail group, tip tanks, and engine. In 1966, Siai Marchetti bought the design and production rights and introduced the SF.260, which featured a slanted windshield bow and a 260-horsepower Lycoming O-540. Three of these appeared in U.S. airspace as Waco Meteors in the 1960's.

Over the years, almost 1,100 SF.260's have been produced by Siai Marchetti in four basic models. Strickler has been importing them since 1980. The original, sold in the U.S. as the Meteor and also supplied to three international airlines for *ab-initio* training was the straight SF.260. In 1974, the SF.260B arrived with a revised outer wing leading edge to soften the stall, a taller vertical stabilizer, and a quicker landing gear motor that brought retract time from 18 seconds down to 5. The 1977 C model featured lower seats for greater headroom, shorter control sticks, servo tabs on the ailerons to lower the increased stick forces due to shortened control sticks, and other minor changes. Almost all of these were built for third world air forces in ei-

ther the basic trainer "M" (Military) option or the armed "W" (Warrior) version with hardpoints and gunsights. Most civilian imports into the U.S. have been essentially the "M" versions, and there are now, Strickler says, about 70 SF.260's in the U.S.; this will change as more and more ex-military aircraft hit the surplus market.

Over coffee, Strickler tells me the firm asking price of the Marchetti I've just flown is $195,000, and my heart sinks. I'm building a new house, and I think I'm going quite a bit over budget and, damn it, it simply doesn't make sense for me to buy this Italian beauty right now. But powerful seeds have been sown.

Driving back to Dallas, I can't stop thinking about the Marchetti. Should I sell the house when it's finished? Then rent something smaller? Remember Toad obsessing about "a motahcar, a motahcar, a motahcar" in *The Wind In The Willows*? I didn't realize it at the time, but this was when I crossed the line: it was no longer *if* I'd get one, it was simply *when*. Later, on the film set, it was hard to push aside the obsessive dreams in order to play a tough riot squad commander.

Like a moth attracted to a flame, I went back to Denton the following February to fly with Strickler again. That was a bad idea. The Marchetti didn't fly any differently, of course, and all I did was to reinforce the sickness. A few months later, Forrest Molberg was killed in an accident while demonstrating the SX-300 to the Air Force. Though his SF.260 came up for sale in late 1989, it was still too expensive for me, and I passed on the opportunity.

In early 1990, I plunked down $400 for a set of Falco plans, drove all the way to Forty

Fort, Pennsylvania to fly a recently-completed Falco, and came close to ordering a complete kit. Now, the Falco flies just like its big brother the SF.260, but the thought of a couple of thousand hours spent sanding spruce got to me. Maybe when I retire to Arizona.

As the recession deepened in 1991, I looked at an SF.260 factory demonstrator that had been used in some wild-eyed, reinvent-the-wheel gasohol project. It needed radios and a new cockpit and God knows what else and, given the fact that prices for everything were plummeting, I thought it was overpriced at $150,000. I decided to be patient, but, a few months later, a number of almost-new SF.260's evaluated by the U. S. Air Force for an elementary flight screening (EFS) aircraft program became available. Though I hoped that prices would be softer, these surplus airplanes had price tags ranging from $210,000 to $230,000 because the price of a new SF.260, buoyed by a weak dollar, had now increased to $240,000 without radios. At this point, I just about gave up on ever having a Marchetti.

By early 1992, I was looking at North American T-6's. Loud, noisy, and slow, they still could be had for a third to a half of what a new SF.260 cost. I found a twice-restored T-6G in western Pennsylvania, had someone who knows the airplanes well do a critical inspection, and started negotiating. Just as I was about to make an offer, fate stepped in again one afternoon in February, 1992 in an obscure aviation bookstore in New York.

"Well, lookee hurr what the cat drug in," says a gleeful voice behind me.

There's no doubt who that belongs to. "From the sound of it, a damn itinerant peddler," I say, turning around. It's Strickler, on a layover after a flight from London. I tell him about my plans to buy a T-6.

"Sorry to hear that," he says with a grimace.

"It's a great old plane," I answer, beginning to feel defensive.

Strickler rolls his eyes.

"A lot of fun to fly," I add lamely.

"Sure is," he says, "considerin' it's old and slow... noisy... lands like a drunk bear and flies like a truck. Got oil drippin' out all over the place."

He's right, of course. What I really want is an SF.260.

Strickler tells me there's an ex-Burmese

Air Force SF.260 up in Seattle. I tell him I know about the plane; it's been advertised in *Trade-A-Plane* for seven or eight months, but, knowing the sellers were asking $170,000 for three other SF.260's they'd sold, I haven't bothered to call them.

"Give them a call," he suggests. "Might be some reason it hasn't sold."

He was right. The owner's rep told me there were problems: Problems with the bank, who wanted loans paid off, and problems with the logs. Seems the mechanic who reassembled the plane on arrival somehow didn't get the canopy emergency jettison mechanism rigged correctly, and it blew off on the first flight. Seven months and $17,000 later, they had a new canopy, but there was no hull insurance. The owner and the mechanic got to arguing about who owed who money, and the log books disappeared. Sensing an opportunity, I hung up and called Strickler, who said I shouldn't worry about the missing logs because he had copies of the complete Burmese Air Force records for the plane.

A day later I was on the plane to Seattle with a certified check for just a whisper over $130,000 in my pocket. After a thorough pre-purchase inspection, checks and titles changed hands, and two days later the plane was in Denton, Texas, where a radio package was installed and Strickler's mechanics found lots of things that need fixing. With its nonstandard Lycoming blue paint and heavy sludge everywhere, the engine had always been questionable, so, when a long-time U.S. owner was killed after his ex-military SF.260 reportedly had an engine failure, I had the engine overhauled. In December, we added an S-Tec 50 autopilot and an HSI, and then I started working on a new paint scheme to replace the cheap silver lacquer the seller had sprayed over the Burmese markings.

Years before, I'd fallen in love with a Spitfire Mk. 24 scheme of 80 Squadron (RAF), the last to operate the Spitfire, in Bill Sweetman's and Rikyu Watanabe's remarkably illustrated book *Spitfire*, but it just didn't look right on my stubby T-34. This time, with the help of an artist I hired to accurately depict the results of minor changes (Italian rondels, rudder flash, and camouflage colors) I came up with in the scheme, everything clicked. When my girlfriend suggested "Fly By Knight" as nose... er, tail art, we added a knight's helmet to the tail and the words "Fuga Di Notte", which means *night flight*, but not in the sense of using an airplane. More like running away from your neighbor's garden with an armful of watermelons.

I've now flown the plane upwards of 140 hours and spent three or four times that many hours on the restoration. Was it worth it?

All I can say is that everytime I fly it, I fall more in love with its near-perfect handling. Parts are mostly U.S. Mil-Spec and easy to come by. Those that aren't are usually stocked by Fox 51. Being designed for third-world air force mechanics, the factory maintenance and parts manuals are comprehensive, well-illustrated, and much-praised by mechanics. Three people fit comfortably and long cross country's are a joy when my Loran's groundspeed indicator seldom shows less than 180 knots. I have no complaints about this airplane's suitability as an IFR platform, though I find my autopilot to be very helpful when I want to hunt for an intersection or study an approach plate. If you are flying in any kind of chop, there's great stability from the 26 pounds per square foot wing loading at utility gross weight. With 62 gallons of usable fuel and a normal fuel burn of 14 to 15 gph, you've got about four hours to dry tanks. I plan 2-1/2 to 3 hour IFR legs.

It's hard to find any negatives about this airplane. Oh, the rear seat is a bit low so the third occupant doesn't get much of a view and some of my friends have gotten the feeling they're in a bathtub. And, fuel management can be a bit of a bore. Since fuel is carried in two 18.3-gallon tip tanks plus two inboard 12.7-gallon main tanks and any imbalance in these leads to a perceptible wing heaviness, I find myself switching the fuel selector back and forth a lot to keep things in balance. But, these are small nits, indeed.

Somewhere, I've read that, back when general aviation was flourishing, the SF.260 was the fastest, naturally aspirated single engine airplane in production. Doubtless, this is still true, but, even if it weren't, this is still the perfect airplane, better than anything yet invented, an aeronautical designer drug that'll blow your socks off.

Could that be a problem? If it is, you're out of luck. Though there are all kinds of "anonymous" groups for alcoholics, overeaters, cocaine addicts, sex offenders, and sheep shaggers, there isn't anything for Marchettiholics?

But, that's *not* a problem for me because I don't have a problem. I've got it all under control.

