

# Falco Builders Letter



Sara Scott checks out the Airone, Frati's latest design.

## Frati Invaded Again

by Alfred Scott

There must be times when Stelio Frati will long for the quiet old days, before he ever heard of me and our crazy homebuilders. Since we entered his life, he's been invaded by a parade of Americans, first me, then my mother, Steve Wilkinson, numerous Falco builders, Roy LoPresti and most recently my two daughters, Sara and Kakee.

Sara and Kakee were tiny babies when I started work on the Falco, and they've grown up around Falco builders, parts, drawings, Oyster fly-ins, wing fillet molds in the back yard, and friends that they've come to know through the Falco. Both have done aerobatics in the Falco, flown to Florida in it, and Kakee has the distinction of using the airsick bag while we were sliding down the beach off Cape Canaveral.

And all their lives they have heard of Stelio Frati, in far-away Italy, but they had never met him. But this past summer, Sara, Kakee and a friend, Sarah Marriott, hit Italy for a five-week back-

packing tour. Sara and Sarah arrived first, landed in Milan, and were met by Carla Bielli.

I told Sara to look for a pretty blonde lady, and as she looked out over the sea of tourists and Italians, there wasn't a blonde in sight. Then a redhead approached them and said, "You must be Sara Scott!" Carla is now a *testarossa* and a bright orange one at that.

The following afternoon, Carla and Mr. Frati met them at their *pensione*. From the beginning, Sara was struck by what a quiet man Mr. Frati is. At first, she al-

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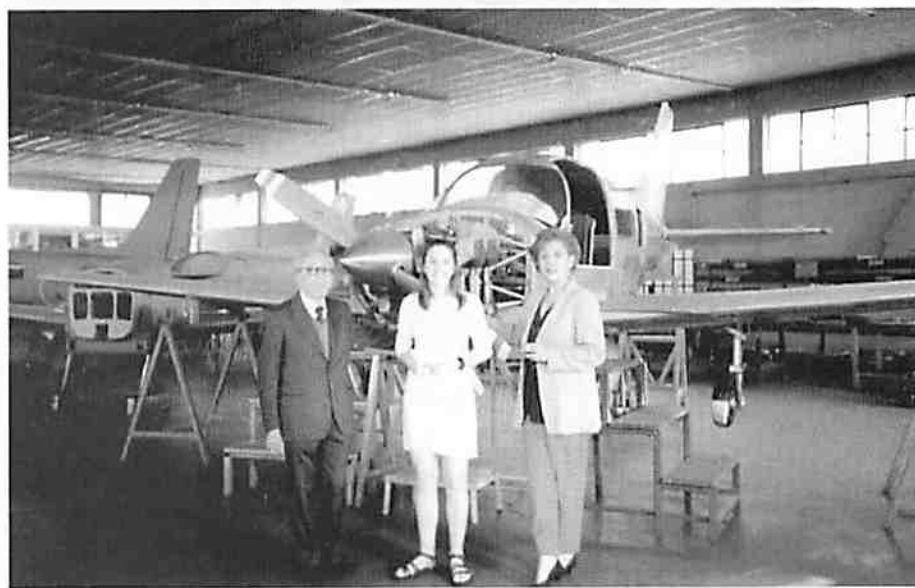
most walked right by him, thinking him to be just another person on the street.

But they bundled into Frati's little Audi and then began the wild ride to see the General Avia shop. Sara was surprised at the small size of the place, deep in an industrial suburb of Milan and with a water purification company across the street. "I expected it to be bigger, a little more grand."

But the ride to the shop was memorable enough. "He's a crazy driver!" says Sara. "He goes really fast, then pumps the brakes sporadically, goes full speed, always in a hurry. He brakes to a crawl and then forgets to put the car back into low gear. It's a combination of being absentminded and also in a hurry. And all the while, Carla was yelling directions."

They stopped by General Avia. It was an early July evening and everyone was gone except for the two office cats. Carla and Mr. Frati showed Sara and Sarah around the office and shop.

Sara was surprised at how bare Frati's office was, but I explained that Frati now works mainly out of an office near



his apartment in Milan. They got a tour of Carla's office, the drafting room, and the shop out back filled with partially complete Penguins and Frati's latest, the Airone, a four-seat version of the F.22.

But what most struck Sara was the starkly different and yet complimentary personalities of Stelio Frati and Carla Bielli. He so quiet and shy, and she so talkative and vivacious.

As we all know, Stelio Frati is a very quiet man, until he gets to know you, and then he will open up and occasionally go into a frenzy of conversation about something that interests him. Sara only saw the quiet side of Frati. "He didn't say anything, and Carla would speak for him. He is very nice and extremely polite, but he seemed almost embarrassed to be around, and there was an uncomfortable silence when Carla left us in the room together. He didn't know what to do with a teenage girl. I asked him

how he decided to design airplanes, and he said 'The same reason my father wrote poetry.' I asked him what he thought of Oshkosh, and he said he couldn't wait for the 50th anniversary of the Falco."

"Carla is a character! And she loves everything about the Americans. She couldn't believe that we knew so little about the U.S. This is so unusual, because so many Europeans just scorn the Americans. Carla said that Frati is more of an artist, and that all of the engineering students who come there to learn from him are more interested in numbers than the aesthetics of the designs."

Kakee arrived two weeks later and met up with Sara and Sarah, and she got the same tour of the shop and a dinner with Carla and Mr. Frati. It was the same thing all over, poor Frati lost in knowing how to deal with a teenage American girl, while Carla understood perfectly.

And when I showed Kakee the cartoon of Frati *con roadkill* from the *Air & Space* article, she told a friend, "I've had dinner with him, and that's what he looks like!"

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 only to 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.

## The Un-Falco: Antonov An-2

by Stephan Wilkinson  
photography by Jonas Dovydenas

This article was originally published in *The Aviation Consumer*.

If your Otter's too old, your Beaver's too small or your Norseman can't get it up any more, maybe what you need is a Kolkhoznik.

No, I'm not talking about adult toys but the Antonov An-2, the world's biggest biplane. Far cheaper than a de Havilland Otter, way bigger than a DH Beaver and offering lots more utility than a Noorduyn Norseman, the An-2, long ago nicknamed the Kolkhoznik ("Collective Farmer"), is a 1,000-horsepower, radial-engine, 12-passenger monstrosity that is appearing in increasing numbers on U.S. ramps and runways; there are currently 34 in the U.S., seven of which are for sale at prices ranging from \$37,500 to \$69,000. Eastern-bloc entrepreneurs are hustling to satisfy our urge to consume anything with wings that offers even a hint of communist-bloc warbird status.

An-2s were used by the Soviet army to carry paratroops—indeed the airplane itself flies like a parachute—and though their code name "Colt" certainly is laughable for an airplane that is the opposite of frisky, they are a legitimate ex-military type.

Many of them are also former airliners. Right up until the collapse of communism, Aeroflot held the record as the world's largest airline, both in terms of miles flown and passengers carried. This was not because they had lots of turbofan Tupelovs, Ilyushins and Concordeks but because millions of those miles and passengers were flown and carried by simple An-2s chugging in and out of Siberian goatfields, Kazakh soccer patches and grass strips from Minsk to Pinsk. Though Aeroflot has since shattered into dozens of individual airlines, the Kolkhozniks are still out there flying difficult, demanding domestic legs.

When it was designed, in 1947, the An-2 was a remarkable achievement. It's easy to make fun of a single-engine, tailwheel, round-engine, biplane airliner with all the grace and mechanical refinement of the Wabash Cannonball, but no airplane be-



*Everything the Falco is, the An-2 isn't.*

fore or since has been able to carry as much into strips as short and be as maintainable and utilitarian as "the Ant." The An-2 gets the job done thanks to full-span automatic leading-edge slats, full-span flaps on the lower wing, more flaps on the upper wing that work in conjunction with ailerons that droop 14 degrees, and an enormous engine that is in fact a licensed copy of the original Wright R-1820 Cyclone, one of the world's most durable aircraft engines.

Lots of DC-3s ran around under the urging of a pair of Wright R-1820s, though the smoother Pratt R-1830 Twin Wasp was preferred by most Doug Racer pilots. Indeed, if the DC-3 was our contribution to the age of iron aircraft, the An-2 was the Soviets' equivalent—an airplane ahead of its time when it was introduced, that has lived on far past its time.

