Sequoia Aircraft Corporation
900 West Franklin Street
Richmond, Virginia 23220
804/353-1713

December 10, 1983

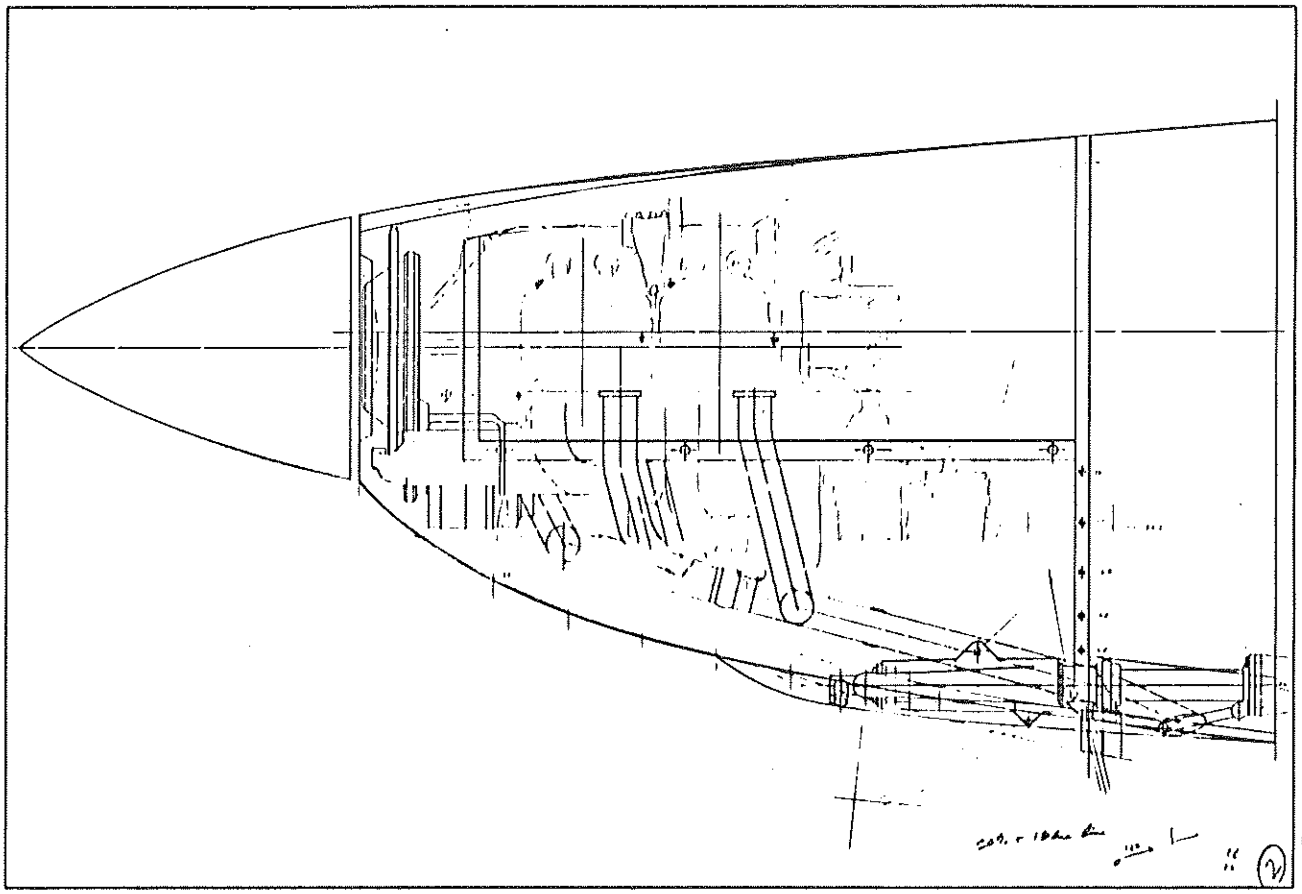
Dear Falco Builders:

Most of my time in the last three months has been taken up with design work on the cowling and other details involved in the engine compartment. This turned into a much larger job than I had envisioned. I found myself bouncing around the engine compartment like a bullet ricocheting around a room. Early on, I thought I could finalize the design of the cowling and then tend to the remaining details of the engine installation. How naive of me! I found that I could not finish the cowling design until I had done the baffling, and the baffling could not be finished until I finished the installation of the oil cooler, alternator cooling hose installation, and cabin heat duct installation. In turn, I had to consider virtually every detail in the engine compartment: landing light installation, nose gear door, nose gear bay doors, induction system, exhaust ports, engine controls and plumbing.

At this time, I am in the process of finalizing the drawings for the cowling. I expect that these drawings will complete in the next few weeks. After that I plan to work on the final design of the engine baffling and complete the drawings for the engine installation.

Earlier, I had indicated that I planned to use a Hartzell 835-44 spinner. This spinner is nearly identical in appearance to that used on the SF.260. While the spinner is attractive, the spinner's lines are not continuous with the cowling. The result is that the spinner looks a little like a bullet stuck on the front of the cowling. For the best appearance (and speed) the lines of the spinner should "flow" with the cowling. To make a long story short, I have decided to use a different Hartzell spinner. See page 2 for a small side view of the cowling and spinner. This drawing is the same size as the paint scheme drawings, so you can cut-and-paste to see what it will look like. The result is, I think, a huge improvement in the appearance of the airplane.

To make the installation of the cowling easier, and to make sure that the cowling is correctly centered behind the spinner, we are having a few cowling jigs made up now. This is a turned aluminum plate. To install the cowling, you first bolt the plate on the propeller flange of the engine. The cowling will match this plate, and the cowling will be clamped to the plate at the front, while the aft end of the cowling is trimmed and drilled for the mounting screws. When the entire process



Above: new cowling and spinner profile

is completed, the plate is removed and the propeller and spinner are installed. This will be difficult for you to visualize from this description, but the cowling installation will be a relatively simple job, and that the alignment of the cowling will be automatic. The cowling jig will be supplied with the cowling and returned to us after the cowling is installed.

The cowling is mounted on the firewall frame with an aluminum angle which runs around the entire "perimeter" of the firewall and which is mounted with screws and a few bolts. This angle is actually five separate pieces, and they will be supplied in the cowling kit. The top center piece extends to a point centered between the bolts that support the front fuel tank. These bolts will go through the aluminum angles and give them additional support. This presents a hitherto-unforeseen difficulty in the final assembly of the airplane. To install these angles, it will be necessary to complete the installation of the cowling supports before the front fuel tank is finally installed.

To simplify the construction of the exhaust ports, I decided to make the stainless steel exhaust port covers so that the left and right ones would be interchangable. This changed the shape of the cut-out in frame No. 1. I was concerned that this might reduce the outflow of engine cooling air, so I checked it against my old production

Falco. I was surprised to find that the Italians had done precisely the same thing. The new shape is shown in the drawing for Revision C3k. This will require that you add additional wood. For those of you that have already cut out your stainless steel firewalls to exactly match the shape of the old exhaust port cut-outs, you will be relieved to know that the stainless steel exhaust port covers will overlap your firewall.

