Falco Builders Letter

Hans Sonntag's Falco before the first flight in August.

The First Homebuilt Falco in Germany

by Hans Sonntag

I first saw a Falco when I was learning to fly in 1968 at Kassel, Germany. What a marvelous shape compared to most of the single-engine planes. Unfortunately the owner of this beauty was very toffee-nosed, and I couldn't persuade him to take me up for a few minutes, just to experience what it is like to be in a Stelio Frati designed plane.

But at least I knew that this plane had the approval of the German Federal Bureau of Aviation. This was quite important for the future possibility of owning a Falco. Some years later, when I was able to buy one, I learned that this plane was not available anymore in Europe. Again some years later, I spent a few days in San Francisco with a friend who is also interested in flying. By chance I opened one of his magazines and saw a tiny photograph with aligned airplanes which I liked from their silhouette. Below it I read: Send $12 to Sequoia Aircraft Corporation for more information. I did so and weeks later received a huge envelope with lots of information. I couldn't believe what I saw—it was all about my Falco.

With the idea that someone in Richmond could provide everybody with Falco spare parts we began looking for an old one or for a damaged Falco which could be rebuilt. We finally found one near Kassel, which our mechanic scorned when he looked at it—"It is a flying s—thouse", he said. This was the exact opposite of my feelings. I thought it was still in good shape. After the 5th takeoff, luckily *with* an experienced instructor, we realized something was wrong with the nose wheel, and we had to land with a retracted nose gear on a grass strip next to the runway. Both of us were unhurt.

In This Issue:

No problem with the damaged plane, spare parts are available in Richmond!

Wrong. This idea was a big mistake! The German 'FAA' permits only a replacement of spare parts from the original producer in an airplane licensed by German Federal Bureau of Aviation. My telephone bill went up to the sky because I phoned from Italy to the North Cape, from Spain to everywhere, to get the parts which had to be replaced. No way to get them. We even contacted Mr. Frati who provided us with a plan of the landing gear screwjacks, which was very generous.

Finally, with the agreement of the Federal Bureau of Aviation, a special maintenance company was authorized to make the parts, and the Falco could be repaired. I was very happy with it for a year and a half. But then I came back from a cross-country flight, and on extending the landing gear, I realized again that something was wrong with the nose gear. I told the controller about my problem and flew over the tower. The controller was the same one when we first landed the Falco on the grass strip with the landing gear problems. He said, "You have the same place to land as you did it the first time". So I did, and everything started all over again. After the Falco was repaired, I sold it because I thought two times were enough. I bought a Piper Arrow.

What a difference! It was really boring to fly. Something reminded me of Sequoia Aircraft Corporation, so I sold the Piper and changed all the money into U.S. dollars. The second step was to convince my brother-in-law to build an airplane with me. The third one was to convince my sister to stay a little bit away from our place (mostly the whole weekends), so that we could build our Falco peacefully and undisturbed.

Then I raised the question with the Federal Bureau of Aviation about the regulations to build a Falco. After getting this information, I ordered all the kits available, and we started to build the tail as recommended in the construction manual. In the meantime we also convinced an official inspector to fulfill the regulations and to look regularly after our work.

The first serious glitch happened when I told my brother-in-law not to install the ribs at the first station of the stabilizer. I lost, and he glued the ribs in place at the right position. When the tail group was assembled with the fuselage, he understood the problem, and he had to take them out again. But we learned the lesson, and we followed the steps proposed in the manual as much as we could.

Sometimes the ambition came through to not follow the construction manual, sometimes without punishment. For example, when we came to the aileron/flap assembly we built it in a vertical position without a jig. The aileron/flap spar was fixed with all hinges at the aft wing spar and the corresponding ribs were then glued in and aligned with the wing ribs.

But not everything went smoothly. We had big problems bending the plywood to the desired radius because approved birch plywood for airplanes which we get here has five plies—which can stay in water forever without soaking the three inner layers. You have to be very patient when bending it, otherwise it will crack. Another problem arose when we installed the brake lines. There was no way to get an aluminum tubing in inch-sizes to correspond with the fittings.

Often there are idioms in the manual which are hard to understand, for example, what does 'squirt' mean? My dictionary gives explanations which don't fit anything.

Also an unexpected trouble came up when a fire broke out in our first shop. All of the construction documents were burned up, but fortunately the tail section and all the other wooden parts were unaffected except the windshield, which was temporarily installed, and after the fire it was quite distorted. With the aid of an infrared heat lamp and a piece of shaped wood covered with felt, we managed to get it back in shape. Sequoia provided us with new plans and a construction manual.

Hans Sonntag (right) with expert from England.

The most inconvenient result of the fire was that we had to build a new shop, which we did on the same ground where an unused shed could be transformed into a workshop. But finally we made the Falco in three years and nine months time, and I am very proud to have kept on because the place where the Falco was built is far away from home. It is not much fun to drive 150 km every weekend. I am also proud to still own my ten fingers.

The 21st of November, 1994 was the last day in our shop. Part of the front of the shop had to be removed to get the plane out. The Falco was transported to Hannover Airport on a huge truck of a maintenance company. It was left in their "trouble corner". This was their name for a place in which they could work without being in a hurry. It should be renamed to "lucky or happy corner". The Falco was put together, and everything was inspected again. Finally when they finished, we got the required second expert opinion from our inspector to get a preliminary license from the Federal Bureau.

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Hans Sonntag at work. Dr. Sonntag is a professor of medicine at the University of Göttingen.

The remaining problem with the Falco is the noise pollution which has to be reduced to about 72 decibels to get it permanently licensed. This is the reason we installed a three-blade propeller and a IO-360-B1E with a restricted RPM to get the noise down. All this is not sufficient, but it seems possible to install very small mufflers in the exhaust system which fit inside the cowling.

On August 14, the Federal Bureau of Aviation gave the dearly desired "green light" which means a preliminary license, and the plane was first flown by Rolf Hankers, an experienced test pilot. Everybody comments on this event more or less emotionally, for instance "with an IO-360 you could get a piece of wood in the air, and it will fly" and other nonsense. But the best news came from Rolf, who was very happy with his first experience. He tested it for more than nine hours.

A few days later on August 20, it was the big day for me. I had my first instruction in my new Falco, and I tell you it was an indescribable feeling. I felt quite comfortable because Rolf was sitting next to me acting as co-pilot. This feeling changed suddenly when he got out and told me to fly the plane to Kassel Airport without him. So much the more as he told me before I should not fly the approach at very low speed, because below about 60 kts it turns the other way around (over the left wing) without saying a word. I have to confess the stall strips are not yet in place.

I am not going to tell you more about my incredible emotions during the flight to Kassel and from the following 27 hours of experience. It will be an incentive for all Falco builders to do some efforts to finish their plane too in less time to get their own sensations.

Coming back to the Falco, the color is papyrus white with stripes of gray and anthracite. The exterior is repeated in the inside, a gray carpet on the floor. The seats and side walls covered with alcantara, a very light leather-like synthetic material, also in gray and anthracite. In addition, it is equipped with a Century I, a King/Bendix transponder, two KX 155, hopefully very soon with a King GPS 35A, a Hoskins fuel totalizer, a four-cylinder EGT and an intercom. The empty weight with all this equipment is 587.23 kg (1294.63 lbs.), and the CG is between 1842 mm at takeoff and 1805 mm at landing.

What more should I say at the end of my report? To build your own Falco has something to do with masochism, but I certainly learned a lot about handicraft. I also learned to answer some questions posed from different people in different ways. Believe me, I don't want to miss one minute of this experience. □

Seduction, Number 50 and the 'M' Word

by Richard Clements

Oshkosh 1984. You sit in Dave Aronson's superb Falco and the thought is immediate. No need to look at Glasair or RV3 or Swearingen 300SX or Thorp T18 or... you are in the ultimate. The past and the future encased in a wooden entity of uncontrollable desire. You have been seduced, you must have it. Falco number 50's birth was simple—order the plans. Its nurturing of eleven years was not. This is a partial story of those eleven years.

Shortly after that memorable sit in Dave's bird, the plans arrived nice and snow-white in a round chipboard container. A study of them quickly revealed the ominous fact that a two-car garage was adequate but not optimum. As my wife was visiting family in France at the time, I took the opportunity to enlarge the garage without opposition. Airplane building began on 14 September 1984 in a heated and well equipped shop/garage. It flew eleven years later to the day—14 September 1995.

The tail spar construction was easy and everything proceeded nicely. Ego reigned. It was plainly evident the plane would be finished in a year or so. The euphoria soon ended. The ribs purchased from Francis Dahlman fell apart in my hands (glue joints separated). Now terror reigned. A newspaper headline, "Homebuilt airplane disintegrates in flight" flashed before my inward eye. The media loves that sort of thing. (As a matter of fact, the local TV Channel 7 interviewed me and my upside-down Falco, under construction, after a Sidewinder crashed, killing a father and son. They wanted to know if homebuilts were safe. Stupid question to ask a homebuilder.)

But, what was wrong with the rib glue joints? Was the dryness of Colorado air affecting the Aerolite which Francis used? Thankfully, a gentleman of Skybolt fame, Lamar Steen, who taught woodworking for thirty years in Denver schools advised me "Throw that #@!& Aerolite away. Use what I recommend for my Skybolt builders—Bondmaster M666". His background and his advice was well taken. Bondmaster M666 is a two-part epoxy manufactured by National Starch.

Yes, the people who make the starch in your shirts. The glue is unsurpassed in my opinion. A 1/4 inch gap will be structurally sound when glued *under water*! Like all epoxies, it is thermoplastic which means it begins to lose strength above 200° F. It is red in color which clearly shows joint seepage. If you don't see glue seeping out of a joint, better find out why as you have a starved joint. It sands easily without gumming sandpaper (Note: hardware store sandpaper is worthless. Buy several good sanding belts and disks, cut them into pieces and staple them to various sizes of wood blocks. They will last forever). M666 makes a perfect filet and wipes away with a wet cloth. It stays open for more time than you need. For example, the entire surface of a wing was skinned with one prepared piece of plywood by myself at a leisurable pace. Right on Lamar, throw that $#@& away and fly in peace.

There are as many opinions on sealing wood as there are kinds of wood. It seemed to me that if Varitane is good enough for a bowling alley, it should be good enough for a wood airplane. It is not, as it is too heavy. T88 epoxy is okay, but the West System is better. Do not thin epoxy because when the thinner evaporates it will make thousands of pin holes in the surface. Not good for water resistance. For a smooth and thin layer, seal with the epoxy as warm as possible and use a squeegee for spreading. Concerning wood rot, here are my thoughts. Rot occurs mostly where wood and metal are in contact. The reason is, the metal, being colder than the wood, creates condensation which is immediately absorbed by the less dense surrounding wood. This moisture is condensed back on the metal. A kind of pump evolves. Entrapped in this unending back and forth water flow are oxides, acids and whatnot from the metal, wood and atmosphere. This is what rots the wood. The obvious solution is to do what you can to eliminate the metal/wood contact.

Very early in the construction, differences with Sequoia began. The seduction became difficult. The first tryst was the glue as Alfred is steadfast in his Aerolite recommendation. But Aerolite was not for me after pieces fell apart in my hand. The next difference was control surfaces skinning, for at the time, the plans called for skinning with cloth. Now that seemed strange, as included in my plans, were control surfaces made of aluminum. So why not skin with 1.5mm plywood as its weight is not much more than finished cloth, and it certainly is stronger and easier to construct? A call to Francis Dahlman and then Alfred produced the response, "&%#@ Clements, build the airplane according to the plans". That did not happen as Falco #50's control surfaces are skinned in plywood. Curiously, about six months later, a revision to the plans arrived with control surfaces skinned in plywood.

From then on I went my way. For example: The fuselage was built first because it seemed undesirable to walk forever around the wing while building the fuselage. The fuselage jig required considerably more rigidity than what the plans called for. Very exact fuselage former spacing was provided for the wing connection points on the fuselage. The main wing spar from Trimcraft Aero (Francis Dahlman) had a 2° warp which provided many fun hours adjusting ribs to compensate for the warp. Etc. Etc. Etc. This was just the wood stage. Hold on for the systems.