The Glider

Part 6 of a Series

by Dr. Ing. Stelio Frati
translated by Maurizio Branzanti

Chapter 3
Elements of Aerodynamics

Moment Arm. Let's suppose we now would like to find the moment, not in relation to the leading edge as we did previously, but in relation to any point on the chord of the airfoil in question, let us say point G for an attitude corresponding to the point A for the moment curve in Fig. 3-19.

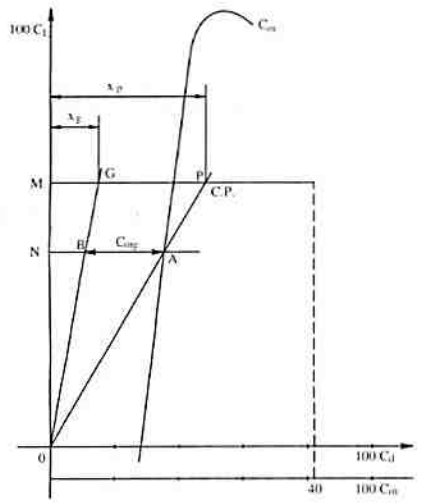


Fig. 3-19

Joining points G and A with the origin O, the extension of the line OA will determine on the reference line the center of pressure C.P., while the line OG will intersect the horizontal line between A and B. The line AB represents, on the C_m scale, the moment of the aerodynamic force for the attitude under consideration in relation to the point G. Thus, if we name x_g the distance of the point G from the leading edge, and x_p the distance of C.P., due to the similarity of the triangles MOG and NOB, MOP and NOA, we have:

$$\frac{x_p}{x_p - x_g} = \frac{NA}{BA}$$

In the chart, NA is the moment C_m in relation to the leading edge and BA is the moment C_{mg} in relation to the point G. If point G happens to be the fulcrum of the aircraft, relative to which we need to determine the moments, these are then found simply by connecting the origin O with the fulcrum G on the reference chord; the horizontal segment found between the said lines and the moment curve will give us the moment fulcrum for that given attitude. This line, which starts at the origin and passes through the fulcrum G, is called the fulcrum line.

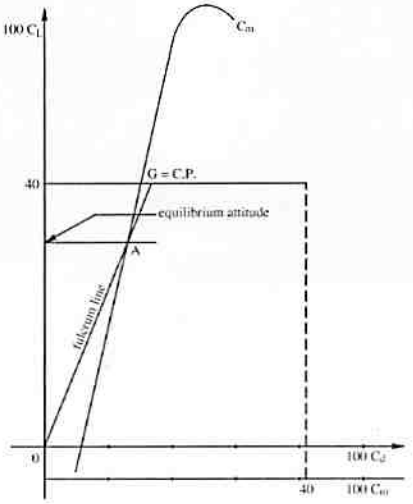


Fig. 3-20

Following this we may establish, given the fulcrum G on the reference chord, the equilibrium attitude, by drawing a horizontal line through the intersection of the fulcrum line and the moment curve. (Fig. 3-20) The C.P. of this particular attitude coincides with the fulcrum G. These properties of the chart allow us to study the aircraft's stability graphically, as we will see later on.

16. Wing Aspect Ratio

Thus far we have discussed C_L and C_d without considering one very important factor of the wing, the wing aspect ratio AR. This is the ratio between the wing span and the mean chord:

$$AR = \frac{b}{c_m} \quad [8]$$

where, b is the wing span and c_m is the mean chord, however the following expression is more widely used:

$$AR = \frac{b^2}{S_w}$$

where S_w is the wing area.

To better understand the effect of the aspect ratio on the wing coefficients, let's remember how the lift phenomenon works. We have seen that during normal flight conditions lift depends on pressure below and suction on top of the wing. Thus the air particles will have a tendency to move at the wing tips from the high pressure zones to the low pressure zones by revolving around the wing tips.

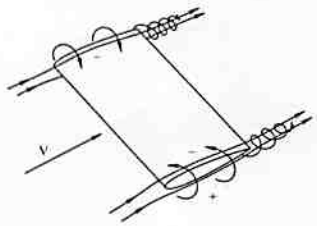


Fig 3-21

Since the air flows in direction V, the air particles at the wing tips will have a spiral motion. This is the so-call vortex, and it produces an increase in drag and a decrease in lift. The larger the wing chord at the tip, the larger are the produced vortexes. An increase in the aspect ratio causes a reduction in the wing chord, and thus a reduction of drag, which depends on two factors, profile drag (C_{dp}) and induced drag (C_{di}).

$$C_d = C_{dp} + C_{di} \quad [9]$$

The coefficient of induced drag is given by:

$$C_{di} = \frac{2(C_{dp})^2}{\pi} \cdot \frac{1}{AR} \quad [10]$$

This induced drag is, in fact, the one produced by the vortex at the wing tips.

For a wing with an infinite aspect ratio, AR equals infinity, the induced drag C_{di} is 0, and the drag is only the profile drag. From Formula 10, we notice how the induced drag C_{di} depends on the lift C_L, and this is explainable by the lift phenomenon itself. The larger the C_L, the larger the difference between the pressure and suction, thus the larger the intensity of the vortexes. The aspect ratio therefore influences the induced drag while the profile drag remains the same.

The variation of C_{di} with the variation of the aspect ratio is found in the following relationship:

$$\Delta C_{di} = \frac{2(C_L)^2}{\pi} \cdot \left(\frac{1}{AR_1} - \frac{1}{AR_2} \right) \quad [11]$$

where AR_1 and AR_2 are the two values of the aspect ratio. During practical calculations, AR_1 is the experimental value given by tables and generally is equal to 5, while AR_2 is the real one of the wing.

The coefficient C_d' of a wing with aspect ratio AR_2 will be :

$$C_d' = C_d - \frac{2(C_L)^2}{3.14} \cdot \left(\frac{1}{AR_1} - \frac{1}{AR_2} \right)$$

Since the vortexes increase drag and destroy lift, an increase in aspect ratio will improve lift as a result. In practice though, these improvements are ignored because they are small values.

Influence of the Aspect Ratio on the Polar Curve. Let us examine the changes to the polar curve with an increase of the aspect ratio.

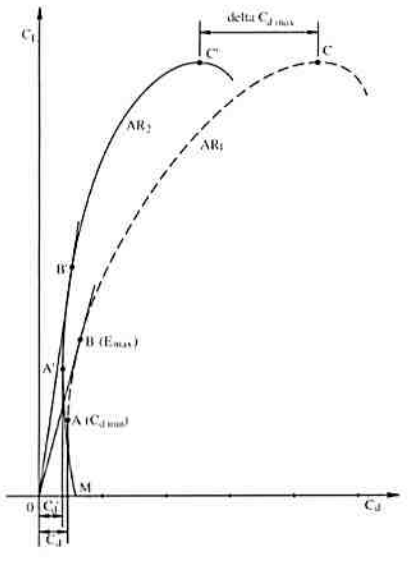


Fig 3-22

Let's consider the polar curve relative to the aspect ratio, AR_1 (dashed line), and let's increase the value to AR_2. Calculating the values for different attitudes, we establish the values of C_d' relative to AR_2. This new polar curve (solid line) will intercept the horizontal axis at the point M, this being the same point as the original curve intercepted, since $C_L = 0$ and the variation $\Delta C_d = 0$. For increasing values of C_L, the variation ΔC_d is negative, and it will increase until it reaches its maximum value at the maximum value of lift, a value given by the line C-C'.

From this new curve we can see that the attitude of maximum efficiency has moved to greater angles of incidence and a greater minimum value for drag. Thus, increasing the aspect ratio gives a double advantage: (a) a reduction of drag, with subsequent increase in efficiency and (b) movement towards attitudes of greater lift with minimum drag. This very important for gliders which always operate at attitudes of high lift.

We should consider though that the aerodynamic coefficients are also influenced by the shape of the wing itself. The optimum shape would be of an elliptical form that resembles the distribution of lift. As a matter of fact, in fighter planes, where the aspect ratio is rather small, this type of shape is often used. These wings are very complicated to build, so for gliders where the aspect ratio is always high, a linear form with a slight curvature at the wing tips gives optimum results.

17. Wing with Varying Airfoils

It is often of more convenient to build a wing with varying airfoils. In modern planes, this is usually the case. A constant-airfoil wing is rarely used. For structural reasons, the wing is usually thick at the connection with the fuselage. It is here that the greatest forces of bending and shear are applied. As we move toward the wing tips, the airfoil is much thinner to reduce drag and to improve stability and efficiency. For these and other reasons, the wing is almost never of constant chord.