As most of you may know, the cooling drag of a light airplane accounts for a large portion of the total drag of the airplane. Anything that you can do to reduce the cooling drag will significantly increase the speed of the airplane. A few years ago, Roy Lopresti cleaned up the Mooney. Most of the speed increase of the Mooney 201 over previous models was a result of lower cooling drag. It is of primary importance that you be very kind to the air where it enters and exits the engine compartment. When the air enters the engine compartment, it slows down. Our cowling, like those of the Mooney 201 and other fast aircraft, will have a smooth inner lip on the inlet. Also, when the air exits at the exhaust port, we will have a "horn" to smoothly speed up the flow of the air. These measures are basic to the design for speed. The exhaust port covers and exhaust port horns will be included with the cowling kit.

We now have a new advertising campaign underway. The first of our new ads has run in Trade-a-Plane, and our color version of the same ad will be in the January issue of Flying. Initial response has been 5 times greater than our previous ad, which is heartening except for the fact that it also raises the number of telephone calls we must field each day. I also took the time to completely re-write our product letter. We have enclosed a copy since I think most of you will find something of interest in it.

In working on the new product letter, I spent some time talking to builders about how much time they were taking on their Falco projects. What most impressed me was the difference in the construction times of the latest builders versus the earliest builders. The lessons learned by the earliest builders are not being lost on our lastest builders, and I note a dramatic reduction in building time. This "learning curve" process is one that is continuing, and I expect that the Falco will be easier and quicker to build as time goes on.

I find it interesting to compare the progress of John Shipler with that of Tony Bingelis. Tony Bingelis is fond of saying that the Falco is one of the most difficult airplanes to build. If you approach the Falco as a project in which you build every piece, I would certainly agree with Tony. John Shipler has been around homebuilding for a long time: he previously build a Skybolt, making every piece. John reports that the Falco is one of the easiest airplanes to build that he has ever seen, and it looks like John will end up building his Falco in less than a third the time it will take Tony.

The most difficult job for John was the wing fillet, which took about 100 hours. We will be making that as a one-piece fiberglass part, which should reduce the installation to a few hours. John is now making the tooling for the Nustrini canopy skirt fairing. This is another 100 hour job, and we will have that part available as a one-piece fiberglass part. When you start talking of replacing 100 hour fabrications with relatively quick installations, the effect is enormous. There are still a lot of parts in the Falco which can be done this way. The control hinge fairings take a lot of time. I plan to have these made in fiberglass. To keep the cost down, they will probably be supplied in a single sheet, which also means that they can all be made in a single layup. With fiberglass construction you can make complex shapes easily, but the real beauty is that you can substantially reduce the parts count. Consider, for example, the reduction in the parts count if the dorsal fin and battery box were each made as one fiberglass piece. Both of these are on my list of things to do eventually.

With homebuilders all a-twitter over fiberglass these days, I often find myself having to defend wood. In our new Product Letter, I present some comparisons between wood and other materials. I make the point that fiberglass is heavy in the product letter. Since writing this, I came across a flight report on the English Slingsby T67 Firefly. This is a license-built version of the Fournier RF-6. Slingsby has built the T67A of all-wood construction. With a 118 hp 0-235 engine, it weighs 1,142 lbs empty. Slingsby has now built the same airplane in fiberglass. The empty weight is 1,410 lbs, and they are now using a 160 hp engine and Hoffman constant speed propeller -- to get the thing to fly I suspect. The fiberglass airplane is 268 lbs (or 23%) heavier than the wood airplane, and only a small amount of this weight increase is due to the engine. I should also point out that among aircraft designers, Fournier is not known for his elegant wood structures, so the comparison between wood and fiberglass is not as favorable for wood as it might have been if someone like Mr. Frati had designed the original airplane. Compared to the Falco, the fiberglass T67M is 218 lbs (or 17%) heavier than the 160 hp Falco. This is after adding in the extra weight of the Falco's propeller, but not counting some of the weight savings I think we will see. The fiberglass Firefly has fixed gear and manages only 148 mph at cruise.

I should also like to point out some concerns about fiberglass being used as a fuel tank. Some homebuilt aircraft have used fiberglass tanks with apparent success, but a recent letter in Sport Aviation told of a homebuilder who discovered that his fiberglass tank "was disintegrating on the inside. Various sizes of epoxy chunks had peeled away from the tank walls, top and bottom, making it almost impossible to drain the tank through the bottom port. Apparently, the epoxy is dissolved by gasoline (specifically, in my case, Amoco Super unleaded). I must assume that my problem is not an isolated one, since I heard by the grapevine that another builder experienced the same problem. It was alleged that a component of auto gas, toluene, caused the epoxy to disintegrate. Another source stated that if the epoxy was sufficiently cured, there would be no problem. If this were the case, I should think that with nearly five years of curing time, I should not have had the problem. Among the many reason I selected a composite homebuilt was the fact that I could legally use auto fuel and avoid the extremely high cost of avgas. Now it seems that I may have been deluded." I have heard similar reports, as has Tony Bingelis, who has scrapped his fiberglass tanks and is making them of aluminum.

In our last builder letter, I talked about how to jig the wing and fuselage center section. John Shipler commented that if he had done it that way he would have been able to build the wing in half the time that it took him. Other builders have agreed that this looks like the simplest and quickest way to build the wing.

John Shipler mentioned that he did all of his plywood scarfing with a 3" drum sander mounted on the back spindle of his radial arm saw. One neat trick he came up with was to make a 15 to 1 angle gauge block of oak. Each time he goes to set up for scarfing, he places the gauge block on the table and sets the angle of the sander (or saw, if he is going to cut spruce), and he is able to quickly and accurately set the angle for scarfing.

Ed Gooch reports that he has obtained some Penacolite G-1131 resorcinol. Ed likes the glue and finds it easier to use than other resorcinols he has used. Ed is also using Aerolite, and he likes the longer working time of the resorcinol for certain jobs. We have now added a section to our price list for Penacolite G-1131 adhesive.

Also new to our price list is a section for C & M Aviation Products. This company overhauls dry vacuum pumps. By all accounts, the overhauled pumps are just as good as new pumps. C & M claims that their vanes are slightly better than Airborne's. New vacuum pumps are sold for $280.00, and the overhauled pumps are sold for $241.94 (exchange) plus $20.00 for an outright purchase. We have arranged for the pumps to be sold direct to Falco builders at dealer cost of $157.25 (exchange) or $177.25 (outright). C & M also works with shops to set them up in the business of overhauling vacuum pumps. While we will not be getting into this, we are working with C & M to include the proper instructions in our maintenance manuals to allow a builder to replace the pump vanes.

For those of you who are not familiar with the operation of a dry vacuum pump, I'll include a brief description here. The pump has a rotor with six carbon/graphite vanes. The rotor turns in an eccentric housing, and the vanes are installed in slots in the rotor. As the rotor turns, the vanes move in and out of the slots. The carbon and graphite wears off slowly providing lubrication. As the vanes wear, they become shorter, so that after about 1000 hours of operation, they are so short that they become "cocked over" in the slots when fully extended, and they break off. Thus, the vacuum pump is a self-consuming pump. Until recently, the maintenance procedure was to operate the pump until failure, and then replace the pump. The wisdom of this operation is questionable if the pump is important for IFR operation. Replacement of the vanes prior to their failure can eliminate the costly replacement or overhaul of the pump. C & M offers the opinion that if the vanes are replaced every 100 hours (a set of vanes costs $36.00) the pump will last indefinitely. I expect that when we get around to a maintenance manual, we will suggest various "levels" of pump vane replacement. For frequent IFR use without an autopilot in which case a pump failure would be a serious problem, we will probably suggest replacement of the vanes every 100 to 200 hours of operation. For light IFR use in which case the pump failure would present a less serious problem, we will probably suggest replacement every 200 to 400 hours. For VFR use, in which the pump failure would be an inconvenience, we will probably suggest that the vanes be replaced every 600 to 800 hours.

