

# Upholstery

This Falco Construction Note replaces Advanced Builder Memo “Chapter 47 Upholstery”

At this time, this chapter is still very incomplete. My intent is to provide the Falco builder with a set of instructions and guidelines that will make it possible to install a “Ferrari” interior in the Falco. I will be suggesting that a builder who wants to have a very high class interior and who still wants to do much of the interior himself should buy materials from Bill Hirsch who specializes in materials for exotic and antique cars. Thus, the many references to the Bill Hirsch materials are intended to give a builder a preview of what the materials are like, so you can know what samples to request.

After writing much of this, I realized that I needed to do some drawings for the upholstery. These are included as illustrations. The intent is that you will treat these like paper dolls. Go find a copy machine, make multiple copies of the designs you like. Cut out the seat cushions and paste on the seat layout and then cut out all of the various pieces and move them around on the basic layout so you can see how these pieces will fit together and how they will look. If you like, you can even color the pieces!—*Alfred Scott*

## Introduction

There is an old saw to the effect that homebuilders do three things poorly: they do a nice job of painting an airplane but don't know how to design a paint scheme; they build instrument panels where the instruments look like they are installed in random locations; and lastly that they install interiors that either look like a Winnebago motor home or a French bordello. So let's see if we can save you from the third deadly sin.

## Glareshield and Turtle Deck

The glareshield and the area directly in front of it should be a *dull, non-reflective black*. Nothing else will do! Anything else will cause a reflection on the windshield and destroy the forward visibility when you are flying in direct sunlight. The reflection is least noticeable when you look at light colored objects like clouds, and most objectionable when looking at dark objects like the ground. We can tell you from experience that even a shiny black vinyl will substantially detract from your ability to see. It's a genuine nuisance.

The simplest thing is to just paint the glareshield and forward with a flat black paint. The most attractive installation is to cover the glareshield with a layer of padding and then leather or vinyl. The padding will keep your avionics cooler and will absorb sound. If you do this, you can do the same thing forward of the glareshield.

The top of the fuselage protrudes into the aft end of the cockpit. The sight of the unpainted exterior in the cockpit is something we have all become accustomed to, but it detracts from the appearance of the airplane. It confuses the eye and visually shortens the canopy, since your eye is distracted from the outline of the canopy by the top of the fuselage. If you have painted a stripe on the top of the dorsal fin, the stripe will enter the cockpit and look strange. This is the *interior* of the cockpit, and it will be much better looking if it looks like the interior—not a spare part of the empennage you are carrying on the trip. We think the diagonal frame should stylistically mirror the glareshield—do to it what you do to the glareshield. It will look best if you have a padded black leather or vinyl “bumper”.

Materials: If you use a vinyl, we recommend Porsche Vinyl PV-1 which is a dull, leather-grain, light weight black vinyl. Black leather or vinyl will produce some reflection with the sun directly overhead. Falco builders who have used leather or vinyl have reported that this is not a problem. Three alternatives are: Imported Mohair #181 (a black velvet), Grade 5 broadcloth No. XBK (a black broadcloth) and Porsche SL-1 sliver knit carpet (a black artificial sheepskin carpet). It is difficult to see how any of these black fabrics or carpet would be appropriate in an attractive interior, but they offer the ultimate in a non-reflective black.

Make a fiberglass part molded to the shape of the diagonal fuselage frame. First, build up the thickness of the curved bow with

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strips of soft flexible foam, pieces of an old blanket, or whatever, so that the fiberglass part will have enough internal clearance for touching the leather and will also have room on the inside for the interior upholstery. Cover this with wax paper or plastic film and lay up the fiberglass part. This bumper will serve a practical purpose since the edge of the upholstery under the diagonal frame is a difficult installation.

## **More Black**

There will be a lot of black in your cockpit, no matter what color you paint your airplane. The instruments and their dial faces are black, as are the control stick grips, throttle knob, avionics faces, circuit breaker knobs, assorted knobs, rudder pedals and seat belts.