Along the building years, I served three years as treasurer and one year as vice president of EAA Chapter 301, two years as president of a local civic association, six years as Republican Precinct Chairman, put two children through college and watched my printing business go south. Then in the of 1988 my wonderful wife, Catherine, became ill with carcinoid cancer of the liver. She was given five years to live. The Falco became of no importance and lay dormant.

The medical profession contends that we all have cancer in our bodies of some magnitude. The level of the magnitude determines the threat to life and when medicine begins to kill you. The immune system keeps most of us free from the threat magnitude, but when the system falters, cancer can flourish. So what does medicine do? Simple, it destroys the immune system with chemotherapy and radiation, and you die!

Never in the history of medicine has so toxic a therapy been embraced by so unknowing a populace. Even blood-letting for high blood pressure was more humane.

After Catherine endured two chemotherapy sessions she decided it was not in her interests to continue another dose of death. She faired well enough. Then Christmas 1991 we learned of a woman in Fort Collins, Colorado who's energy healing was impressive. We visited her the day after New Years. Our lives took a profound change on that day. In short, the work healed Catherine, and I spent three years learning it. The calling to understand something totally alien, totally contrary to my understanding of conventional science was irresistible (like being seduced by the Falco). There are indeed other forces available to us for healing. Today, I am one of 52 persons in the world certified to practice Quantum Energetic Technique. All of this took time from building N618RC and so did the "M" word.

Alfred is absolutely right about one thing—modifying the aircraft. It will perhaps add years to the construction time. But, nothing is absolute. On my first flight in a Falco with Karl Hansen, the gear level was raised, the ammeter pegged and the emergency gear crank was turned several times to secure the gear in the up position. The reverse took place upon landing. The same occurred on two other flights with other Falco builders. To me, this was not right. It was poor engineering. An emergency system should not be used as a normal system (like using a circuit breaker as a switch). Further, the forces applied by hand-cranking must surely over-stress the entire system and eventually cause failures. A modification (the "M" word) was mandatory.

Two Martin Marietta aeronautical engineers, one hydraulic engineer, one process control engineer, three EAA Technical Counselors, one FAA Certified Design Counselor, a retired Ball Brothers machinist and myself developed a hydraulic system for my aircraft. Now in my printing shop is an hydraulic paper cutter which in 30 years of moving a clamp and cutting blade up and down at least a thousand times a day never missed a beat. This was the system needed for the Falco. In essence, it was quite simple. We replaced the screwjacks with hydraulic pistons. The geometry remained the same. Hard points were machined for the piston medial anchors.

An emergency system was devised and installed. Over 100 gear extensions were done on jacks including failure of the pump and electrical failure. Not once did the system do anything other than what it is supposed to do—raise and lower the gear effortlessly both normally and under system failure conditions. The downlock is the hydraulic pressure which is little different than a screwjack downlock. Now any system can fail. So, the quest is to design one that has the least possibility to fail. In my mind, hydraulics is that system. The gear lever is raised or lowered, three green LEDs come on, and I fly the airplane unconcerned about the landing gear.

Well folks, this modification (or 'experiment') placed my aircraft, which I now call a Metafalco, in a Sequoia nonstandard classification. Any inquiry about the aircraft will be informed of the nonstandard classification. I cannot purchase anything for it from Sequoia Aircraft. But the Metafalco has numerous other "M's". There is the sacrilege of the pilot in command sitting on the right. I have my reasons for this change, and it sure makes Catherine look good sitting on the left.

The exhaust system has the anti-reversal system found in Kent Paser's book "Speed with Economy" which happily produces a nice fuel burn reduction. I recommend all of you read the book for ideas derived from 20 years of experimenting and racing. There are single exhaust pipes for each cylinder. A Toyota starter with bracket manufactured by a good friend, Ron Denight, here in Denver. A Honda alternator. Full electronic ignition to come. The removal of the gear extension system between the seats allowed for a hinged instrument panel and a sloping console from the floor to the instrument panel. On this console is the fuel selector and gauges, gear and parking brake and flap handles, elevator trim and all the radios.

Since the radios are on the console, the indentation in the forward fuel tank was removed. This increased the fuel capacity by one gallon. The instrument panel is now uncluttered and even has a glove box like a Ferrari should! The seats recline. The control stick is a "Hey, look at that stick!" You've got to see my rope trick for the tie downs. Etc. Etc. Etc. Somewhere along the way I received a letter suggesting that I was building an abortion. Correct me if I am wrong, but as I understand it, experimental is the first word in EAA. *Experiment. Surely everyone must understand that* without that word, the EAA would not exist and none of us would be involved in the wonderful arena of building Stelio's masterpiece.

The issue of modifications is not one that Sequoia will discuss with you for any length of time. They have their position which is undoubtedly well rooted within the liability assemblage and perhaps the desire to keep the fleet pure. Nevertheless, it would be beneficial to have definitive guidelines from Sequoia as to what modifications are acceptable and what are not. My input on this is nothing would be accepted that involves structural changes or safety of flight. Anything else, let's talk about it.

As in sealing wood, there are as many opinions about paint as there are paint colors. Out of frustration with the advice being given in this matter, I called the local Ferrari dealer. What paint do you use? PPG Acrylic Urethane. A magnificent color which can be seen for miles in all directions. Accentuating the color are appointments of Southwest/Indian motif.

Building is the issue and allure of the EAA and the aircraft, not the flying. Nothing less that a complete aerodynamic redesign can "M" the way the Falco flies—fast, smooth and responsive. In that regard, the Falco is near perfection. I had my kicks flying the F100, the F101, the F104, the F4, etc. Flying is not a biggie with me, but I treasure my Metafalco for the way it flies and its "M"s, for they are simply system modifications. This is not open rebellion or crass indifference or sour grapes. This is due thought for things that needed thought. Building the aircraft and making it better in my mind gave me great satisfaction. I suspect it is the same with all builders. See mine, and perhaps you will understand. Eleven years ago I sat in one and was seduced.

Fuel-Management Computers: Shadin vs Electronics International

by Stephan Wilkinson

This article originally appeared in The Aviation Consumer.

The least accurate instruments in a light-aircraft cockpit often are the fuel gauges. Usually activated by a corklike float on the end of a thin metal rod that rises and falls through an arc in response to the fuel level in the tank, the rod "wipes" across a potentiometer that sends a signal to the needle on a cockpit gauge. It invariably seems that fuel gauges display increasingly less accurate readings as the fuel level falls, until—in a typical lightplane—it isn't a bit unusual to have the last five gallons per tank "unreadable."

So pilots have for a long time known that their real fuel gauge is the clock: If you have 60 gallons of fuel aboard and know that your engine burns 12 gallons per hour, obviously you can fly for five hours, right? Well, sort of. For even a Patek Philippe Texas Timex makes an approximate fuel gauge, since you need to factor in how much extra fuel you burned during the climb, how much you'll save during the descent, and what the density altitude is doing to your fuel-burn rate.

Much of that is irrelevant if you fly an airplane fat with fuel and make it a point to never, ever land without an hour's worth of gas left. I, however, own an airplane that carries only 40 gallons of fuel and has a 180-horsepower engine that—depending on altitude, power setting, care in leaning and phases of the moon—can burn anywhere between 8.5 and 10.5 gallons per hour, giving me a theoretical absolute duration of somewhere between 3+50 and 4+40.

Both of my airplane's fuel gauges have little red stripes near the "E" symbol, and they mean, "if the needle is down here, we're off duty. Silence means empty." To complicate matters further, I should drain one of the two tanks completely if I want to achieve maximum range, and this means 20 minutes of staring at the fuel-pressure gauge waiting for the first hint of a fluctuation. Fuel-injected engines can occasionally be difficult to restart in flight, so the buck and surge of the tank running dry is always a thrill.

Shadin Microflo-L (Boeing P-26 model)

It also bears saying that running a tank dry in a twin can be even more disastrous. In one thoroughly recorded (on videotape) accident, a light twin with a high-time pilot at the controls underwent a fatal Vmc upset at low altitude when a tank ran dry and it took some 15 seconds for fuel pressure to be restored to the dead engine.

I sometimes fly 3.5-hour legs in my airplane, yet I have never enjoyed it. Particularly when I recently descended out of a nice tailwind and landed 50 miles short of my destination with both needles in the red and discovered to my dismay that I still had a dozen gallons aboard. (I felt a little better, however, when the FBO told me, "Yeah, some guy in a Navajo was also tryin' to stretch it there awhile ago, too. He landed about a quarter-mile short of the runway. Ran out of fuel.")

This is a long way of explaining why I've installed a modern, digital fuel-management system linked to the GPS receiver in my Falco and have discovered a superb instrument that is as vast a leap beyond conventional fuel gauges as loran and GPS are over the four-course range and airway beacons. As part of the process, I temporarily installed and compared two competitive light-aircraft fuel management systems that fit into 2.25-inch circular panel holes—The Shadin Microflo-L and the Electronics International FP-5L—and came up with some conclusions that surprised me.

A fuel-management system of the sort we're considering here is actually quite a simple setup. All of its wonderful functions—telling you how much fuel you'll have left when you reach your destination based on your current groundspeed, miles per gallon you're achieving at your current power setting and wind aloft, time to empty and so forth—are simply a result of the microprocessor magic to which we've all become accustomed. Like a Korean microwave oven, the unit could easily be loaded with far more functions than you'd ever want. Dollars per nautical mile? Percentage of fuel burned? Volume of fuel remaining in cubic inches? Fuel flow in pints per hour? Weight in ounces of fuel used? No problem.

Actually, that's not quite true: the 2.25-inch-diameter faces of both the Shadin Microflo-L and the Electronics International FP-5L are already crowded with switches, annunciators and readouts, and the fact that EI crams 11 separate functions into its tiny instrument is a laudable ergonomic achievement.

All such light-aircraft fuel-management systems get their basic input from a simple device called a fuel-flow transducer, and most of these transducers are made by Floscan. (Shadin now uses a different transducer for heavier equipment such as turbines, but its Miniflo and Microflo units intended for light singles and twins still use the Floscan.)

Twenty years ago, when I worked at an automotive magazine, we had as part of our performance-testing equipment a Floscan fuel-flow transducer identical to the one in my Falco today. We were then on the cutting edge of road-test technology; other buff books based their fuel-consumption calculations on the gallonage readings of the service-station fuel pump when they refueled a car after a test.

The Floscan transducer has been around for a long time, but it still serves its purpose. The unit is nothing more than a little paddlewheel through which the fuel flows, and the speed at which it spins is counted by a tiny photoelectric sensor. The more fuel flowing, the faster it spins; the faster it spins, the more "pulses"—revolutions—the lightbeam counts. The design shows extreme "reproducibility": If the vanes pulse 29,421 times per gallon today buzzing the sagebrush in Arizona, they'll pulse 29,421 times per gallon tomorrow at 18,000 feet over Alaska.

Fortunately for pilots and unfortunately for race-car teams, a transducer of this type requires steady-state flows for accuracy. Even a microprocessor has difficulty counting and averaging the wildly fluctuating

fuel flows present in an automobile's fuel system, when the throttle goes from wide-open to closed under braking to gassing for up- and down-shifts. Which is why you still see Formula 1 and Indy cars running out of gas on the last lap despite sophisticated track-to-pit telemetry systems.

However, it is possible for a well-designed lightplane unit to function based on the readings of a transducer in the fuel line even to a carburetor, where the flow is not as steady as a fuel-injection system's. (The indicator readout won't update as rapidly when throttle or mixture positions are varied, since the computer is averaging the readings, but the difference isn't great.) Electronics International's FP-5L offers numerous carbureted, STCed installations, though Shadin's Microflo-L has only some Lycomings.

Because there inevitably are tiny manufacturing variations, each fuel-flow transducer is calibrated individually at the factory by running a known amount of fuel through it, and the transducer is then assigned a "K factor"—K, unaccountably, for korrection. (Hey, whoever said these people can spell? Look what they do with the perfectly good word "bite.") The K factor is programmed into the computer/indicator, and the result should be nuts-on fuel-used accuracy.