I was also interested to learn the reasons why vacuum pumps are subject to failure from dirt and contamination with solvents (such as varsol from an engine wash-down). Dirt or other solid particles that enter the vacuum pump can become lodged between the vane and its slot. This causes the vane to become jammed, and it quickly breaks off, failing the pump. Solvents which enter the pump run into the crack between the vane and slot by capillary action. This creates a suction area in the base of the slot, causing the vane to become stuck in the "low" position. The vane will stick in this position during low engine speeds, but once the engine rpm's are increased for take-off, the vane will suddenly fly out to the "high" position and break off. A broken vane will always become jammed between the rotor and the eccentric housing, and the pump will fail due to a sheared coupling.

As you may know, a system has recently been developed called the Standby Vacuum System. I am not at all sold on the system, and some of you may have seen my letter on the subject published in The Aviation Consumer. I spoke to C & M regarding the system, and they share my concern. In my view, the system has the potential for creating more problems than it solves, since it has the potential for shutting off the vital cooling air to the vacuum pump during periods of low manifold pressure operation (such as during taxi operation). Also, the system's valve introduces flow restrictions to the vacuum pump, reducing the amount of air which can reach the pump. It is absolutely vital to the operation of a dry vacuum pump that an adequate flow of air reaches the pump, since this is the pump's only form of cooling. Our vacuum system, like all properly designed systems, uses special low-loss fittings to keep the flow of air up. Introducing additional restrictions to the system can only make matters worse. Additionally, the system dumps air into the intake manifold tube of one of the cylinders, thereby leaning the mixture of that cylinder. A number of pilots have reported rough-running engines as a result. I think the system is a poorly-executed clever idea.

A better solution is to use a Century I autopilot. With a vacuum system, the most important thing is that the system be properly designed and maintained. For the possibility of a vacuum system failure, I think it makes more sense to have a viable alternative than redundant vacuum systems. The Aviation Consumer, for example, has a Mooney 201. In this aircraft they have a Century IV flight director. In the event of a vacuum system failure or an electrical failure, the flight director ceases to work. Thus, the system is a luxury that will not work in either failure mode -- right when they need it the most. Now, to guard against this likelihood, they are thinking of installing an electric standby vacuum pump, another 8 pounds or so in addition to the 40 pounds of the flight director. The Century I is all-electric, so in the event of a vacuum system failure in a Falco, you should switch on the autopilot.

Even if you don't plan to do any IFR in your Falco, I still think all of you should consider installing a Century I. If you don't want to spring for the price of a new one, then you can watch the pages of Trade-a-Plane. You can usually get a good used one for about $500.00. Since you get a gyro with the autopilot, you don't have to buy a turn and bank. The additional weight over a T&B is only a couple of pounds. I have a lot of time in my Falco now, and while I love the handling of the airplane, there have been lots of times on long trips when it would have been wonderful if I could have hit a switch and had the thing drone on rock-steady for hours while I relaxed, ate a sandwich and read a map.

As we are an OEM, we are able to purchase some things at discounted prices, even in small quantities. At the request of a number of builders, we are going to offer a propeller, spinner and governor kit. We will be handling the orders on a very minimum mark-up. We will not be stocking the parts here, so they will be shipped direct to you. The propellers are made to order and normally are shipped 10 to 12 weeks after receipt of order. As we will be just processing orders, we will not be able to take the risk of collection without additional charges. Accordingly, this kit will be handled only on a payment-with-order basis. I expect to have final details on this kit by our next builder's letter, but in the meantime, any of you who want to get your order in before that should let me know that you are interested.

Prior to the Oshkosh show, we prepared a few new pages for our kit folder. We had intended to include them with our last builder letter, but this was overlooked. In any event, they are enclosed herewith.

I have received a number of letters regarding our electrical kit from builders who were under the impression that it has a lot of "extras" for the full IFR panel. As they don't plan to install all of the instrumentation, the question is whether a cheaper basic system might be available that would suit their needs.

First, you need to understand that the electrical system is an integral part of an entire system design, including such related things as the instrument panel, center console panel, throttle quadrant, pitot-static system, fuel system, etc. If all of these parts are not to be used, then none of the rest should be either.

The instrument panel, as all of you know, is removable. This is absolutely necessary for the maintenance of the aircraft. To do this, all wires pass through three large connectors on the "back" of the panel. The electrical system provides a number of wires which would not be needed in such a basic airplane. The wires and their pins are a relatively inexpensive portion of the kit. If they were not installed initially, there is absolutely no way that the wires could be installed in the connectors at a later date. If I were to guess, I would say that eliminating these wires and pins might reduce the cost of the kit by less than $100.00.

The other way that the kit might be changed would be to eliminate a couple of circuit breakers. The instrument panel is already drilled for all of these, and the bus bar as well. Installing additional circuit breakers at a later date would not be a simple matter once all of the wiring is installed. While circuit breakers are not cheap, I don't see the logic for leaving a few of them out.

We also provide sufficient wiring for the audio system. This is just wire, and wire is really cheap. All in all, I do not think it is advisable to change the kit in such a way, nor is it in the best interest of the builder -- particularly when you consider the effect on the resale value of the Falco. We average about two calls a week inquiring about purchasing a completed kit-built Falco, and I can tell you that these folks are only interested in a Falco that will accomodate a complete installation of avionics and instrumentation.

You have to see the instrument panel and the electrical system completely installed to begin to appreciate it. Even though I designed all of it and am intimately aware of all of its features, I am still struck with a sense of awe when I see it. Dave Aronson has his system installed now. All during the process of building his Falco, Dave has had a number of experienced homebuilders assisting him. At almost every step of the construction of his Falco, these friends have been helping Dave with advice on how to do things. In short, they have been completely at home with all of the things that Dave was doing. Dave says that the electrical system completely blows their minds; that they have never seen anything like it and don't know even how to react. For them, it's like looking at the inside of a computer, but Dave can pick out any wire and tell them what it does.

I asked Dave to triple-check every single thing in the electrical system: the drawings, the wire tabulation, the installation instructions, the color code chart, etc. This slowed Dave up a lot. In all we found about six or seven typographical errors that anyone would have caught, and we are correcting these in the subsequent manuals. Dave's instrument panel was shipped to Flight International, who did the avionics installation. I was delighted that they had only a few questions for me, and they found they system just like working on any production aircraft.

Knowing the system as I do, I expect as more of these are installed it will be quickly known among Falco builders that it is unthinkable to go any other way. In the meantime, I asked Dave to jot down his thoughts on the electrical system and kit for you. This is to be found in the "Mailbox" section. I agree with Dave on the need for larger conduits and openings through stations 4 and 6. I plan to work on this and to include such conduits in the fuselage kits as soon as I can get to it. Also, if you are installing the standard floors between frames 2 and 3 (i.e. not the lowered floor), I think it would be a good idea to route the heavy battery wires under the floor. This would require two holes through the frames and conduits as well. Dave agrees that this would make the installation of the heavy battery wires much easier than routing them up and over the nose gear bay cover.

