Falco Builders Letter

Italian corruption: Nustrini gear doors to go with the Nustrini canopy.

First Flight:
Art Witzke

One problem with Richard Clements's scheme of painting your completion number—in his case, 50 for the 50th Sequoia Falco finished—is people like Art Witzke, whose Falco flew for the first time on December 8, 1994, and who just *now* has gotten around to telling anyone about it! Art may also have walked away with the longest completion time record at 13 years.

Art Witzke hails from Northville, Michigan. That's a Detroit suburb and, not surprisingly, he worked in the automotive field, as an engineering manager in engines at Ford Motor Company, handling the design and development of engines through all of the phases. He retired about 14 years ago, at a time when computers and electronics were just coming along. Art was strictly a slide-rule type, so he got out "just in time".

During WWII, Art started out as an engineering maintenance officer trained at Yale, and then when the B-29's came along, he transferred to the big bombers where he worked as a flight engineering instructor. That was the first plane that required a separate flight engineer to monitor and control the engines. In all, he put in about 800 hours in B-29s, training flight engineers over flights that would sometimes last 10-15 hours at 25,000 feet. It all required constant calculations for the power setting for various altitudes and weights, something that today would all be done by a microprocessor.

Art has always been a hobby-builder of things from an early age, and built model airplanes as a kid. So when he retired, he started right in on the Falco and worked at a leisurely pace. Art built all of the wood components but purchased most of the other kits.

The Falco has a 160 hp I0-320-B1A engine and constant-speed propeller, along with a Sky-Tec starter and Pelican alternator. Equipment includes an autopilot, Terra nav-com, loran and transponder. The Nustrini canopy is raised by 1 1/2" and Art installed a vertical extension of the diagonal frame No. 6 which seals against the canopy.

N41854 weighed in at 1,290 lbs empty, which is exactly the same as Dick Reichenbach's, which is based 100 miles north in Bay City.

When it came time for the first flight, Art enlisted the assistance of a friend who is into competition in a Yak. The initial flights were uneventful, and they've taken the Falco through all of its paces including some rather strenuous aerobatics including wingovers, aileron rolls, barrel rolls, hammerheads, spins, Immelmans, loops, Cuban eights, reverse Cuban eights, competition turns, and split-S's.

The Falco flew well from the beginning, and with a trim tab on the aileron and rudder to correct some very minor out-of-rig problems, the plane now flies hands off. Art says the handling is very nice. "I thought it would be lighter on the controls. I didn't find it that touchy." And aerobatics are "almost effortless."

The Falco now has about 50 hours on it, and Art has been getting more comfortable with the plane. He says his biggest problem is letting it down without overspeeding. "Things happen a bit too fast for me, so I get the gear down out of the pattern. To let down, I put the prop in max rpm and throttle back to 15 inches manifold pressure to use the prop as a brake."

In This Issue:

When he was building the plane, for reasons that I've never understood, Art decided to build the wheel well doors in the same manner as he'd seen them in early photos of Luciano Nustrini's Falco. The doors were attached to the gear leg and there is a fairly complicated lever linkage required. This is the way the very first Falcos were built, and this method was abandoned in favor of the wheel well door design that we now use. In fact, Nustrini's Falco now uses this same design. The nose gear door is hinged on the engine mount and actuated by an arm that's attached to the nose gear trunnion.

I never knew why the first method was abandoned, but maybe Art Witzke has rediscovered the reason. Mechanically, the landing gear doors work fine, and they produce a lot of drag when the gear is down. However, Art says "I can't say the wheel covers do anything for me. I did the initial flights without them, and surprisingly, I couldn't find that much difference in speed when I put them back on. Of course, I didn't do a calibrated run, so I don't have exact numbers."

The Falco cruises typically at 160-170 knots indicated at typical altitudes, which is "fast enough for me".

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

Art installed a Huntington lift reserve indicator, a rather rare device that he read about in *The Aviation Consumer* some years ago. This device is somewhat related to an airspeed indicator, but it measures differential air pressure from a probe that's installed under the right wing. You adjust it by changing the angle of the probe. I remember from reading the article that the inventor had a difficult time explaining the device in terms that others could understand, but it tells you how close you are to a stall. Art says the device works well in his Falco, and he's surprised at how little lift reserve you have immediately after takeoff.

One curious problem that Art reports is that the polyethylene Poly-Flo tubing in the pitot-static system has broken twice. In each case, it broke in the center of a large radius in the tubing leading to the pitot pressure switch. He said the tubing was cracked right in two, like a broken piece of glass. It makes no sense to him at all. The only explanation I can think of is that the length of tubing might have a harmonic frequency that sets up a vibration mode.

Other problems include a gear-down microswitch that was inoperative and problems with the Terra radios that have gone back to the factory 4 times. Most recently Art's biggest problem is a medical one, and he's currently waiting on getting his aviation medical back after some problems with blood pressure that came up when he went in for some oral surgery. Art says he's never had a problem before, but thinks perhaps the worry about the surgery brought it on. They gave him some medication for it, and this automatically voided his medical. So right now Art is waiting while doctors trade letters and clear things up.

The Falco is painted all white with gray striping. Art used an automotive paint, PPG acrylic urethane, because it holds up well and has a good finish, but he wasn't able to get a completely dust-free or bug-free painting environment. The nice thing about this paint is that you can sand and buff out any imperfections.

Art Witzke learned to fly about 30 years ago and over the years has owned a Cessna 150 and then a Beech Musketeer, which he sold when he got the Falco in the air. The Falco is based at the Howell, Michigan, airport. Stop by if you're in the area.

—Alfred Scott

Replacing—and Improving—Your Falco's Vacuum Pump

by Stephan Wilkinson

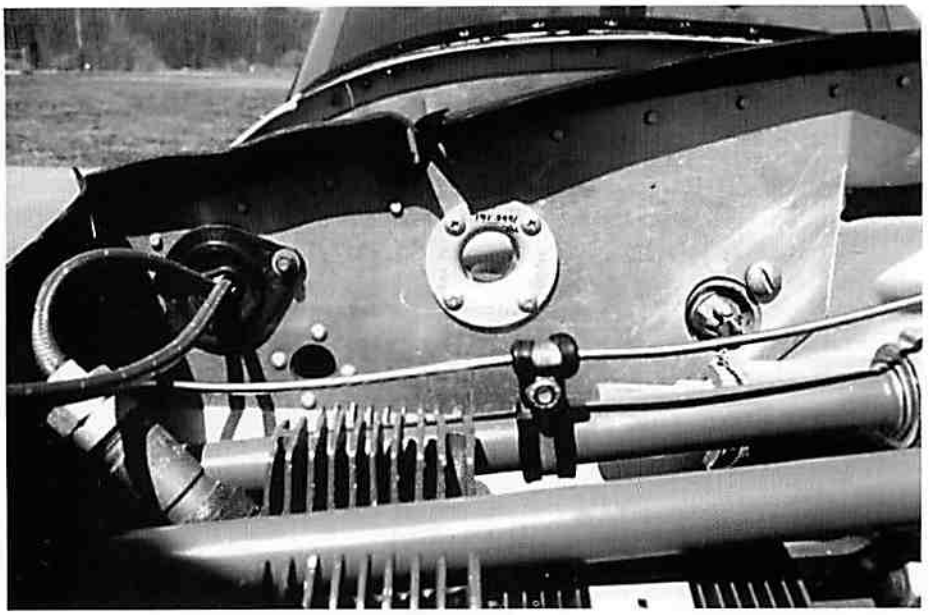
Death, taxes and vacuum-pump failures: three certainties. You'll be replacing your Falco's Airborne dry pump any day now. As we all know, these puppies wear out in anything from 10 to an absolute maximum of 900 or 1,000 hours, with the median being about 400 hours if you take reasonable care of the pump. (Which means bagging it when you wash down the engine, replacing the Garlock oil seal whenever it begins to leak, changing both the regulator and system filter when you do your annual, not using Teflon tape or sealants on any of the pipe joints in the system, and the like.)