The manufacturers—both Shadin and Electronics International—claim plus or minus two percent accuracy, which is the most the FAA will allow without demanding far more rigorous certification testing. Yet it's interesting how many owners of Shadin fuel-management systems complain of instrument inaccuracy ranging all the way up to 10-percent errors in fuel actually burned versus fuel-used figures computed by the Shadin.

Electronics International FP-5L (North American A-36 model, an early version of the P-51)

Shadin claims that this problem only occurs when their units are hooked to an airplane's existing fuel-flow transducer rather than installed as a system with a new transducer supplied by them, but that's not the only reason for inaccuracy. Several factors can affect the operation of a transducer, ranging from electrical noise (which may require shielding of the transducer output wire) to installation variations, which requires resetting of the

Fuel-flow transducer

Ideally, a fuel-flow transducer should be mounted upright, dead-level and stock-still, which is the position it was in when initially flow-checked and calibrated. But when it's inside an engine compartment rather than on a flow bench, such factors as vibration, heat or even a trapped microscopic air bubble can change the K factor. The new flow rate will be absolutely consistent, but minutely different.

The Shadin installation manual says nothing about how to reset the K factor, so some owners aren't even aware this is a possibility. In order to reset it, you need to collect your actual-versus-indicated fuel-burn figures, call the factory tech-support line, let them figure a new K factor and tell you how to reprogram the unit (which requires getting at a couple of thumbnail switches inside the box). Shadin frankly doesn't want the liability of a pilot being able to screw around with the K-factor setting, particularly in flight. Electronics International's FP-5L manual is very clear on how to refigure and reprogram the K factor and indeed assumes that such calibration will be part of the initial dial-it-in process.

Shadin Microflo-L

Shadin, for better or worse, is the industry standard. The small Minnesota company makes fuel-flow meters, totalizers and transducers; engine trend monitors; and fuel/air data computers for a wide variety of fixed-wing and helicopter piston- and turbine-engine aircraft. (They're also in the process of type-certificating a two-place, low-wing trainer based on an elderly European design.)

Recently, Shadin has had the lightplane fuel-management system market pretty much to themselves. At one time, Alcor, Hoskins and Silver also made simple fuel-management systems, but all are out of production. Hoskins continues to produce a fuel totalizer, the FT-101A, which displays either the amount of fuel used or the current fuel flow—a small fraction of the functions that the Shadin and EI units offer—but it is certificated only for Mooneys.

Shadin offers two versions of its basic system: the rectangular, 7.5-inch-deep Miniflo and the round, 4.25-inch-deep Microflo, which fits into a standard 2.25-inch small-instrument hole. Both provide fuel-used/fuel-remaining/fuel-flow data or, for about $200 more, can be interfaced as -L models with a variety of lorans and GPS receivers to also provide real-time endurance and nmpg functions. My choice was the Microflo-L, since installation simply meant substituting it for a G-meter that I never used anyway. (Large avionics houses sell the Microflo-L and transducer for about $1,500, $1,300 without loran/GPS functions. Installation and hoses are extra, of course.)

Some pilots will argue that the loran/GPS interface is a waste of money, for all you're doing is electronically melding two functions you already get for free: The plain Microflo will tell you time to empty, and your rnav unit will tell you time to destination. The $200 buys you an interface that does

the arithmetic—subtracts one from the other—for you. (That isn't entirely true in the case of the Microflo-L, which also offers a miles-per-gallon readout.)

Some also criticize the fact that though the readout is marked "fuel to destination," it may not be your destination at all; the unit is computing based on whatever waypoint, beacon, fix or airport you happen to have programmed into the rnav. If that's a fault, it exists equally in both the Shadin and EI units.

Behind the panel, the Microflo-L is in a standard stamped-aluminum instrument can 2.25 inches square. The face of the instrument is silk-screened in ordinary instrument-legend white-on-black, and has a relatively haphazard scattering of four microtoggle switches and one clunky four-position rotary wafer-switch knob (which seems a bit out of place on a box this expensive). The readout can be manually dimmed for night flight, but the unit will not interface with your aircraft's panel-dimming system.

Installation is relatively simple. Three wires come through the firewall from the fuel-flow transducer, two go to ship's power and ground, and one more brings serial data from the loran or GPS. All terminate at a standard nine-socket female computer microconnector that mates with pins on the back of the indicator can. For do-it-yourself installation—homebuilders or those of you who can get somebody to sign it off—the most you might need to do is have an avionics technician install the shielded wire from the radio rack; everything else is about as complex as wiring a dimmer into your dining room light switch.

In the case of my Falco, however, which carries a Northstar GPS 600, the Shadin installation also required intallation of an RS-232/422 serial-data converter box, roughly the size of a pack of cigarettes and costing an additional $175. (The Electronics International FP-5L already contains the interface circuitry.) Though only Northstar-equipped panels require the interface unit, don't assume compatability with your loran or GPS unit will be a simple plug-in job. It might be, but it might not, judging by the experience of owners queried on the CompuServe Avsig forum.

Also in my case—which could well have had more than a little to do with the fact that I'm not an avionics technican—installation of both the Shadin and EI units required several consultations with the factories before GPS data came through, even though achieving the basic transducer-generated figures was a piece of cake.

Both the Shadin and EI units call for wiring that at first glance seems a bit baffling to those of us only superficially familiar with digital "serial data." If you're computer-wise, you'll figure it out quickly, but the bottom line is that some of the wiring shown is irrelevant: it's only there to provide the capability for your loran/GPS unit to redundantly display the same fuel-to-destination and fuel-reserve information your fuel computer is already showing (assuming your loran or GPS has this capability). All you *really* need to hook up is the nav unit's signal-input wire and, if you're fussy, its shield.

Installing the transducer in the fuel line is equally simple, though you'll need to buy (or make up) a new line to accommodate the transducer, which takes up the equivalent of about two inches of hose. Shadin supplies the 800 number of Herber Aircraft Co., which will make up the proper Aeroquip replacement hoses and firesleeving to fit each STC, or will do it based on your measurements for an experimental installation.

Shadin uses a five-by-seven-dot matrix of tiny LEDs for its display, a presentation they chose largely in order to provide better visual continuity with modern avionics—particularly the newer GPSes. In fact, they offer the option of either yellow or red LEDs if you're into serious panel styling and are offended by a hodgepodge of colors and readouts.

One Shadin advantage that is immediately apparent is that the display presents two readouts at all times: gph at the left, and at the right, whatever optional readout is selected (fuel to destination, endurance time, etc.). The competing EI FP-5L unit displays only the single selected function.

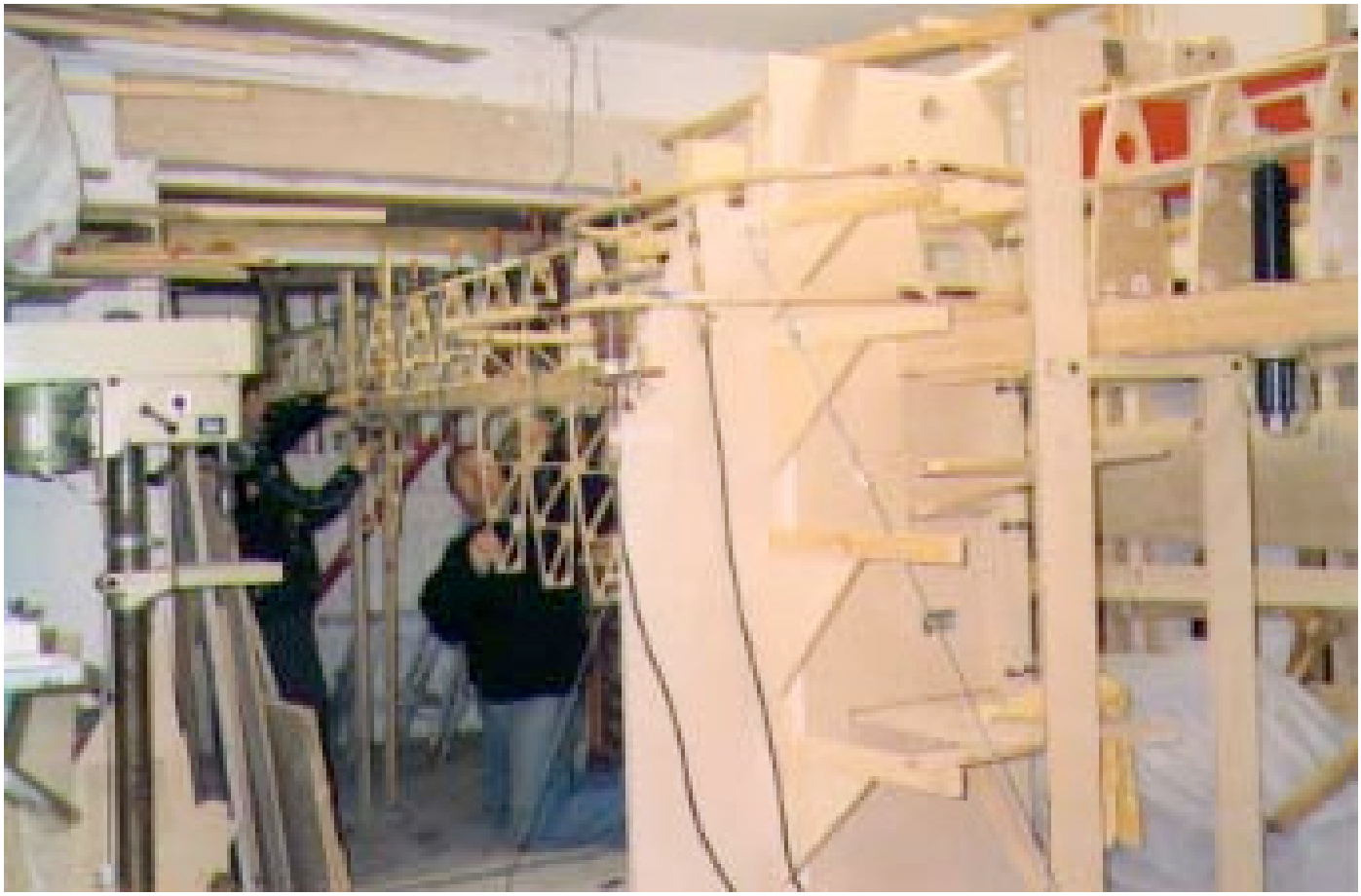
Another is that all fuel readouts—fuel used, fuel remaining, fuel to and at destination—are in gallons and tenths, whereas the Electronics International unit displays only gallons. Individual tenths might not matter, and indeed Electronics International argues that normal variations in topping-off techniques invalidate any attempt at such precision, but frankly, I find the preciseness reassuring even if it's of superficial importance.

The Microflo-L also has a rotary-switch position marked "nmpg"—nautical miles per gallon. Using groundspeed data from the loran or gps, it calculates your efficiency in terms of fuel burn (though not necessarily speed) depending on various altitudes and wind components. If you're like the neurosurgeon who jots down the mpg of his 12-cylinder BMW 750i at every gas station, you'll love it. If you're like many pilots, you'll two-block the throttle and choose your altitude based purely on groundspeed.

Electronics International FP-5L

The first thing you'll notice about the FP-5L is its apparently excellent—albeit admittedly external—quality and ergonomics. Unlike the Shadin unit, the behind-the-panel enclosure is an anodized, extruded-aluminum box, a miniature version of the sort you might see enclosing top-end hi-fi equipment. (The disadvantage is that it's a full 2.5 inches square rather than the Shadin's 2.25 inches, making the clearance between the adjacent instrument—in the case of my panel—so tight that I had to reroute one existing wire, small as it was.)

The face of the FP-5L has sharp, high-quality embossed legends and markings, and the layout is, at least to my eye, more appealing and logical than the Shadin's: a single left-or-right toggle switch selects functions in linear fashion, and the selected functions are indicated by a row of five green indicator lights. Two tiny pushbuttons are used both for programming (the once-in-awhile parameter programming as well as the constant fuel-added programming) and for selection of the loran/GPS functions, which consist of "fuel to destination" and "fuel reserve at destination." As is true of the Shadin, the unit considers the "destination" to be whatever fix happens to be selected on the loran/GPS at that moment.