Commenting on Dave's letter, I'd like to say again that the kit does not include any charge for the design work that went into it. The kit price is based on the costs of the components only.

Tony Bingelis ran into a problem with his nose gear steering. While I don't mean to embarass Tony by recounting the tale, I think that failing to do so might lead others into the same trap. Tony built his own engine mount and on installing the rudder cables to the nose gear steering arm, he found that the cables hit the cross tubes of the engine mount and the turnbuckle forks would not align with the steering arm. After fighting with it for a few days, Tony cut his engine mount apart and changed the geometry of things so that it would work. After this, Tony reported his problem and asked where he had gone wrong.

First, when you come across such a problem, the first thing to do is to contact us. When I read Tony's letter, I knew instantly what the problem was: Tony had omitted the AN43-5 eyebolts shown on drawing No. 122 (sheet A25) and which you can also see on the control system kit drawing. Folks, this airplane has been around for 28 years now, and if something doesn't fit, contact us before changing things.

An English Falco (G-VEGL) was recently damaged in a landing accident and the last three feet of the left wing was destroyed. The Falco is now being repaired. The repair is being done by Chiltern Motorgliders which, like Doncaster Sailplanes, is an expert on wood aircraft repair. We were asked to approve the repair scheme, and in the process of talking to the company I learned something interesting. Aerolite glue comes with two types of hardeners: formic acid and a powder. The formic acid hardener is the most common type. Chiltern advised that the formic acid attacks and weakens epoxy, plastic resin and casein glues, and a long-standing airworthiness directive in England prohibits the use of the formic acid hardener near such glues. The formic acid hardener does not affect resorcinol, which is essentially inert. Also, the powder hardener used with Aerolite does not affect the strength of other glues.

More on rib stitching. Mr. Frati advises that rib stitching is not necessary due to the large gluing surfaces; however, if you wish to rib stitch anyway, then no harm is done. The best way would be to drill holes through the plywood so that the stitch passes right next to the underlying rib.

We recently discovered that page R-14 was missing from some copies of Revision List No. 83-1. Also, we occasionally hear from builders who ask about how the install the antenna kit. The installation instructions were sent out some time ago, but apparently we did not include them in the construction manual. In any event, copies of both of the above are enclosed.

I know that many of you have been reading articles on the use of auto gas in aircraft. I am very much in favor of using auto gas, but I think that there are some limitations that have been glossed over in most of the reports. To date, I have been appalled at the coverage in the media on the subject. The articles either say that "autogas is okay" or repeat insignificant (other than legal) concerns of manufacturers and oil companies. The best article to appear recently was in Light Plane Maintenance, and it is one that I completely agree with. A copy of the article is enclosed.

Sincerely,
SEQUOIA AIRCRAFT CORPORATION

Alfred P. Scott
President

ROLL CALL

Please send in your progress report on a separate piece of paper and not as part of a letter as these entries go into a separate file. Please give your name and builder number.

648. Jim Kennedy. Main wing spar to go and all wood will be finished. Hope to complete it in the next few months and then the full commitment when it's in the jig. Keep up the good work. I plan to buy all the metal parts within the next 12-24 months from you.

656. John Lapensee. All my parts still in storage. Waiting for spare cash to come my way. Enjoying Builder's letter. Wish that I could be as far advanced as some. There are many excellent Falco builders out there. Keep up the good work. Will join you all soon.

683. Earl Edwards. Basic airframe complete and out of jig. Control surfaces skinned, fuselage and wing hardware in place. Control system kit on hand. My son has taken an interest in the project, and I now have a valuable helper.

699. Rick Fitzwater. Main wing spar complete, fuselage frames complete fron No. 6 aft. Vertical and horizontal stabilizer complete. Elevator 1/2 complete. Aft section of airframe assembled. Completed new 900 sq. ft. garage/shop for project.

MAILBOX

It was great to receive your call. As I told you I was injured just before Xmas and am just starting to work on a limited schedule. I shall be starting my Falco as soon as possible (this fall for sure) so you shall be hearing from me soon. The picture of your panel looks great, and the center console is a big improvement.

Walter Greczyn

I just finished my canopy installation including the fiberglass aft skirt. It was a monumental task to get contoured and close fitting without gluing everything to the fuselage permanently. Then too, in the nick of time I realized that the skirt must not cover the battery box door when the canopy is closed... that would have been something! Overall effect is pretty good and the fit is better than on Frati's SF.260C's from the looks of the pictures in the AOPA magazine.

Lately, I've been hearing about fuel/fiberglass tank problems. The aromatics in the unleaded fuels apparently are eating away the resins and making some tanks leak. I had first hand claim to this from an honest looking gent. Also heard other rumors. Couldn't get any facts to satisfy me so I decided to scrap my fiberglass tanks and build aluminum ones. Oh well, I need some more metal working experience, anyway... better safe than sorry.

Wish I had known that Bellanca-type resorcinol was available. I have used resorcinol quite a bit in the past, and it is a superb glue when the joints are pretty good and you can clamp them. I would have used it for 75% of my Falco. There are a lot of joints... difficult joints that are better suited to epoxy. A builder should decide where to use different glues for himself. In my Falco are T88, resorcinol, plastic resin, Aerolite, and 5 minute epoxy. Each has its place and purpose, I think.

Tony Bingelis

I would like to extend a long overdue thank you for your hospitality. We had a wonderful stay. Sue and I both enjoyed Virginia, thought it very beautiful and look forward to visiting it again soon. And naturally flying the Falco was a superb treat. What an airplane! A class all alone. How mundane seems everything else by comparison.

Bill Nedell

I continue to be amazed at how fast you turn my orders around. I just got home from a week-and-a-half business trip and your shipment was waiting for me.

Jim Petty

I've now completed the electrical kit installation with the exception of a few wires in the engine compartment. Now that I've finished this work I feel that I am in a better position to comment on it. Prior to ordering the electrical kit and beginning work on it, I was totally unprepared for its level of sophistication and the obvious state-of-the-art technology that was utilized in its design. The plans are extremely complete in their detail and are highly accurate. Only a few minor mistakes were identified. The installation of the system is simplicity itself.

Prior to ordering the kit and after learning the cost, I was having a difficult time imagining how it could possibly be so expensive. However, looking back on it, I'm not sure how you'll be able to recover your cost for the design work that was involved for the price of the kit. I now feel it's one of the best buys of any of the kits. The installation was straight forward and although I was working at a relatively slow pace in order to re-check all of the circuits as I went, it only amounted to about 5 weeks of work on a part-time basis. Had I chosen to design this system myself, I can easily see at least a year of research and work at the drawing board.

The only comment I have in reference to the electrical system installation would be an effort to place the electrical parts into the airframe prior to the installation of such things as the forward gas tank, center console, etc. I'd also recommend the use of large conduits between frame 4 and frame 6. I spent a great deal of time fishing wires through the frame even though I thought the holes were adequate in size.

In summary, I'd like to advise everyone that the electrical kit is well worth the cost and will substantially increase their satisfaction with the airplane once it's completed. I think the electrical kit is an absolute necessity. Anyone that might have any questions can certainly give me a call.

Dave Aronson

QUESTIONS & ANSWERS

Q: Revision A4C says to install the flap motor to the right side, but the torque tube is made in such a way that the motor has to be on left side of the airplane. What's wrong?