No airplane in history has been in continuous production essentially unchanged as long as the An-2. In fact, you'd be hard-pressed to name any complex machine that has been manufactured as long. First flown in 1947, it went into serial production in 1950 and is still being built today. (I saw a dozen of them on a stalled production in Mielec, Poland during a research trip for *Aviation Consumer* in 1994, and someday soon, those airplanes will come out the door as yet more brand-new An-2s.) Bonanza enthusiasts will argue the point, but the still-in-production Bo bears as much similarity to the 145-hp, vee-tailed Beechcraft that went into production in 1947 as does a DC-4 to a DC-3. The sole "major" An-2 airframe change over half a century was a

squared-off vertical fin and rudder brought on line in 1964.

The An-2 is loaded with nice touches that make it clear it's meant to operate in the field—way out in the field. The two huge batteries, for example, slide in and out of their racks on trays with built-in connectors, so you can recharge them easily or take them into the yurt with you on a cold Siberian night. The belly of the airplane has pneumatic connectors that allow hooking an air hose to the airplane's on-board compressor (for the air-brake system) so you can pump up the main or tailwheel tires after service. And the main tires themselves don't mount on pesky, tube-eating split wheels but have removable truck-type beads, so there's no need to disassemble the wheel and brakes.

There's another belly fitting behind a small door, plumbed into the airplane's fuel system, that allows your crew chief—you do have a crew chief, don't you?—to drape a hose into a 55-gallon drum and upload gasoline using ship's power to pump it. And if you left your ladder back at home base, there are four kick-in steps built into the Ant's aft fuselage that lead to a catwalk up the aircraft's spine, out the wings to the fuel tanks or over the birdcage windscreen to the oil reservoir. The oil tank holds 32 gallons, although the engine can safely be operated on as little as six. "Fill it up, and you might not have to do another thing about oil for three months," one An-2 owner told me. Well, maybe... another former An-2 pilot reminisced about his perhaps-leakier aircraft and said, "As I remember, it was a very safe sys-



tem: you ran out of fuel just before you ran out of oil."

So what is it like to fly an An-2? Let's be honest here: Out of 115 separate types logged over 29 years, this is the single most unpleasant airplane I've ever flown. Not because it's nasty—it's certainly the most benign large airplane in my experience as well—but because it combines the challenge of instruments as random and unfamiliar as those in a slumlord's boiler room with the manipulation of controls straight from the Allis-Chalmers School of Design plus the physical demands of roll and pitch forces that must have produced entire generations of Aeroflot weight-lifting teams. (The only systems as heavy that I've ever experienced were a BAC 111 in manual reversion, with the hydraulic boost shut off.) Other than that, it's a piece of cake.

Preflight is a 30- to 45-minute job, and if you were working for Aeroflot, that crew chief would have done it for you. But you're not, so one of the more important acts is walking the big four-blade prop through anywhere from 10 to 20 or more blades to purge the engine of oil. The PZL ASz-62 engine doesn't so much burn oil as leak it, and if too much oil pools in the bottom cylinders, you'll get a hydraulic lock: (The rising piston tries to compress the incompressible oil in the cylinder, and the next sound you hear is that of a conrod bending.)

If you detect an incipient hydraulic lock, pulling a sparkplug will drain it, but another option is turning the prop backward, which will safely force the oil out an intake valve. "You'll end up with oil all over the starboard side of the airplane when it fires up, but at least you're up and running in 10 minutes," says An-2 importer Bill Walker, of St. Simon's Island, Georgia. It takes that long because the next step is to run the engine at dead-idle for about a minute, till all the excess oil has been spit into the exhaust collector ring but before the collector has heated enough to burn the oil. Then you shut down, get out and drain the exhaust low point again.

You'll want to leave the oil-draining till last, after the usual flurry of control-lock removal, slat-checking and systems preflights. While I was visiting Walker's An-2 operation on St. Simon's, a genteel resort island just off the coast of Georgia near Brunswick, the telephone in his office rang with a call from



a dismayed new An-2 owner who had ruined the engine on his very first start-up. He'd known enough to drain the bottom cylinders but had let an hour elapse between preflight and going flying, and it was just enough time for oil to sneak back down into the bottom cylinder.

An An-2 walkaround reveals a number of interesting and unusual details. Proper main-gear strut extension, for example, is checked by opening a door on the gear-leg fairing that reveals a sliding scale of marks corresponding to various airplane weights. If the index mark on the strut matches the mark for your all-up weight, all's well. If not, hook an air hose to one of the belly pneumatic fittings and pump 'em up.

The leading-edge landing and taxi lights are ordinary bulbs backed by silvered—or, after a few years of service, silver-painted—reflectors. The bulbs were probably replaceable at whatever the Soviet equivalent of a Pep Boys store was. Though at least one An-2 owner claimed the lights are "excellent," they look decidedly low-tech. But hey, if things get that dark, there's a small, downward-facing port on the copilot's side of the cockpit, sized to accept the barrel of a flaregun. Don't bother keying the mike to turn on the runway lights, just buzz the strip and fire off a couple of illuminating flares.

Another classy feature of An-2 night flight is the instrument panel. All the dial markings are painted with radium, a technique outlawed in the U.S. decades ago. The "floodlights" are actually ultraviolet, to excite the radium. "It's the only airplane I know of that you

can fly at night and get a sunburn," one An-2 owner said.

The leading-edge slats are held closed by simple rubber bungees. You check them by climbing a stepladder, pulling the the slats out and checking that they close enthusiastically enough to try and bite your fingertips off.

And one nice touch, there's a little light built into the fuselage side just above the ground-power socket aft of the passenger loading door. It goes on when the pilot switches to battery power, so the poor crew chief, standing back there in the Siberian propwash, knows that he can unplug the power cart and hustle indoors.

The An-2 is cranked by an inertial starter—a big flywheel spun into life by a teacup-size electric motor. You can engage it in a variety of ways, some of which require more hands than I have. There's a certain amount of careful priming to do first, after wobble-pumping with a stalky lever below the captain's chair, but then you either manually engage the rapidly spinning flywheel to crank the engine by pulling a tee handle with one hand and feeding it spark and fuel with your other two, or you push a button for "electronic start," turn on the mags after a few blades have passed the windscreen and stand by the throttle.

Either way, it's the usual Return of the Industrial Revolution sound and smoke as the round engine catches—effortlessly, on the day that Walker and I flew his N76AN—and the copilot gets the benefit of most of it: the exhaust outlet is on the right.



Taxiing an Ant is an art. The brakes are pneumatic, operated by a lever resembling a bicycle handbrake on the left horn of the pilot's yoke, and big biplane rumbles along breathing a loud refrain of hisses and groans—psssssss... tssssshhh... psssst... paaaaah—and sounding like an old Fifth Avenue bus. It only takes light dabs at the lever to provide directional control (by pulsing the lever while pushing one or the other rudder pedal), and “The airplane has so much brake it’ll sit on its nose in a New York second,” says Bill Walker’s partner Charley Houck, a widely experienced ex-Army utility-plane pilot.

“Some people make the mistake of thinking they’ve got hold of the yoke, and actually they’ve got the yoke and the brake,” Walker points out. “I sold an engine and a prop the other day to a guy who did exactly that, pulled back on the ‘yoke’ and stood the airplane on its nose.”

How do you make a takeoff in an An-2? You don’t. The airplane does. “The [Cessna O-1] Bird Dog is the only other airplane I’ve ever flown that takes off three-point,” Charley Houck admits. With 15 degrees of flap, by the time you have advanced the power and monitored it sufficiently to set 950mm of manifold pressure—1,030 is the maximum allowable—the thing is off the ground like an Acapulco parasailer showing off to the girls on the beach. The yoke never moves.

Come back to “eight and eight”—the Russian equivalent of running squared (800mm MP and 1,800 rpm)—with flaps in trail at five degrees, and you’re climbing at a comfortable rate that I’d guess is no more than 600 fpm. “You

don’t do anything in a hurry in this airplane,” Houck had cautioned me. The An-2 has three-axis electric trim, but rather than trim-position indicators, it makes do with three green lights that blink on only when each trim tab is at its dead-neutral position. From that point, you’re on your own: the takeoff setting is one-potato two-potato three-potato up elevator, and the ailerons and rudder are set by feel.

Feel? Well, let’s just say flying an An-2 is like making love to a fat lady who’s had too much to drink: there’s a lot to work with, it’s unresponsive, you’re never quite sure when you’re there, and it’s big-time ugly. Roll control is enormously heavy and delayed: “Is it gonna turn? Oh, yeah... there it goes.” Adverse yaw is considerable—a living demonstration of the purpose of a rudder.