Mine failed at 330 hours, though because I have an alternate-vacuum-source shuttle valve, it didn't cause any difficulties. I was returning from an appointment in Washington, VFR at 9,500, when I noticed that the peanut vacuum gauge was indicating suction of only about 2.5 pounds. When I checked it by throttling back (thus temporarily creating considerable manifold vacuum), the gauge went back into the green—about 5.5 psi. Obviously, the shuttle valve in the engine compartment had defaulted to the stronger of my Falco's two vacuum sources, which at that moment happened to be the intake manifold rather than the pump.

If you want one of the shuttle valves, Alfred Scott is your man. Sequoia can get them special order for you, and they're identical to the valves that are at the heart of the Precise Flight alternate-source system, with one difference: they aren't wired to turn on a "pump inop" light on the panel. You'll have to monitor the gauges, you poor thing.

Interestingly, the gyro instruments continued to run apparently normally even at 2.5 psi of vacuum; I'd wondered if they would quickly spool down, thus requiring a constant cruise/throttle-back/cruise routine in IFR conditions, to force the instruments to spin back up temporarily. It didn't seem to be the case.

Nevertheless, I canceled plans to take the Falco to Detroit several days later, where I was scheduled to undertake for a car magazine the onerous task of road-testing a Hummer—the civilian version of the Humvee military vehicle featured in Desert Storm. But that's another story.



The plastic flange is installed on the right baffle.

Anyway, I went via Uselessair, expecting bad weather on the day I was scheduled to return, and of course the weather was clear for days. (But what the hell, I got to go shopping for software in the mall at PIT....)

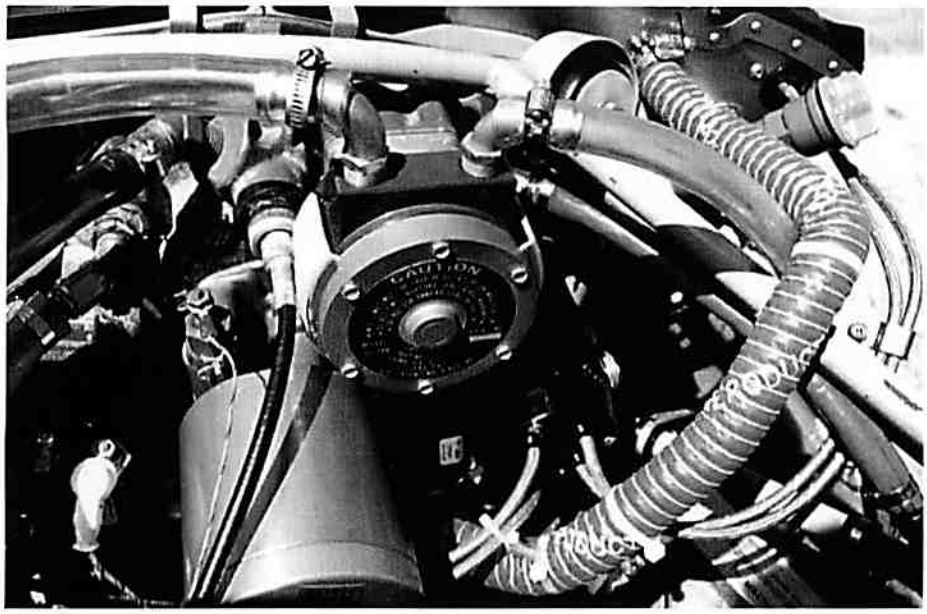
When I came home to replace 747SW's failing pump, I did two things: substituted a Sigma Tek 1U128-006 "Gold Label" pump for the Airborne 211CC that I was removing, and installed a Rapco pump cooling kit. You might want to consider doing the same. If nothing else, the Sigma Tek pump has a two-year/1,000-hour warranty (whichever comes first) versus the Airborne pump's one-year/700-hour guarantee. That doesn't mean it is a better pump, but it's a strong suggestion. And right now it costs less: I paid Chief Aircraft $350 for mine outright (new, of course); they didn't want a core exchange. Airborne pumps advertised by a variety of sources in *Trade-a-Plane* seem to be going for $430 to $450 including the core exchange. (In fact, I'll be selling my junk Airborne core and will thus lower the cost even further.)

The basic difference in the Sigma Tek pump is that the rotor is aluminum, while the Airborne's is made of the same graphite as are the blades. Also, the Sigma Tek pump can be spun in either direction, while the Airbornes are "handed"; they come as either CC (counterclockwise) models, as on the Falco's Lycomings, or the less common CWs (clockwise).

Rapco makes cooling kits for both Airborne and Sigma Tek pumps, and they consist simply of a plastic shroud that fits around the midsection of the pump, a length of 1" CAT tubing, and a flange that fits onto a hole that you cut in the righthand aft engine-cooling baffle. A blast of air is thus piped to the pump, supposedly lengthening its life expectancy.

Rapco claims that the prime cause of premature dry air pump failure is overheating, though I suspect the prime cause is contamination of the incoming air by dirt, oil, phlogiston, bad karma and the like. But cooling air can't hurt, and the FAA/PMA-approved kit only costs $44. Okay, it consists of nothing more than two pieces of plastic; a foot and a half of cheesy ducting that I wouldn't put on a Subaru, much less a Falco; and two plastic Ty-Raps that Rapco provides in place of the proper Breeze clamps. But that's the price of the validation, inspection, quality control and paperwork demanded by the FAA for STCing and "parts manufacturing authorization," and ultimately, it's a good thing.

Installation is simple. Cut a 1 1/8" hole in the baffle, machine-screw or rivet the plastic flange in place, snap the shroud onto the pump, run the hose between the two, and you're done. The only additional details are that the kit instructions require Dow RTV 736 high-temperature sealant or the equivalent between flange and baffle (which I did) and at each end of the hose (which I didn't, since I don't want my hose glued in place). I suspect the requirement to glue the hose in place—which indeed would be a requirement were an A&P to do an STCed installation—is simply the result of an overzealous FAA person covering every base before signing off on the STC, since I've never heard of CAT/SCAT/SCEET ducting being sealed to its flange in that manner no matter how critical it is.