A: We choose our words very carefully, and sometimes you have to study them carefully to tell precisely what we mean... or in this case what we do not mean. Everything goes in just like it is shown on the drawing, but when you put the actuator in place, turn it over so that the motor is to the right side of the aircraft. If you put it in with the motor pointing to the left side of the aircraft, the motor will hit the support bracket.

Q: I have just received my windshield and canopy kit. I am installing the windshield and am worried about the way the windshield is trimmed. It comes out just right at the top front center, but it seems short on the sides and doesn't match the diagonal frame. Is something wrong?

A: Everything is the way it should be. The windshield is trimmed so that it ends up going slightly more aft than the diagonal frame. The reason is that if the windshield did not do this, when you started to cut the recess for the thickness of the windshield, the plywood skin would be cut completely away from the diagonal frame. This might give you more ventilation than you need!

Q: What do you think of putting insulation in the fuselage side walls between the outer and inner skin?

A: We don't have any definitive answer, but we are inclined to advise against this. There seems to be little, if any, reason for installing the insulation. Very little noise would come through the side walls, and the air space is all you need for heat insulation. There is some possibility that you would be trapping moisture and could be asking for rot. Installing insulation in the roof rafters of a house is a certain prescription for rotten rafters. Whether this same phenomenon would also apply to your Falco, we can't say, but we'd rather not find out the hard way. We would advise drilling some small holes through the inside skin to allow air to escape as you gain altitude during flight and to allow for some air circulation.

Q: What do I need to buy for the strobe system?

A: The Falco uses a Whelen system. The A650 wing tip lights are the latest model numbers but the A429 types are essentially identical. You will need the following Whelen components:

A650-PG-14 or A429-PG-14 Wing nav & strobe light
A650-PR-14 or A429-PR-14 Wing nav & strobe light
A500-14 Tail nav & strobe light
A413A, HDA-DF-14 Power supply
HD, T3-90 Installation package

by Kas Thomas

AFTER YOU'VE SPENT all afternoon talking to bureaucrats and assorted dimbulbs—getting non-answers to straightforward questions—conversing with Al Hundere is like having all the wax fall out of your ears at once. Suddenly, things sound intelligible again.

Al, in case you've never met him, is a professional straight-talker who also happens to be president of Alcor, Inc. (P.O. Box 32516, San Antonio, TX 78284; phone 512/349-3771). Most people know Al Hundere as "the guy who makes EGTs" (he invented the exhaust analyzer for recip aircraft), or as "the guy who invented TCP" (which isn't true; he merely had the foresight to see the need for the stuff, find out who held the patents—namely Shell Oil—and buy the marketing rights to an aircraft version of it). But even if EGTs and TCP hadn't come along, Al Hundere's international reputation as a fuels-and-lubes sage would have been cinched by his pioneering work in ashless dispersants, runaway preignition, and fuel properties, done when he was with California Research Corp. (Standard Oil, Richmond) in the late forties.

But mainly what I like about the guy is, he takes the marbles out of his mouth before he talks.

Al called a while ago, and we had an interesting chat about a variety of matters—Alcor, TCP, valve deposits, etc. It was the etc. that intrigued me most.

I learned, among other things, that Al Hundere agrees with Mobil on FAA's handling of autogas certification. "There's no question about it," Hundere asserts. "The FAA decision to grant autogas approval was based on politics, not engineering."

Whether Hundere sensed my shock, I don't know. I just know that when I regained consciousness, he was saying: ". . .and there's going to be problems now, mark my words. Somebody's going to get killed—it's just a matter of time."

"I take it you have some reservations about the autogas work performed by EAA," I observed, cannily.

"That's right."

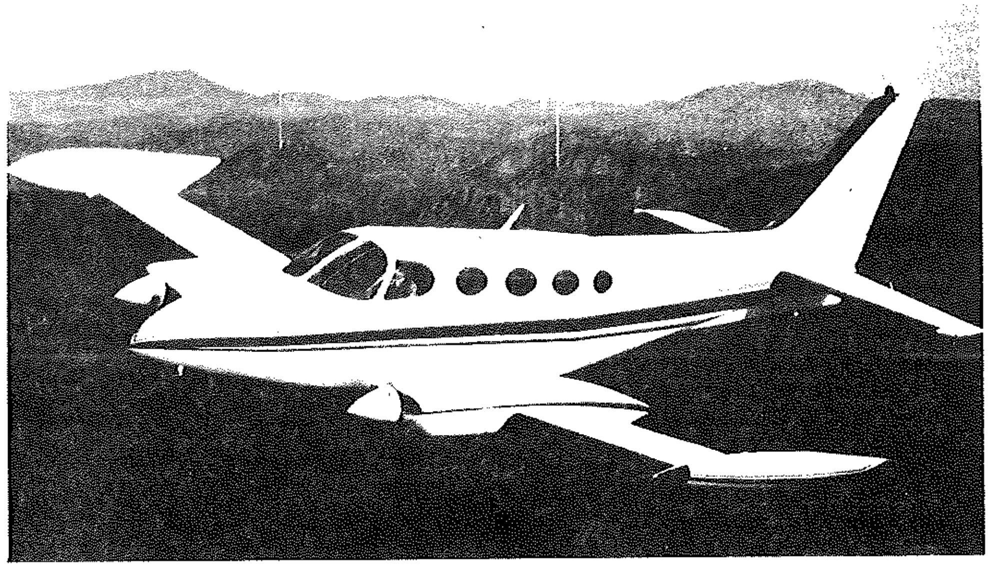
"Are you worried about vapor lock? Or octane ratings—"

"Vapor," Al snapped. "There's no problem with anti-knock performance. Autogas is quite satisfactory in that department."

I was still catatonic. Hundere went on: "There isn't an airplane made today that won't give you vapor lock on the highest vapor pressure autogas, under the worst hot-day conditions. And there are *some* planes that'll give you vapor lock on a *standard* day."

"But Al," I winced, "EAA looked for vapor lock."

"They didn't look hard enough. The vapor test they did for the FAA, that was a joke.



Al Hundere successfully flew his Cessna 340A on autogas once, in an emergency. The key was to take off on avgas, then switch to aux (auto) tanks in cruise. The engines (TSIO-520-NB) did not detonate.

They heated the fuel, then flew on up to service ceiling. Well, everyone with a year's worth of college chemistry knows that when you heat a complex mixture like gasoline, the first thing to boil off are the light ends—the molecules that give you the vapor-pressure problems. So all they did was fume off the light ends, and fly to service ceiling. And of course they found no vapor lock. That's no test of vapor lock."

"I know that, Al, and so does Harry Zeisloft at EAA. Harry is the first to admit that that was a stupid test. It was FAA's idea. But you know, EAA went beyond that—they did their own vapor trials, too."

"Well they didn't do 'em right, or they would have got vapor lock in that Cessna 150."

"Al," I said, "they took samples from ma-and-pa gas stations all over the country, and couldn't find any that approached maximum RVP limits set by ASTM specs."

"Kas," Al replied patiently, "there's auto fuel on the market today with Reid vapor pressures of 15 psi. I know because I get the Department of Energy survey reports. EAA just didn't look hard enough."

"Well, Harry says EAA couldn't find it. So they got Amoco to specially blend them a high-vapor fuel, which they trucked to the airport packed in ice."