Cruise speed seems to be about 105 knots at the 45-gph, day-in-day-out “eight and eight” power setting, though the book says you can get as much as 125 knots cruise if the Party is buying the gas. There is no normal mixture-control lever, since the carburetor has autolean, but it is said that Aeroflot old heads cut the safety wire on the “emergency leaning” control and pushed it forward an inch or so (it works backward, naturally) on long-range flights.

The An-2 supposedly has no identifiable stall speed. In fact, the book emergency procedure for an engine failure IMC or at night is to close the throttle, secure everything, drop full flaps, pull the yoke full aft and keep the wings level. The leading-edge slats will snap out at about 35 knots, and at a forward

speed of about 20 knots, the airplane will sink and eventually hit at a basically survivable, parachute-like descent rate. I tried slow flight at an indicated 30 knots, and it didn’t seem all that different than full cruise, other than the fact that the airplane eventually insisted on turning slowly left, perhaps due to a moderate fuel imbalance.

At one point during my brief flight with Walker, a rainshower off the Georgia coast beckoned, and I stuck the Ant’s locomotive nose into the squall. For a few brief moments, as water poured through windshield cracks, chinks, ventilators and the panel itself while two tiny windshield wipers flopped ineffectually, it was almost possible to imagine what generations of Aeroflot pilots must have experienced as they slogged through the weather at 500 meters, making rudimentary approaches into grass fields in foul conditions.

Their tools? N76AN has a primitive radar altimeter, and the biggest instrument on the panel is an ADF display as big as a dessert plate. “It’ll pick up a 25-watt beacon from 100 miles away,” Houck claims. That and a brute of a 20-watt Balkan 5 remote-mounted comm radio—the standard Soviet airline box—are it, as far as avionics go.

Time to go home, with fuel pouring through the engine at the rate of \$100 an hour. Fortunately, the wind was pretty much down St. Simon’s Runway 16, since the An-2 is reputed to be a bear in a crosswind. (With a touchdown speed of 30 knots, a 10- or 15-knot crosswind component can be very difficult to manage, particularly in an airplane with a huge vertical fin and fuselage side area about equivalent to that of a mobile home.) Fly the initial approach at 80 knots with flaps 15, then slow to 70 to extend flaps 30. A serious short-field landing requires flaps 40—accompanied by 14 degrees of aileron droop—and 65 knots.

The electric flaps are extended with a button on the throttle right where we’re used to finding a TOGA switch. They’re milked back up with a button on the power pedestal. Or, if things get real busy on a go-around, you hit a red emergency flaps-up switch elsewhere on the pedestal and get rid of everything hanging except the gear.

If you start playing with the flare at about 20 to 30 feet and let the airplane slow from a bit below 70 knots all the way down to 35, you just might lose enough

buoyancy that the thing won't bounce too badly when you hit. But even if you do, a short blast on that big four-paddle radial will help you retrieve just about anything you do wrong as long as you're traveling in a straight line.

All in all, a remarkable machine. If your idea of heaven is being able to fly backward in a 30-knot headwind while carrying an entire baseball team plus the manager for the price of a mid-range BMW, have we got an airplane for you.

### There's Only One Problem: the FAA Doesn't Like An-2s

In February 1994, the EAA and the FAA cooperated in the issuance of a document intended to clarify the regulations controlling aircraft in the "experimental exhibition" category. That class is intended for uncertificated aircraft, or aircraft operating outside their original certification, that are approved only for use in air shows, competitions, exhibitions and other activities such as film and television use.

The rules basically allow such airplanes not only to be flown to and from such events but to be flown for "proficiency." Unfortunately, an increasing number of owners had been using the "proficiency" catch-all to cover virtually any cross-country or

pleasure flight they decided to make. Hence the FAA/EAA "clarification."

Unfortunately as well for owners of Antonov An-2s brought into the U.S. since 1993 (earlier ones were exempt), the new interpretation of the rules specified a brand-new category within the experimental exhibition classification, called "category IV." It covers a very strange assortment of bedfellows: Lockheed C-130s, Ilyushin IL-76s (a 375,000-pound C-141 lookalike), Antonov An-24s (a 48-passenger turbo-prop twin), all Cessnas with un-STCed auto-engine installations... and Antonov An-2s. The rules specified that these airplanes, if registered experimental exhibition, could operate within a 300-nm radius of their chosen base but could not land anywhere within that area. They had to return to home plate.

This, of course, makes the An-2 virtually useless in practical terms. And the spike through its heart was another stipulation outlined in the reg-interpreting paper: no intentional parachuting out of any experimental aircraft of any sort, thus divesting the An-2 of the sole mission that it might otherwise have flown superbly and profitably under a return-only-to-base limitation. (Oddly enough, experimental exhibition categorization

does not preclude commercial activities, since warbird owners who provide their airplanes to movie- and commercial-makers certainly charge handsomely for their services.)

Aaron Newman, a 64-year-old New Jersey insurance agent who last May bought an An-2 from Bill Walker without tumbling to the limitations of the experimental exhibition category—"We didn't fully understand what we could and couldn't do," he ruefully admits—is particularly incensed by the category IV stipulations. He even sees a bit of a conspiracy in it. "They'd love the An-2 in Alaska," he says, "and that's why all the trouble started. I believe there was pressure brought on the FAA by Cessna, which wanted to keep selling expensive Caravans. There are 20,000 An-2s being retired all over the Eastern Bloc, and I think Cessna imagined the sky black with An-2s over here. The FAA caved in to Cessna and GAMA when they wrote those category IV rules."

The truth of the matter is almost certainly somewhat simpler. The FAA saw the prospect of 20,000 uncertificated six-ton, 1,000-horsepower airplanes that could be bought for the price of a used Skylane and flown by private pilots—soloed by students, even—since their gross weight was just 350 pounds under the 12,500-pound type-rating restriction. So they said, "If you simply want to own the world's biggest biplane and display it at air shows or rent it to ad agencies, you're welcome to it. And you can do all the proficiency flying you wish, but we're going to make it impossible for you to do anything but proficiency flying, by limiting you to landing only back at your departure airport. Have a nice day." Cessna never had to lift a finger.

Some Antonov enthusiasts have also pointed out that since the An-2 is currently manufactured by the Polish company PZL Mielec, and since Poland has a bilateral airworthiness agreement with the U.S., the airplane ought to simply be certificated and be done with it. However the U.S.-Poland bilateral agreement plainly states that it doesn't cover airplanes originally designed in a country that does not have a bilateral agreement with the U.S. Such as the former Soviet Union, for example.

"It's been an education that I didn't know I was going to get," Newman groans.





## Mendocino Missive

by Pierre Wildman  
and Susann Flowers

The Seventh Annual West-Coast Falco Fly-In was held this year in scenic Mendocino, California. Mendocino is a small coastside town billed as an artist's community in the tour guides (that's marketing-speak for "there are a lot of strange-but-harmless people there"). The 30 or so attendees stayed at the Hill House, which is the setting of much of the TV series "Murder She Wrote".

The weather was generally cooperative, although it sure kept us all guessing. Thursday morning, Larry and Ann Black's Falco was the first to grace the quiet Little River Airport. A short while later Per and Lena Burholm arrived in their Falco. The afternoon saw the arrival of John and Pat Harns, Dave and Barb McMurray, as well as Jim and Doris Kennedy (in the "Tin Falco").

Friday was the first serious day of flying, mixed with lots of socializing and storytelling. Several ground-bound arrivals endured the winding roads that lead to Mendocino. This was our secret plan to motivate people to fly instead of drive! The Frati stable spent a lot of time in the air that day, with the owners graciously giving rides to anyone who wanted one. John Harns provided a special treat for a lucky few who got to see the Falcos in flight, up close—really close! Legend has it that John has more close-formation time than all the rest of us have flight time!

In between flights, lots of questions were fielded about building techniques, tools, aircraft performance, and the like. Everyone had something to add. All the builders were looking for ways to do it better. Dan Dorr had the most memorable quote of the fly-in with "Perfect would be okay with me". Jim Kennedy found himself answering lots of questions about the F.22C, which was a nice centerpiece of the Falco line-up. Some people brought photo albums and even the odd piece of airplane for show-and-tell.

Friday night brought a special event—a ride into the towering redwoods on the famous Skunk Train. A fun dinner was served at the Mendocino Boys Camp, located deep in the forest.