Women, and Steve Wilkinson, accessorize.

They also need you to place enough RTV at the mating of the shroud and the pump to seal the plastic shroud in position. You're then supposed to go back into the engine compartment and seal up with RTV enough baffling leaks and inter-cylinder spaces to equal the area of the hole you've cut in the rear baffle. This is done on the assumption that you're depriving the engine of that much cooling-air flow, which is now going to the vacuum pump. That's fine for an STCed installation on a Cherokee, but most of us have already sealed up all those ugly leaks. If you haven't, here's a good excuse to do it.

Installing the kit on an IO-360 (and I assume an IO-320), you'll also have to file a notch in the thick plastic of the cooling shroud so that it fits between the pump body and the tachometer drive—a slight modification that is specified in the instructions, though they warn you not to file through the shroud. I used a Dremel tool and cutting burr to quickly make a relatively neat, 3/4"-long notch and checked the thickness of my cut by holding the shroud up to the sunlight until I could see the translucency where the plastic was getting thin.

Unfortunately, the Rapco kit supplies only 18" of cheap CAT tubing, and you'll need at least six inches more than that to reach from the engine-baffle flange down and around the right magneto and back up to the cooling shroud. But you're going to buy nice orange silicone SCAT or even double-wall SCEET anyway, right? And lose the Ty-Raps; real men use hose clamps.

If you're going to change your vacuum pump—whether to a Sigma Tek or the standard Airborne—what you actually need to order are not only the pump itself but a new vacuum-system filter and a new Garlock seal for where the pump shaft fits into the accessory case. (The warranties generally assume replacement of the filter and seal.) The filter element is $14.50, the Garlock is $5.15, and while you're at it, why not spring for a new air-regulator filter for $1.95?

The hardest part of replacing the Garlock is getting the old one out, which requires prying and levering with a hook-ended tool; an A&P who helped me eventually gave up and punched a small hole in the Garlock and inserted a sheetmetal screw, giving him something to get a grip on with pliers. The new seal is simply driven into place manually. You could get fancy and use a bench press or even heat the aluminum pad and freeze the Garlock, but my friend—who does this every day—simply used a mallet, a seal-driving tool (a large deep socket looked like it would work as well) and a careful eye as he tap-tap-tapped it into place.

Replacement of a vacuum pump is not rocket science, though some A&Ps—and the FARs, as far as production airplanes are concerned—will tell you that it's beyond the capability of ordinary pilots. They may be accustomed to the habits of one local EAAer friend of mine who, when I gave him a ride to his hangar so he could work on his junky little single-seat "aerobatic" (God help us) biplane, proceeded to remove the lovely three-blade Hoffmann composite propeller with a pipe wrench because he'd forgotten to bring along the proper-size socket.

Nevertheless, putting on a new vacuum pump requires an acceptable level of cleanliness, proper torquing, and one other thing: the ability to re-time the right magneto of your engine. There's virtually no way you'll loosen the lower right mounting nut without removing the mag, at which point the nut is totally accessible with an ordinary open-end wrench. Some A&Ps fabricate a special tool or loosen the nut by jimmying it with a long screwdriver and a mallet, but most admit that the damn nut is virtually inaccessible on the IO-360.

Warning! If you do pull the mag, immediately stuff a clean rag tightly into the substantial opening in the accessory case and leave it there. Many an unhappy mechanic has watched a nut or washer from the vacuum pump plummet into this maw just as surely as toast falls jam-side down, and then you're looking at pulling the entire accessory case to get it back out.

Timing a magneto is simple, if you have the proper timing light/buzzer unit ($59.95 in my Aircraft Spruce catalogue) and the instructions that come with it. Because our magnetos are so archaic, the procedure used is identical to the one your grandfather used on his Model T Ford. Literally. Even though he didn't have the FAA to help him.

The only other major point to consider when replacing a vacuum pump is to do some basic troubleshooting regarding the cause of the failure, especially if the pump's demise was particularly premature, rather than simply slapping a new pump in place and launching on your next trip. Is there residual contamination in the supply line? You need to clean it out. Is your filter so overloaded it's letting in twigs and pebbles? You need to replace it. Did oil contaminate the pump? You need to find and fix the source.

Finally, if you're replacing a counter-clockwise-rotating Airborne pump with a Sigma Tek that rotates either way, you should know which way counterclockwise is, since the Sigma Tek simply has arrows denoting rotation direction to indicate which of the two pipe-joint fittings atop the pump becomes the inlet and which the exhaust. The easy answer is that they're in the same positions as the ones you removed from the Airborne pump, but just so you know, all engine- and accessory-rotation directions are given as viewed from the cockpit, looking forward, not as seen from the prop looking aft.

The Antenna Wars

In our March issue, Jim Kennedy recommended the Model VHF-5T antenna available form Advanced Aircraft Electronics. His comments caught the watchful eye of Jim Weir, designer of the copper foil antennas that we use. Jim Weir offered the follow comments, which we forwarded to Jim Kennedy and Advanced Aircraft Electronics for their reply. All this stuff is over my head, so form your own opinion.—Alfred Scott

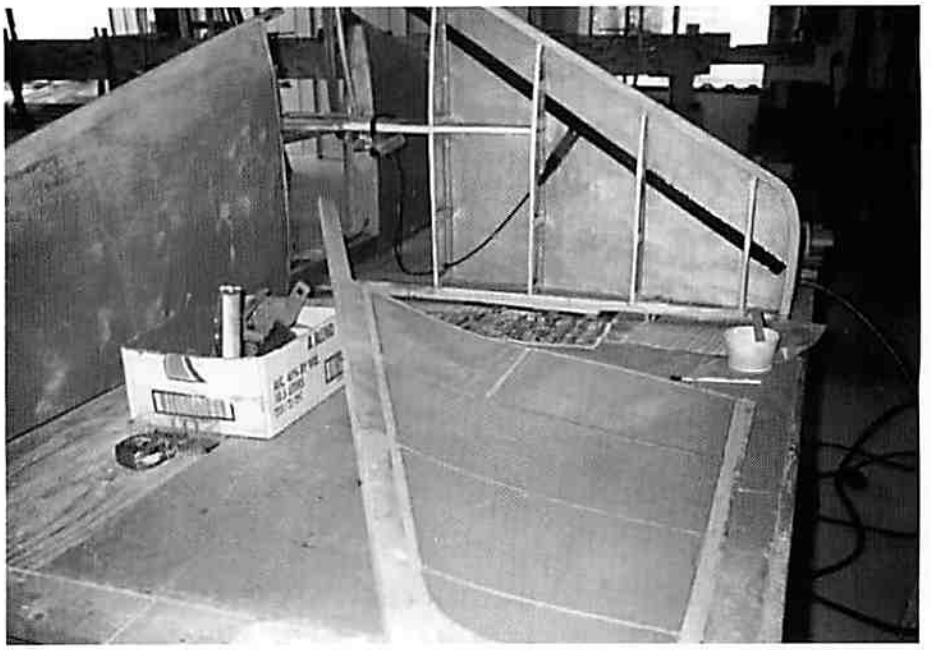
Jim Weir Thrusts

Recent issues of this newsletter make claims for "new design antennas" that have "high gain". As the inventor and proud papa of the 'copper foil' style of antenna, I feel obligated to comment.