"Good."

"And they didn't get vapor lock."

"Well then, it must not have been a hot day. You know, temperature is a key thing here. You don't have to worry about vapor lock if there's snow on the ground."

"Right."

"But I can guarantee you, you'll get vapor lock in your Cessna under the right temperature conditions, with auto fuel meeting the upper limit of Reid vapor pressure, which is 15 psi under ASTM D-439. Hell, we got indications of vapor lock on *10-psi* fuel, at *sea level*, on an 85-degree day, in some of the tests we ran for California Research."

"But that wasn't in a high-wing plane, was it?"

"We got it in low-wing *and* high-wing planes. Listen. All this stuff you hear EAAers saying about 'you can't get vapor lock in a gravity-feed fuel system'—that's pure bullshit."

I knew Al was right—because I've talked with Turbo 210 owners who have had vapor lock in level flight, operating on 100LL—but I said nothing.

"AFTER WORLD WAR Two," Hundere recalled somberly, "private aviation had vapor lock problems—serious problems. It had the oil companies concerned. So at California Research Corporation, we studied the problem. We flew a number of airplanes on fuels ranging from 80-octane avgas to special blends of pentane and iso-octane, proportioned to give 10 pounds of Reid vapor pressure, 13 pounds, or what have you. We flew high-wing planes and low-wing planes, two-seaters and four-seaters. Some of what we learned wasn't too pleasant. I published the results in 1948. Then I was part of an industry committee to study the problem, and with Lock York of Continental Motors—and R.A. Coit of Shell Development—we published our recommendations on vapor lock in an SAE paper." This was in 1950.

I have copies of the papers Hundere is referring to. They are sobering reading.

(Continued on next page)

(Continued from previous page)
Among other landmark findings, Hundere observed that "vapor lock" does not always occur in an all-or-nothing way. In fact, long before power interruption (frank vapor lock) occurs, mixture leaning takes place as the vapor/liquid ratio of the fuel increases. This can cause detonation, if the engine is operating at high brake mean effective pressures (BMEP). It can also cause significant rpm reduction.

Since the airplanes are referred to in the technical papers as "airplane A, airplane B," etc., I asked Hundere to tell me what kinds of planes were actually used.

"The Navion was the worst," Al recalled. "On a hot day, you *really* had vapor lock in that aircraft. We never did any takeoffs with it, on either 10-pound or 13-pound fuel—it was too dangerous. On an 85-degree day, the fuel temperature coming out of the wing tanks was 91 degrees. Going into the carburetor, it was 121 degrees. We made runs where we would switch tanks from one containing low-vapor avgas, to one with 10-pound-RVP test fuel, at the start of the takeoff roll. About fifteen seconds into the roll, the fuel pressure would drop from 13 psi to 6 psi, often accompanied by misfiring. Needless to say, we aborted.

"The rest of the aircraft were high-wing types—the Cessna 140, Stinson Voyager, Piper Family Cruiser, those were some of the aircraft we used. We found that in the gravity-feed airplanes, the limiting Reid vapor pressure for incipient vapor lock on a 100-degree day was anywhere from eight to ten psi. That's *below* the upper limit for auto gas. And that's what I mean when I say it's just a matter of time until somebody gets killed."

"Have you told EAA of your concern?" I asked.

"I've tried to. But nobody's listening real well over there right now." Hundere paused, then said: "They'll listen a lot better, I think, after a few people crash."

LEST ANYONE GET the idea, at this point, that Al Hundere is just another neurotic-bedwetter pessimist when it comes to using autogas in airplanes, I think I should point out that long before EAA made "autogas" a GA buzzword, Al Hundere was promoting its safe use and had done more (till 1977) than any other person in the world to champion its cause. In a 1969 article in *AOPA Pilot* entitled "Autogas for Avgas," Hundere shot down all anti-autogas arguments put forth by the oil-company apologists (the same arguments that are being pursued by Mobil, Exxon, etc. in robotlike fashion today), and told of his experiments flying a Piper Super Cub and a Beech Travel Air on auto-grade regular gasoline.

I might add that Al Hundere is the only pilot I know who has successfully flown a Cessna 340A—which is turbocharged *and* pressurized—on auto fuel. (Kids, don't try this at home.)

Will vapor lock plague Cessna 140s? Hundere found (in tests conducted more than 30 years ago) that the limiting Reid vapor pressure for vapor lock in a Cessna 140 on a 100-degree day was 8 to 10 psi. Some auto gasolines have RVPs of 15 psi or more.

In 1976, Hundere submitted a novel proposal to FAA which—had it been adopted—would have allowed Alcor Inc. to distribute auto fuel to airports. Under the Alcor spec, the fuel would have been called 80/87AA (auto-aviation); it would have been essentially nothing more than highway-grade unleaded gas blended with a minute amount of avgas to achieve a final lead content of 0.25 ml TEL/gal, which Hundere claims is the minimum amount necessary to ensure adequate valve face lubrication. To eliminate transportation costs, the 80/87AA would be made from locally obtained gasolines. This would mean seasonal fluctuation of vapor pressure. To take care of the latter problem, it would be required that participating FBOs determine the limiting OAT (outside air temp) for use of the fuel, based on instructions provided by Alcor. Then, at the time of each fillup, participating pilots would be required to carry an updated panel placard clearly indicating the limiting temperature, above which takeoff would not be attempted. (For situations involving partial fillups, Alcor would provide charts for interpolating limiting OATs and RVPs.)

In practice, the Alcor system would have been safe, simple, economical, and practical—all the things the current avgas distribution situation is not.

FAA Assistant Administrator for General Aviation Allan Landolt turned Hundere's proposal over to Flight Standards, which assigned it to one W.A. Wiseman (a former Continental Motors employee). An extensive correspondence developed between Wiseman and Hundere. Then Wiseman retired.

"Before Bill retired," Hundere remembers, "he called me up and told me he was moving to Florida, and said that he would try to get me a final answer on the autogas proposal. When he got back to me, he said the FAA had decided to defer to NASA on the question of autogas. Next thing I knew, NASA came out with a lengthy Request for Proposal, involving auto fuel research."

Hundere wrote to Langhorne Bond on July 29, 1977. "What very little useful data that will be obtained [by NASA]," Hundere complained to then-Administrator Bond, "will be at the expense of far too much money and time. As you will note from the RFP, *no research or testing is requested on the only fuel property that limits the safe use of autogas for avgas*, and that is vapor pressure." (Hundere's italics.)

Says Hundere now, looking back: "All you had to do was take one look at the NASA proposal and you could see that they were simply trying to reinvent the wheel. I wrote lots of letters to NASA and FAA, advising them that they should cancel the RFP and read my proposal again. It would have saved taxpayers a lot of money. Instead, NASA gave the contract to the University of Michigan. And the University of Michigan spent a lot of tax dollars, did no flight testing, and concluded, in the end, that NASA was right to give University of Michigan all that money. Which was all quite predictable."

I asked Al Hundere why Alcor failed then—why EAA has succeeded now.

"Because," he reiterated, "the political timing was wrong for me, and right for EAA. *Our engineering was sound.* Better than EAA's, I believe. But we got turned down. For political reasons. What other possible explanation could there be?" □

ANTENNA INSTALLATION

INTRODUCTION.