We also believe that the windshield bow and the canopy frame should be painted a dull black. Ditzler DPE-1538 zinc chromate primer is an excellent paint for this purpose. It is a dull black primer, and you can use it on steel or aluminum parts without having to use anything else. Dull paints are non-reflective which is exactly what you want in a cockpit, but it is also easy to repair a non-glossy paint. You don't notice a painted-over spot like you would with a gloss paint.

We have found that the control sticks, rudder pedals torque tubes and trim tab wheel look best if painted a dull black. There something a little jarring about seeing these in white.

## **Instrument Panel**

We are strong advocates of painting the instrument panel dark grey. Business jets and turboprops are almost always painted a dark grey. It's a very attractive, businesslike, no-nonsense color which offers just enough contrast with the black instrument bezels and dials to make them stand out, but it's not so much contrast that it makes the panel look busier. It's a design scheme that's used on many calculators, computers, digital watches and portable radios with that "military" look—the subtle shade difference draws attention to the black buttons and dials without botching it up.

Some years ago, we experimented with a number of paints and found one color that was simply wonderful. Pactra 20017 "Asphalt" is a paint sold for camouflage paint schemes on model airplanes. It comes in a little shake-and-spray can. It was beautiful! We put it on our instrument panel display that we take to Oshkosh. After applying the lettering, we sprayed the panel with the protective spray fixative, and the color turned much darker—to almost black. We also found that the paint was not very durable, but this is probably because we did not use a good primer. It's a big mistake to paint the panel without first spraying a primer for adhesion.

If you want to do what Cessna does on their Citation jets, the paint is Federal Standard No. 595-36118. This flat gray paint can be made up by any paint store. If you don't use dark gray, you should at least paint the panel a flat black. But whatever color you choose for your instrument panel, first check to see what it will look like after it is sprayed with a spray fixative.

We have found that it looks best to paint the instrument panel, pedestal, quadrant cover, all center console covers and the nose gear bay cover the same color. One early kit-built Falco had the panel, pedestal and quadrant cover painted dark grey, while the center console covers and nose gear bay cover were painted dark red. It just looked wrong to have the grey pedestal sandwiched between the console cover and nose gear bay cover.

False panels to cover wiring.

## **Design of the Interior**

Whenever you discuss the design of the upholstery of your Falco, you must also consider the paint scheme and the instrument panel. These things are hopelessly interrelated. The paint scheme will be the one thing that will give the overall personality and flavor to your airplane.

The interior of the airplane is dominated by the instrument panel, and even with black paint and no lettering, the instrument panel is very busy. The upholstery should not try to compete with the instrument panel for attention. Keep the upholstery simple and comfortable—and don't try to make a "statement".

There are a few practical considerations to keep in mind. The sun beats down and the color of the interior will have a marked effect on the temperature in the cockpit. For this reason, we generally recommend lighter colors. This is particularly important