Radio systems and gardens have a lot in common. If you only have so much watter, you can sprinkle the whole garden with an equal amount of water, or you can get a nozzle that will put all the water into one corner of the garden and let the rest of the garden go dry. There is no 'magic wand' that makes more water. You can spread it out equally or you can put it all into one corner. It isn't rocket science to do either one.

Jim Weir:
"The antenna has absolutely no idea whether it is being used for a transmitter or receiver."

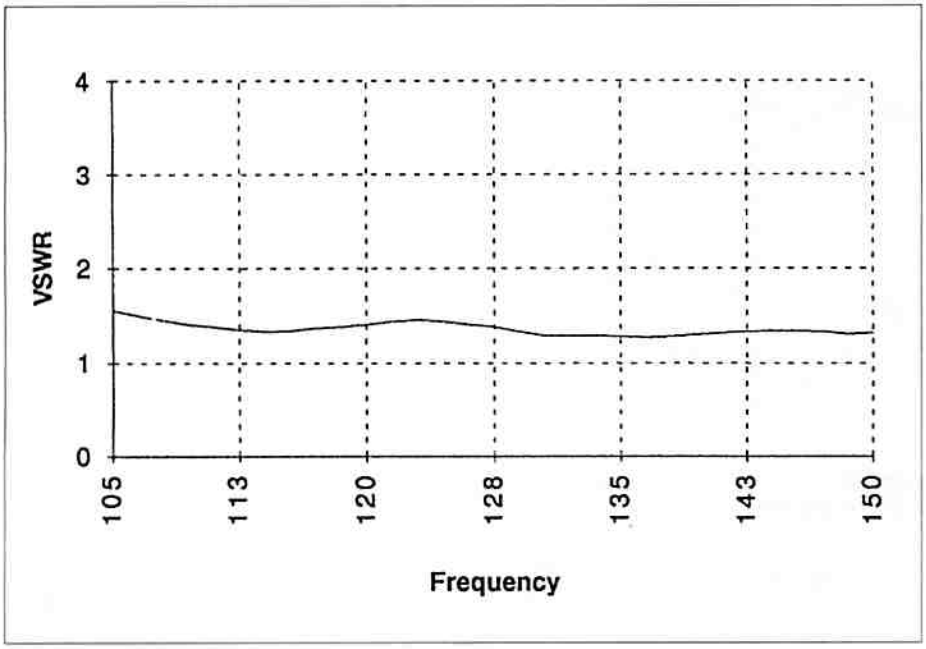
The same is true of radios. You only have so much radio capability (power for transmitters, sensitivity for receivers). You can cover the whole area in every direction from the airplane, or you can squirt it all in one direction. All "gain" means is that you are using a nozzle to squirt the radio one direction or the other. Unfortunately, airplane antennas are fixed in position. You can't "point" the nozzle of a gain antenna without pointing the airplane at the same time. If you could always presume that your intended station was in one direction, designing an antenna to squirt all your energy in that direction would be child's play. That isn't the real world. You never know what azimuth a ground station is going to be relative to your airplane's nose so your "gain" antenna can only point in one direction at a time.



Top: Jim Kennedy's antenna being installed.
Above: Like Jim Weir's antenna, Stephen Friend's Falco has absolutely no idea if it is being used as an airplane or a photography model.

To say that an antenna will perform okay for nav (or receive only) but not for comm transmitters reveals a deep misunderstanding of antenna fundamentals. All antennas from Marconi's acre-sized arrays to the little patch antennas on the back of your cellular phone are 'reciprocal'. That is, the antenna has absolutely no idea whether it is being used for a transmitter or receiver. If you can show me a passive antenna (one without internal transistors and such) that has the slightest difference between transmitting and receiving, I can guarantee you a Nobel prize in physics.

The author of the referenced column is correct—prefabricated antennas on fiberglass will crack when bent. That is why RST Engineering has always and continually advocated the use of thin copper tape that bends, folds, and generally maneuvers around surfaces. We also maintain that paying $150 for an antenna that does nothing more than the ones we sell for less than $5 a copy is wasting good money that you could spend on other neat goodies for your airplane. I once watched a tanker truck full



of gin pour its product into the bottling factory. First the truck disgorged half its load into the "red label" vat and then the second half into the "blue label" vat. When questioned, the truck driver just shrugged and said that some folks that paid double for the "blue label" swore the stuff tasted much, much better than the 'cheap stuff', even though it came from the same batch.

This is not so say that we don't have some new ideas that will make your foil antennas easier to install and perform just a bit better than the original designs of twenty years ago. After all, even Frati and LoPresti have come up with some new wrinkles in that time span. But like those honorable gentlemen, the basic design considerations of good airplanes and good antennas stand the test of time, and it is in the details that we advance the art.

Jim Weir
RST Engineering

Jim Kennedy Parries

Boy, taking on Jim Weir is like taking on God! I have sat through many of his sessions at Oshkosh and have the highest regard for his talent and contributions to avionics in sport aviation. I also agree with everything he said in his response, i.e. (1) dipole aerials are all unity gain and non-directional, and (2) transmit and receive are equally important.

However what he did not address was impedance matching the coax cable to the aerial (using his terms) so we don't have any restrictions in squirting the water (the signal) out the other end. Or delivering the water (receive the signal) over the entire wide aviation band.

The big question with the RST foil aerial is matching the 50 ohm coax cable to the 377 ohm radiating elements in free air. The ferrite rings around the coax cable out near the antenna act as chokes which absorbs the unradiated energy from reflecting the signal back to your radio. It makes the aerial very reasonable to make but not a very good match. But it works. This is probably why the term 'High Gain' was used by Advanced Aircraft. I would not use this term since only an active device has gain.

I am more convinced than ever that a manufactured aerial with precise length radials, balun coil, encapsulated and tested for impedance matching with a low vswr of 1:5 to 1 over the entire aircraft band is the best choice for the Falco. After all, we can't try it in the air until it's too late, and we can't change it easily. I have sold about 20 of these aerials and have about 10 flying, all with good results. I prefer the special-orders ones with the good quality RG58A/U coax cable encapsulated rather than a BNC connector you can't get to.

I notice the aerials are now being sold by Chief and Aircraft Spruce at a discount. I have arranged for a discount for Falco builders. The recommended VHF-5T with 20' cable potted is $129.00, while the standard VHF-5T is $119.00 ($149.00 list). Call 800-758-8632 and identify yourself as a Falco builder.