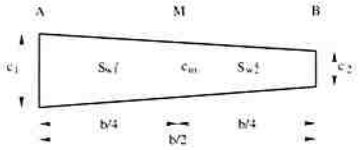


Fig 3-23

Let's see how we can determine the wing characteristics when the airfoil is variable. Let's consider a wing with a shape as shown above, where the airfoils are A at the wing root and B at the tip. If the variation between A and B is linear, as is usually the case, then we can accept that the airfoil M in the middle would have intermediate characteristics between A and B. This is not precisely correct due to induction phenomena between adjacent sections, but practical tests show that this hypothesis is close enough to be accepted for major calculations of wing characteristics.

With this hypothesis in mind, where the intermediate airfoil has intermediate characteristics, we can now consider the portion between A and M to have the characteristics of airfoil A, and the portion between M and B to have the characteristics of airfoil B.

The area S_{w1}' of the half wing relative to A will be:

$$S_{w1}' = \frac{c_1 + c_m}{2} \cdot \frac{b}{4}$$

and the area relative to B:

$$S_{w2}' = \frac{c_m + c_2}{2} \cdot \frac{b}{4}$$

These areas will be doubled for the full wing, thus for the airfoil A it will be S_{w1}, for the airfoil B it will be S_{w2}. ($S_{w1} = 2 \cdot S_{w1}'$ and $S_{w2} = 2 \cdot S_{w2}'$) The ratio between these areas, (S_{w1} and S_{w2}) and the total wing area S_w is called the coefficient of reduction. Thus we have:

$$X_1 = \frac{S_{w1}}{S_w} \quad \text{for airfoil A}$$

$$X_2 = \frac{S_{w2}}{S_w} \quad \text{for airfoil B}$$

These coefficient of reductions, X_1 and X_2, are less than 1, and their sum is obviously:

$$X_1 + X_2 = 1$$

The coefficients C_L, C_d, and C_m of the airfoils A and B are multiplied by the respective coefficients of reduction X_1 and X_2. These new reduced values are then added together to the coefficients C_L, C_d, and C_m of the wing. Summarizing, if we say that C_{LA}, C_{dA}, C_{mA} are the coefficients of the airfoil A, and C_{LB}, C_{dB}, C_{mB} are the coefficients of the airfoil B, then the ones for the complete wing, C_L, C_d, C_m will be:

$$C_L = (C_{LA} \cdot X_1) + (C_{LB} \cdot X_2)$$
$$C_d = (C_{dA} \cdot X_1) + (C_{dB} \cdot X_2)$$
$$C_m = (C_{mA} \cdot X_1) + (C_{mB} \cdot X_2)$$

As an example, let's consider a wing with the following dimensions:

Wing span (b) = 12 m
Wing area (S_w) = 12 m^2
Maximum chord (c_1) = 1.2 m
Minimum chord (c_2) = 0.8 m
Midpoint chord (c_m) = 1.0 m

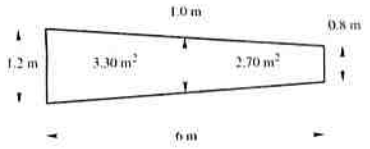


Fig 3-24

Let's suppose that airfoil A is the maximum chord, and the minimum chord is airfoil B, and the variation between them is linear. The areas for the half wing S_{w1}' and S_{w2}' will be as we have seen:

$$S_{w1}' = \frac{c_1 + c_m}{2} \cdot \frac{b}{4} = \frac{1.20+1}{2} \cdot \frac{12}{4} = 3.30 m^2$$

$$S_{w2}' = \frac{c_m + c_2}{2} \cdot \frac{b}{4} = \frac{1+0.80}{2} \cdot \frac{12}{4} = 2.70 m^2$$

and for the full wing,

$$S_1 = 2 \cdot 3.30 = 6.60 m^2$$
$$S_2 = 2 \cdot 2.70 = 5.40 m^2$$

the coefficients of reduction will be:

for airfoil A

$$X_1 = \frac{S_{w1}}{S_w} = \frac{6.60}{12} = 0.55$$

for airfoil B

$$X_2 = \frac{S_{w2}}{S_w} = \frac{5.40}{12} = 0.45$$

Let's suppose now that for a particular attitude we have the following values for C_L, C_d, and C_m.

Airfoil A	Airfoil B
$100\,C_L = 50$	$100\,C_L = 45$
$100\,C_d = 3.5$	$100\,C_d = 2.5$
$100\,C_m = 15$	$100\,C_m = 12$

Multiplying these values by the respective coefficients of reduction, X_1 and X_2, we will have the reduced coefficients as:

$100\,C_{LA} = 50 \cdot 0.55 = 27.5$
$100\,C_{LB} = 45 \cdot 0.45 = 20.2$
$100\,C_{dA} = 3.5 \cdot 0.55 = 1.92$
$100\,C_{dB} = 2.5 \cdot 0.45 = 1.12$
$100\,C_{mA} = 15 \cdot 0.55 = 7.5$
$100\,C_{mB} = 12 \cdot 0.45 = 5.4$

Therefore the wing coefficients at this attitude will be finally given by the following summation:

$100\,C_L = 100\,C_{LA} + 100\,C_{LB} = 27.5 + 20.2 = 47.7$

$100\,C_d = 100\,C_{dA} + 100\,C_{dB} = 1.92 + 1.12 = 3.04$

$100\,C_m = 100\,C_{mA} + 100\,C_{mB} = 7.5 + 5.4 = 12.9$

By repeating the same operation for different attitudes, we may calculate the polar curve for a wing with varying airfoils.

18. The Complete Airplane

In the preceding paragraphs we have seen how aerodynamic coefficients of the wing are obtained as functions of the wing shape, airfoil and aspect ratio. To obtain the coefficients for the complete airplane, it will be necessary to determine the coefficients for the other parts of the plane, and then add them to those of the wing. Things are not so simple though; the phenomenon of aerodynamic interference comes into play. That is the disturbance that one body in an airstream is subjected to by the presence of another body.

However, due to the simple design of a glider, the coefficients may be derived with good approximation by analytic calculations, but particular care should be given to the intersection axis of the wing and the tail section with the fuselage. In the final calculation, the lift supplied by the fuselage, the tail section and other parts of the plane are never considered due to their small values relative to the lift supplied by the wing.

As far as fuselage drag is concerned, it is not easy to give exact values, since experimental data for gliders is nonexistent. A solution would be to go back and experiment in a wind tunnel, but due to their long wing span, the wing chord of the model would be so small that it would be impossible to make any precise calculation. In practice, for the calculation of the full glider coefficients, the drag from the fuselage, the tail section and other parts, is considered constant, and their lift is nil.

Additional Coefficients. The coefficients of drag of all other parts that are within the flow of air have to be taken in consideration, and these must to be added to that of the wing. To do this, this coefficient C_d, is multiplied by the ratio of the area of the part in question and the area of the wing.

Note however that for the fuselage, tires, etc. the area considered is the largest area perpendicular to the airstream, while for the tail group it is the area in the same plane as the wing.

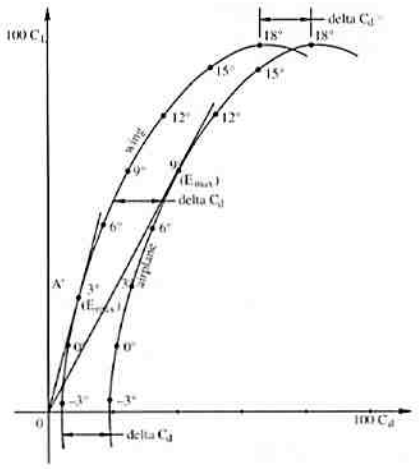


Fig 3-25

These ratios multiplied by the value of C_d will give additional coefficients of drag. Thus, for the fuselage

$$100C_{df} = 100C_d \cdot \frac{S_f}{S_w}$$

and for the tail section

$$100C_{dt} = 100C_d \cdot \frac{S_t}{S_w}$$

and so forth for the other elements.

The coefficient of total drag for the plane (C_{dTotal}) is then the sum of the wing coefficient (C_{dw}) with the ones for the other elements:

$$100C_{dTotal} = 100C_{dw} + 100C_{df} + 100C_{dt}$$

Since lift will not vary, the airplane's efficiency is:

$$E = \frac{L}{D_{Total}} = \frac{100C_L}{100C_{dTotal}} = \frac{100C_L}{100C_{dw} + 100C_{df} + 100C_{dt}}$$

The polar curve of the complete airplane is therefore equal to that of the wing, but it is slightly moved by a line equal to the value of the drag coefficient given by the other elements. (Fig. 3-25) As we have seen, the polar characteristics of the complete airplane has deteriorated, but the maximum efficiency has moved towards a larger incidence, something that could be useful in gliders.

Construction Notes

There's an interesting new adhesive on the market, a product known as Bison Timber-Tix. I first heard of this glue from Jean Peters at Western Aircraft, who raved about the glue.