Radio Systems Technology has designed the internal antenna system described in this section. The system provides for the installation of antennas for dual VHF COM, dual VHF NAV (VOR-LOC-GS), DME, ADF, transponder, and marker beacon within the wooden structure of the Falco. Radio Systems Technology is not available to custom engineer a system for any modifications of this system.

Radio Systems Technology offers kits and components for this system which are described in our kit information literature. These kits include all of the antennas for a normal complete IFR system. Builders who wish to order the antennas separately may use the "materials required" list for each antenna, but we would strongly advise that all antennas be installed even though no immediate use of the antennas is planned, as it will be quite a problem to install them after the aircraft is complete.

NO. 1 COMMUNICATIONS ANTENNA INSTALLATION.

See drawings No. 160 & 161. The primary VHF communications antenna consists of a ferrite-foil antenna located in the vertical fin. The foil antenna elements are sticky-back and may be temporarily attached to any clean, dry wooden surface. It is absolutely mandatory to cover the elements with varnish, epoxy or some other nonconductive coating to ensure that the elements are firmly and permanently attached to the airframe. The antenna radiators consist of two pieces of copper tape arranged as a vertical dipole along the leading edge of the vertical fin. Each "ear" of the dipole element is 20.3" long, with a 5-10mm center gap. It is important that the antenna be placed as far forward on the vertical fin as is reasonably possible to get the antenna away from the metal hinges. There are several methods of installing the antenna. The antenna may be installed on the inside of one of the side skins running between the skin and the ribs, or the antenna may be installed on the outside of the skin, with a small hole drilled in the skin for the lead to the coaxial cable and balun. The balun is the name for the assembly of ferrite toroids. Three toriods are all that are required. Sometimes four are used, but it doesn't make any difference. The toroids should be as near to the end of the cable within reason, but there is no critical distance -- anything within about an inch is fine. The coaxial cable and ferrite balun assembly should be fastened firmly against the skin so that they will not vibrate loose during service. Epoxy resin with a small strip of fiberglass cloth should do the job nicely. In particular, the solder joints at the coaxial cable-to-elements must be coated with epoxy and fiberglass cloth so that years of airframe vibration will not break the joints. There is no critical length of coaxial cable or matching network required for this antenna. Keep the coaxial cable and any other metal fittings as far away as possible from the antenna tips. (Metal near the center of the antenna -- that is, near the coaxial cable attach points -- has little effect on the proper operation, but the tips are rather sensitive.) The coaxial cable should run aft at right angles to the antenna elements and then down the main fin beam, along the upper right side fuselage longeron to frame No. 7, then to the center console area, then forward to frame No. 3 and up to the radio. The coaxial cable will require one

UG88 (male) and one UG89 (female) BNC cable connectors at frame No. 8. Do not run the coaxial cable along the bottom of the fuselage as it will interfere with the marker beacon antenna.

Because the length of the antenna is important for good reception, it is preferable that the antenna elements be laid out straight on (or under) the skin, and if the elements are run "up and over" the rib capstrips, the reception of the system will suffer.

If only one communications antenna is installed, it should be this antenna since the radio waves from unicom radios and antennas are vertically polarized to a greater extent than other communications (ATC, FSS, tower, ground, etc.).

Materials required:

1	RST Ferrite-foil Antenna Kit
1	UG88 (male) BNC Connector
1	UG89 (female) BNC Connector
25'	RG58 Coaxial Cable (includes 3' extra)

NO. 2 COMMUNICATIONS ANTENNA INSTALLATION.

See drawings No. 160 & 161. The No. 2 VHF communications antenna is identical to the No. 1 COM antenna described above; however, this antenna is installed in the left wing and no cable connectors are required for the coaxial cable.

The center of the antenna should be installed 120mm outboard of wing station No. 10, with the elements fastened to the upper aft face of the main wing spar. The elements are run along the spar to stations 9 and 12, and then the elements are run aft along the two ribs. The elements should run diagonally along the rib; that is, from the top of the wing at the aft face of the spar to the bottom of the wing at the aft end of the antenna elements. The antenna elements may be attached to the inside of the wing skin (that is, sandwiched between the rib and skins) or they may be sandwiched between the spar and the ribs, but we think that the first is preferable structurally.

The purpose of running the elements diagonally down-and-aft is to make the antenna as vertical as possible within the wing. VHF communication radio waves are vertically polarized, some more than others depending on the transmitter antenna. A similar antenna design was used within the wing of the Bellanca Viking (designed by Radio System Technology), and it was found that the communications antenna in the wing worked well when talking to everyone except unicom, and the range with unicom was limited to about 20 miles.

The coaxial cable should be run at right angles to the element down the spar aft face, then forward through the spar just under the upper spar cap to the wing leading edge strip (still at right angles to the antenna elements), and then along the leading edge strip to the cockpit and the radio. See "Special considerations in wiring" if wing tip strobes are used.

Because a metal pitot tube line will interfere with the operation of the antenna, a nylon line should be used. The wiring for the wing tip lights should be run along the leading edge of the wing. The usual method of installation is to drill a small hole in the wing rib gusset just aft of the forwardmost vertical brace, and run the wiring through this hole.

As with the No. 1 COM antenna, the antenna elements, ferrite balun assembly, solder joints and coaxial cables must be firmly attached to the wooden structure with epoxy and fiberglass cloth to prevent airframe vibration from affecting the antenna.

Materials required:

1	RST Ferrite-foil Antenna Kit
17	RG58 Coaxial Cable (includes 3½' extra)

VHF NAVIGATION ANTENNA INSTALLATION.

See drawings No. 160 & 161. The VHF navigation antenna is a nearly identical mirror image of the No. 2 COM antenna, but in the right wing. The elements are run along the aft face of the wing spar to the ribs at stations No. 9 and 12, and instead of angling diagonally aft-and-down the elements are brought directly aft so that the entire antenna is horizontal. Navigation radio waves are horizontally polarized, so the ideal is to have the entire antenna exactly parallel with the fuselage W.L.O. Because of the design of the wing, you may find it easiest to run the antenna elements along the bottom skin. The slight curving of the bottom of the wing will have very little effect on the antenna's reception. Since the length of the antenna is important for good reception, it is preferable that the antenna elements be laid out straight, and if the elements are run "up and over" the rib capstrips, the reception of the system will suffer.

Note on drawing No. 161 that the length of the elements for the NAV antenna is 22.8" for each element.

The coaxial cable should be run at right angles to the elements forward to the wing leading edge strip and then along the leading edge strip to the cockpit and the instrument panel. See "Special considerations in wiring" if wing tip strobes are used.

If one NAV radio is used, the coaxial cable may be run directly to the radio. If two NAV radios are used, the signal is split at the instrument panel into two equal parts with an RST-513 nav splitter to feed two VHF VOR-LOC receivers, plus a separate glideslope output. If desired, a second glideslope output may be added later by splitting this glideslope output.

(With all other things being equal, it is usually preferable to install two separate navigation antennas since the signal is weakened slightly by the splitter. The engineer who designed this system considered the possibility of installing two navigation antennas and concluded that the use of one antenna with a splitter was superior to the use of two antennas, since more signal was lost to the resistance of the extra length of the coaxial cable to the tail of the airplane than was lost to the splitter. Any builder determined to experiment with a second nav antenna should purchase the materials for an extra antenna and install the antenna in the stabilizer.)