When we last saw Stuart and Vivienne Gane, they were having a few problems in Belgium, but they're now back home and working on the Falco again. This is the scene in early December.

Many pilots seem to consider the EI's faceplate to be less professional in appearance than the Shadin's. To some, it seems an item more appropriate for a hot rod's dashboard than an aircraft instrument panel. "Looks like one of those fifty-cent stick-on clocks," said one, homing in on what to him was the cheap-appearing liquid-crystal display. Depends where you're coming from, I guess. A dot-matrix display like the Shadin unit's always puts me in mind of cheap home-computer printer output. Neither opinion is at all relevant, for both displays seem quite legible even in bright sunlight, though the Shadin's is harder to see through dark sunglasses. (The FP-5L's is backlit to increase daytime visibility.) EI likes the LCD readout because there are no filaments to fail—and, I'm sure, because it's cheap.

Electronics International claims that one of the FP-5L's strengths is the rapidity with which it updates its display. Move the mixture control, and you get a near-instant readout of the fuel flow in gph, rather than jiggling the mixture, waiting for the display to catch up, and then having to correct back to the flow number you wanted. (Once you've installed and become familar with one of these units, you'll find yourself straightaway setting mixture according to fuel flow—just as you would on a turbine aircraft—rather than referring to an EGT indicator. You'll learn that what you want is 10.1 gph at full throttle/2,400 rpm at your normal cruise altitude rather than going through the whole lean/peak/enrich/stabilize sequence.)

Unfortunately, I was unable to confirm this in the Falco because I'd installed the FP-5L so that it was reading fuel-flow information from the transducer I'd already permanantly installed for the Shadin Microflo-L unit. It was a transducer sized for a slower-acting computer, so the FP-5L had to be reprogrammed for a slower update rate of about once per second rather than the optimal 2.5 times per second.

However, this demonstrated another FP-5L characteristic: the manner in which it can be programmed for various criteria that you personally preselect, one of which is the update rate. You like your readouts in liters, Imperial gallons or pounds rather than plain old gallons, for example? Done and done: tell the unit what you wish, change it from day to day or according to the party in power at the moment, and that's the readout you'll get. The Shadin Microflo will read in any of a variety of modes, including pph for either jet fuel or avgas, but the selected criterion is factory preset, and you'll have to call the factory technical-support line to find out how to change it. (It's not hard, but nor is it spelled out in the ops manual. Shadin would rather that you didn't mess with the unit, particularly via the front panel in flight.)

There are also two programmable red annunciator lights, one for low fuel and the other for fuel pressure. The "low fuel" light can be programmed to blink first when you reach a fuel level that you have determined is the lowest you want to go before considering landing at the next reasonable opportunity—say an hour's fuel if you're cautious—or simply when you want to switch tanks. (Pressing any button or moving the step-switch cancels that blinking.)

You can also program that light to blink again at a For-God's-sake-put-'er-down point. This time, it will stop winking when you manipulate any button or switch, but the annunciator light will then continue to glow steady red. Program in your own limit number according to your bravery.

If the word "programming" brings to mind the horror of resetting the blinking "12:00...12:00...12:00" on your VCR, have

no fear. Setting and resetting the FP-5L consists of a simple sequence of switch- and button-pushes that are done with the engine off and the aircraft powered up, and it's simple enough that you could change the parameters from flight to flight if you wished (setting the low-fuel warning at 30 minutes for VFR and 45 for IFR, for example).

The second red annunciator light covers high and low fuel-pressure warnings, and can either be programmed for whatever limits you wish—say those in your engine-operating manual. Or, if it bothers you to have a red light come on at idle or during full-throttle takeoffs, the light can be totally disabled (though the fuel-pressure psi reading will still be indicated in the readout window). Still, a high-pressure light can warn of a clogged injector or other ailments. And if you set the low-pressure light to come on at a pressure high enough that it will detect the first fluctuation of a tank running dry, it can be a boon for people like me, who routinely empty a tank.

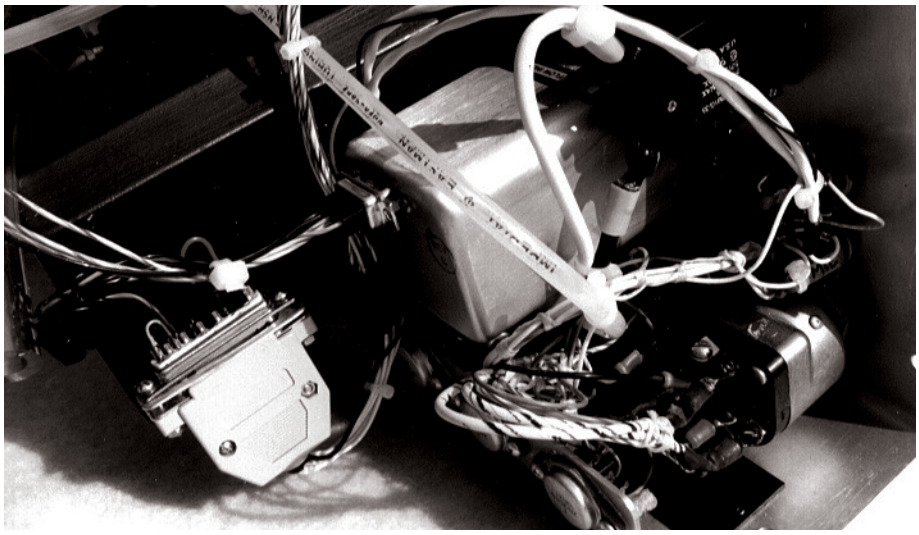
The fuel-pressure functions of the FP-5L are an option, and they require the installation of a four-wire pressure transducer, in addition to the normal fuel-flow transducer. This needs to be mounted on the end of an extension hose teed off the fuel line somewhere upstream of the fuel-flow transducer.

Why not just disconnect the existing fuel-pressure line leading to your cockpit fuel-pressure instrumentation and instead route it to the EI pressure transducer—which in fact is what I did for my temporary test, since the Falco is experimental? Because the EI unit is STCed only as a secondary source of fuel-pressure information and must be placarded, "Refer to original fuel flow/pressure instrumentation for primary information." (Shadin's Microflo can, in certain cases, replace original-equipment fuel-flow instrumentation, which is nice if you need that instrument hole for some other purpose.) Also, reading fuel pressure at the injector spider doesn't provide the fastest possible response rate, even if experimental status did provide me with this option.

Though the FP-5L provides fuel flow and fuel pressure information to the tenth of a gallon or psi (and time to empty in hours and minutes), fuel used/remaining is shown only in whole gallons. As noted earlier, I prefer to see tenths, though it can certainly be argued that if you're so low on fuel that pints matter, you're in excrement too deep for any instrument to help. It does require, however, that in order to reprogram the unit with a new K factor—which can be done in a matter of seconds, after you've done the arithmetic to show the difference between fuel actually burned and fuel the FP-5L as originally installed says you've burned—you need to flow perhaps 150 gallons through the instrument before making the correction. Since you can only adjust in increments of whole gallons, you need to have burned enough fuel that a few tenths one way or the other are immaterial.

One complaint, which may have something to do with the unit's gallonage coarseness: at times, readings sampled in flight will be off by a gallon here or there. For example, "fuel remaining" will show as 29 gallons, yet at the same time, the GPS-generated "fuel to destination" and "fuel reserve at destination" figures will show as 3 gallons and 27 gallons, obviously totaling 30 remaining rather than 29.

Another EI characteristic to be aware of: the loran/gps-generated data (fuel to destination and fuel reserve at destination) are available only as momentary readings, displayed for whatever length of time you hold in the relevant pushbutton. Whether this is a limitation depends on whether you happen to prefer that such a reading be on screen for extended periods of time (as is possible on the Shadin unit).



What is noteworthy, however, is that all this comes at two-thirds the price of the Shadin Microflo-L—about $1,000 complete, *including* the optional fuel-pressure transducer, from avionics discounters. (Subtract about $250 if you're willing to forego the GPS link, making the straight FP-5 quite a bargain.) Unlike Shadin, however, EI leaves it up to you to find a supplier for the proper-length hoses.

Bottom Line?

When I began this experiment, I bought from Shadin a Microflo-L and borrowed from Electronics International an FP-5L, figuring that the Shadin was the industry standard and the one I'd want to end up owning. Also, several friends owned Shadin Miniflos (the somewhat larger rectangular-head version) and were quite happy with them. By the end of the test, I realized the choice was not so simple, though I'm happy with the dual readouts and greater apparent preciseness of the Microflo-L. Here's the scorecard: compactness: Shadin slightly narrower, Electronics International slightly shorter; superficial quality and graphics: EI, in my opinion; TSOed: Shadin; STCs: EI (includes more carbureted engines); switchology and ergonomics: EI; number of functions: EI; visual warning functions: EI; miles-per-gallon information: Shadin; fuel-pressure information: EI; amount of information displayed: Shadin; display precision: Shadin (tenths of a gallon); display clarity in daylight: EI; installation manual clarity and completeness: EI; factory support and installation advice: my experience with both was outstanding, but several *Consumer* readers have complained that Shadin has been unresponsive to GPS-interface problems; update rate: EI, at least according to its own claims; ease of programming: EI; price: EI.

Who wins the contest frankly depends on the weight you give to various criteria—price, number of functions, TSOs, type and variety of readouts, etc. But however you look at it, a modern, compact fuel-management system is one of the most effective and economical additions you can make to your panel. If you're flying a highly stressed, turbocharged time bomb of an engine, you might prefer to devote the money and panel space to an engine analyzer/monitor of some sort. Frankly, however, I'm happier to be flying with a plain old EGT and a good "gas gauge" for the first time in my lightplane life. □

Heroes

by Robert Cumberford

This article first appeared in the December 1995 issue of Automobile *magazine.*

One compensation for lost youth is that, if you live long enough, you might be fortunate enough to meet some of your personal heroes. Yes, designers have heroes, too, just like regular people. I have been particularly lucky in meeting many of mine, because circumstances allowed me to start encountering some of them when I was quite young. I was still a teenager when I shook the hand of Battista "Pinin" Farina, as I was when I went to work for Harley Earl at General Motors. I was even younger when I met Laurence Pomeroy, the great British engineer/writer whose books on Grand Prix cars are worth their weight in precious metal these days.

Pomeroy introduced me to Mike Hawthorn, Britain's first World Champion racing driver, at Sebring in 1954. "Oh, Mike. I'd like you to meet my young American friend," he said, leading me up to a seated figure perched on the back bumper of a rental Ford. As we got closer, we saw that the white-haired Hawthorn was rather occupied, drinking from one Coke bottle as he relieved himself into another. "Right. Just a moment. Here, hold this," he said, as he thrust one of the bottles at me. A true gentleman, our Mike. It was the cold one.

Over the years I've met a dozen Indy 500 winners, heroes all, from Ralph DePalma (who came to our L.A. high school with his nephew Pete DePaolo to preach safe driving) to Rick Mears, and almost as many Formula 1 champions. I have talked with Jimmy Doolittle and Douglas Bader, had dinners with Marcello Gandini and Giorgetto Giugiaro, lunches with Franco Scaglione and Nuccio Bertone, and talks with other greats, near-greats, and will-be-greats in the worlds of design and vehicular derring-do. Memorable events, all of them. But none more so than meeting Dottore-Ingegnere Stelio Frati this past summer.

Frati is a designer, of course, an airplane designer from Italy, a country that makes very few airplanes of any kind, but one with an extraordinarily rich aeronautical heritage all the same. To put Frati into an automotive perspective, he is an engineering genius whose airplanes embody vastly superior handling characteristics in the way Colin Chapman's Lotus cars did, along with the charisma of Ferraris. They're wonderfully light, too, but unlike Chapman's cars, Frati's airplanes don't break in extreme service. That would be reason enough for me to admire him greatly, but not to make him a personal hero. He is that because his airplanes are beautiful. He is a superb aesthetic designer, on a par with his countrymen Bertone and Farina.