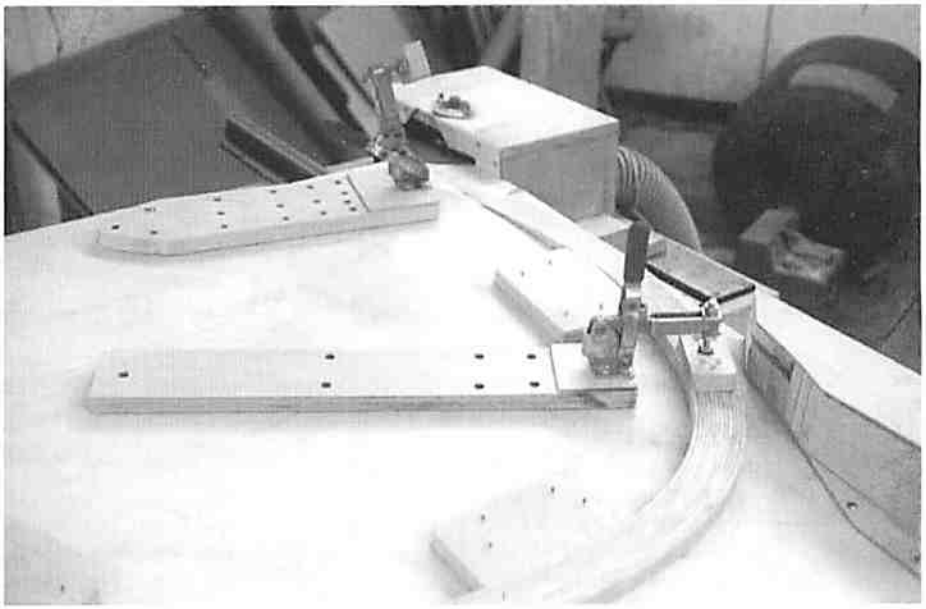
Timber-Tix is a one-component glue that comes in a 50 ml tube or 310 ml cartridge (for use in a standard caulking gun). A clear, thixotropic material of toothpaste consistency, Timber-Tix is a moisture-cure polyurethane adhesive that hardens from the moisture in the air or in the wood. It may be used to glue a wide variety of materials: wood, concrete, expanded polystyrene, glasswood, formica and metals on porous substrates.

Timber-Tix is advertised as weather- and seawaterproof, and meets Din 68602: B4 standards (whatever they are). The glue is gap-filling and said to be extremely strong. To use, you apply a bead of glue with the caulking gun, troweling the glue around as necessary. You must assemble the parts within 30 minutes and the parts should be prevented from moving by clamping slightly. Handling time is 2 hours at 20°C and setting time is 24 hours at 20°C. The lower the temperature, the longer the setting time. Mininum application temperature is 5°C.

This adhesive has become very popular for building wooden boats, where it is used in place of epoxy. It is manufactured in Holland by Perfecta Chemie B.V, P.O. Box 160, 4460 Ad Goes, Holland. Tel: 01100-31944, Fax: 01100-32077. The U.K. distributor is Bison Adhesives U.K., Rowberry House, Copse Cross Street, Ross-on-Wye, HR9 5PD, England. The North American distributor is Trans World Distribution (attn: Charles Sinclair), 424 35th Avenue NE, Calgary, Alberta T2E 2K7, Canada. Tel: 403-277-2554, Fax: 403-277-2544. Western Aircraft sells the adhesive and is probably your best contact for small orders.

Whenever a new product comes on the market, there's a tendency in people to rush to embrace the 'new boy in town' as if it will cure all problems. My experience with adhesives, however, is that there are no easy answers and that simplistic answers are always wrong. Each glue has its own characteristics, strengths and peculiarities, and it's important to get to know a glue before you start using it for important applications.

We don't know, for example, if this glue is thermo-plastic like epoxy, but apparently it is not. The manufacture claims temperature resistance up to 125°C, and if that's accurate, then the glue has ample temperature resistance for our use. We don't know how it behaves under heavy clamping pressures. We don't know if the strength is affected by long-term exposure to high temperatures.



Top: Timber-Tix adhesive.
Above: Scarfing a fuselage frame on our modified shaper.

Based on what I know so far, however, this glue is well worth investigating, and I suspect that it will eventually turn out to have a number of applications where it would be an excellent choice.

I never cease to be amazed at the way in which an idea developed by one Falco builder ends up being adapted to a different application by another builder. You may remember the method that Fanie Hendricks used to temporarily hold pieces in place. He would put masking tape on the bottom of a hinge and also on the wood structure and then use instant isocyanate glue to bond the back on the masking tape on the hinge to the masking tape on the structure. The hinge would be held in place rigidly, and you can break it off by peeling the masking tape off the hinge.

— — —

Al Aitken used this concept when locating the landing gear fittings on the wing and forward wing spar. As you know, in our manual we have a method of nesting the fitting on the forward wing spar inside the fitting on the main wing spar. This insures perfect alignment.

In the past, all builders have simply clamped the fittings to the spars. Instead of clamps, Al Aitken put masking tape all over the forward wing spar, and also cov-

ered the bottom of the landing gear fitting with masking tape. Instead of clamping the fitting to the forward wing spar, he simply coated the masking tape with epoxy, put all the fittings in place and set the forward wing spar in place and moved it around until the spar was located properly.

After the epoxy hardened, he took the forward wing spar off and the landing gear fittings remained in place. He was then able to drill the mounting holes through the spar because the glue and masking tape held the fitting rigidly in place. After the holes were drilled, the fittings were easily peeled free from the masking tape.

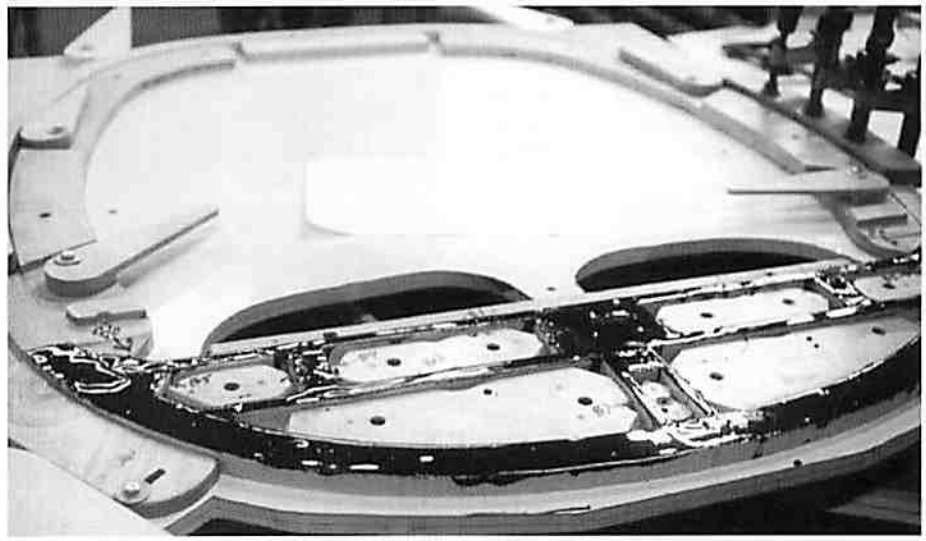
Cecil Rives reports that Shadin is now 60 to 90 days away from shipping their new shortened version of the Miniflo fuel totalizer. The length goes down from about 8" to 4". Hans Sonntag pointed out that Aircraft Spruce carries a fuel totalizer made by Hoskins, the FT101A. I was not previously aware of this model, but it has the same functions as the other models and appears to be the right size for the Falco panel. Certainly, at 4.5" the length is right.

In our electrical kits, we've recommended the AMP 601827-1 wire stripper. This model is a standard type that's used in radio shops by every technician. Recently we tried to order some tools from AMP for an overseas builder and some of them were discontinued—though Brenda doesn't remember which those were. In a catalogue, I noticed that Grainger is now selling a wire striper which appears to be the exact same model as the Greenlee 45000 (Grainger 5C655) for about $25.00.

Jim Petty reports that he has had good luck with an epoxy sanding primer, something called W.L.S. 200-69 grey, which is made by W.L.S. Coatings, Los Angeles, California. Jim got his from the Lancair folks, who apparently use it on their airplane.

Steve Wilkinson has been fighting a noise problem with his strobes. On the ground, when he is taxiing out, there is this *whee-whee-whee* sound on the radios from the strobes—the sound that the last little piggie made all the way home. In the air, the sound is less noticeable, but Steve still wonders if it is affecting his range reception.