I don't think 3% of a radio cost is expensive. Matter of fact, I used one for nav also. We need to at least keep one good VOR ILS system up and running for a while. Yes, Jim, receive is important. Probably more so.

I have sent a copy of this to Bill Butters with Advanced Aircraft Electronics for his response.

Now, if I could only close by singing "God Bless America" as well as Jim Weir, I'd be a happy camper...

Jim Kennedy

Bill Butters Jousts

In the time that I've been a pilot, I've never seen a fellow pilot without a strong opinion on *any* subject (even subjects in which he has no first-hand information). Additionally, I never met a fellow engineer who didn't find fault with anything and offer he could do better. Combine these two, and offer a forum in which to express himself, and we have a newsletter editor's delight.

It's not our policy to criticize our fellow manufacturer's products. The consumer community will do a very objective evaluation of all the products on the market, and the worthwhile products will survive. It's curious that someone would imply that our antennas are just a repackaging of the infamous tinfoil product. If I could offer an airplane product for only $5, I'd just give it away as a premium along with the purchase of another item.

Actually, I spent a lot of time engineering this antenna design to provide the builder with one less detail which could slow down his project's progress. The VSWR for either our comm or nav is excellent, and it only requires the builder's decision to mount it vertical for comm or horizontal for nav. (Hand-helds mount it at 45° for a good operation with both functions.) That's the good news. The bad news is that this design can be mounted in so many locations on the airframe that there's an even chance that the operation could be either excellent or poor. That's why we send along a 12-page instruction booklet and willingly spend our nickle on the phone to assist anyone in their installation.

I have to take credit for the brand name "High Gain". This one thing seems to annoy the engineer purist who takes exception and then uses everyone's time to explain basic antenna fundamentals to those who will listen. I selected the name as a marketing differentiator rather than a technical descriptor. Even my suppliers have suggested that I change the name. One suggested "Black Beauty", but this may run afoul of some governmental or sociopolitical association. Perhaps I should have a name-the-antenna contest.

Bill Butters
Advanced Aircraft Electronics

The Glider

Part 12 of a Series

by Dr. Ing. Stelio Frati
translated by Maurizio Branzanti

Chapter 6
Applied Aerodynamics

30. Airfoils. Criteria for Choosing Them. Wing airfoils can be classified in three categories from the geometric point of view: thick airfoils with relative thickness greater than 15%, medium airfoils with relative thickness between 12% to 15%, and thin airfoils with relative thickness less then 12%.

When choosing an airfoil, we should not consider the aerodynamics characteristics alone. We also have to take into account the requirements of the construction.

In the case of gliders, the wing span is always considerable, thus the selection would be made from medium, or even thick, airfoils. It is important that the airfoil be of sufficient thickness so that the strength-to-weight ratio of the spar is not compromised—particularly at the point where the wing meets the fuselage.

The airfoil's thickness is therefore established by considering both the aerodynamics as well as the construction.

Among these, we particularly take into consideration the following:

1. Maximum value of the lift coefficient $C_{L\,max}$. This is the factor that directly influences the minimum velocity.

2. Maximum value of efficiency $E = C_L / C_d$. As we have previously seen, this is of utmost importance, especially for gliders.

3. Maximum value of the power factor. $C_L^{3/2} / C_d$ This index measures the quality of climb and the velocity of sink. The higher the value, the lower the power required to maintain flight. Therefore, the higher the value the lower the sink velocity V_y.

4. Minimum value of the moment's coefficient for zero lift C_{M0}. This factor is the index of stability of the airfoil, and it gives the movement of the center of pressure. If its value is negative, it means that the airfoil is stable.

It is not necessary to find an airfoil that simultaneously satisfies all these requirements, and some of them offset each other. For example, airfoils with a high value of $C_{L\,max}$ have generally a high value of C_{M0}, that is they have a considerable movement of the center of pressure.

Therefore to obtain the best compromise between the various characteristics we turn to a combination of different airfoils. The wing is seldom of constant airfoil, particularly in gliders. At the fuselage as we have seen, even for construction reasons, a thick airfoil with high lift will be convenient. At the tips, however, a thinner and more stable airfoil, with low drag and small pitching moment, will be necessary to reduce losses and increase stability and handling qualities.

Let's understand that, if there is doubt in selecting a single airfoil for the wing, the doubt will be greater when selecting more than one airfoil. For this reason it is not possible to tell which will be the best airfoil for a glider. To all these factors that may influence the selection, such as the particular type and use of a glider, we have to add the designer's own preferences.

As we saw in Chapter 1 when considering the characteristics of the various gliders, there is a great variety in the design of the wing airfoils. We go from the concave convex airfoil to the biconvex asymmetric airfoil for gliders with same architecture and same use. Until ten years ago the most common design were the concave convex airfoil, which presented optimum characteristics of efficiency and minimum sink speed, but lower horizontal speed and little longitudinal stability. On the contrary, today we see the use of airfoils with little curvature or even biconvex asymmetric. In concluding, we can say generally that thick, curved airfoils constant throughout the full wing span, are the most convenient for recreational gliders.

For training gliders, the curved airfoils but with varying extremities to the biconvex asymmetric or symmetric, are still preferred. For competition gliders, the preference goes to the semi-thick, and much faster, airfoils. For the tail section, there is not much doubt, since the biconvex symmetric design is always used with thicknesses ranging from 10% to 12%.

Construction Notes

Al Dubiak mentions that he came up with a novel and effective way to remove staples. He uses a soldering gun to heat the staples, which then come out easily. Al doesn't know why this works, but he thinks the heat melts the glue. What I'm wondering is what brought him to try it in the first place!

Larry Black reports that he developed a problem with the fuel pressure line. There is a 1/8" aluminum tube that goes from the injector spider to a Swagelok fitting on the baffling. The tubing broke inside the Swagelok fitting, which has two ferrules which squeeze down on the tubing. The tube broke between the two ferrules, however the tube did not pull out, but a small amount of fuel leaked out in a tiny spray.