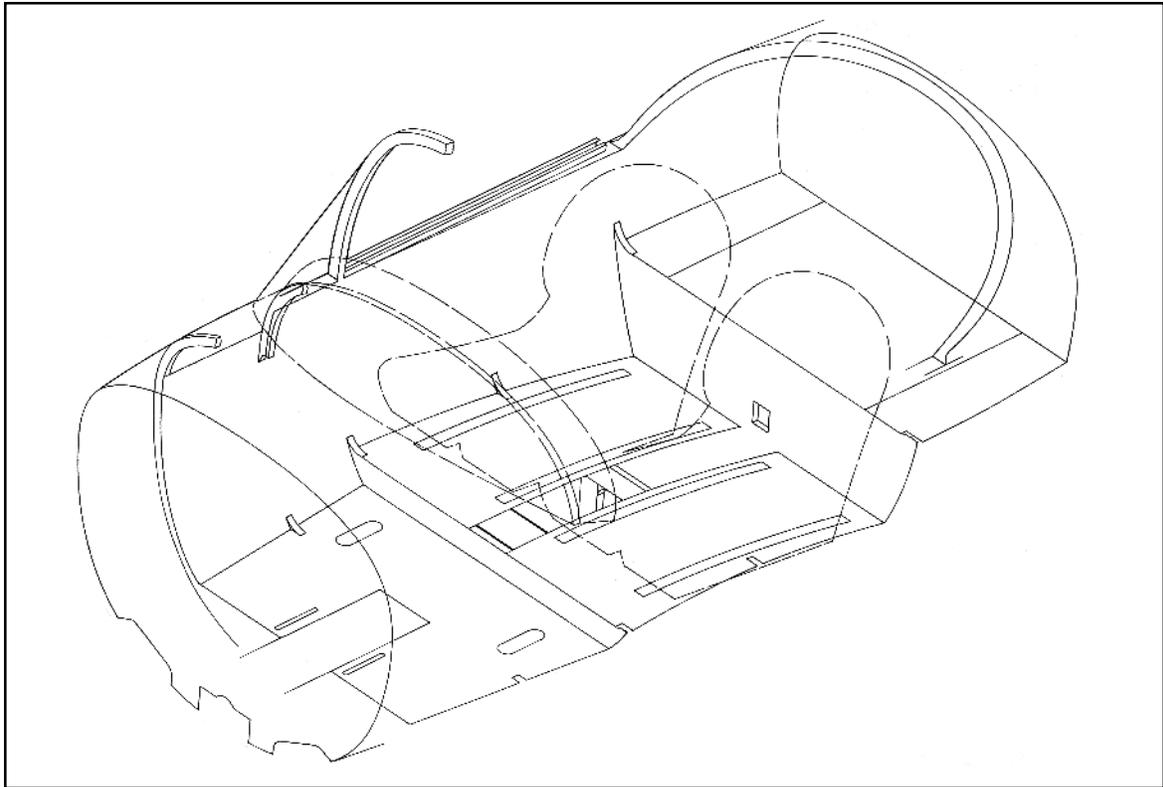


Figure 1. Upholstery Layout

if you live in a hot area. The sun will also fade the colors of the fabrics, but if your Falco is hangared most of the time, this is not a major concern.

Remember that at some point you will be caught in a downpour—it happens to everyone sooner or later. The seats and carpet are going to get soaking wet. Consider how the materials will be when they are wet. What if some crazed airplane hater—or your ex-wife!—dumps a bucket of rotten tomatoes in the plane? On a cross country trip, you will at some point drop part of your lunch on the seats or carpet. Will you be able to take the upholstery out of the airplane for cleaning and drying?