In casting about for an answer, Steve heard from John Schwaner who owns the famous Sky Ranch overhaul shop in California. John's advice to Steve was "Yes, there is a simple 100% cure. Install a choke (not a capacitor filter) on the power lead as close



as possible to the strobe. The best type of choke is a wire-wound ferrite that Radio Shack sells. Next best are ferrite beeds, which have an advantage for certified aircraft in that the beads are external to the wire installation and probably don't require any approvals to use. Installation tips for strobes: 1. Don't run ac currents through the aircraft structure where they can radiate, i.e. don't use the aircraft as a ground circuit. Run the ground wire back with the power lead. 2. Best wire is a shielded 2-conductor but be careful. Shielding can radiate. Shielding should be copper (not stainless). Ground the shielding at both ends and at least every 10 feet. 3. For the frequency you are working with, the bus is not a low-impedence connection. Anything over .01 ohm is not low-impedence. The best place to connect is direct to the battery. The farther away, the more the problem you might have. When hooking to the bus, keep the connection as far away from the radio connection as you can. 4. Put another ferrite bead on the radio power lead. 5. This takes care of strobe whine. It does nothing for the strobe 'pop'. The whine is conducted primarily through the power lead; the pop is transmitted out of the top of the strobe. I have a simple ferrite bead kit for strobes if you are interested. I don't have the Radio Shack part number for the choke, but it looks like an internal transistor radio antenna—a couple of inches long with about 50 wraps of copper wire. Put it in series to the strobe as close to the strobe as possible"

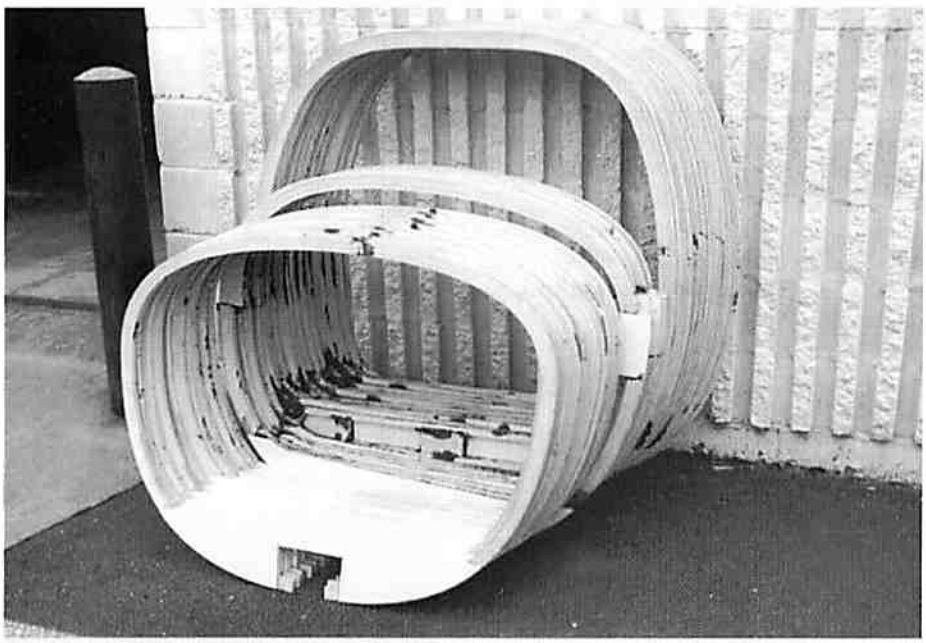
Steve tried this on the two wing tip strobes (but not the tail strobe) and he hasn't yet gotten rid of the sound. At one point Steve thought he had the problem solved when he noticed that the radio that was hooked up to the antenna in the vertical tail was the only one that produced the whining sound. We concluded that the strobe leads are probably next to the antenna wire. That test was in the hangar and after taking the airplane out of the hangar, the problem persists. Lord knows why it would behave in the hangar and not outside the hangar, but there you have it. The mystery is still unsolved. More on this saga as it unfolds, but in the meantime we'd love to hear from anyone else who has solved this problem.—*Alfred Scott*

Goings On at Sequoia Aircraft

Things are in high gear around these parts on the fuselage frames, which are finally coming together. We now have frames 2, 3 and 4 going together, and frame 5 will start today. In the case of frames 3 and 4, we can only make one per day since the glue must dry before it is removed from the jig, however frames 2, 5 and 6 are made like wing ribs, and we are able to make many of them in a single day.

As things now stand, we expect to ship the first partial shipment of fuselage frames this week to those builders who are holding up their wing construction. I hope to complete the rest of the fuselage frames in the next month or two. The jigging methods are all very straightforward, and it's primarily a matter of building the jigs, making the cutting fixtures, cutting the parts and then refining the jigs. All of the hard work is in the design and fabrication of the jigs, and once that's done, the actual process of gluing a frame together is relatively easy.

The vast majority of our problems with the frames have to do with the spring-in of the spruce laminations. It's really frustrating to make the laminating jigs with phenomenal precision and then have the laminations spring in after the glue dries. The only conclusion that I can make is that the resorcinol glue shrinks when it hardens and pulls the wood in. Trimcraft had the same problem. In the future, I suspect I'll make some changes to the laminating jig shapes, but that's all a-ways off.



Top: Prior to cutting up and trashing all of the Trimcraft laminating jigs for the fuselage frames. Above: Frames 2, 3 and 4.

We are assembling frames 3 and 4 with resorcinol glue and clamping the parts in the jigs overnight. It's essential that we get enough glue on the parts, and the result is a rather messy affair as it comes out of the jig. We clean the parts up generally, but you should expect to spend some time cleaning up the little runs of glue.

In particular, on frame 3 and 4, you should spend the time necessary to sand down any to-be-glued surface to the wood. There's no way to avoid the spread of glue on the underside of the blocks, and this needs to be sanded down. You would not, for example, want to glue a shiny surface of glue to another part of the aircraft.

In addition to the fuselage frames, we are also putting together five main wing spars, and we will shortly begin work on a new batch of tail group ribs.

All this has kept us very busy, and doubly so recently because Brenda Avery has decided to retire. Brenda has been here for ten years, and as you all know, she really runs this place. I'm very fond of Brenda, and I hate to lose her. Brenda's husband is a sports fan (Brenda swears she never heard "football" or "sports" mentioned in the marriage vows!) who likes to attend all sorts of events, and this has taken them both away for extended times. This, plus a second home they have in Blacksburg, has put a crimp on Brenda's time to the point that she hasn't had much time for herself, and Brenda is planning to go back to college to get her degree.

We have been very busy over the last month and a half interviewing people to take Brenda's place. This has taken an extraordinary amount of time and is one of the reasons this *Falco Builders Letter* is late going out (also the delays in the fuselage frames—right now Brenda's a handy excuse for everything!).

The interviews themselves have been an interesting experience. Someone at Oshkosh asked Brenda what it was like working for me, and she said it was "like marriage without sex" and in talking to people who were interviewing for the job, she would use the same description. In one interview, I was talking to a girl and told her that Brenda had once said that working for me was "like sex without marriage". As I watched her eyes get big, I realized I had blown the quote.

Then there was the German man who faxed us his resumé and who insisted on coming in for an interview even though he was grossly overqualified. He had a strong accent, and Brenda started making jokes about the guy bringing his Doberman along for the interview. I suggested to Brenda that she could explain that "working for Alfred is like marriage without sex, however in your case Alfred could probably make an exception!" We never pulled it off, and the German turned out to be a very nice man after all.

As all of you know, Brenda would be hard to replace, and that made the interview process all the more arduous. Brenda is a jewel, and I'm happy to say that we've found another in Susan Rogers, who will be starting in May. Brenda will be staying on to explain everything to Susan, and she will be easy to reach with questions, so you don't need to worry about everything going to hell when she leaves. Also, you haven't seen the last of Brenda. She's coming to the big Falco 40th birthday at Oshkosh in 1995, and one of these days she's going to make the Great Oyster Fly-In when it doesn't conflict with a football game. Thank you, Brenda, for ten wonderful years.

There's a new entry to the price list—engines. Lycoming has been making their engines available through kitplane companies for a number of years now, but we've not participated before because they had a minimum order number. They've recently dropped that requirement, so we are now able to offer factory new engines outright at discount prices. Since no company is buying in any serious quantity today, we get the same OEM price as all of the other kitplane companies or manufacturers.

Delivery of the engines will be 90-120 days after receipt of order, and because we are handling the orders for a minimal markup, we need to be paid at the time the order is placed. The engines have a standard factory warranty for 100% parts and labor for the first year, which begins with the time of initial engine startup, and if you purchase one of these engines, you should register the engine with the factory just prior to starting the engine.

As you know, engines are also available from the factory as overhauled or remanufactured engines. Those options are available as always through overhaul shops such as Mattituck, and the only engines that are available through us are factory new engines.