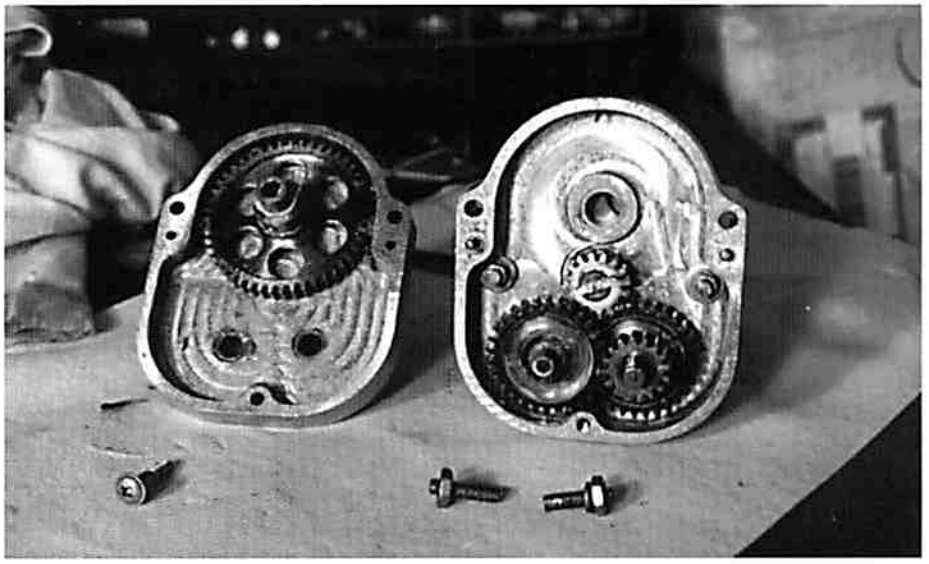
Larry is not sure why this happened. His Falco was one of those involved in the infamous mis-fueling fiasco on the West Coast of a couple years ago. As a result, he got a new engine, and Larry wonders if the problem was caused by the engine change. This is the first such incident like this, but it will give everyone something to watch out for.

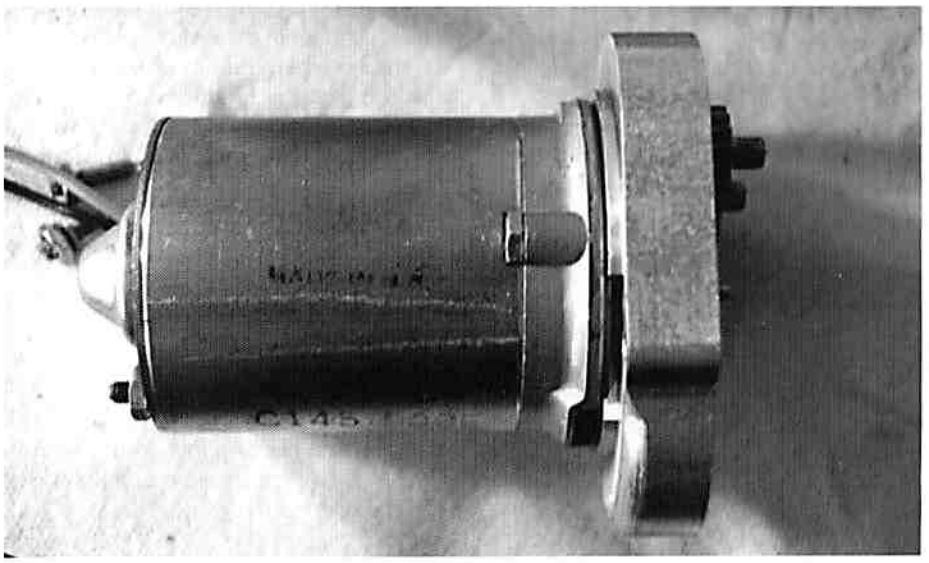
And here's another gosh-that's-never-happened-before incident. Jim Petty took off in his Falco and noticed that the gear did not come up. He popped the circuit breakers for the retraction system, cranked the gear fully down (which took a couple of turns) and landed. He put the airplane on jacks and selected gear up. When he did that, he heard a 'thunk' sound and also the sound of the motor running. He shut the system down quickly.

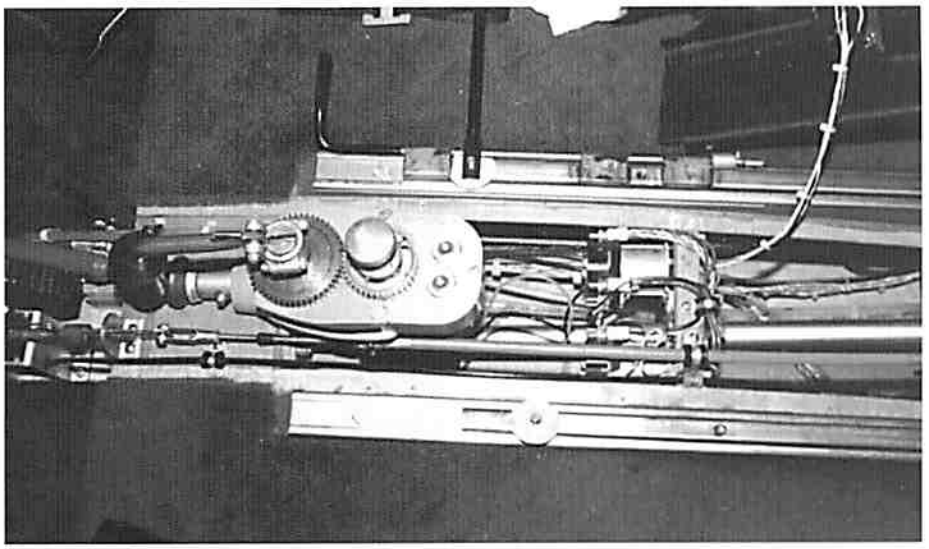
Jim discovered that the gear retraction motor had fallen off (that was the 'thunk' sound). As you may know, the motor is retained by two threaded steel studs which are installed in the cast end frame of the motor. The studs had stripped out of the casting. Why this happened is something he can only speculate about. Perhaps the nuts were over-tightened when the motor was installed.

Jim solved the problem by drilling out the stud holes and installing a couple of AN3 bolts with the bolt head on the lower side and with the bolt head keyed into the motor housing so it can't turn.

The motor has a pinion gear mounted on the shaft, and when the motor fell to the bottom of the plane, the motor continued to turn. There are a lot of wires and plumbing in the bottom of the plane, and Jim said the gear abraded some wires and a fuel line.







Jim Petty's landing gear motor.

In his case, it didn't cause any serious damage because the motor was running for only a short time. Jim points out that if this had happened in the air, the motor could have done a lot more damage. Chewing up wires and fuel lines is not a pleasant thought.

Jim suggest checking your motors for looseness at annual inspections and also that you could put a strap on the motor to restrain it in a situation like this. This could easily be done with a few nylon tywraps.

—Alfred Scott

Goings On at Sequoia Aircraft

I hope everyone has read the CAFE Foundation's report on the Falco in the June *Sport Aviation*, in which Larry Black's Falco was tested, measured, weighed and evaluated.

Overall, I thought it was an exceptional report, and it gives a very accurate description of the Falco. With any article like this, there are always little mistakes, and all of you will have caught the mis-description of the retraction system, but don't let this cloud your thinking.

I found the speed of the airplane to be pleasantly similar to those published for the original production Falcos. We've had Falcos come in with a wide range of speeds, some quite short of these numbers, and some well above them. I've also noticed that the Sequoia Falcos have a wide variation in the rate of roll, and I've yet to see one that will roll as fast at The Corporate Disgrace.

Larry's Falco came in for some criticism for the headroom, and it's worth noting that he uses some Subaru seat tracks which are a little taller than our seat tracks. On the other hand, it's not a substantial difference, and we all know the Falco does not have an abundance of headroom.