Frati was at the Experimental Aircraft Association Fly-In at Oshkosh, Wisconsin, to help celebrate the fortieth anniversary of his Falco F.8L, an all-wood two-seat sport airplane the performance of which—for a given amount of power—has hardly been surpassed in the ensuing four decades. Frati speaks no English, although he understands it quite well. Like many northern Italians, he does speak French, giving us a way to communicate. He is a small, quiet man, a little shy, and extremely modest about his accomplishments.

They are considerable, because it is no small task to design, build, and certify an airplane, and he has twenty-seven of them now. Jumping through all the technical and bureaucratic hoops erected by various governments to assure that objects passing over our heads won't fall on us is a daunting task for big companies working with dozens of engineers. Frati, working with just one other engineer and two draftsmen, recently certified four distinct versions of his F.22 airframe in less than four years.

It was evident that Signor Frati was much bemused by the sight of eighteen or twenty of his complex and exacting Falcos sitting on the ramp at Oshkosh. When he was first approached by laid-back Virginian and former Marine Alfred Scott with the idea of letting American enthusiasts build Falcos in their basements and garages, he dismissed the idea out of hand. "Impossible," he told his longtime assistant, Carla Bielli. "The Falco is too complicated." So Signora Bielli did what she apparently often does: She ignored Frati's protests, said, "Why not?" to Scott, and persuaded Frati to sign the contract that Scott quickly sent back.

I've known about the Falco for all of its forty years. Designed for GT racing, it seemed such a perfect sculptural object in 1955 that anyone who likes airplanes even a little has to love it a lot; it is at once delicate and immensely strong. Made entirely of thin laminates and shaped bits of wood ("God's own composite," the late Frank Costin, creator of voluptuous early Lotus sports car bodies and the wood-chassis Marcos cars, called it), the Falcos at Oshkosh looked to have been carved from Carrara marble, so perfect were their shiny white surfaces.

Those individually built airplanes say a great deal about Americans. It doesn't matter how hard a task may be: If they are doing it because they *want* to, they'll do it right. Europeans may appreciate good *things*, but they don't often possess the *means* to do things our middle-class people consider perfectly normal, like building an airplane at home. We may worry about taxes, the deficit, and our economic futures, but we are rich by world standards and so can afford to tackle projects that would indeed be impossible for Europeans, if only on financial grounds.

Industrially, all developed countries are about on par. Consider a couple of bad productions cars, the Chevrolet Vega and the Fiat Strada. They were both unreliable junk when they left their respective factories and deteriorated at similar rates from there. Individually, there are big differences: Think about the Kurtis or A.J. Watson Indy cars that ran the Race for Two Worlds at Monza in the Fifties, compared with the Ferraris and Maseratis that ran against them. The American cars were of such perfect craftsmanship that Europeans could hardly believe they were meant to be driven. The Ferraris' engines were of course well finished, as always, but the bodywork was lumpy, bumpy, and badly painted. As always.

Even though his own workers are no slouches, I am reasonably certain that the good Dott.-Ing. Frati has never seen any of his designs as well executed as those made by American craftsmen. A General Avia F.22 is probably better than a Beechcraft for workmanship, but mechanical objects created by people working for themselves in this country, whether homebuilt airplanes or street rods or customized trucks on lowriders, are the finest machines I have ever seen in craft and finish. I can—and often do—quarrel with the design objectives, but I admire inordinately the driven perfectionisn that leads to flawless execution. And when that perfectionism is directed toward a design as worthy as the Frati Falco, I am delighted.

And I am grateful for the person who made it all possible: the creator. Without the intelligence and imagination of a good designer, a craftsman's skill is wasted. Willie Nelson's heroes have always been cowboys. Most of mine are designers. □

Building an SF.260

by Stephan Wilkinson

Last week, the Falco was running so well that it gave me no opportunities to tinker, so I took some time off from N747SW and built an SF.260. Hate to be without a project, you know.

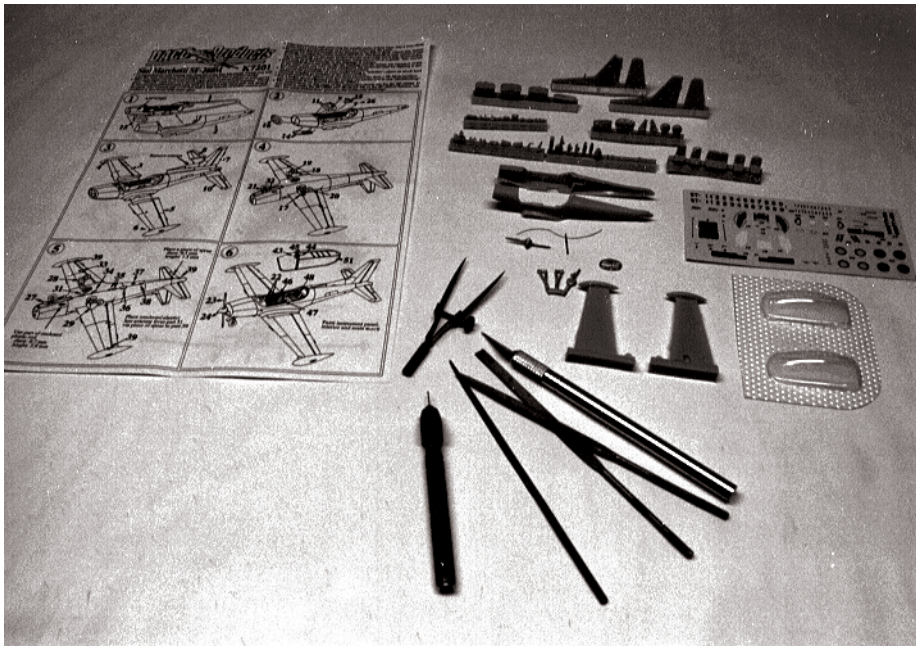
Okay, okay, this SIAI-Marchetti was all of four inches long and was made of delicately detailed resin castings instead of aluminum, but that also makes it small enough to grace my turbocharged wife's desk at *Ladies' Home Journal Magazine*, where it arouses endless shock, confusion, perhaps even penis envy.

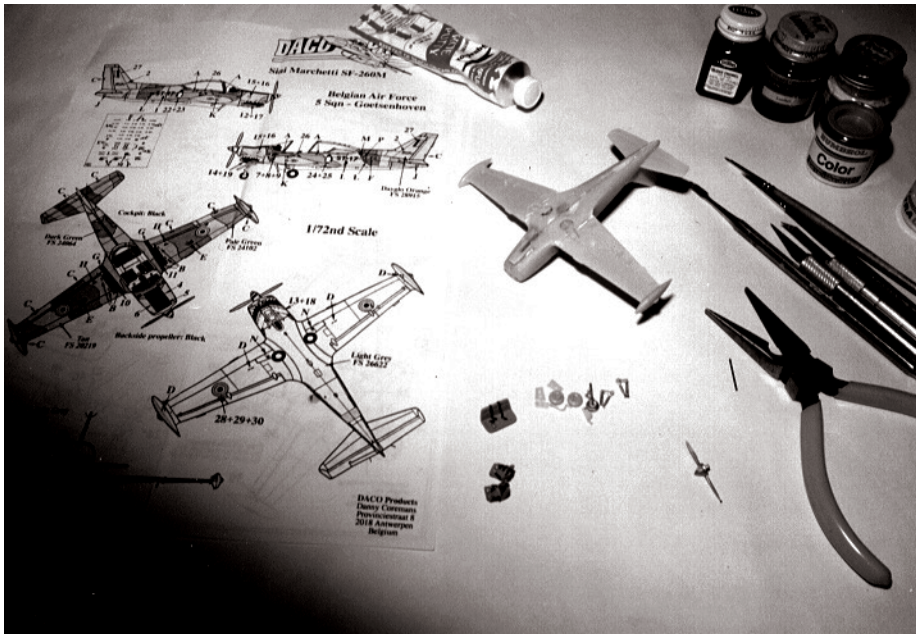
I should back up and explain that in the last year or so, I have become fascinated by the irredeemably dorky hobby of fine-scale modeling. I have turned into a basement nerd, building an increasingly complex series of scale model-airplane kits in both 1:48 and 1:72 scale in the workshop once reserved for full-size Falco pieces. (Plus the occasional unusual car—the most recent one a jewel of a resin model of the maroon eight-cylinder Duesenberg that won the Indy 500 in 1924.)

For those of you who still think of 'scale models' as plastic kits pasted together with Testor's cement, brush-painted with hobby-store enamel to cover up all the wet-glue fingerprints and then plastered with decals, you need to know that *serious* modelers build stuff of achingly fine detail—no seams, no joints, no gluelines—airbrushed to a fare-thee-well, and that many of them make their own decals to reproduce a specific airplane. Some even make their own *kits*.

It's called scratch-building, and my friend Mike Jerram, the English aviation writer and photographer, is a master at it. Jerram, truly a modeling crazy, once admitted to me that he also owns over 800 airplane scale-model kits that he has yet to build. His wife refers to them as the world's most expensive styrofoam attic insulation, and he reckons that he probably has spent as much money on his hobby as I have on the Falco.

When I recently reminded Jerram of this, he wrote back, "You think *that's* a lot? I recently picked up a catalogue for the late Jim Wood's private collection of unbuilt kits. Jim was a Vietnam veteran RF-101 Voodoo recon pilot who went to work for Pan Am flying 727s out of Berlin, then got grounded because of a heart problem and settled in Oxfordshire, where he collected kits. He died a couple of years ago, and his widow has decided to sell off his collection of 6,000-*plus* kits."





Well, it's nice to know that Real Men also get seriously involved with model airplanes too.... Jerram also pointed out that he had just sold nearly half of his own 800 unbuilt kits, but had then converted the considerable profit into the purchase of a smaller number of considerably more expensive and more arcane kits. (Expensive? At a recent modeling convention in England, Jerram told me he saw a small, crude, 1950s Revell kit of a United Airlines DC-6 offered for about $600.)

I'm slowly working my way toward that level (scratch-building, not the owning of 6,000 unbuilt kits), and I have graduated from plastic kits to the rarer forms of scale modeling using resin, metal and vacuform pieces. To explain: There are some superb plastic kits in your local hobby shop, many of them from the Far East dead-accurately detailing an airplane's every rivet, instrument-panel dial, vent, antenna and inspection plate. But in order to produce and market such a kit, the manufacturer needs to design and build enormously expensive hard tooling.

As a result, the big manufacturers can't take the risk of molding millions of examples of a plastic model nobody wants. A Fairey Flycatcher, say, or a Curtiss Condor. A Cherokee Six, a Piper Apache, even a SIAI-Marchetti SF.260. Hence, the popular plastic kits virtually all recreate the warbird favorites—Bf-109s, Tomcats, F-16s, Mustangs, Zeros and the like. All

of them are models that a million kids would—and do—buy.

To model the really interesting stuff, such as Westland Wyverns, Ryan Fireballs, rare piston-engine airliners, Chance-Vought Flying Flapjacks, Grumman Bearcats, Waco biplanes, Nooruyn Norsemen and the like, you have to buy resin or vacuform kits. These kits are issued, often in limited editions, by cottage-industry craftsmen, not by the Revells, Monograms, Hasegawas and Tamiyas of the world.

These guys basically make an original model, in pieces—often they simply carve it out of hardwood—and then make female fiberglass molds of those pieces and use them to individually hand-cast hard-resin components that become the kit.

You'd be amazed at the detail they can reproduce. The SF.260 kit that I built, for example—the final product of which is big enough to fit in the palm of my hand—has accurately curved classic Frati joysticks replete with handgrips; a complete power pedestal with throttle quadrant; full wheel-well detailing; brake calipers on the wheels; seats with full Pacific Scientific shoulder harness in place, casually tossed across the seat cushions; and a full and accurate instrument panel. I don't know how they do it.

Vacuform kits are somewhat different, and vastly less detailed. The idea is that you, the model-builder, use your ingenuity to add the detailing yourself. For vacuforms, the producer simply melts sheets of thin, soft styrofoam over half-molds of the requisite parts. The modeler cuts the styrofoam pieces out, melds the halves and goes on from there. To build an accurate, detailed vacuform kit is not easy, and serious vacuform modelers consider the kit itself to simply be a canvas upon which to create a model.