Saturday morning we learned the good news that John and Chris Shipler had arrived late the previous evening, adding



*Top: John and Pat Harns arrive. Center: Jim and Doris Kennedy in the F.22. Above: The Kennedy's artificial horizon.*

yet another Falco to the flight line. This was also the morning for the fly-out breakfast at Clearlake, California. Breakfast at the Sky Room was great, and spawned a lot of conversation about whose Falco was fastest. And so was born the First Annual Falco Air Race!

All parties agreed that a race would be held from the Ukiah VOR to Little River Airport, about 25 miles. The rules were to start wing-abreast over the VOR at 4500 feet, indicating 135 knots. On my count, each pilot would pour on the coal, and the first to arrive over Little River



*Top: John Harns watches Dave McMurray park his bird. Center: Early morning line-up. Above: John Harns and Larry Black.*

Airport at 4500 feet would be declared the winner. Sound simple enough?

You learn a lot about people when they race! One pilot, flying an award-winning beauty, is alleged to have applied full power early. Another, ex-military pilot

remedied that infraction by initiating a descent. After the race, yet another pilot claimed "Yeah, but I still had a couple of inches of manifold pressure left".

Flying lead in my Seneca, we found that we had to keep adding more power to

stay in front of the lead Falcos, which were closing slowly. Dave Nason was riding with me as the official observer, keeping me posted on the whereabouts of the contestants. By the time we crossed the airport at 2000 feet (so much for the rules!), we were indicating 190 knots, with 2 Falcos right behind us, and the rest not too far behind them. We were all really moving, and it was all we could do with 440 hp to stay in front of the 160 hp speed-demons!

Who won? Well, there are a lot of opinions about that! Dave McMurray was the first across the airport, with John Harns a very close second. But somehow it seems inappropriate to declare an official winner, under the circumstances. It looks like we'll have to have another race next year, maybe with some 'clearer' rules.

While all this hell-raising was going on, Susann led a group to the Botanical Gardens, where beauty of another sort was on display. The main highlight was a spectacular Begonia display, and who could forget the hike through the "Redwood forest that meets the sea." Afterward, they had lunch at the Wharf restaurant overlooking the Fort Bragg harbor where Goldie Hawn and Kurt Russell fell "Overboard." After lunch, they couldn't wait to get back for some last-minute shopping in the quaint Mendocino boutiques. Barb McMurray drove the "cargo shuttle" to help transport the loot back to the hotel. I think it's safe to say that the ladies were well-entertained by the Mendocino coast, and they almost forgot how much fun they were missing by not hanging around the airport.

Back at the airport, Saturday afternoon was filled with more poking around airplanes, and of course, flying. Dave McMurray was coaxed into removing some panels so the rest of us could see how he installed his battery and such. Cowlings spent more time open than closed. Naturally, all the owners were more than happy to answer questions from all sorts of people.

In keeping with tradition, we had a banquet dinner Saturday night. The food was great, and people really enjoyed themselves. After dinner, Susann and I gave a talk and slide show of our transatlantic flight in the Seneca a while back. The evening concluded with several people offering thanks to the whole group for making it such a great time.



## Construction Notes

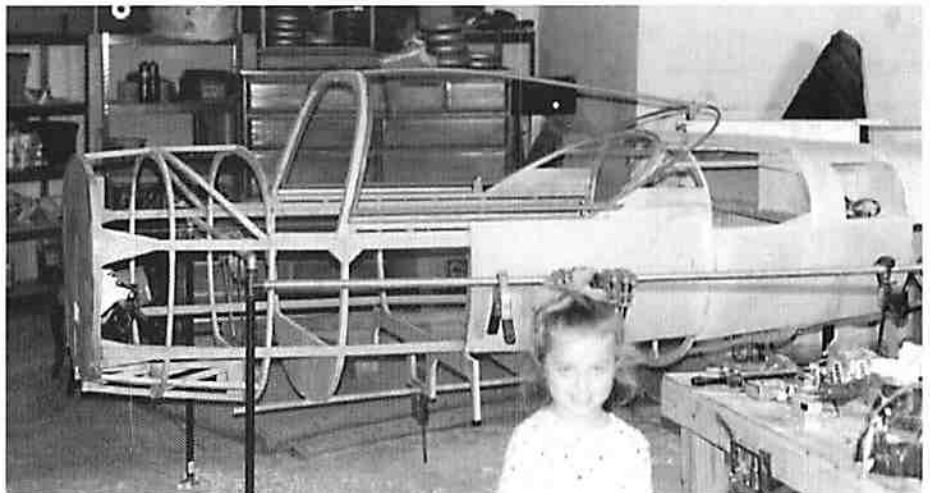
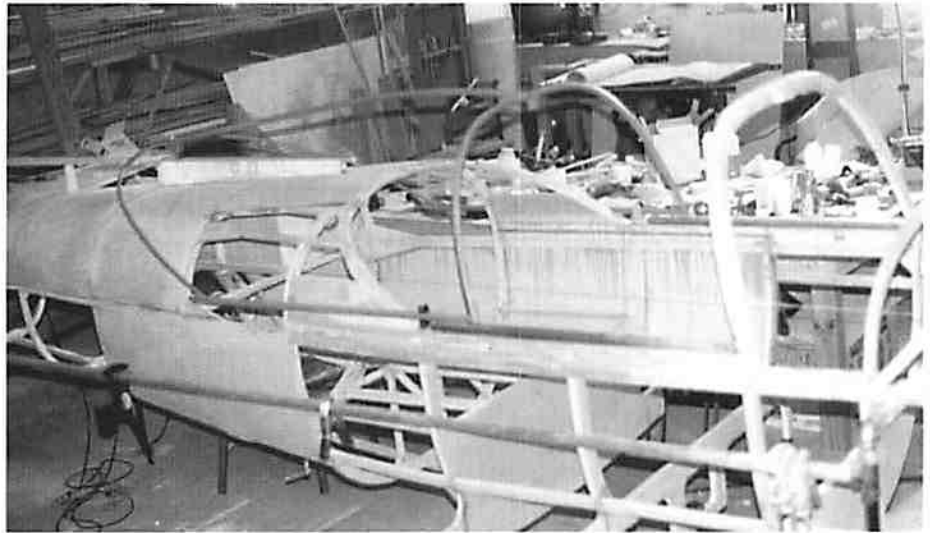
There's a bit of a controversy swirling around Aerolite glue these days, thanks to a couple of articles on glues. In the June 1996 issue of the EAA's *Experimenter* magazine, there's an article by Bob Whittier entitled "Exploring the Wide World of Adhesives". The article is generally an excellent summary of the history of adhesives.

In pursuing the subject of urea-formaldehyde glues (Weldwood Plastic Resin and Aerolite are the two most popular brands), the author made contact with Victor Boyce, an Australian now living in Florida. If you have made the rounds in the woodworking shops of Oshkosh or Sun'n'Fun, you've undoubtedly run into Victor, who has waged a one-man campaign against Aerolite, and he was largely responsible for the banning of Aerolite in Australia.

I've listened to Victor, and I've read the material he has sent on the investigation of Aerolite in Australia. The evidence is quite clear that there is some weakening of the glue, over time, in very hot and humid climates. At about 120°F, urea-formaldehyde glues begin an oxidation process which makes it become weak, and it tends to decompose into something that resembles brown sugar. The problems occurred with dark-painted airplanes that were left out in the sun for long periods of time, while airplanes painted with lighter colors or which were hangared have not suffered.

In his article, Whittier says "...the FAA now considers UF glues to be unacceptable" and later "and that is why Aerolite glue was banned some time ago in Britain and related countries, and why the FAA now takes a dim view of Weldwood, Craftsman Plastic Resin and other UF glues." And in a recent article in *Sport Aviation*, Tony Bingelis said "now it seems that the FAA will agree with Australia that the glue should not be used in homebuilt aircraft."

I asked Ben Owen, the EAA's director of information services, about the 'FAA ban on Aerolite and urea-formaldehyde glues'. Ben said that to his knowledge it was not true. We called Tony, who said he was "deliberately vague" in the article and said his source was the article in *Experimenter*. (Tony also said he was through with writing articles for *Sport Aviation*, and that he had written his letter of resignation. Ben and I both



Milton Thompson's Falco takes shape. Pretty girl!

laughed—we've all heard this many times before from Tony!)

So from what I know, this 'FAA ban' is simply not true.

It's also not true that the glues have been banned in England. I asked Francis Donaldson, chief engineer of the Popular Flying Association about this, and he replied: "No, we certainly have not banned Aerolite in the UK and, in fact, Aerolite and Aerodux are the standard approved glues for construction and repair of wooden aircraft and gliders. Apart from these two, we are now accepting various epoxies (T88 and West Systems) as these have crept into use via various kitplanes, such as the Minimax, Loehle and Fisher kits rather rely on the gap-filling and fillet properties of epoxy."