The thing that I found most interesting was the measurement of the stick forces, as shown in the chart of static longitudinal stability. I was intrigued to see that the stick forces level off below 110 mph and actually drop from 80 to 70 mph. I've always assumed that the stick forces were roughly linear, like most other airplanes.

We've all noted that the Falco is an airplane that you can drop the flaps and gear, fly the pattern and land without ever touching the trim. I've never understood why that was the case, and this chart of stick forces certainly explains the phenomenon. I don't understand why this happens, or if this is an intentional part of the design. I've sent a copy of the report to Mr. Frati, and I hope we can get his comments on the report.

I regret to report that Ray Purkiser died on May 18. Ray had surgery in December for a non-malignant brain tumor and his health declined steadily from that point because of complications. Our condolences to Sherry Purkiser and the other members of the Purkiser family. Ray's son, Cliff, will be selling the Falco this summer.

We're quite busy here with making wood parts. We have a large batch of tail group ribs under way now, and the wing spars are nearly done. This is a rather large undertaking, and I hope to have the spars out the door in a couple of weeks. Right now, all that's left is to machine the taper on the main spars and then glue the plywood on the aft face.

We are thinking about changing our advertisements to include new photos, so we're looking for some really terrific shots of the Falco. What we need are publication-quality photographs, preferably air-to-air shots.

If you've never done this type of photoshoot before, the most important thing is the lighting. All the best photographers will only shoot in the early morning or late afternoon when the sun is nearly on the horizon, and this produces a soft light on the plane. I don't know a single serious photographer who will shoot at any other time.

You'll need to use color transparency film, i.e. slides. Print film is useless for this type of work, and most of the professionals use Kodachrome 25, Kodachrome 64 or Fuji Velvia 50. You're best off using a fast 80 or 100mm lens for this type of work. So the critical elements are fast lens, slow film and soft light. The pros all use motor-drive cameras and burn up lots of film on this type of shoot figuring that the film is the cheapest part of the process.

Above all, though, be careful. Air-to-air photography is a dangerous activity, if you don't know how to fly formation.

—*Alfred Scott*

Susan's Corner

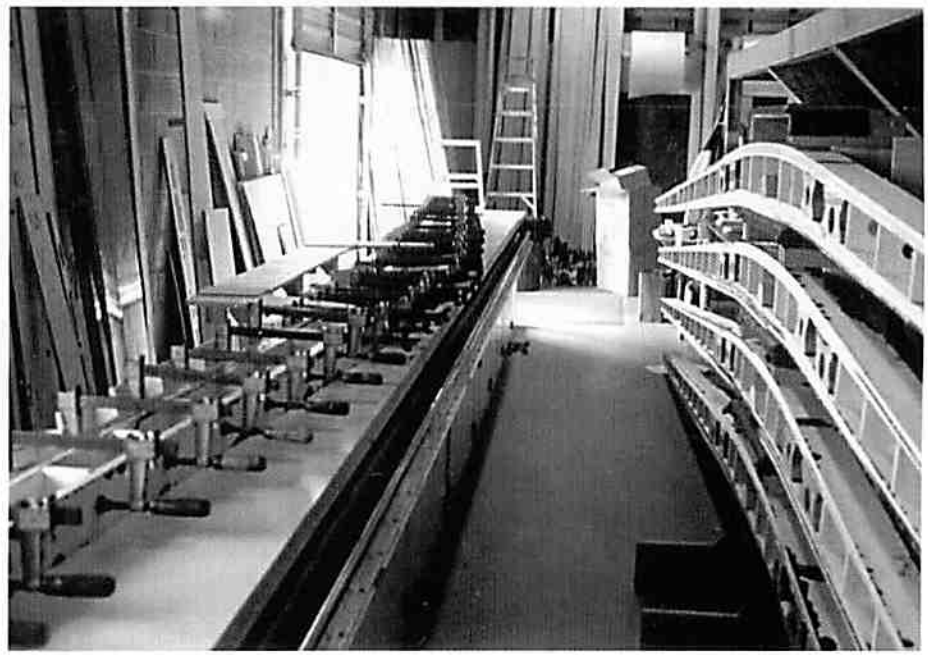
We have been hand-over-fist working on the next batch of main wing spars and still anticipate being able to begin shipping them out this month. What an exciting process this has been. There hasn't been a day go by that I haven't learned something new.

In fact, we've been so busy with the spars (and other things) that I've let the time slip away from me and I haven't done my homework for Oshkosh '96. If any of you want room reservations, please call me ASAP so I can let the Paper Valley Hotel know what the count is. So far, about 10 of our 20 rooms have been spoken for.

Glyn Russell has been nice enough to agree to handle the Builder Dinner in my absence this year, so please give him a call if you would like to attend. He can be reached at 205-416-7195, ext. 224.

I've found another "oops" in our inventory. The four Whelen utility lights that attach to the glare shield seem to be missing their brackets. One builder called and asked me for them and when I went and checked, lo and behold, they weren't even there. We're in the process of having the brackets made (mainly because the cost to get them from Whelen included a pint of blood and my first born son!), so please let me know if you need these brackets and screws and I'll send them out. I expect we'll have them in stock within just a couple of weeks.

For those of you who are going to Oshkosh, have a great time. Maybe we'll make it next year. But do drop us a note and tell us how it was.—*Susan Stinnett*



Sawdust

• So much for the Mustang mystique. The P-51 Mustang has always been the machine of dreams for pilots—gorgeous, fast and with a Merlin engine. Certainly anything that looks that good must fly most wonderfully, but pilots who have owned them often say that they fly like a Peterbilt with wings, that it takes both hands on the stick to pull through a loop and the most fun of flying one is taxiing out in front of your friends with the canopy open.

Now comes scientific proof. A 1991 study by John M. Ellis and Christopher A. Wheal published by the Society of Experimental Test Pilots compared four leading U.S. World War II fighters—the P-51D Mustang, P-47D Thunderbolt, F6F-5 Hellcat and FG-1D Corsair—concludes that the P-51 was the best of them, overall, but that it had such a high stick forces that it often required two hands and that it would snap and spin absolutely unpredictably, often so violently that it would jerk the stick from the pilot's hands.

Said the report, "[The P-51] scored high in performance, was well-suited to long-range escort missions and would do well intercepting non-maneuvering targets. However, its extraordinarily high stick forces, totally inadequate stall warning and vicious departures make it quite unsuited to the air combat maneuvering environment. It is a tribute to the adapability of the pilots who flew them that Mustangs scored so many kills against the opposition."

On the other hand, we read portions of this report to Parke Smith, who once flew Spitfires, Hurricanes and P-51s with the RAF. He said the report was the "biggest bunch of crap I've ever heard"... "complete garbage", etc. He agreed that the Mustang was not nearly as delightful and light on the controls as the Spitfire, but he thought it was as easy and maneuverable to fly as a CAP-10, which he flew for years.