It's an interesting hobby, particularly for those Northeast winter months when there's less Falco-flying to do, and long evenings to be spent in the workshop while the ladies of the house watch *Seinfeld* and *Roseanne*, both of whom I detest. There are *incredibly* detailed plastic kits—$80 is not an unusual retail price for one—where the challenge is not creativity but simple dexterity, since every bullet in every gunbelt is already molded in sharp detail for you. And there are vacuformed styrene kits that provide me with little more than the basic shape of the airplane but that are ready to be detailed and refined to the limits of my ingenuity, using brass wire, rod and tubing as well as sheet styrene, clear plastic and even tiny individual moldings of parts that I make from a mixture of leftover West System resin and microballoons.

The SF.260 isn't a kit with which to start your modeling career, for resin is delicate, comparatively expensive and requires certain assembly techniques and tools that modelers inevitably gather as they progress through the Monogram and Revell kits to more 'adult toys' such as this one. But if you can't resist simply owning the kit to add to your Frati Collection, it's available through its designer, the Belgian modeler Danny Coremans, at DACO Products, Provinciestraat 8, 2018 Antwerp, Belgium. Danny takes Visa and Mastercard, and the price including air shipping comes to about $33. (Tell Danny I sent you.)

The kit has about 50 pieces, most of them resin and some of potmetal (nosebowl, gear legs, etc.) plus a canopy and a sheet of decals for a variety of Belgian Air Force squadrons that use SF.260s. I painted mine to roughly match N747SW's gray-and-red Italian *Aeronautica Militare* color scheme. Don't look too closely at the photos of the quasi-finished model: I rushed the final stages of construction in order to get it done in time for this Builder Letter, so the canopy and windshield are wrong, and I'm still awaiting some 1:72 Italian Air Force decals special-ordered through a modeler acquaintance in Italy.

But hey, that's the beauty of modeling: I'm going to make an epoxy master of the correct SF.260 canopy shape, remold myself a new canopy out of clear plastic sheeting, and do it over again. Just like a 1:1-scale Falco. □

Goings On at Sequoia Aircraft

by Alfred Scott

I've recently finished a complete revision of the Falco Construction Manual. It was a huge project that took months of work, and most of that time was taken up by reworking the illustrations. All of the illustrations are now an integral part of the manual, so I can now revise it with ease.

At this point, the content of the manual is essentially the same as the one you all have, but the graphics are much clearer, and there are a lot of formatting changes, so the manual looks better than ever. If you are currently in the process of building a Falco, then you should be working from the most recent manual and should request a copy. There won't be any charge for the new pages, but if you've finished the project, are presently inactive, or haven't yet started, then please don't be frivolous by requesting a copy you don't need at this time.

Over the next year, I will be making additional changes to the manual, adding new chapters and improving the current manual by adding to the existing chapters with greater information and graphics. The present manual is a dramatic improvement over what we've done in the past, and still just a taste of what is to come.

Things have been popping around here! In the last year, we've experienced a dramatic increase in sales, up in some cases to more than double last year's numbers. Susan Stinnett and Bill Motley have, at times, been barely able to keep up with the pace of things.

Susan and Bill are also fastidious neatniks, and they have been going over the warehouse and cleaning things up, organizing, relabeling, repackaging, painting, waxing and polishing everything in sight. It's a remarkable transformation, and our warehouse is starting to take on the appearance of a corporate dining room. That's all fine with me, because I'm one of those whose idea of cleaning up is to move things from one pile to another, and Lord knows we don't need another of my type around here!

On the kits, things are in relatively good order. We have the plywood now in hand for the next batch of spars. This is all cut up, and we have begun the tedious process of scarfing the pieces and all of the other steps that go into making a batch of spars. The spruce is now on order, and we'll get the spars under way once that comes in.

As you can see from Richard Clements' article, we have an unhappy camper as a result of our policy regarding modifications. Richard asks for an open discussion of this issue. I'm happy to oblige, and it's a good idea to remind everyone about our policy regarding modifications to the Falco design.

We understand that everyone does things a little differently, and it doesn't bother us when we see a builder changing the paint scheme or upholstery. But when the changes become substantial, involve major things, appear to have little engineering involved and bring a new element of risk and possible embarrassment to the Falco design, we no longer sell parts to the builder of that airplane. When we invoke this policy on modifications—as we have done in a number of instances—we keep it between the builder and ourselves. It is not our intent to embarrass anyone, and we hope that the builder will change his mind—as some have done.

As we all know, under the rules of the amateur-built category, you can go into your garage, build anything you like and go fly it. There's total freedom to design and build anything you want and, within reason, the FAA will let you go fly the contraption, if only to make a single pass down a runway to prove that you don't know beans about designing and building a plane.

On the other hand, airplanes have a number of inherent dangers associated with them, and it's difficult to design an airplane well, even if you're an experienced aeronautical engineer.

Among our builders, we have the full spectrum of personality types. At one end, there's the ultra-conservative who has the highest regard for the engineering that goes into a design like the Falco. At the other is the rebellious type with a theory on everything and a contempt for all things conventional. Everything is too expensive, the major aircraft companies are populated by idiots, and all the world is crazy except for me. They fall in love with their own ideas, and the airplane becomes a soapbox for 'see how clever I am' speeches.

It's easy to spot the extreme crazies out there, but a little knowledge is a dangerous thing. People who make changes often have great confidence in their designs and tend to not see the dangers. In the introduction to *Race Car Engineering and Mechanics*, Paul van Valkenburgh says "...the most humbling knowledge is that the more you learn about anything, the more you realize how little anyone knows for *sure*. If anyone tries to give the idea that he knows all the answers, you can be sure that he really doesn't even know the questions very well."

Let me tell you the story of my friend Walter Marsh, who lives here. Walter is easily one of the smartest people I know. He's got a degree in mechanical engineering and is a self-taught electrical engineer and programmer. He can program everything from an IBM System 32, to a PC, to a controller chip for embedded systems. There's hardly a mechanical device that Walter is not intimately familiar with.

Walter worked for years at Philip Morris, designing machines to make cigarettes, and then moved to another company that made street-sweeping machines. Walter can, and has, designed almost anything. He's eccentric, with few social graces, almost no patience for slow-witted people, and everyone who knows him regards him as a genius.

When Walter gets his mind on something, there's no stopping him, and he becomes so focused on his current project that he barely notices the rest of the world. When I designed Gonzales, our spar-milling machine, Walter wired it and hooked up all of the motor controls. It's all a big mystery to me, but routine stuff for Walter.

When this project was going on, Brenda Avery was sitting at her desk one day when Walter came to see me. She said it was the most amazing sight. Looking for all the world like a poorly dressed, white-male Whoopi Goldberg, Walter sort of fell through the door and stumbled headlong into my office with an arm-load of wires—right through Brenda's office and by her desk. "He didn't even *see* me!" she said. "He wasn't being impolite not speaking to me—I didn't even exist."

You get the picture of what this guy is like? Well, some years ago, Walter and a couple of friends built a two-place Quickie. As they were working on the plane, Walter developed a contempt for the design of the airplane. Much of the systems design was left to their imagination in the first place. He designed a dual-bus electrical system with redundant 14-volt systems that were joined in series for a 24-volt starting cycle—something like that. It was very sophisticated, and also heavy, which rendered the Q-II effectively into a single-place machine. Walter was at home with such things as levers, pulleys, control systems and electrical circuitry.

But it's also remarkable how blind he was

to obvious things. They got an experienced Q-II pilot to do the first flight, and the airplane was so badly out of rig that it required full right aileron to keep it level. They only learned about this *after* getting it airborne, and the pilot was able to turn in one direction only, completed a quick circuit and landed. Then Walter proposed twiddling with the turnbuckles on the control cables to move one aileron up and the other down, to correct the rigging problem. I explained to him that this would simply move the position of the control stick, and it wouldn't do a thing to correct the problem.

So they heated the wing, twisted it into position and let it cool—aren't thermoplastic airplanes wonderful!—and then Walter was ready to take the plane up himself. He sat in my office one day as I explained to him that 95% of all accidents on first flights of homebuilt airplanes were related to problems with the fuel systems. I could tell that Walter was hearing the words, but not really taking it all in.

A week later, a much humbler Walter Marsh came to my office, sat down and said, "Tell me about fuel systems."

"What happened?" I asked.

Walter then explained that he had three complete engine stoppages on his first flight in the airplane. And with a VW engine, the propeller does not windmill. Walter had been able to get the engine running again with the starter, but it was a frightening experience.

We then went through the design of the fuel system. Like most people, Walter had heard that you should have a 'low point drain' and that the gascolator should be installed on the firewall. So he ran the fuel line through the firewall, located the gascolator down at the bottom of the firewall, right next to the exhaust pipe, and then back up to the engine.

The obvious problem was that the heat from the exhaust pipe was boiling the fuel, creating a vapor lock. It was an easy problem to diagnose and fix. (Even so, Walter continued to have so many problems with the engine quitting, that the plane is now permanently retired.)

I recite all this, not to embarrass Walter, but to demonstrate that even the brightest of people can make the most basic mistakes in a field that they don't completely comprehend. I've seen this same syndrome occur over and over, with the Falco and with many other airplanes.

There's a built-from-Falco-plans airplane in Canada that has 6:00x6 tires, hydraulic retraction system, Mazda engine and fixed-pitch prop that's ready for flight. People who have seen it say that it barely resembles a Falco and appears to have clipped wings. It's reported that on the attempted first flight the plane would not get off the ground and over-ran the end of the runway.

There's an all-metal Falco-like plane somewhere in Texas that was started by an eccentric lumber-mill owner in Alabama who thought the Falco should have been designed in aluminum, so he hired an engineer to crank out a set of drawings. The basic structure is done, but he's lost interest in the project and has sold it to an arrogant know-it-all homebuilder in Texas who told me with supreme confidence that the plane would easily handle a 300 hp engine—he could apparently tell that by simply looking at the design—but wanted our assistance in working out the retraction system mechanism. Fat chance.

We should remember that there are also a lot of lawyers out there and that we live in a litigious society. Because of this, all companies who offer kits are forced to have a policy regarding modifications. Without such a policy, you would have a free-for-all and the wild diversions in design would come back to haunt all of us over time. It's been my experience that the builders who engage in these modifications have little understanding of the legal consequences and the potential for destroying our company.

With the Christen Eagle, before you bought the kit, you had to agree in a written contract not to change the design in any way and that you would use the specified engine and propeller model number and no other. We have a policy as well, and we refuse to sell components to anyone who makes major modifications to the Falco. We're open to suggestions and changes, of course, but we would expect anyone changing the Falco design to put the proposed change through the normal process of engineering review and analysis. John Oliver has done this with the front fuel tank, as has Howard Benham on underwing tanks. We have no problem with either one of these, because they did the normal amount of engineering that any responsible company would do.

If you are going to have a policy, it should be applied uniformly. When we do this, we keep it between the builder and ourselves, and we don't want to embarrass anyone. Besides, it's a painful thing for everyone because I have always liked the people I've had to say 'no' to, and inevitably those people who fall below the line feel outraged and wronged. That's true of any policy, law or regulation. But for all the rest who follow the design, there's a benefit in having a common design and that we can all learn from our common experience with a design that's essentially the same with all of the airplanes.

In the case of Richard Clements' airplane, the changes he has made and the observations he offers, first I want to say that I like Richard Clements, and there's no joy in imposing this policy on him or anyone else. I also hope he never has a problem with the airplane.

On Aerolite, Richard's account differs from my memory of the events. When Trimcraft first starting making Falco ribs, they used Weldwood plastic resin glue. As Richard relates, the plywood gussets literally fell off when the staples were removed. Others reported the same thing. As we all now know, Weldwood plastic resin glue has very poor adhesion to birch plywood. Trimcraft switched to Aerolite, and we've had no further reports of problems.

Second, Richard had a problem with Aerolite that appears to have been a bad batch. In his tests with Aerolite, Richard reported that the glue had little strength. A Falco-building engineer friend, Robert Cordray, tested the same batch and confirmed that the glue had little strength, but Cordray subsequently purchased an additional supply of Aerolite and found it was fine. My conclusion, and Cordray's, was that Richard had a bad batch of Aerolite.