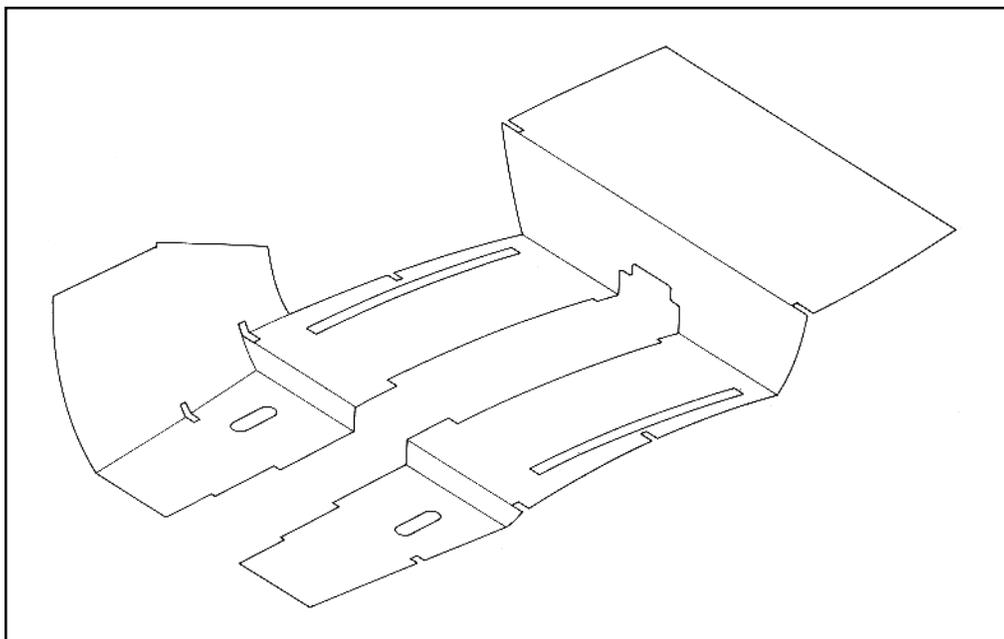


Figure 2. Carpet

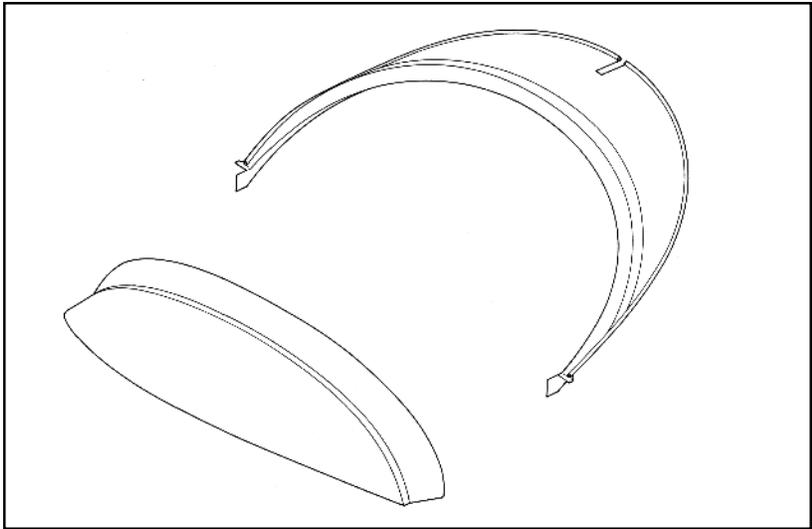


Figure 3. Glareshield and Turtledeck

And don't forget that you can add a lot of weight if you're not careful. We once heard of a man who had his Piper Aztec completely upholstered with tooled leather down in Old Mexico. He noticed that the plane wasn't performing well and checked the weight. The upholstery had added 600 lbs to the airplane. Leather and carpet are the two "heavies", and you should not add weight needlessly.

Keep in mind that the "interior" of a Falco is really part of the outside of the airplane. When you pull the canopy closed you haven't shut out the world like you do in a limousine with darkly tinted glass. You are shoulder-to-shoulder with the sky and the clouds. Think of the upholstery in this setting—as in a convertible where the top is always down. So don't try to create a cozy, dark womb that is no relation to the outside of the plane. When you fly the Falco, you'll spend most of the time looking at the instrument panel and straight ahead, but you will see the wing and the interior side panels at the same time. On many Falcos, the top of the fuselage is inside the canopy so the exterior paint is in the "interior." It should all work together.