• Media Watch. The *Air & Space* article on the Falco birthday party is now scheduled for the July/August issue. Watch the November issue of *Forbes FYI* for an article by Steve Wilkinson on building the Falco.

• If you're going to the Oshkosh show, be sure to take in the Falco Builders Dinner. This year it will be held on Sunday, August 4, at the Green Mill restaurant (formerly Martine's) at the Midway Motor Lodge at Appleton. That's the same spot we've held it for years. The bar opens at 7:30 and dinner will be at 8:00. As always, we need a head count for the restaurant, so please let Susan Stinnett at Sequoia know if you can come.

Top: The latest in high-tech lawnmowers allow you to fertilize and cut the grass in a single operation. Above: Herbert Müller of Passau, Germany, says the exhaust system of the Series IV Falco makes too much noise for the German authorities.

• Don't miss the Seventh Annual West Coast Falco Fly-In at Little River Airport in Mendocino, California, September 12-15. Pierre Wildman and Susann Flowers (the 'WildFlowers' now that they're married) are hosting the event. The weekend begins with a ride on the famous Skunk Train on Friday evening, and a banquet at the Ocean Club Restaurant at Hill House on Saturday evening.

• Falcos on the move. Charles Gutzman's Falco, sold to a pilot in England some years ago, has now been purchased by Eric Wierman and Thomas Buettgenbach in the Los Angeles area, so it's back in the states. And just as that Falco was leaving England, an Englishman purchased Bjoern Eriksen's Falco for $105,000.

Mailbox

Readling the CAFE Foundation results in June's *Sport Aviation* and the comment about exhaust smells reminded me to mention something. I have just completed our test schedule for C of A, and the first item on the list was to do a CO [carbon monoxide] test with approved instruments—actually I did it last but then you have previously noted that we do things a little differently in this hemisphere. It seems that I might be the first person here silly enough to actually do it!

The test involved taking readings at instrument and also head level with vents open and closed and in various flight regimes. Most were all right except for landing—gear down, idle power, vents closed. The meter shot up to 200 ppm (50 is max permissable) and by the end of the landing roll Annie and I both felt decidedly unwell. This hadn't been obvious before because I always have the vents open a little and crack the canopy while taxiing.

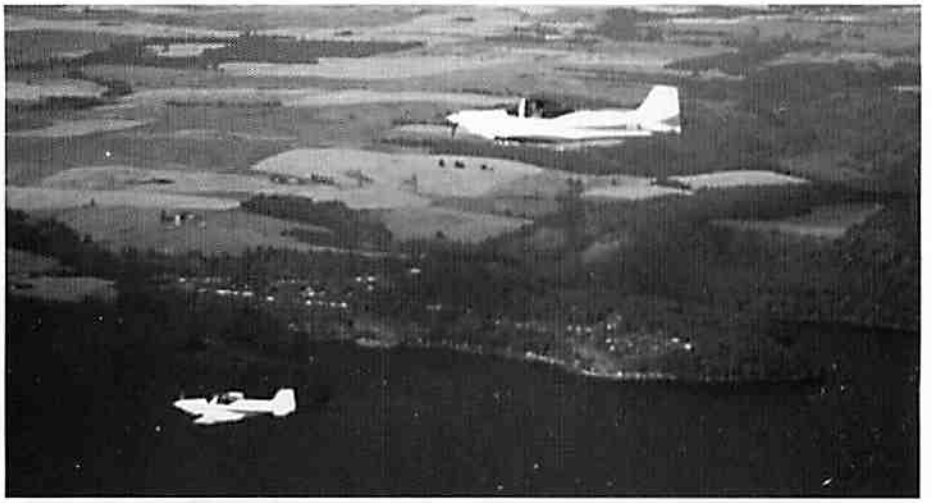
Until then I had left the cover off the landing gear gearbox—I think I liked the comfort of seeing the cogs go round. By installing the cover and putting a bit of foam in the tunnel around the nose gear shaft to stop gasses migrating forward and through the trim and parking brake slots, the CO levels are back to less than 50, though perhaps a 'Deadstop' on the panel might be an idea.

I thought the rate of climb and roll rates a little low in the CAFE test. I think this Falco would double those figures.

Stephen Friend
Breadalbane, NSW
Australia

I have noticed a slight exhaust smell on slow flight and landing in some Falcos, and I had never traced it down to the path that the fumes were taking to get into the cockpit. It's clear from this that the fumes are coming in through the wheel well, into the lower part of the fuselage via the landing gear screwjack opening, and then up into the cockpit. Stephen Friend's method of sealing things up make a lot of sense.

On the CAFE Foundation's tests, I'll mention that I've seen dramatically different rates of roll in Falcos. Al Aitken and I have measured the roll rate of The Corporate Disgrace at about 120 degrees a second to the left. That's a complete roll in three seconds. I've also flown in Falcos that took seven seconds to complete a roll. Stephen Friend's Falco has a 180 hp engine, and the rate of climb is dramatically higher with that engine.—Scoti



Top: McMurray and Benham Falcos at West Coast Fly-In, September 1995. Above: Jim Petty's Falco is now fully painted.

Re: Your ad in KITPLANES. Very good I remember when this new Italian plane was announced. Falco F.8L it was, so they said. Good looking, fast and above all fully aerobatic.

In mid-may 1959 it was, in Munich, capital of Bavaria. As for me, I just had been promoted Lieutenant, and for I had studied aerodynamics for two or so years in Torino, my command of Italian was not bad. On the other hand, the Falco's instructor pilot spoke absolutely no German at all. So it was my job to sit on this right side, to watch him and all his manoeuvres and to assist him in handling the wireless, for said Italian spoke no English, too. I still remember the plane's registration. It was I-RALA.

Well, minutes after I had clinbed in, we were airborne. Rate of climb was not actually breathtaking, but all the controls were obviously well-balanced, and the level of noise in the rather wide cabin was low. Not so low was the voice of Munich tower control when he has to tell Lima-Alpha a third time to change frequency to I forgot what channel. I tried to tune in with trembling hands, but after all I had to tell Munich control that frequency was not available on the plane's radio. The model somehow reminded me of Marconi's set of about 1908 vintage. As a result, Munich tower gave strictest order to land at once (!), but the Italian instructor pilot refused to understand, and did so with the broadest grin I had hitherto seen on a human being's face. After he had thus given proof to being third class as a radio operator and a linquist, he came to his real business: flying.

And he was quite a pilot. And it was quite a plane. All his aerobatics were perfect and wonderful, and all the plane's controls did need were just fingertips. Half an hour later and after we had crossed (unannounced, of course) the Austrian frontier, with one more grin and a gesture he said, "Su macchina, Teniente!"

The only not-so-good thing I remember was Falco F.8L's behavior when it came to crosswind landings. A real critter then, but otherwise a great plane.

Dipl. Ing. Rudolph Siegfried
Oberst i.G. (ret) LUFTWAFFE
Main, Germany