On the Bondmaster M666 epoxy glue, from what I have read of the product, it's probably an excellent product and may well be a wonderful glue. I tend to be very conservative when it comes to glues, and I wish I had a better understanding of the glue, because all glues have their peculiarities.

On the other changes, it's been my experience that Richard is too quick to change things and, from my perspective, doesn't stop to ask why things are done the way they presently are. I also have trouble following the logic of some of his 'fixes'.

For example, Richard bases his redesign of the retraction system on two things. When Dave Aronson's Falco first flew, there was a problem with the way the wheel well door was connected to the screwjack. This is one of those messy details in the evolvement of the Falco design, in that we

hooked up the wheel well door mechanism in accordance with some drawings that Mr. Frati had sent us. In that case, the pushrod was connected to the screwjack end fitting bolt and *not* to the screwjack. This created some geometry problems that caused the gear to start to retract when you got excessive tension on the wheel well door pushrod in the gear-down position. It was a flat-out design error that has nothing to do with the method of retraction. We corrected this by moving the connection to the screwjack itself and changing the geometry of the pushrods.

Second, Richard observed that Karl Hansen's Falco was popping circuit breakers. This was related to a problem of voltage drop caused by locating the landing gear motor relays on the back of frame 6 and by the substantial loads being imposed on the system by the full set of wheel well doors all around. We relocated the relays to frame 5, increased the wire and circuit breaker size, and designed a new '13-second' gearbox to accommodate the loads imposed by all those gear doors. How and why these things justify a complete change to a hydraulic system without a downlock system—particularly after Richard had already purchased our retraction system kit—is completely beyond me.

It appears, at times, that Richard tends to hear only what he wants to hear. For example, there's the well-understood situation that when rot occurs in wood airplanes and boats, it usually happens under metal fittings. The generally accepted reason is that when condensation occurs, it will be drawn by capillary action between the fitting and the wood, and it works its way into the wood through bolt holes. The usual protection for this is to bed the metal fitting in a moisture-excluding substance so that moisture never works its way in there. Yet Richard talks in terms of metal being colder than wood, and that you must eliminate metal/wood contact to prevent rot. From my experience, neither is true.

Richard decided that the way the wing tip lights and strobes were wired didn't make sense, because you had three wires in a coax cable for the strobe and also two additional ones for the nav lights. Wouldn't it make more sense to have all five wires in a single coax cable? So he found a five-wire coax, put it in the airplane and then sent me a complete description of where to get the wire so that all of you could do the same with your Falcos.

But there's a *reason* those wires are hooked up that way. Normal aircraft wire has insu-

Oshkosh vendor with a few conditions.

lation thick enough for a 600 volts without arcing between wires, and the power packs of a strobe system sends something like 1800 volts to the strobes. This requires a special type of wire with thick insulation to prevent internal arcing, and the wires are enclosed in shielding to reduce electrical system noise. That's why the wires to the nav light are normally outside the shielding and are run as separate wiring.

Richard told me one day that he was getting ready to have his engine mount chrome-plated. There's a *reason* you don't do that, because welds inevitably have a certain amount of porosity that traps the acids used in the plating process. The engine mount will look pretty and shiny, but over time any trapped acids will slowly eat up the engine mount. In this case, Richard changed his mind and didn't plate the engine mount.

So what we have in Richard Clements' airplane is a machine that could be seen by different people in different lights. In the view of some, it would be the best of experimental aviation—a homebuilder taking a proven design and engaging in a number of experiments and improvements, some of which may work, and some of which might not. In the view of others, you have an airplane with an extraordinary number of changes designed by a printer who has a number of peculiar theories on things.

I'm sure that some of Richard's ideas are good ones, but I also think that some of them probably have unforseen implications—how many of you forsaw the problem of flap flutter? However, if any aircraft or kitplane company designed a hydraulic retraction system without downlocks, *The Aviation Consumer* and product liability attorneys would tear the company to shreds—and they would be right to do so.

It's a free country we live in. I hope the airplane brings Richard many years of joy and pleasure and that he never has a single problem with it. If lives and litigation were not part of the equation, all this would be easy.

Construction Notes

Howard Benham reports, "Somewhere in the construction manual there is a caution about the Sigma-Tek pump, part number XXXX-006 not fitting on the IO-360-B1E. We checked this out and cannot find any reason not to use this unit. The only caution is that the pump must be installed after the engine is installed on the mount, and of course would have to be removed first if the engine is to be removed from the mount. For those of you not familiar with the Sigma-Tek design, it is the only new design in vacuum pumps in many years. It combines a new rotor design along with the new composite vane. This allows the unit to be used rotated in either direction without fear of breaking the vanes."

"Anyone contemplating installing an inverted oil system might want to consider installing the B&C VAC-2 oil pick-up unit at the same time that they install the vacuum pump as the VAC-2 replaces the existing spacer unit the vacuum pump is mounted on. The VAC-2 is designed to allow you to go inverted without the momentary loss of oil pressure that usually occurs while the upper lines fill with oil."

"You may find that the mounting bolts will need to be shortened a small amount (1/4"?) to prevent the end of the studs from hitting the housing of the vacuum pump. Also you will have to adapt a wrench to be able to tighten the bottom inside nut, but if this pump proves to be as reliable as I think it will, it will be worth the work."

Actually, the only problem we ever had with a Sigma-Tek pump was with the 160 hp I0-320-B1A, where it hit the engine mount. Dave Aronson had this problem and couldn't make the pump work. I have no idea if the current Sigma-Tek pump has the same problem.

Steve Wilkinson faxes, "FYI, I just got off the phone with a guy names Alex Borla, who is one of the top automotive exhaust-and-muffler experts in the country. He builds stainless-steel systems for everything from Lamborghinis and Ferraris on down, consults for Chrysler and Ford, and his systems are considered the performance-car after-market gold standard. He also does *lots* of race-car work."

"Anyway, I was interviewing him for an article I'm doing on the lightplane noise problem (he has a Baron and is working on designing muffling systems for aircraft), and when I was done, I asked him if what I was doing on the Falco—wrapping the ex-

haust system in that asbestos-like tape that supposedly keeps the exhaust hot and adds to the extractor effect, as well as slightly quieting it—was doing it any harm. He said that if the exhaust system was mild steel yes, but if it was a good-quality stainless, as our is, absolutely not. He also said that it indeed would add some power."

"He said that the only way you could possibly hurt the system by wrapping it with that tape is if you got the EGT about 1,700—which, of course, would require that you lean it to peak at a very high power setting. You probably already know all this, but he also said that the key to designing a durable high-performance header system is allowing the thing to 'work' through slipjoints, as everything expands at different rates. I described our system to him, and he said it sounded excellent."

"Anyway, I found that reassuring, since several people have looked at the asbestos wrapping and predicted a variety of apparently ill-informed doomsday scenarios."

Accident Report, N11HM

The following is Howard Benham's narrative description in the NTSB accident report on the takeoff accident of Falco N11HM.

Aircraft was started at approximately 1805 and taxied to the runup area on the west side of runway 18/36 at Brady-Pippin field. The flight was to Augusta airport, which is about 4 miles southwest of Brady-Pippin. Runup was completed and the windsock checked. Wind was from the south at approximately 8 to 10 knots.

Aircraft was taxied to the takeoff end of runway 18. Final takeoff checklist was completed and windsock checked again just before brake release. Acceleration was normal and aircraft was rotated for takeoff at approximately 62 KIAS. Within 1 to 2 seconds after liftoff, the indicated airspeed dropped to approximately 52 KIAS, and the right wing dropped. Recover was initiated and recovery was successful, but IAS was slow to increase.

At this point, the midfield windsock indicated the wind has shifted 90 to 100 degrees to the left still at approximately 10 knots. At this point, I made the decision to put the aircraft back on the runway because there was insufficient distance remaining to climb above the power lines and trees located approximately 50 feet beyond the south end of the runway. The aircraft was landed and maximum braking applied.

When it was apparent that I would be unable to stop prior to the end of the runway, I steered the aircraft between two large fence posts at the end of the runway and between two trees. The aircraft stopped with the nose of the aircraft between the trees and the tail still on the dirt road at the end of the runway. All switches and controls were shut off, and the passenger and I exited within 5 to 10 seconds after the aircraft stopped. After we cleared the aircraft, I observed the midfield windsock indicating a wind from the northeast still at about 10 knots.

When I determined that there was no fire, I re-entered the cockpit to recheck all electrical switches off, fuel off and to shut off the ELT. Following this the Sheriff's department and FAA Flight Service Station were notified. The FSS notified the FSDO duty officer and permission was received to move the aircraft from the road after we confirmed that there were no injuries.

The runway is approximately 2400 feet long by 100 feet wide. The surface is well packed and grass covered. The runway had been mowed the day before the accident.

Video Review:
First Flights in Your Homebuilt Aircraft

by Al Aitken

In March 1993, the flight test report of the Sequoia 300 aircraft was published. It was the first of its kind for homebuilt aircraft and since then the EAA, the CAFE Foundation and the FAA have increased their efforts in preparing homebuilders for flight testing their creations and enhancing the safety of flight test evolutions. The EAA's new video titled "First Flights in Your Homebuilt Aircraft" is a welcome step in that direction. The video is coproduced by the EAA and the FAA. It is a marvelous piece of work if only in its recognition of the serious nature of flight testing and the critical necessity of thorough planning along every step of flight test program. At no time are the risks, perils and unknowns more focused than just prior to and during the first flight of your homebuilt. It is for that reason you should review the EAA's new video and then plan in great detail for the first flight of your new Falco.

Flight testing is an exercise in risk management. There are basically three types of flight testing with varying levels of risk: experimental, developmental and production. Experimental flight testing is conducted on one-of-a-kind, never-before-flown and unproven prototypes. The F/A-18's first flight with a McDonnell Douglas experimental test pilot at the controls was an experimental test flight, as was John Harns' first flight in the Sequoia 300. Developmental flight testing is conducted on aircraft after the initial first flights to expand the flight envelope and verify performance parameters and handling characteristics. The flight tests reported on in the Sequoia 300 report were developmental flight tests. Production flight tests occur on aircraft as they roll out of the factory after having been crafted by the same set of people using standardized jigs and practices. Flight testing a Falco, although primarily production testing of a proven design, embodies elements from all three testing types. Review of the EAA's video and then thorough preparation and conduct by an experienced pilot will help minimize the risks.

A few comments on the details of the EAA's video may help you keep focused on your first flight of the Falco. Astronaut Hoot Gibson opens the video with his philosophy on flight-testing homebuilts. He mentions that he has a number of things he wants to "check out" during the first

flight. I believe the only purpose of the first flight is a safe landing and therefore, anything checked out should be something that contributes directly toward that specific purpose. You'll have plenty of opportunity during the 25 hour fly-off period, so save the gadget- and system-checking out for subsequent flights.

Precede the first flight with a series of carefully planned high-speed taxi tests. Use the runway for these tests and prepare for them as if you were actually going to fly. The EAA video mentions one high-speed taxi test during which directional and longitudinal control is tested. I think each axis of control should be tested separately in this order: directional, lateral and then longitudinal. Refer to the Falco Flight Test Guide for all the details. Carefully planned and conducted separate high speed taxi runs testing each axis while the main tires remain firmly on the runway will safely gain you much insight into how your Falco will react to your control inputs once you get it into the air on its planned actual flight. Once the high-speed taxi tests are accomplished, go back and shut down, inspect your Falco thoroughly, correct any abnormalities now and review your preparations for the first flight.

Plan the first flight takeoff and climb to put yourself squarely in the heart of the known Falco flight envelope while always leaving yourself able to make a safe emergency landing should the engine fail. Again, the comprehensive Falco Flight Test Guide will cover all the details of things to do on the first and subsequent flights. Climb to a minimum of 3,000 feet AGL and simply fly the airplane to get acquainted with it. Don't raise the gear. Do adjust the power after level-off to maintain just below the gear speed (109 KIAS with gear doors on, 130 KIAS with gear doors off). Don't raise the flaps during climb-out until after 1,500 feet AGL and leave the prop and mixture controls as set for takeoff. Just fly the airplane using shallow banked turns to stay within gliding distance of the runway. After 30 to 45 minutes of getting acquainted, conduct the slow flight and approach-to-stall characteristic tests discussed in the Falco Flight Test Guide. These are important because you must know how the airplane feels in slow flight and how it will react when close to the stall. You must also find out if it will stall in the landing configuration (gear still down, flaps 20 degrees—heart of the envelope, remember!) above the normal stall speed of the Falco (57-59 KIAS in this configuration). If it does, you must adjust your planned approach speed (1.3 times the tested stall speed) so as to avoid the stall during your actual approach to landing. It's far better to discover all this above 3,000 feet AGL with room to recover than to have this nasty bit of news pop up at 400 feet during your turn to final.