"Our view is that Aerolite is perfectly satisfactory for the lowest ambient temperatures found in the UK, and is particularly good with the damp conditions for which we are well known! We have

not come across any cases of glue failure due to excess temperature."

The wing ribs of the Pitts Special are today built with Weldwood Plastic Resin glue, they always have been, and it's a fully FAA certificated design. Stearman wing ribs have been made for 50 years with the stuff. Production Falcos from the 1950's and 60's were built with Aerolite, and there's been no pattern of glue problems.

I think the Australian authorities were correct in their observation that urea-formaldehyde glues weaken when exposed to long periods of high temperature and humidity. However, I think the ban on Aerolite was ill-considered. They banned acid-catalyzed urea-formaldehyde glues while permitting other urea-formaldehyde glues. Yet the acid is a catalyst that disappears in a few days and leaves only cured urea-formaldehyde. The Australians acknowledge this disparity, yet they ban the glue on the basis that 'other acceptable glues are available'.

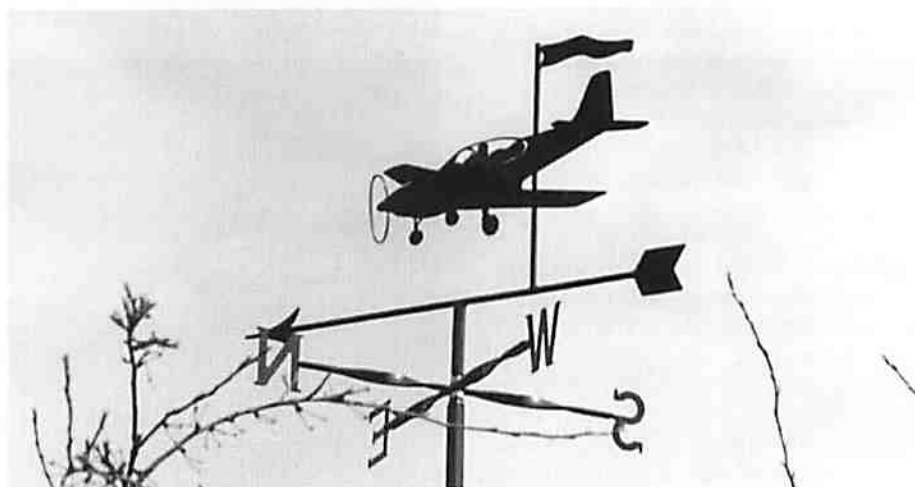
Therein lies the rub. There's one thing that all knowledgeable people agree on—the more you know about wood glues, the more you realize that there is no one perfect glue. All available glues have their strengths and weaknesses. Epoxies are thermoplastic. Weldwood Plastic Resin glue is cheap, easy to use, yet adheres poorly to birch plywood. Only resorcinol is truly waterproof and unaffected by heat, but it's difficult to use in small quantities, requires higher curing temperatures and has very poor gap-filling characteristics.

At the end of the day, our advice is still the same: learn the strengths and weaknesses of the available glues and pick the one that's best for you. We use Penacolite resorcinol for all spruce laminations, and Aerolite for everything else. Lots of people use epoxies in their Falcos. There's no doubt that the glues are user-friendly and excellent adhesives. The principal concern with the epoxies is that they soften with heat. If your plane is painted a light color, there's no reason for alarm, but if you paint an epoxy-glued Falco a dark color, you're taking a needless risk.

We have offered two types of main landing gears for the Falco. The Cleveland wheels use a standard 5.00x5 tire, while the Rosenhan uses a 5.30x6 boat trailer tire. We used the Rosenhan wheel because at the time that we began offering the Falco, Fred Rosenhan was a colorful homebuilder-machinist who delighted in making wheels for homebuilders and undercutting the prices of everyone else. And also, the 5.30x6 tire was one-half inch narrower when installed.

That half-inch has proved, over time, to be not worth the effort, and doors can be made which cover both wheel types. Fred Rosenhan has long since sold his business to a businessman who quickly realized that good ol' Fred was giving them away at cost all along, so the price advantage is long gone. And over the years, we've heard rumors and then reports that Goodyear would no longer make the 5.30x6 tire. As a result, we've phased out the 5.30x6 wheels and brakes and in the future will only offer the Cleveland variety.

But the availability of tires is still a concern, and thus we were interested to hear the following from Steve Wilkinson: "I've always been embarrassed by the chunky, industrial, coarse-treaded look



Top: Gwen Devoe gets her first ride. Above: Clive Garrard's weathervane.

of the Goodyear 5.30x6 four-ply tires that fit my Rosenhan wheels. They're so squared-off that I've been forced to explain to people that because I operate out of Upstate New York, I need snow tires. (You'd be surprised how many people—even pilots—accept that explanation as a logical one.) So when I recently decided to change my main-gear tires at 330 hours because the tread was worn in the center, though by no means bald, I went to the local industrial-tires supplier and ordered a set of Carlisle 5.30/4.5 x 6 six-ply forklift tires."

"They're more rounded than the squared-off Goodyears, particularly when you slightly shave the outside edges of the tread with a razor blade (which I'd also done to the Goodyears, to little avail). And the tread itself isn't patterned like a mountain-bike mud tire. The Carlises fit the wheelwells just fine, even though my wheelwell-door-to-tire clearance was always minimal during the retraction/extension cycles with the Goodyears."

"As I remember, the Carlises are rated for a load of 1,200 pounds (each, I'm as-

suming...), plus a speed rating that seemed rather minimal, but I'm sure it's conservatively based on a 12-hour-a-day near-constant industrial cycle rather than a 10-second dash to 70 mph a couple of times a day. I wouldn't want to step-taxi to the most distance runway at JFK at 50 knots on a hot day on top of them, but I'm sure for normal Falco use, heat buildup won't ever be a problem. Price was something like \$35.00 apiece."

"One more tire note: A while ago, I had a left main shock strut that would bleed down to a point where it needed to be pumped back up every two or three months. It has since been fixed and holds air apparently permanently, thanks to the over-size oleo O-ring that Sequoia will supply on request for builders suffering this same problem. However, I once operated the airplane for a couple of flights with the strut to low, and as a result had to replace the nosegear tire prematurely. You'll be surprised how quickly the nosewheel tire will 'cup' and obviously wear asymmetrically—and thoroughly—if you try to operate with seriously unequal main-gear shock extension. Beware."

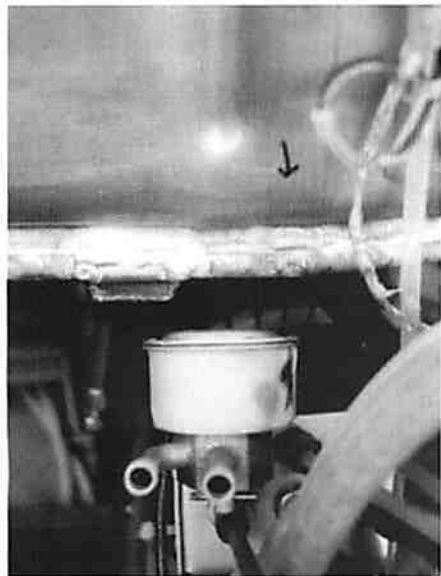
## Fixing a Fuel-Tank Leak

by Stephan Wilkinson

There's nothing that brings me nearer tears than the weeping blue stain of a microscopic but intractable leak in my Falco's fuel tanks. It has happened several times now, and my attempts to correct it have ranged from total removal and replacement of the offending tank to the application of PRC, an evil-smelling, rubbery, sticky, two-part tank sealant that supposedly can seal a leak from the outside. Neither approach worked. (Admittedly, the front tank that I replaced was one that had initially been used by Sequoia in some of the stress-testing that led to the adoption of the stiffening channels on the current tanks, but even the replacement tank eventually sprang a couple of pinhole leaks.)

Then somebody on Compuserve's Avsig electronic bulletin board told me about a remedy called AeroSeal, sold by a Mooney owner in Florida named Norm Smith and STCed for the *in situ* treatment of welded-aluminum tank leaks in Mooneys. So I faxed an inquiry to Smith's company, Aero-Trim, and at 0830 the next morning, my phone woke me up. It was Smith, calling from Florida.