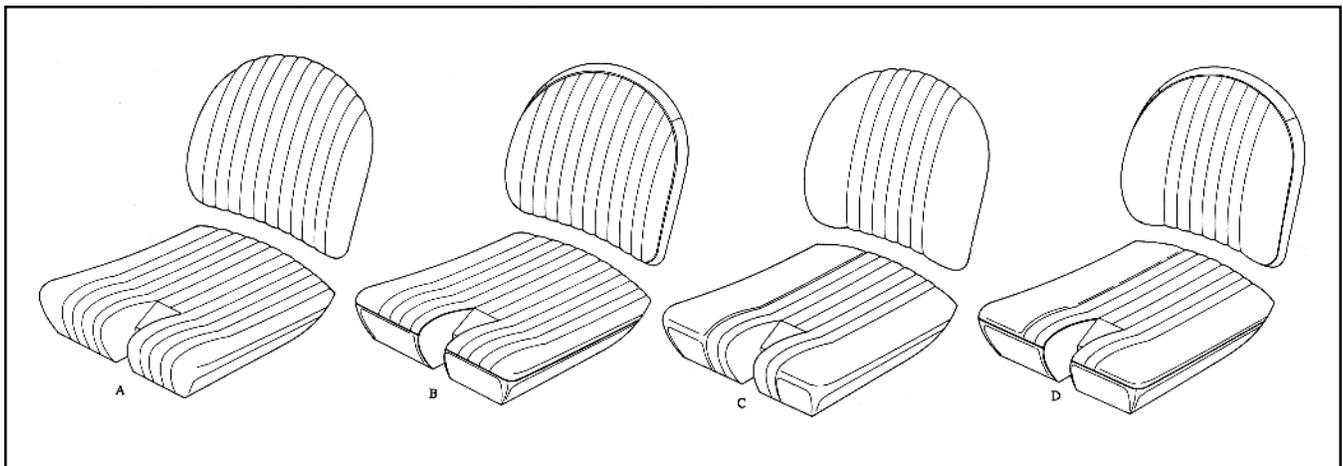


Figure 4. Seat Designs

Our strongest recommendation is to keep the interior monochromatic—one color. Rolls Royce, Ferrari, Mercedes-Benz, BMW, Honda Accord—all the better cars—use only one color in the interior. One color does not make for a bland interior—it makes the best looking one. There are subtle things you can do with stitching, mixing leather with fabric and carpet that keeps it interesting, but please consider using only one color.

One color also means staying away from tweeds and plaids. The early 928 Porsches had plaid interiors, and they looked horrible. The bottom-of-the-line Jeep Cherokees have vinyl-and-plaid interiors which is a clever version of the bait-and-switch marketing scheme: buyers are attracted by the low prices advertised, but then the salesmen sell the customer the more expensive version with the attractive interior.

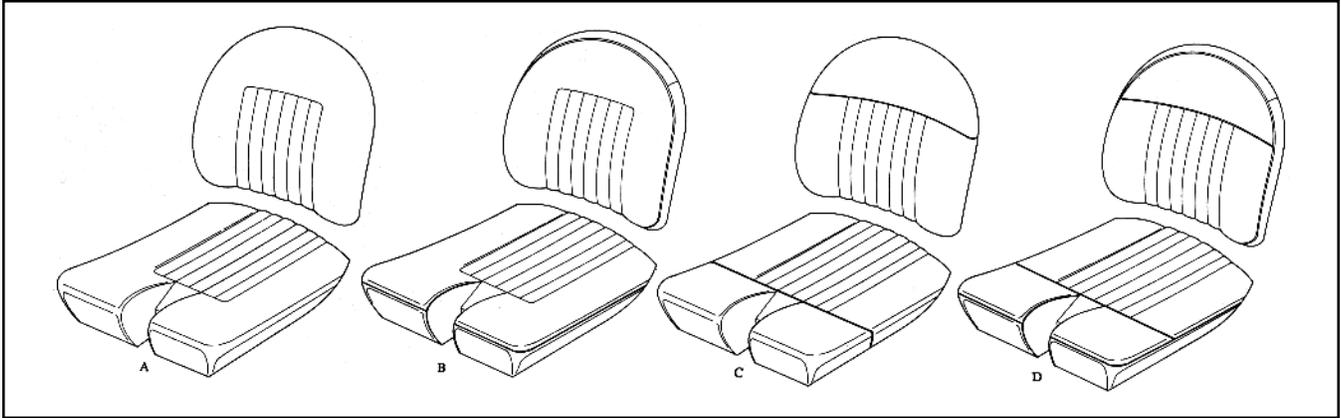


Figure 5. Seat Designs

Keep high contrast out of the interior. It doesn't work to have a seat made with a light-colored center and dark leather on each side. You don't want your interior to look like a holstein dairy cow!