Materials required:

1	RST Ferrite-foil Antenna Kit
22'	RG58 Coaxial Cable (includes 3½' extra)
1	RST-514 Splitter
4	UG88 (male) BNC Connector

MARKER BEACON ANTENNA.

See drawings No. 160 & 161. The marker beacon antenna is a ferrite-foil antenna similar in construction to the NAV and COM antennas described above. This antenna also has two elements, each 34.3" long, installed in the bottom aft section of the fuselage. The center of the antenna is about 70mm forward of station No. 11. The elements of the antenna are installed on the bottom center longeron. Due to the nature of the marker beacon signal (blasting at the airplane from below at close range) it is completely acceptable to run the elements of the antenna "up and over" the fuselage frames.

As with the other ferrite-foil antennas, the elements, ferrite balun assembly, solder joints and coaxial cable must be securely fastened with epoxy and fiberglass cloth.

The coaxial cable should be run at right angles to the antenna elements along the fuselage skin up to the upper right side longeron and then routed forward with the cable for the No. 1 COM antenna. The coaxial cable will require one UG88 and one UG89 BNC cable connector at frame No. 8.

Materials required:

1	RST Ferrite-foil Antenna Kit
1	UG88 (male) BNC Connector
1	UG89 (female) BNC Connector
20'	RG58 Coaxial Cable (includes 3' extra)

TRANSPONDER ANTENNA INSTALLATION.

See drawings No. 160 & 162. The transponder antenna is a rod-ground plane device. The ground plane should be mounted horizontally (parallel with fuselage W.L.0.) with the radiating rod pointing straight down. It is important that the bottom side of the antenna (the side with the radiating rod) be kept 300mm from any metal. There is practically no radiating field on the top side (the side where the coaxial cable attaches, so metal objects near the top side of the antenna have very little effect on the operation of the antennas.

Install the transponder antenna in the right wing between station 3 and 4. The fore-and-aft position in the wing is not critical, but it is best to locate the antenna in the forward part since this results in a shorter coaxial cable. The ground plane may be glued to a piece of 1mm birch plywood with epoxy glue. The plywood sheet should be supported by 10x10 spruce strips and the whole affair may be installed between the ribs in any convenient manner. You may find that the most convenient location is to locate the radiating rod in the middle of one of the ribs. We would suggest that all nails and staples be removed from the ribs as well as any used in gluing on the wing skin.

Route the coaxial cable to the instrument panel as shown in drawing No. 160.

Materials required:

1	RST Transponder/DME Antenna Kit
10'	RG58 Coaxial Cable (includes 3½' extra)

A second transponder antenna, if required, may be installed in the right wing between stations 5 and 6. This requires 12' of coaxial cable, which includes 3½' extra.

If wing fuel tanks are used, the transponder antenna should be installed in the fuselage between stations 7 and 8 on the right side of the aircraft. This requires 12' of coaxial cable, which includes 3' extra.

DME ANTENNA INSTALLATION.

See drawings No. 160 & 162. The DME antenna is identical to the transponder antenna except that it is installed in the left wing.

Materials required:

1 RST Transponder/DME Antenna Kit

10' RG58 Coaxial Cable (includes 3½' extra)

A second DME antenna, if required, may be installed in the left wing between stations 5 and 6. This required 12' of coaxial cable, which includes 3½' extra.

If wing fuel tanks are installed in the aircraft, the DME antenna should be installed in the fuselage between stations 7 and 8. This requires 12' of coaxial cable, which includes 3' extra.

ADF ANTENNA INSTALLATION.

No special antenna is offered by Radio System Technology since most newer radios are being supplied with a combined sense-loop antenna. This antenna should be installed inside the top of the fuselage around station No. 9. Because of the proximity of the antenna to frame No. 8, it may not be necessary to have cable connectors if the cable can be easily detached from the antenna, or if the antenna can be easily detached from the airframe.

SPECIAL CONSIDERATIONS IN WIRING.

Any of the antenna coaxial cables may be run beside any other antenna coaxial cable. Care must be exercised in installing some of the antenna cables near strobe light wires. Strobes are operated by high voltage, and these high voltage wires lead from the strobe power supply to the strobe light. It is permissible to run these high voltage lines with the cables for the DME and transponder antennas, but the VHF navigation and communications antenna cables should be spaced about 6" from the high voltage lines to eliminate the noise that will otherwise be created. The ADF antenna cable is ten times more sensitive to the strobe light high voltage wiring and should be kept as far away from it as possible. The strobe light wiring for the tail should be run down the upper left side longeron, that is, on the opposite side of the fuselage from the ADF cable.

GENERAL COMMENTS.

Wood aircraft are customarily covered with a metalized paint over the fabric. This "silver" coat has no effect on the operation of the antennas, since the metal parts in the paint are in suspension and do not touch each other.

These assembly instructions have been written without the actual installation of the antennas in a Falco. Accordingly, we suspect that there are some ways of installing the antennas which are easier than others, and that there are a number of better ways of installing the antennas which have not occurred to us. The placement of the antennas within the aircraft should not be changed, but we are free to admit that we do not have all of the answers about what is the best way of installing the antennas, fitting them to the structure and how this installation best meshes with the assembly of the aircraft. Please let us have your ideas, if you come across some better way of doing things.

For additional information on these types of antenna systems:

1. "The Plastic Plane $5 Antenna System", Sport Aviation, Jim Weir, May 1979.
2. "Antennalets", Sport Aviation, Jim Weir, January 1981.
3. "Economy Antennas", Sport Aviation, Jim Weir, October 1976.

ANTENNA KITS & COMPONENTS

The following kits and components are available from Radio Systems Technology.

KIT NO 860. ANTENNA KIT - ASSEMBLED. Includes all required components for two VHF COM antennas, one VHF NAV antenna, one dual NAV plus glideslope splitter, one DME antenna, one transponder antenna, one marker beacon antenna and all required coaxial cables and cable connectors. Connectors to radios not included. Cable for No. 1 COM and marker beacon have cable connectors installed. All ferrite toroids and heat shrink tubing installed. Splitter assembled.

120.50

KIT NO. 861. ANTENNA COMPONENTS. Includes all of the same components as Kit No. 860 except that cable connectors, ferrite toroids and heat shrink tubing is not installed. Splitter not assembled.

83.00

RST FERRITE-FOIL ANTENNA KIT. Includes enough copper foil tape and ferrite toroids to make one NAV or COM antenna. Will require coaxial cable. (Add $0.50 for marker beacon antenna.)

5.00

RST TRANSPONDER/DME ANTENNA KIT. Includes an aluminum ground plane, radiating rod, shoulder washers, nuts and solder lugs to make one antenna. Requires coaxial cable.

7.50

RST-514 BNC-GS DUAL NAV PLUS GLIDESLOPE SPLITTER KIT	13.50
RG58 COAXIAL CABLE	.15 per foot
COPPER TAPE	.25 per foot
SHOULDER WASHERS, for DME/transponder antenna	.25 each
FERRITE TOROIDS	.25 each
75 OHM COAXIAL CABLE, 36" long (for splitters)	.75
UG88 (MALE) BNC CABLE CONNECTOR	2.00 each
UG89 (FEMALE) BNC CABLE CONNECTOR	3.50 each

All prices are F.O.B. Grass Valley, California.

Order from: Radio Systems Technology
10985 Grass Valley Avenue
Grass Valley
California 95945
Telephone: (916) 272-2203