"Jeez," I thought to myself fuzzily, "how does he make any money answering every inquiry by long-distance phone?" Smith enthusiastically touted the virtues of his product and explained that you simply created a slight vacuum in the offending tank, sprayed the "stuff" on the leak from the outside and let it be sucked into the leak, where it hardened. I liked that feature, since one of my leaks was under a tank-stiffening bracket, in a location that I



September 1996

couldn't possibly reach or even clean for the application of standard external sealant. But I could spray it, and an aerosol mist would find the sucking leak. (Not a misprint. That's *supposed* to be an s.)

Smith carefully explained that his AeroSeal only worked for the tiniest of leaks—.005 inches in size or less, which meant not dripping or running but simply exuding enough gasoline to leave the tell-tale blue stain and an unmistakable odor. That sounded like exactly what I had, so I said, "Great. Send me some. How much is it?"

"Five-sixty," Smith said. "That'll be enough to do at least two tanks."

"Only \$5.60? That won't even pay for your phone call."

"No, \$560," Smith explained.

"Uh, yeah, right. That's what I meant," I stammered, suddenly embarrassed to be unmasked as a two-bit player who shopped at Pep Boys rather than Million Aire.

But Smith gave me a break: he sent me "half a kit," for \$280. When it arrived, the half-kit was revealed to consist of two pint-size pump-spray bottles each containing about enough liquid to fill a plastic 35mm film container. One of the liquids was labeled "AeroSolv," and by its smell appeared to be about 15 cents worth of trichlorethane cleaning fluid—an excellent but common solvent with which to clean the tank leaks before applying the AeroSeal.

But what was in the AeroSeal bottle? The only clue was the label, "contains methacrylate ester." Hmmm. A variation on Krazy Glue, which is a cyanoacrylate ester. But methacrylate ester I'd also heard of: it's the main component of a wide variety of Loctite threadlockers and sealants, and I began to suspect that what I'd bought was a small quantity of something very much like classic Loctite 290 Threadlocker with an astronomical markup. (Loctite 290 is dyed green and AeroSeal is relatively clear, so they obviously aren't identical. But the fact is that 290 costs about \$12 an ounce retail, and Smith sells replacement quantities of AeroSeal for \$93 an ounce.)

Anaerobics such as cyano- and methacrylate esters become adhesive and hard in the absence of oxygen, which is why Krazy Glue will stick your fingers together or to anything you touch. The glue is harmless until you contact something—or yourself—and the touch seals out the air.

Presto, the model airplane builder's affliction, welded skin. (Particularly embarrassing when it happens during a nose-picking episode.)

An "anaerobic" condition also exists in the minute interstices of a bolt or nut's threads, or in a microscopic porosity. Indeed, Loctite recommends the use of penetrant 290 Threadlocker to seal leaking welds in aluminum tanks. And, interestingly, warns that the maximum porosity it'll seal is .005". Hmmm again.

Well, I owned Norm's "stuff," so I might as well use it, I thought.

Smith's extensive directions sheet specified sucking a vacuum of half an inch to an inch of mercury out of the offending tank via the tank vent line—after draining the tank of fuel, obviously—but warned that this was *not* to be done using a vacuum cleaner. I assumed that this was because the suction of a vacuum cleaner could instantly collapse an aluminum tank. Smith, however, later explained that the greater danger was that enough fuel fumes remained in the tank to cause an explosion if sucked through a sparking vacuum-cleaner motor. Hard to believe, since there's virtually no airflow—other than as a result of what is sucked into the tank through any pinhole leaks—from the tank to the vacuum cleaner.

A Shopvac was my only convenient source of vacuum, though FBOs who specialize in this work usually have vacuum pumps made from modified air-conditioner compressors. And the Shopvac worked just fine, after proper precautions were taken. Most important, of course, was totally draining and cleaning the tank, then blowing it free of fumes. Since the vent line is at the very top of the tank and any residual fumes would collect at the bottom, I decided the risk was somewhere between minimal and nonexistent.

Then I made a simple water manometer (see photos), using a panel of scrap plywood, some hardware-store clear plastic tubing and water dyed black with a bit of ink. An inch of mercury is equal to 13.6 inches of water, so I marked the plywood panel appropriately. Actually, I marked it quite inappropriately, but a physics-savvy friend pointed out my error before any damage was done: The "inch of mercury" is not denoted simply by the water level dropping 13.6 inches but by the level dropping 6.8 inches and at the same time rising an equivalent 6.8 inches on the other side of the U of tubing, for a total difference of 13.6 inches.



If you have an old altimeter sitting around, that'll work as a manometer as well, since a gain of 1,000 feet in altitude is roughly equivalent to a vacuum of an inch of mercury.

The manometer tubing led to a cutoff plastic bottleneck that I duct-taped to the filler opening of my airplane's front fuel tank. (None of this needs high-tech sealing, remember; you're dealing with an excess of vacuum, not a paucity.) On the other side of the rig, some more clear plastic tubing, taped to the nozzle of the Shopvac, led to a vacuum regulator that Alfred lent me and then to the fuel-tank vent fitting.

But before taping everything to the airplane and starting the vacuum cleaner, I tested the rig by eliminating the fuel tank from the loop, plumbing the vacuum line directly to the manometer line. Then, with a leather punch, I made half a dozen holes clear through the vacuum line. With the vacuum cleaner running, the holes open and the regulator screwed fully out (open), the Shopvac was able to pull barely any vacuum at all at the manometer. I progressively covered one hole after another with duct tape until the Shopvac was able to suck about six inches of water, then fine-tuned the rig by closing the regulator till the requisite maximum of 13.6 water-inches of vacuum was available.

If you don't have easy access to a vacuum regulator, you can accomplish exactly the same thing by covering and even half-covering some of the holes you've made in the plastic tubing; the regulator is simply a convenience.

The first step in AeroSealing a weld-line leak is to make absolutely sure the fuel tank is devoid of gasoline, particularly if the leak is along a seam at the bottom of the tank. You'd be surprised how much gasoline can remain in the crimp of a Falco tank weldment even after the tank has been drained. The only certain way to get it out is to blot it up with a clean, lint-free, absorbent rag tied to a string or wire and maneuvered into any such crevice with something like a wooden dowel. Simply leaving the cap off won't allow the residual fuel to evaporate. It'll puddle down there nearly forever in what is essentially a 100-percent-hydrocarbons atmosphere at the bottom of the tank.

Next step: hook up your vacuum system to the tank, get the requisite six to 13 water-inches of vacuum established, and either spray or brush the AeroSolv on the point(s) of leakage—which, of course, will be denoted by a blue stain. You might also want to indicate the leak point with a Magic Marker arrow, since the solvent and a wipe

with a clean paper towel will eliminate the telltale stain and leave you wondering exactly where the microscopic hole went.

The solvent will be sucked through the leak, thus cleaning it of gasoline. You might want to do this twice, and then wait 15 minutes or so for the solvent to thoroughly dry, with the vacuum running all the while.

Then—vacuum still running—spray or brush the AeroSeal directly onto the leakage area. Though Smith's directions don't specify it, it seems to me a good idea to have an assistant then slowly reduce the vacuum to zero as you continue to brush or spray AeroSeal on the leak. That'll avoid the possibility of pulling all the AeroSeal entirely through the leak and into the tank, leaving you no better off than when you started.

Finally, with the vacuum source now turned off, paint or spray one last coat of AeroSeal on the outside of the leak for good measure.

Did it work? Yup. No more blue stains. But is all this worth \$280 (or \$560 for the full kit) for a small bottle of what must be very similar to a \$5.79 hardware-store squeeze-bottle of Loctite 290? Certainly it is if you have a Mooney and want to be legal, since Loctite is not STCed for use as a fuel-tank sealant. Smith says that his certification process had to prove to the FAA that AeroSeal neither attacked a Mooney fuel tank's rubbery internal PRC lining nor the airplane's engine. He also claims that Loctite *does* dissolve PRC and also, "It cures kind of hard and cracks easily. AeroSeal when it cures still has a little bit of flexibility, and you have to have that."

Smith also claims that he put some Loctite 290 into the gas tank of a lawnmower and "It stopped that thing cold." When queried as to how the minute quantity of Loctite that could migrate into a gas tank through .005-inch holes could possibly stop a lawnmower engine, Smith answers, "It screws up the injectors." Not knowing of a fuel-injected lawnmower, I find it hard to accept this explanation. (Nor does Loctite warn that its 290 sealant shouldn't be used on automotive—or lawnmower—fuel tanks.)