Avoid a clash of textures between carpet and the fabric for the seats or side panels. A plush pile carpet will go with leather, velour and fabrics, but a tweedy loop carpet will be difficult and will require exceptional taste to match with a fabric.

The carpet and the interior should be of the same color family. They do not have to be of exactly the same shade. If there is to be a difference, normally the carpet should be the darker of the two.

You can use a black or grey carpet with seats and side panels of a different color. This will work visually, but it is probably less successful than having the carpet the same color as the seats and side panels. When you have a lighter color for the carpet—say a light tan—the instrument panel dominates. If the carpet is the same black or dark grey, the instrument panel visually merges with the floor covering, and it's less distinct. Also consider the luggage compartment. If you are going to cover it with the carpet, do you want the contrast of the black or grey floor with the side panels and rear bulkhead?

At some point we will do some drawings for the interior. In the interim, digest these notes. Decide what advice you like and what you don't. Make a study of car interiors. There is so much to be learned by looking at the interiors in the better cars. Notice the choice of fabrics, colors, textures, stitching patterns and techniques, carpet types, carpet bindings, etc. Do you like the look of loop carpet or pile carpet?

In the main, we would avoid a study of airplane interiors—most are on a par with '57 Ford pickups.

We think the best thing to do is to mentally decide on an overall scheme for the interior, then start looking for the materials.