—Alfred Scott

Instrument Panel Removal

by Stephan Wilkinson

Having removed and replaced my instrument panel a good dozen times since I first flew the airplane, I've gotten pretty good at it. This morning, I took it out in little more than 30 minutes and carted it over to the next-door avionics shop to have a #2 comm transmit failure repaired. (With my tools carefully laid out in sequence on the wing and everything perfectly organized, I could probably do it in 20, but I prefer to lope back and forth between cockpit and workbench, gathering first one tool, then another, working out the kinks in my back, petting the neighbor's dog, having another beer, whatever.)

Replacing the panel takes a little longer, since it never seems to slide back into place quite as easily as it slides out, and making connections is always harder than loosening them. But in either case, I've found that a proper checklist is crucial, so you don't end up with the panel in your lap, the MP gauge still in place, and the neighbor's dog playing fetch with your Phillips screwdriver.

Yours might be different, particularly if you have the new glass-cockpit, turbocharged, swing-wing version of the Falco, but here's my checklist:

1. Remove all radios from their racks, since it would take Schwarzenegger to bench-press the panel singlehandedly with them still in place.

2. Unscrew the combination manifold-pressure/fuel-pressure gauge from the panel, with its connections intact, so that it will dangle free when you remove the panel. (Careful when you do finally remove the panel, since it can fall and hit the power pedestal.)

3. Unscrew the EGT/CHT gauge, if you have one, from the panel as well, so it too will dangle free when you remove the panel.

4. Disconnect the three cannon plugs—P1, P2 and P3.

5. Reach up behind the panel and disconnect the tachometer cable. (It's a good idea, when you first install the panel, to make this connection only finger-tight, since there's really no room to get pliers of any sort onto the knurled collar of the connector.)

6. Cut the ty-rap securing your avionics-antenna coax bundle to the bottom flange of the instrument panel.

7. Disconnect the antenna coaxs from their behind-panel connections.

8. Disconnect the two vacuum hoses from the vacuum regulator atop the nosegear bay.

9. Disconnect pitot and static lines behind the panel. (This job is made infinitely easier if you put connectors somewhere in the lines midway between the instruments and the "garbage bracket," where you can easily reach them. Trying to remove and replace these lines from the instruments themself is extremely difficult; with an autopilot installation in fact impossible.)

10. Remove the 3/16" bolts securing the panel bottom flange to the power pedestal.

11. Remove the plastic handles from the power levers.

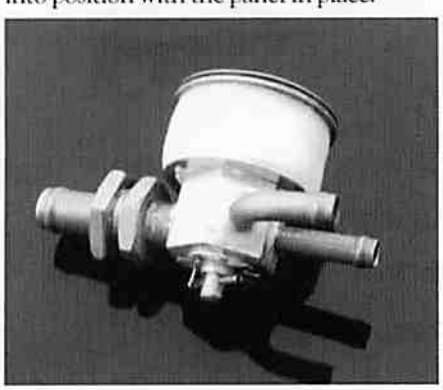
12. Remove the 3/16" nuts and Phillips machine screws securing the fiberglass power-pedestal cover, and remove cover.

13. Remove the 3/16" nuts securing the panel to frame No. 3.

14. Loosen glareshield. You don't have to remove it, just pull out the screws and lift it a bit, but this is critical; one builder I know who epoxied his glareshield into place permanently has found that panel removal is extremely difficult.

15. Remove the panel.

The panel replacement is roughly the reverse of the above sequence, with one extremely important revision: Your first step must be to replace the manifold-pressure/fuel-pressure gauge while you're in the cockpit with the panel perched loose in your lap or atop the power pedestal. It's *extremely* difficult to replace that gauge from behind the panel once it's fastened into place. The EGT/CHT doesn't create such a problem—at least not in my airplane—and can easily be jockeyed into position with the panel in place.



The Sequoia vacuum regulator is now finished, working fine and shipping.

Your Test Pilot

All homebuilders of aircraft have the same fantasy. After years of working in your shop on your beloved creation, lavishing care and taking the craft of building an airplane to a new high, it is finally time to fly the plane. You take the airplane to the airport, check it out carefully, and then launch it into the air. It will fly as perfectly as it looks. The handling will be perfection, even exhilarating. The speeds will be even better than promised, and as the sun goes down, you will turn, dive, roll and loop in an orgasm of aerobatic poetry. It will all be perfect.

It's also nonsense. And unlike fantasies about winning the Indy 500, climbing Mount Everest, winning the Presidency, or scoring with Kim Basinger, this is one fantasy that could kill you because you might actually attempt it. Homebuilders seem driven to do their own first flights, as if their manhood were at stake. Some see it in terms of a christening or wedding night. They built the airplane, and *of course* they are going to fly it!

But let's take a look at this decision in a coldly rational way by listing the major points involved.

1. *The aircraft has been built by an amateur who has never built an airplane before.* Let's face it, putting aside all the personal pride you may have in your work, you've never actually built an airplane before. The machine is most certainly *not* something that has come out of a series of accurate, proven production jigs and fixtures.

2. *Most homebuilders don't do a lot of flying while they are building the airplane, in fact, many stop completely.* Very few builders, at the time of the first flight, are current to the point that normal flying is instinctive, much less current enough to deal with serious problems on a first flight of a new, unproven airplane.

3. *The aircraft, even if properly built, will have flight characteristics which will surprise you if you are not completely checked out in that type.* All homebuilts aircraft have some exceptional flight characteristics. Many of the best ones simply have responsive controls, but others have high landing speeds or require unusual landing techniques.

We all know that the Falco is a great classic airplane with legendary handling, but it is also *not* an airplane that a Cherokee/172/Mooney pilot should just get in and go fly, much less flight-test. It takes quite a bit of getting-used-to before you can comfortably land the plane.

Frank Strickler

The Glasair III is a very high-performance machine that requires an unusual landing technique. Frank Strickler once told me, "I have now test-flown three Glasair III's on the first flight, and I'm never going to get my hieney in one of those machines again." This is a former Air Force instructor who flies SF.260s and numerous warbirds in his time off from his regular job of flying airliners. If this jet-jockey and P-51 pilot is uncomfortable with a popular kitplane, how is the average homebuilder with very few current hours going to fare in the machine?

Or take the Kitfox. Here is a slow-moving, conservative design that everyone likes and rightly so. The engine is on the front, the tail is on the right end, and it lands and takes off in no space at all. But the Kitfox has distinctly different handling characteristics, so much so that one experienced Kitfox pilot has written a short book about flying the airplane. When you flare the Kitfox, it is so light that it lacks the inertia to keep flying, so it's quite easy to flare and drop it in hard. Fully 25% of the Kitfoxes in England have been totalled—thankfully without any fatalities due to the slow flying speed of the plane.

Don't get me wrong, I really *like* the Kitfox and in particular I think that Phil Reed, who owns the company, is the best new face to hit sport aviation since Frank Christensen brought out the Eagle. But anyone who says, "Aw hell, it's just a Kitfox. I'll fly it for you!" is being grossly irresponsible. It's an airplane that can crash like any other. Before you fly one—and especially on its first flight—you need to be checked out in a Kitfox just as you would a Falco, SX-300, Glasair III or anything else.

4. *By far, the largest number of accidents in homebuilt aircraft occur on the first flight of the pilot in that aircraft.* In 1992, 14% of homebuilt accidents occurred on the pilot's first flight in the aircraft, and 5% on the second flight. In all, 24% of the accidents occurred during the takeoff or landing phases due to inadvertent stalls, rolls or veering off the runway, thus 40 to 50% of the accidents seem to indicate a lack of familiarity with the flight characteristics of the aircraft.

This pattern of accidents in homebuilt aircraft has been confirmed by insurance companies (see "How to Kill Yourself in a Homebuilt Aircraft", *Falco Builders Letter*, March 1992), who now insist on pilots being checked out in many types before they will sell insurance.

These statistics are for the pilot's experience in a given aircraft, and they do not isolate the first flight of the aircraft. However, there is nothing to suggest that a test pilot with no previous experience in the type would be *less* prone to have an accident than the general statistics indicate.

5. *Flight testing is a dangerous activity.* We all instinctively know this, but we need to remind ourselves that the streets of Edwards Air Force Base are named after *dead* test pilots. Over the years, a *lot* of pilots have died flight-testing new aircraft.

In the early days of aviation, the military would simply let their most skillful pilots have-a-go at a new aircraft, but it didn't take long to notice that a lot of the pilots ended up dead. Since those days, they've learned and have developed a methodology for flight testing to minimize the risk.

If you put all of these factors together, they bring you to a very sobering conclusion that test-flying a homebuilt airplane is potentially a very dangerous activity, and any rationale that says otherwise is just wishful thinking. If stupidity is doing the same thing over and over and expecting a different result, then the decision of a builder to do his own first flight really comes down to emotion and ego, not intelligence.