If some numbers that Smith dropped are legitimate, I'd guess that he's paying about \$13 an ounce for the chemicals that go into AeroSeal. He claims that the certification process cost \$15,000, and since there are only 8,500 Mooney M20s on the planet (albeit virtually all of them with weeping

wingtanks at one time or another), one could certainly make a case for a considerable markup. Interestingly, Smith's basic rationalization for the markup is that a Mooney tank scrapeout and relining costs \$5,000, so he sees AeroSeal as a one-ninth-the-cost bargain rather than a 700-percent markup.

But as an experimental-aircraft owner with a repairman certificate that allows me to maintain my Falco, what I've learned from this whole moderately expensive but educational episode is that (1) the key to sealing a pesky aluminum fuel-tank porosity is establishing a slight vacuum in the tank, to help draw a wicking sealant into the leak, (2) that building a rig to establish such a vacuum requires nothing more than a Shopvac, some scrap wood and about \$5 worth of hardware-store plastic tubing, and (3) it's my bet that a \$5.79 vial of good automotive/industrial penetrating anaerobic threadlocker will do the job just fine on any of our tanks.

Maybe I *should* have shopped at Pep Boys.

Aero-Trim Inc., 1130 102 Street, Bay Harbor, Florida 33154. Phone (305) 864-3336, fax (305) 864-5454.



## Calendar of Events

Falcos on the half shell. Don't miss the Great Oyster Fly-In and Gathering of Stelio Frati Aircraft on November 2 at Rosegill Farm Airstrip, Urbanna, Virginia. It's the only place in the world where you can eat raw oysters, drink beer and do aerobatics in a Falco and still be accepted socially. Bring your sleeping bag (or significant other), stay for dinner capped with dessert of Oyster Zabaglione. Contact: Dr. Ing. Alfredo Scoti at Sequoia Aircraft.

## Sawdust

• Military Intelligence Philippino-style. From the country that gave us Imelda Marcos, the lady of a thousand shoes who first coined the phrase 'silent majority' (she told Richard Nixon that "we are supported by a silent majority"—Tricky Dick subsequently adopted it) comes the latest in sensible transactions. They've got 18 unservicable SF.260s which need new engines and the possibility of buying new Lycomings seems to have eluded them. Instead, they've undertaken Project Layang, and upgraded one aircraft to an Allison 250-B17D turboprop engine. This is a good deal, because it only cost them 18 million pesos (\$690,000) as compared to about 28 million pesos (\$1,073,000) for a new SF.260TP. See, that means they save 10 million pesos (\$383,000) per airplane, so overall they'll save 280 million pesos (\$10,724,000) by spending 504 million pesos (\$12,420,000). Hey, for that kind of money, you could get over 30,000 pairs of Gucci's.

• At least he walked away from it. Perhaps the most despised man in aviation, Arthur Alan Wolk, who as plaintiff's attorney has won enormous awards in suits against Cessna and Piper (and thus has done more to raise the cost of flying more than any other individual) recently crashed his Panther jet off the end of the runway at Kalamazoo. We were curious what sort of sympathy he got, so we tuned into some of the on-line services to see what the cyber-groupies were saying. Here's a sampling: "It should be real interesting to see who gets sued on this one and why!" "Numerous unlucky individuals, most likely, probably including those who rescued him." "Hmmm, now who will Arthur sue? Maybe the Michigan Highway Dept., berm in wrong location. No, let me see? I've got it, Kazoo Airports Comm., airport in wrong location! Better yet, God! Wind from north rather than south upon receiving takoff clearance." "Guess he could sue Grumman, eh?"

"Come on boys, making jokes about accidents? You're in the wrong forum." "Normally I'd agree with you about the inappropriateness of joking about accidents. But Wolk has made many enemies in his pursuit of wealth at the expense of the aviation industry. It could be argued that flying is a little less accessible to us all because of his activities."

"I'm not condoning jokes in the wake of



*Top: Seen at Oshkosh, the latest Frati airplane to be proposed for production. This is the F.15F Excaliber, formerly known as the Delphino. The airplane has a 200 hp Lycoming and the design is now owned by Mario Rosati, of Rome, who has made a deal with the Russians to have the plane built in the MiG-29 factory at Sokol. They plan to install a 300 hp engine and sell it for \$225,000 with basic VFR avionics. The airplane is to be imported by Century Aerospace of Columbus, Ohio.*

*Above: Agent Deep Spruce sent us the following report: "Penetrated tight security to photograph highly-modified former Mazda-engined so-called Falco at the Reese's Corners International Airport, near Sarnia, Ontario. It's being re-engined with a Lycoming. Note beautiful canopy, non-stock gear and cropped wingtips. I'll keep you informed when it attempts to fly again."*

a crash, after all, an irreplaceable aircraft was involved—sorry about that—but I'm not asking where flowers should be sent either." "Well said. Sometimes you go to a wake to say goodbye to the

dead. Sometimes you go to support a surviving family member. Sometimes you go to make sure." "At the risk of sounding completely heartless: What's the condition of the airplane?"

## Mailbox

I have received and read with interest the report in the June *Sport Aviation* on the Falco of Mr. Larry Black.

I very much appreciate, first of all, the activity of the CAFE Foundation and its professional capability in flight-testing the general aviation aircraft. And it's remarkable how, in just five flights, they have investigated the flight qualities of the Falco, which agree perfectly (if I remember well—40 years have passed!) with the results of the tests performed on our 150 hp prototype.

The stick force values are indeed very light, but this was an intentional effect of the design, and today it would not comply with the new amendments of the FAR. In 1955, there weren't any limits imposed on the values of the stick-force per 'g'.

However, we did not find the light stick-force inversion in the climb condition. This could possibly be caused by excessive friction somewhere in the elevator control system, or maybe by the effect of the stall strips (which were not installed on our prototype) on the horizontal tail surfaces at high angles of attack.

I think that it's possible, considering the good trim authority of the Falco in the approach to landing condition—see the FAR 23.161(2) requirement—to install a downspring on the control stick in order to eliminate the stick-force inversion. The value of the load applied by the downspring to the stick must be 0 lbs with the stick full forward and 4 or 5 lbs with the stick full back (with the aircraft on the ground, of course).

Finally, I was surprised to see the low roll rate of 43 degrees/second in the table on page 73 of the report. In our Falcos, the roll rate exceeded 100 degrees/second. Perhaps the plane should be checked for the correct differential angular displacement of the ailerons and/or the possibility of the stick to reach the full lateral position.

In conclusion, please convey my compliments to Mr. Larry Black for the wonderful completion of this Falco.

Stelio Frati  
General Avia  
Via Trieste 24  
20096 Pioltello (Milano)  
Italy

Like Mr. Frati, I was also surprised at the roll rate of 43 degrees a second. We have tested



David Nowill testing G-OCAD.

my Falco at about 120 degrees a second for a full aileron roll. Most of the homebuilt Falcos I have flown have a roll rate of about 70 degrees a second or greater. I flew Larry Black's Falco a couple of years ago, and I rolled it then. While I didn't time the roll rate, Larry Black remembers that I mentioned at the time that his Falco rolled faster than any other homebuilt Falco I had flown, but not as fast as my production Falco. Larry and I are both wondering if the reported 43 degrees a second was perhaps a typo introduced by misreading a handwritten 93 degrees a second.—Alfred Scott

Re: The CAFE article in *Sport Aviation*. My thinking has been clouded by "switch back and forth as needed to maintain balance" (yeah, burn some off the aft tank if it is full), "when cockpit work load" and "traffic pattern demands", etc. What are we flying here? I thought it was a Falco.

But flaps before the gear? Recommended? By whom? And an experienced (?) pilot did it? Clean up the dirtiest garbage first, the aim is altitude. The bulk of the article was of considerable interest to me, nonetheless.

Time finally flown off, bad winter and spring and for a while I was avoiding the cross wind (over ten knots I stayed on the ground) landings. Got it down now, it is a slippery rascal and declines invitation to stop flying until you do it right. Minor problems only: moved the gear down switch to the nose gear bay, one loose connection on the ammeter gauge, one misdirected wire (CHT and EGT switched, no high CHT!), a minor prop governor adjustment (2800 RPM on takeoff 1st flight), needle/ball adjustment required and a gear door adjustment sums it up.

Speed is not spectacular, 23/23 at 8500' gives me 160K true. A fair amount of nose-down trim is needed at that power setting. Checked location of leading edge of horizontal stabilizer (remember one builder had a problem there) but it is where it should be with respect to W.L. O. I am getting drag I don't need.

It remains a delight to fly, now in annual inspection.