By now you should be quite comfortable flying your Falco (but never complacent) in normal and slow-flight maneuvers and should be ready for the ultimate purpose of this first flight: the safe full-stop landing (don't even think about touch-and-go's or fly-by's). Fly a wider-than-normal pattern using shallow turns and plan for a slightly longer than normal final. Fly your approach at 1.3 times your tested near-stall speed holding power on until crossing the threshold. Then ease the power off gradually in the flare to achieve the characteristic Falco soft kirplop touchdown. Continue to 'fly' the airplane during the roll-out to a safe, slow taxi speed. Only then should you consider congratulating yourself on a job well done.

After your successful first flight, inspect your airplane thoroughly. Note anything from your flight and inspection that needs attention (i.e. binding control, heavy wing, engine roughness, etc.). Determine the cause of the problem and fix it before the next flight. Subsequent flights must also be thoroughly planned. Know what you are going to check out on each flight, and don't deviate from the plan. Remember, plan the flight and fly the plan. Throughout all of your flight testing, the most important thing to do under any and all circumstances is *fly the airplane!* Another old saying applies here: "Lose not thine airspeed lest the ground come up and smite thee mightily".

If you feel that what I have discussed here is beyond your ability in a flight test scenario, you might do well to consider asking a more experienced pilot to conduct the initial tests for you. You might feel it's like asking your friend to take your new bride on the honeymoon for you, but flight testing is deadly serious business. Make sure you are up for it.

Susan's Corner

Greetings folks and friends. For the first time ever, in the history of Sequoia Aircraft, we're all decked out for the holidays. I've put up lights, trees, snow flakes, candles, do-dads and whatnots. There's Christmas music on the radio and even a decorated tree in the warehouse. I love the holidays and all the fun and excitement it brings. Even Alfred has developed a charming one-liner that only adds to the merriment—"I hate all this fu—ing gaiety," chirps he, as he clomps through the front door, cheeks rosy from the cold, snow gently swirling 'round his head. Straight out of Dickens, I'm sure.

It doesn't seem possible that the holidays are upon us again already. I guess it's true what they say—time flies when you're having fun. And it really has been a great year. Sales have skyrocketed. We've made some tremendous changes around here, and I've learned more about these beautiful planes than I ever thought possible. I guess I shouldn't say that last part too loud because inevitably when I get a little too cocky and confident something comes along to humble me again—usually real quick, too. All kidding aside, it really has been, and continues to be, a wonderful learning experience, and meeting so many of you at Oshkosh this past July was really an added bonus.

Alfred talks about how busy we've been with kits and all, but I must tell you—he's no slouch either. In fact, he's been busier than a one-legged dog burying a bone! There were many days, a few weeks back, that he barely emerged from behind closed doors. And now that I think about it, I'm not sure if it was because he was so busy or because every time he showed his face I made him put something else on his 'To Do' list. There are times I'm sure, that he sees me as the nag from hell—but there is just soooo much to do...

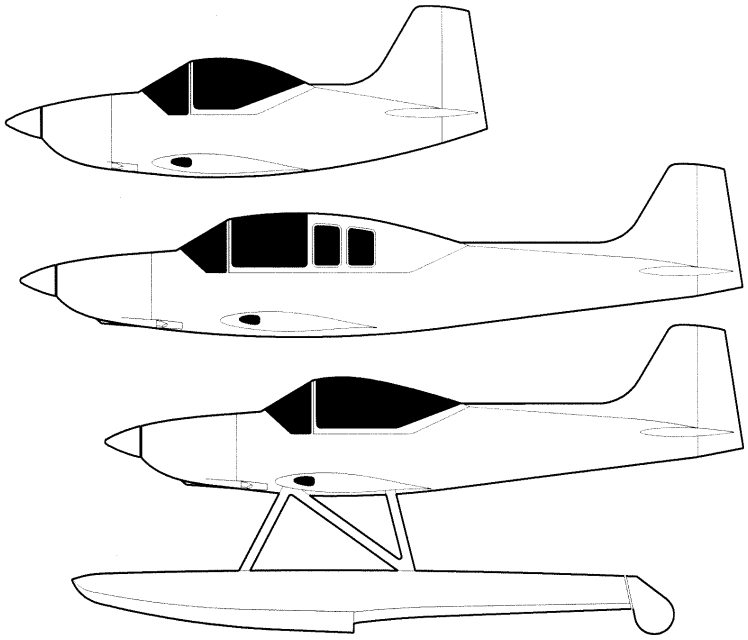
I have a couple of business issues I want to mention to the active builders among us. I have just received a new shipment of the canopy seal (more than 2,000 feet!). In the last year or so, those of you that purchased the canopy equipment received a seal that may not have been quite up to par. It had been wrapped up for quite a while, a little too tight, with some tape that was a little too sticky. I had one person mention to me that his seal was kind of kinked and wouldn't cooperate real well. If any of you weren't happy with the seal you received and would like a new one, just let me know. I'll sell it at cost ($20 for a little over 25 feet).

The other issue is the electrical kit. Those of you that bought the electrical kit in the last couple of years were missing the 0-gauge cable for the battery (which should have been in the sub-kit for the airframe wiring). I think I have sent the cable to all those who should have gotten it, but if I have missed anyone, please let me know and I'll ship it right out to you.

I hope all of you have a wonderful holiday season and a super, terrific, fantastic, great New Year. Any bets on who will be the first to have their 'first flight' in 1996? Keep sending in the pictures and progress reports—we love to get them. And until the Spring issue, fly safely.

—Susan Stinnett

New Falco models by Clive Garrard: Compact, Pimpmobile and Floatplane versions.



Mailbox

We want to say thanks for all the support we have received from everyone since the accident involving our Falco, N11HM, on September 17, 1995. During the six years of construction of our Falco, we made many special friends. In the short two-and-one-half months our airplane flew, we made several trips and met in person many of those friends that we had previously only known through phone conversations.

The Oshkosh experience is one we will never forget. Susan and Tim were so helpful and the van was a godsend. Meeting Mr. Frati and Carla was a special event. Our battery compartment door is signed by Mr. Frati, and that was one piece of the wreckage that we salvaged. It was exciting to see so many Falcos lined up together.

Just one week before our disaster, we attended the West Coast Falco Fly-In held at Coeur d'Alene, Idaho. There we made new friends and were reacquainted with those we met at Oshkosh. What a great trip it was! Thanks to John Harns who let Marty fly with him and take pictures, we have several good shots of our plane in the air. One has three Falcos in the picture and the wing of a fourth.

Our Falco may have flown only 72 hours but every one of them was very special. At this point we have not decided where to go from here. The insurance company decided that the airplane was not repairable, and neither one of us has the heart to start over on another Falco building project at present. We are currently looking at a couple of Falcos that may be up for sale soon, and (heaven forbid!) a few Wichita-built aircraft have been discussed as possibilities for transportation in the meantime. Whatever the decision, we will always be part of the wonderful Falco family.

Howard and Marty Benham
Augusta, Kansas

Thanks for Oshkosh '95 handouts, for my inductions into the fraternity of Falcoholics, putting faces with builders and awesome Falcos, demonstration ride with Tripp Jones on Saturday morning, delightful Frati, and on and on. I regret that I had to divide my time with Glasair N1ML among that other "group" but I guess taking home the "Champion Kit Built Bronze Lindy" and listening to all the compliments was worth it! I am very proud of the MacMurray's, J. Shipler, and all the rest of the dedicated builders for perseverance and dedication to excellence.

I was shocked to hear of the Benham and

Gane wipeouts. Scary, depressing, sad, what can you say—condolences to all involved. A theory for consideration—an excessive angle of attack might cause a rapid drag buildup and loss of performance due to open wheel wells even though the hole is in the belly and not airfoil. Ask any old Globe Swift pilot, especially early low-power models. A short rough strip or wind shift could set you up for this configuration. I am very interested in any follow-up on these accidents.

Progress report: all tail components completed short of final sealer coat of varnish and fabric, set aside and ready to tackle the flap and aileron project. A very sporadic working schedule and roller coaster experience stretched into 15 months. This provided much enjoyment when not frustrated with some of the inefficient skinning operations which seemed to fight me at every turn sometimes. However, I was able to persevere and have a fine-looking tail section 'on the shelf'.

A couple of weeks ago on Sunday morning, Richard Clements flew his all-yellow Falco (50th) in to Fort Collins, and I got to spend a half-hour looking, asking and sitting in it. It looks great, and he said flying off time was going very well to date. I'm looking forward to a ride when expedient. It still lacks trim and upholstery.

Jack Lange
Fort Collins
Colorado

I don't think we'll hear any additional information on the two accidents. Howard and Marty Benham have concluded that it was a freak of nature in which the wind shifted dramatically. Stuart Gane wrote all that he knows about his accident, and he's back happily working on the Falco.—Alfred Scott

All wooden components are now completed. The main wing spar took about 7 weeks working during the evening. The undercarriage is completed, all hinges cut out and await riveting and painting. My wife says we have two kinds of time in our house: Zulu (normal time) and Falco time. Two hours can mean anything! But she still supports me!

Alan Powell
East Ewell, Surrey
England

I'm happy to report that things are starting to move along. After spending huge amounts of time building (and rebuilding, and fixing, and...) the elevator, the stabilizer went together in a snap! For me, the key was building a good jig. By having everything easily referencable during fitting and gluing, all the ribs and such went in quicker and straighter than when I did the elevator.

Bill Russell skins the ailerons and flaps.

To keep things like the leading edge nice and straight, I have adopted the method the Benhams used. This involves long pieces of aluminum angle clamped together with all the ribs in between. The extrusion is expensive, but is much lighter than steel, and works like a charm.

I have found that bicycle inner tubes make terrific clamps. For example, when clamping the stabilizer leading edge, instead of cutting a bunch of triangles and clamping with them, I simply wrapped a tube from the leading edge around the main stabilizer spar, and clamped the tube with a spring clamp.

To make sure the ribs did not squish in, I capitalized on your tip about stapling. In some long-lost newsletter, you noted that if you did not apply pressure to the stapler when firing, the staple did not go all the way in. So, I marked where the ribs contacted the leading edge strip before gluing, shot staples while holding the staple 1/8" (oops, 2mm) off the wood. Sure enough, the staple stuck out a ways, preventing the ribs from squishing inboard when I clamped. I have definitely ramped up the learning curve, and I am having a great time with all the building.

Pierre Wildman
Sunnyvale
California

We all had a fabulous time, not only at Oshkosh, but the whole experience of being in your country. Beth and I spent a couple of days in Chicago before driving up to Appleton—to admire the architecture, etc., and luckly we hit a major Monet exhibition, with many paintings we had not seen before. It was a great start to our holiday, but of course, the real highlight was seeing all those flying Falcos. It was intriguing to see the various levels of finish and detail treatments.

Of especial interest to Gordon, David and myself, were the interpretations of how to hinge the main gear doors. We had followed the drawings pretty much to the letter, but found that the geometry of the hinge line meant that large rebates had to be cut into the wing to allow the doors to fully open. However, on looking at Stephan's aeroplane, we realized that we could reverse the hinge and although this brings part of the hinge knuckle into the airflow, it does mean that no rebates are required and generally a much neater job can be made. Almost for that reason alone, the whole trip was worth it—for the peace of mind and workmanship satisfaction. Since our return, we have rebuilt the whole hinge area detailing and are much happier bunnies now.

It was fun meeting you all. We enjoyed the experience immensely and thanks again for all the help and advice you give us.

Clive Garrard
Leicestershire
England