If nothing goes wrong on the first flight, then almost anyone can do it, but how quickly would you react if the engine quit on takeoff? On a first flight, you have to assume that the worst will happen. The airplane will be badly out of rig, the cockpit will fill with smoke from an electrical fire and the engine will quit. You need a pilot at the controls who can calmly put the airplane back on the runway. In short, you need the best pilot you can get your hands on, and if that pilot isn't you, then you are letting your ego and emotion do your thinking, not your brain.

—*Alfred Scott*

Sawdust

• Falco at Ground Zero. When the big earthquake hit Los Angeles in January, the epicenter was in the San Fernando Valley, four blocks from Rick Fitzwater's house. Rick reports: "Boy! What an ass-kicker! I am glad to report that my family is fine, except for several cuts caused by running through broken glass barefoot in a pitch dark house, and my wife Pat has a nice goose-egg on her head caused from some unknown flying projectile. Our house received no structural damage I am happy to say. The Falco received substantial damage to the left wing, which *was* ready to skin. I had a full sheet of drywall and two full sheets of three-quarter-inch plywood stacked near the wing which fell over onto the outer third of the wing. Since the wing is not skinned, it is still very flexible. The wing tip flexed back about 18 inches and popped every glue joint holding the ribs to the spars. The spar held up well however and supported the full weight. It will take some time, but it is repairable. The empennage and fuselage is fine, although my elevator (also unskinned) flew off the wall and sustained damage. The skinned horizontal stabilizer is stronger—the lumber rack behind it emptied itself onto this section of the airframe but it sustained no damage whatsoever. We are still getting aftershocks. It's like sitting on a bowl of Jello!"

• The "Swing-Wing Falco" article in the April *Kitplanes* suckered more people in than any other April-fools article in recent memory. At the peak, we were getting two calls a day from breathless believers—"65% more speed, wow!"—and the same number were calling Jonas direct. Ominously, most are working on their own composite designs and want to incorporate the swing-wing mechanism in their designs. Jonas reports that a local pilot burst into his hangar looking for the Swing-Wing Falco. "There it is!" he exclaimed as he saw Jonas's Falco, and rushed at it. "Well, this is a Falco all right, and it looks just like the one in the article, but this one doesn't have the swing-wing mechanism. They've probably got the swing-wing version hidden in a hangar somewhere." Even the BIC razor blade company was suckered and called Jonas so they could send Gando some razor blades. At press time, Jonas was fabricating a lever control arm to put in the right map pocket for display at the Lakeland air show.

• Penquinos into production. *Flight International* magazine reports that Stelio Frati's General Avia company has delivered the first two production models of the F.22 aircraft to Italian aero clubs and has completed another eight aircraft to be delivered in Europe and Thailand. Production plans are to produce 50 F.22s in 1994, 150 in 1995, and 300 a year in 1996 and beyond. The magazine also reports that the company is in advanced negotiations with a major US distributor, who wants an initial batch of 50 aircraft, and has talked to Mooney about a possible co-production deal. The magazine also confirms earlier reports that Russia's Sokol manufacturing plant, which produces Mikoyan MiG-29 and MiG-31 fighters plans to build the Frati-designed F.15F Delphino four-seat light aircraft in a joint venture with the Italian Procaer company, which owns the design.

• Remember all the hoorah about simplified certification and how many people came to see FAA certification as an impossible hurdle? Consider this, General Avia certified the F.22A last May. The F.22B was certified in December. The F.22R and F.22C Sprint will be certified in April. Thus, in an eleven-month period, Stelio Frati and his tiny company has certified *four* separate aircraft with the RAI and FAA.

• Making a sow's ear from a silk purse. Sukhoi has announced that it plans to produce an *agricultural* version of its Su-29 aerobatic machine. They're going to take the reigning ultimate aerobatic aircraft, capable of phenomenal roll rates and impossible maneuvers, and turn it into a spray plane. The new Su-38 will have a new, larger wing with winglets, an underwing spray bar, and a raised rear cockpit. How're you gonna keep them in Paree once they've been down on the farm?

• Telling it like it is. "It's a bird! It's a plane! It's a flop!" screams the headline of an article in the May 2 issue of *Fortune* wherein Alan Farnham says what no aviation writer has (or is permitted to by the publisher). The article is filled with wonderful quotes: "If the American Marketing Assocation were ever to carve up a mountain, Rushmore-like, commemorating misbegotten things, Starship would be there, next to New Coke and the Edsel." "Because aviation writers are polite, and because they know Beech deserves great credit for having faced so daunting a challenge, trade magazines have hesitated to say how Starship—as merchandise—has fared. Let me help: It's a dud. A fiasco. A Little Bighorn with wings." On the airplane's weight, which "spiraled upward, gaining Oprah-like momentum...." On the cost, claimed to be $350 million, "If Beech, instead of fabricating Starship from advanced composite materials, had instead used $1,000 bills laminated three-ply, it literally could have built all 53 airplanes for $300 million and still had $50 million left over for monogramming, ashtrays, and a lifetime supply of in-flight nuts." Others say the cost is more like $750 million. Consider the glass panel. "This instrument panel, developed at a cost of $25 million, uses 14 TV screens in place of mechanical gauges to display information in a palette of colors that includes magenta. Imagine yourself flying an Amana Radar Range, and you've got it." "Starship will be remembered as, if nothing else, aviation's version of *No new taxes*."

Brenda's Corner

On May 1st, I will celebrate my 10th year of employment with Sequoia. It's hard to believe that it's been ten years since I walked into Sequoia's headquarters in a basement of an apartment building and found out that people actually build their own airplanes.

The ten years have been filled with new adventures and new friends. That's what makes my decision to retire a difficult one. But, ten years seems to be a good milepost at which to leave.

There are a lot of things I am looking forward to having time to do. One thing I'm going to do is go back to college and get my degree. Who knows where that will lead? When I was in school I thought I wanted to be an accountant, but intermediate accounting took care of that. I'm not quite certain what path I will follow now.

I want to thank you all for making me feel that I was a important part of Sequoia Aircraft. Getting to know Falco builders and their families has been the best part of all. It's been a unique and interesting job, and I am going to miss the reaction I get when people ask me where I work and what I do.

Even though I'm leaving, I'm not going away completely. Alfred has asked me to go to Oshkosh in 1995 for the Falco's 40th birthday celebration, and I plan to be there. Plus, I'll be on the mailing list for the builder letter so I can keep tabs on what is going on with all of you.—*Brenda Avery*

Mailbox

I'm sorry to tell you that since our last talk I discovered I had a brain tumor (gleoblastoma) which required surgical removal. I now am beginning radiation and chemo therapy to try to clean up the remainder. You can guess how long it will take to get my FAA license renewed even if everything comes out okay. Fortunately, I have two boys that are better than ever pilots, and I can still make sure from the right seat that they are properly checked out.

Karl Hansen
7615 Sierra Drive
Roseville, CA 95746

This is distressing news. If you would like to write Karl and Shirley, their address is listed above. In a long telephone call after this letter, Karl said that the entire Falco experience has been the highpoint of his life. His advice from his new perspective is to "enjoy today, and don't forget from time to time to wrap your arm around your wife and tell her you love her." Karl vows he's going to beat this thing, and I'm sure I speak for everyone in hoping that this dear man, whose enthusiasm and warmth has touched us all, will make a speedy recovery.—Alfred Scott

Progress for me has been slow, primarily due to work pressures. I have had troubles related to the supplier of resorcinol adhesive I was using, and I have been left 'high and dry' by the chemical company. The Borden certified resorcinol was an excellent product, but unfortunately is no longer being manufactured primarily due to fear of litigation. I truly believe that litigation is a social and business cancer. I have been trying to find a new supplier but work got in the way, and I haven't had time to address the issue since.

Each year at Easter, my wife Sue and I make our pilgrimage to Mangalore in South Eastern Australia, a short drive from the city of Melbourne. Last year was very special for us as it was the first time we had seen a 'real' Falco. Guido and his team did a fine job and the Falco was easily the most popular topic of conversation at Mangalore. I enjoyed meeting your friend Dean Hall. He was a wealth of knowledge. With several of the other Falco builders in attendance, and often in the company of Dean, we enjoyed a number of interesting Falco-oriented conversations. I particularly appreciated the valuable tips from Wayne Milburn who assisted in Guido's Falco project.

After we trek to Mangalore this Easter, we are detouring on the journey home to collect the main spar spruce from Perfectus Airscrew in Melbourne. The 8-metre length certainly makes for an interesting logistics problem.