John Brooks Devoe  
Stratham  
New Hampshire

I was surprised by that thing about raising the flaps before the gear, but it's not the CAFE test pilot's fault. It turns out Larry Black misunderstood something about the wiring circuitry in the landing gear system and thought that the warning horn logic meant you should bring the flaps up first. In fact, you should bring up the gear first. Takeoff flaps should be about 15°, and the flap position switch should be adjusted so that the horn doesn't come on until about 17-18°. This puts the switch at something greater than takeoff flaps, but something less than the normal initial landing flap position of 20°.—Alfred Scott

Our Falco is getting perilously close to painting, which apart from the upholstery, is the only remaining thing to do. We ran the engine for the first time in June. Do you like the clever little windsock attached to the top of David's head? It seems to be indicating that the engine is indeed turning and there is some propwash.

Clive Garrard  
Foxton  
Leicestershire  
England





*Stephen Friend prepares to inspect the sheep.*

I have tapered both rear spars in plan form, so I can safely order hardware to build the flaps and ailerons next. While waiting for delivery, I should finish No. 1 and 2 wing ribs. (I built all ribs with a CAD program mylar templates. What a joy. Nice to have a Hewlett Packard friend.) It's very enjoyable to work on the ribs. The flap and aileron spars are a piece of cake. Forward wing spar is laid out on the bench.

*Jack Lange  
Fort Collins  
Colorado*

I thought it time for a project update. All skins, except for the bottom center section of the fuselage, have now been applied and the glare shield has been fitted. All of the tail structure aft of former 8 is complete and ready to be glassed and primed. Battery box, battery hold down complete, as is the battery box door and lock assembly.

I will semi-fit the windscreen before the fuselage is turned over to finish the bottom skins. The baggage compartment now has the interior skins installed and will finish the rest of the interior skins in the next few months. Seat cushions are now upholstered, and I have all the necessary materials for the cockpit upholstery.

I wanted to install a Concorde RG-35 battery without purchasing one because of the possibility of it sitting around the shop for several more years. I called Concorde Battery and found out that they have dummy batteries available, and will ship one to any builder needing to finish a battery installation. You need to ask for Skip at (818) 813-1234 to make the arrangements, and you will need to ship the battery back to Concorde when finished with it. Having

the battery available allows you to finish the battery box construction totally knowing that the battery will fit when you do purchase one. Concorde Battery Corporation, 2009 San Bernardino Road, West Covina, CA 91790.

*Bob Brantley  
Santa Barbara  
California*

At the EAA Rocky Mountain Regional Fly-In and IAC Aerobatic Cup Contest, my bird took: Best Wood Aircraft, 2nd in Homebuilt and 3rd in Grand Champion. There were over 100 aircraft in the judging. I feel good about the judging since my aircraft does not have the striping, tail art, upholstery, one instrument (turn & bank is frozen) and the main wheel well doors are not installed.

Concerning the main wheel doors, unless there is some way, in the gear up position, to interlock the main wheel doors with the strut door, I will abandon the main wheel doors installation and simply fill the hole with a fiberglass or aluminum cover. This would make it like the open wheel version. As everyone who has examined this matter with me concluded, the problem with the main doors is the poor mechanical advantage derived from the very short lever arm attachment distance on the door. The door simply will not stay shut in flight, and we doubt stiffening the door will help.

At the fly-in, I flew several friends (payback for all their help over the years). We made some high-speed passes (190 kts indicated) to impress the crowd. I noted in those passes that in straight and level flight, both ailerons were deflected up approximately 1/2 inch from the trailing edge of

the wing tip. On the way home, I checked this at all speeds and it remained a constant 1/2 inch up on both. On the ground, I had one person hold one aileron 1/2 inch up, and I tried raising the other. I could raise it, but it took considerable force.

I discussed the matter with several EAA Tech Counselors, and received the following thoughts: Every wing will seek its natural flex as much as it can. In this case, the lift produced by the ailerons is why the deflection is up rather than down. There could be large forces on the control cables that are stretching the cables and thus the deflection. Check the cable tension. Make it according to the plans. Do not over-tension as this will place undue loads on pulleys, and could cause catastrophic system failure. Even though the cable tension is correct at any one time, being that the aircraft structure is wood, there is a natural temperature-caused expansion and/or contraction of the structural material that will affect the control cable tension. This varying cable tension will produce deflection no matter what we do.

I have not rechecked the tension at this writing, but it will be done very soon. Other than proper tension, I do not know what to do. Any thoughts on this would be appreciated.

*Richard Clements  
Lakewood  
Colorado*

*I've never seen ailerons floating up like this on a Falco, neither on mine or any that I've flown. I called Steve Wilkinson and asked if he has seen this happen on his, and he says the ailerons are in the same position in the air as they are on the ground. It seems to me that something is wrong and needs to be identified and corrected. That sort of unwanted movement in the ailerons is not part of the design and could conceivably be dangerous. It's not a result of the pushrod and cable design of the plane, and there has to be something that's bending, flexing or stretching that should not. I urge you to find the problem and fix it. Something's definitely not right.—Alfred Scott*

I realize that your builder's newsletter is hardly the place to carry on an engineering discussion of antenna design performance, but there were a couple of things that brothers Kennedy and Butters said that just need an answer. Failing to answer then directly is tantamount to accepting, which I just can't professionally do.

Kennedy states that a radiating element is 377 ohms in free air. This is not true; 377 ohms is a theoretical number called the

"impedance of free space", whatever the hell that means. The impedance of a very thin quarter-wave dipole in free air is 72 ohms, and therefore a 1.4:1 mismatch to a 50-ohm line. However, by using the 1/2" wide tape and the "details" that I mentioned at the end of my original letter, we can quite easily match that 1.4 mismatch down to zero.

The graph shows the VSWR (or "mismatch" as I call it above) from 105 to 150 MHz. Since VSWR is a ratio, having a ratio of less than 1:1 is impossible. This graph goes to zero, a theoretical and practical impossibility.

The plot purports to show a flat matching curve from well below the aircraft band to well above the aircraft band. The bandwidth is somewhere around 35%, a very good match indeed. Not having the opportunity to play with one of these antennas, I can't vouch for the accuracy of the measurements, but I'm just suspicious by nature when most fairly simple designs not involving long quarter-wave matching sections and the like have a rough time making 20% bandwidth, not to mention 35%. And, most antennas using tuned quarter-wave elements have some sort of central 'dip' and then slowly rising edges. Like I said, this may truly be the graph, but I'd have to repeat the measurements on my antenna pattern range before I'll take them at face value.

VSWR is just one little part of the 'goodness' of an antenna. I've got a 50-ohm resistor in the lab that has a VSWR of 1:1 from DC to daylight, but it makes a rotten antenna. A curve of gain versus frequency would give me a comfort level I just don't have with VSWR as the only characteristic.

I don't take an antenna marketed as 'High Gain' as anything more than what the label says. There *was* the company making ham antennas called 'Hi-Gain' and they purposely misspelled their first name so there wouldn't be any confusion. Choosing an intentionally misleading name as 'high gain' for a product as a 'marketing differentiator' is just what it is—a marketing ploy.

"Giving away" a \$5 antenna is only making someone else pay for the 'gimmie'. Last I looked, \$5 would still buy a six-pack of Old Rammycackle.

I did *not* sing "God Bless America" as my closing at Oshkosh last year—I sang "Battle Hymn of the Republic"! Brother



### *New Hampshire can sleep soundly with Col. Devoe on the prowl.*

Scott may take exception to that as a damyankee marching song of the Civil War, which is was. Sorry, Alfred.

A minor point. I was accused of talking about 'aerials'. I haven't used that word since high school. Most of us call them 'antennas' unless we learned our English on the other side of the pond.

*Jim Weir  
RST Engineering  
Grass Valley  
California*

I'd like to let you know that I have completed my purchase of Allan Hall's Falco and currently have it in Indiana where I reside during the school year. I will be taking it to

Florida to have the repair work done on the wings and fuselage. I will completely refinish the plane and plan to do so in fiberglass, as opposed to the Stits cloth it currently is in.

The plane now has over 50 hours, of which I have 23. I find it a pleasure to fly. I contracted with a CFR to fly with me from San Diego to Indiana, some 11 air-hours over two days. I do look forward to getting all things in order so that I can get basic aero instruction in the plane, and I will equip it for IFR flight. Thank you for all prior considerations. Perhaps I'll have it completed and can attend the November Falco gig.

*Martin Pierce  
Muncie  
Indiana*