I have made almost all of the components for the empennage and have finally progressed to the main wing components. I have started at the wing tips, making the bows was fun and easy. I have made several of the ribs but not much more. I have hoping to make better progress this year, and hopefully can commence purchasing some of the kits.

Neil Kowald
Linden Park
Australia

I've just recently purchased the spruce kit from Jean Peters (which incidentally has gone up in price slightly from your price list to US$2670 + packaging), and we got onto the topic of glue. He is keen for me to try out a new glue he has from Europe called Timber Tacks (or something similar sounding!). He told me that he was also trying to convert you all to his way of thinking and gave you some to test. I wondered if you had any results yourself or if you were going to stick (excuse the pun) with the original suggestions. I am quite interested in following his line as I'm sure a single-part glue has got to be the ultimate in simplicity and consistency. He also suggested Araldite 509 for spar work which I am trying to track down at the moment. I know the problems associated with epoxies when warm although Jean is adamant that this particular glue is fine up to 600 degrees or so. I am aware of your company line and therefore don't really require the full speech but I would like any comment on his system if you've had a chance to test it at all.

I've nearly completed my workshop (the West Auckland Falco Factory) so I am looking forward to the arrival of the spruce.

George Richards
Auckland
New Zealand

Timber-Tiks is an interesting glue—see "Construction Notes" for more details. On the epoxies... well, let me put it this way: I'm very fond of Jean Peters, and he does a great job of cutting spruce (he supplies much of the spruce for our kits), but I don't see things the same way he does when it comes to glues. I'm interested in seeing independent test data on an adhesive before I use it for a critical application. If this room-temperature glue can go to 600 degrees, then the manufacturer has succeeded where 3M, Dexter-Hysol, Gougeon Brothers and other industry leaders have failed. The epoxy that Jean likes may be the best glue in the world, or it may be just another epoxy. I don't know, and I'm not really interested is pursuing any glue for which no test data is available. Sorry to be such a stick-in-the-mud conservative, but I'm from Virginia (which Mark Shields once described as a "hot bed of social rest") where conservatism comes naturally.—Alfred Scott

Sorry to waste your time on the glue question. Actually I did a bit of research myself and called the manager of Ciba Geigy. His comments were not surprising, but I thought I'd let you know anyhow. Araldite was not developed as an adhesive and therefore he was quite surprised that someone was using it as such although he was sure that it would bond spruce. One thing he made very clear was that Araldite 509 definitely did *not* have good temperature qualities, and he doubted that it would still be bonding well at 60°C, let alone 600 degrees.

George Richards
Auckland
New Zealand

We have a beautiful aircraft for sale. It is designed by Stelio Frati. The type is F15A Picchio and is in very good condition. It is powered by a Lycoming 160 hp and cruises at 140 knots. If you are interested, please contact me by fax at 39-371-32578.

Maddonini Giovanni
Loc. Casa S. Guiseppe 32B
20075 Lodi (Mi)
Italy

Solid raves on the carrier article. You're a writer! Actually, it's a thrill for me to watch others go through the experience through your words. You can sit in a thousand bars and tell a thousand drunks that a visit to a carrier is a life-altering experience, and they'll just look at you. It's something you have to experience for yourself.

George Larson
Washington, DC

The U.S.S. Kitty Hawk trip was through the kindness of George Larson, editor of Air & Space *magazine and co-conspirator with Meredith Scott on the idea.—Scoti*

I thoroughly enjoy the FBL. You ought to be a writer. Actually, you are. But the FBL is probably not in the top ten or even the top 29,000 in circulation so you are unlikely to be catapulted into the James Michener ranks on the basis of it. The Corporal Goldberg story was a classic, and the U.S.S. Kitty Hawk report was outstanding.

You might be interested in my recent flight to the Oshkosh board meeting in the RV-4. A hefty tailwind provided me with ground speeds up to 255 mph going east, and the payback coming west put me at 175 mph. More important, it was one of those rare crystal-clear winter days in the midwest. The winter-time absence of bugs, and no thermal turbulence allowed me to go as low as I wanted. I flew from the Mississippi River to Ft. Collins at an altitude above ground that made a hundred feet seem high. The telephone poles and towers were in dramatic contrast to the snowscape, and visible from a more-than-safe distance against the blue sky horizon. At times, I flew ten feet off the frozen and drifted farmland, and at that speed, the sensation was phenomenal.

I know that you will be concerned about safety. My response is that if anyone is going to do that kind of thing, he has to practice it just as you would aerobatics, or IFR approaches, or any other special flying discipline. You do have to stay alert, and any in-cockpit work other than the quickest glance is done after climbing way up high, such as a couple of hundred feet for a moment—and then back down.

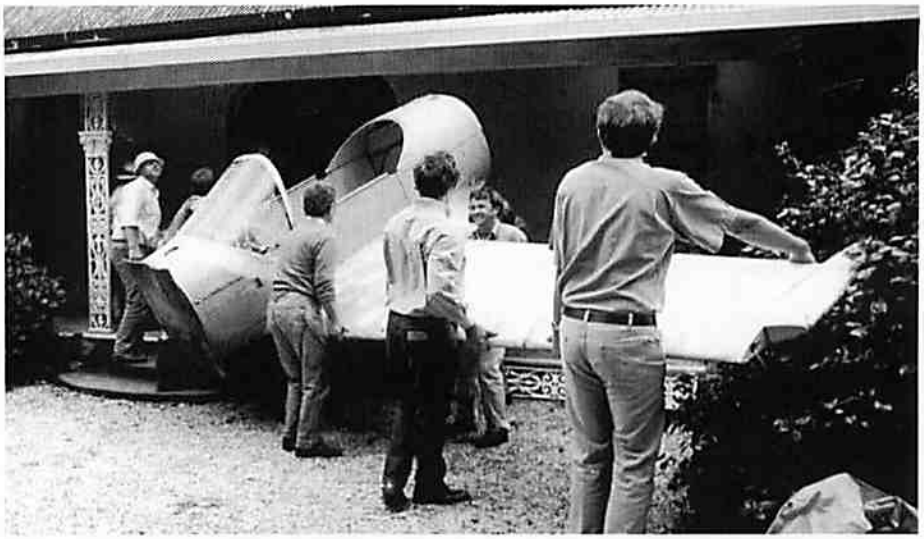
I had the experience recently of flying an airline pilot in the Skybolt from Chino, CA to Ft. Collins, and she was ecstatic. We did the Grand Canyon, Monument Valley, Lake Powell, Canyonlands, and Arches including flying down in the canyon up against the wall in Marble Canyon and Hidden Valley. I have done this many times and know the country well.

Dean M. Hall
Ft. Collins
Colorado

Dean Hall gives a new meaning to the phrase "prairie skimmer". If I read about him doing a face-plant into an Iowa haystack, I'm going to know what really *happened!—Scoti*

I've seen Stuart Ganes's Falco with the raised Nustrini. Having now tried Matt Clark's Nustrini canopy and Stuart's raised one, I'm converting to the raised one. Luckily, all I have to do at the moment is raise my canopy frame bow.

Progress... all wood 'bits' finished except the main wing spar. I've finished scarfing up the laminations for this, and just waiting for the weather to warm and fresh glue to arrive and then I'll laminate them together. The jigs are already built. The tail feathers are built, and I'm float-sanding them at present.



Top: Rollover party for Stephen Friend's Falco.
Above: Howard and Marty Benham's Falco plays dead bug.

I've bought my engine, an IO-320-B1A, and it's off for a zero-time rebuild. My next task is that I want to completely build the firewall.

Gary Montgomery
West Lothian, Scotland

I never cease to marvel at the quality of your plans—and I don't hesitate to point out the importance of having well-thought-out plans of this nature when I speak to our Adult Air Academy's participants [at the EAA]. We have several different plans for them to study and there is no comparison—the F.8L Falco plans stand head and shoulders above them all. So there!

William E. Roerig
Kaukauna, Wisconsin

Just a quick note to all who have been interested in the West Coast Fly-In. The dates are September 15-18. The location is beautiful Sunriver, Oregon—nestled on the east side of the Cascade Mountains, elevation 4156 feet. Barb and I would encourage you to make your reservations as soon as possible.

By the way, it looks like we will actually be flying a Falco to Sunriver, not a "spam-can." After nine years on the project, believe me, the anticipation and excitement is building. Our first flight is tentatively scheduled for late May!

With Cecil Rives coming from Houston and possibly the Kennedys from Florida, we could have three "new" Falcos on the ramp, along with the beautiful "oldies" that have been coming in the past years. We have nine confirmed to date.

If you need more information, reach us at (707) 443-3088 (days) or 442-4024 (evenings) or at our address below.

Dave McMurray
P.O. Box 1111
Eureka, CA 95502