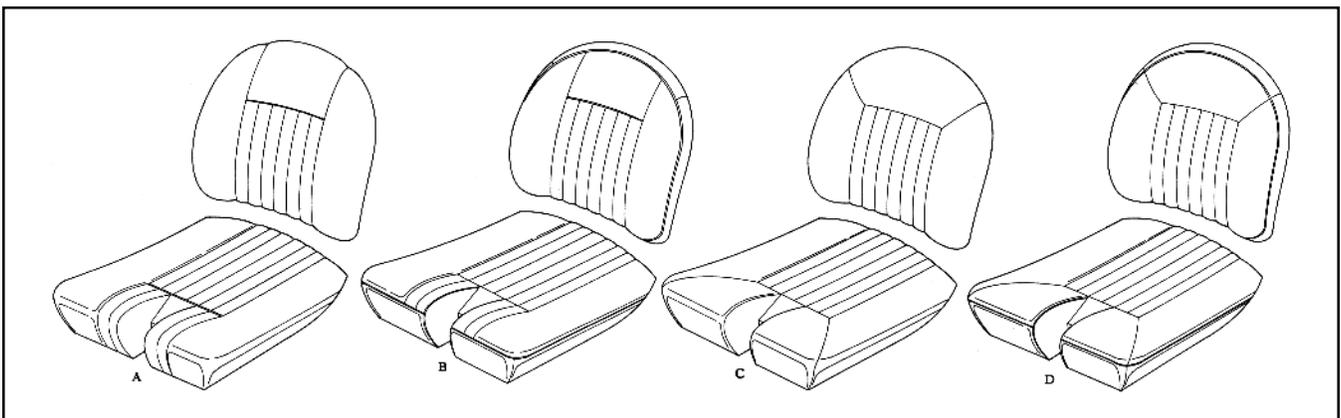


Figure 6. Seat Designs

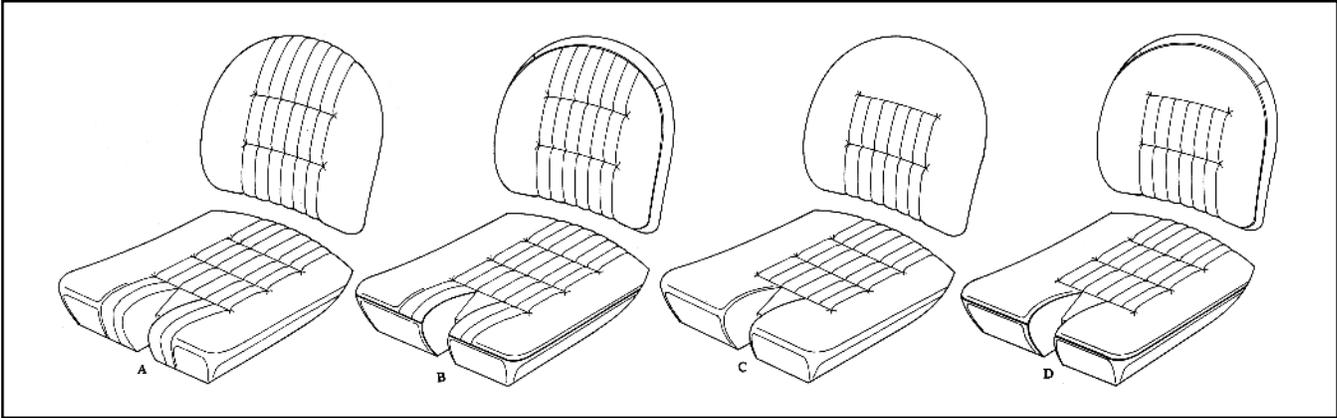


Figure 7. Seat Designs

Notes to myself:

Lu prefers a medium grey interior with loop carpet and nylon velour fabric.

Lu: no more than 2 colors in the interior in addition to black. Thus, one color for the carpet, one color for the leather or fabric. You can use some accent colors by picking up the exterior trim colors and use these colors in very small lines for a very subtle touch.

judging carpet. imagine it on the floor.

mass produced cars use combinations of plain and textured fabrics, leathers and vinyls to break up large areas. You can't do that.

Be glad there is no headliner.

Marsupial back cushion with pouch.

Don't skimp on cheap fabrics and carpets.

Pick up a trim color from the paint scheme.

Steve: don't get carried away with materials you see in offices like suade leather.

make a decision as to whether you want a utilitarian interior or a show plane. Any good car has a utilitarian interior.

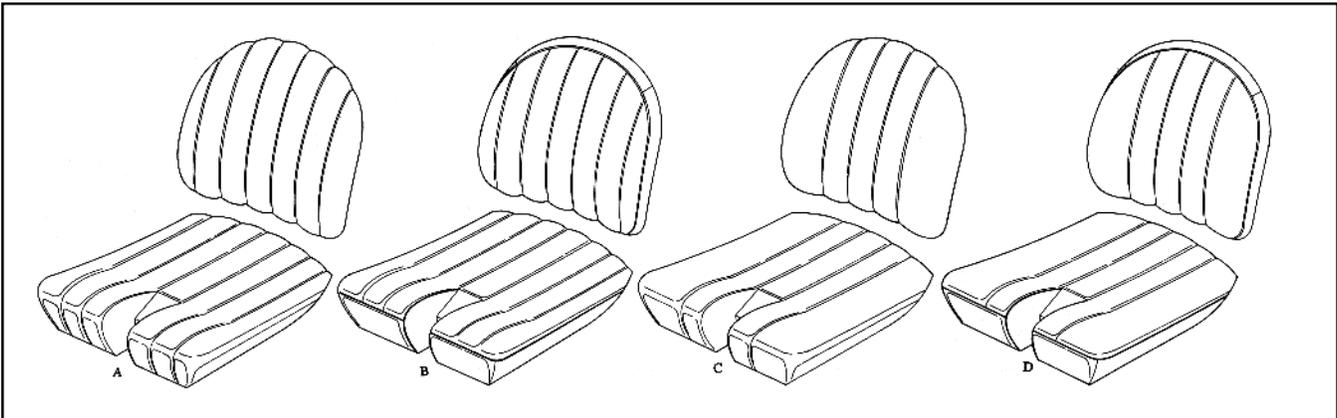


Figure 8. Seat Designs

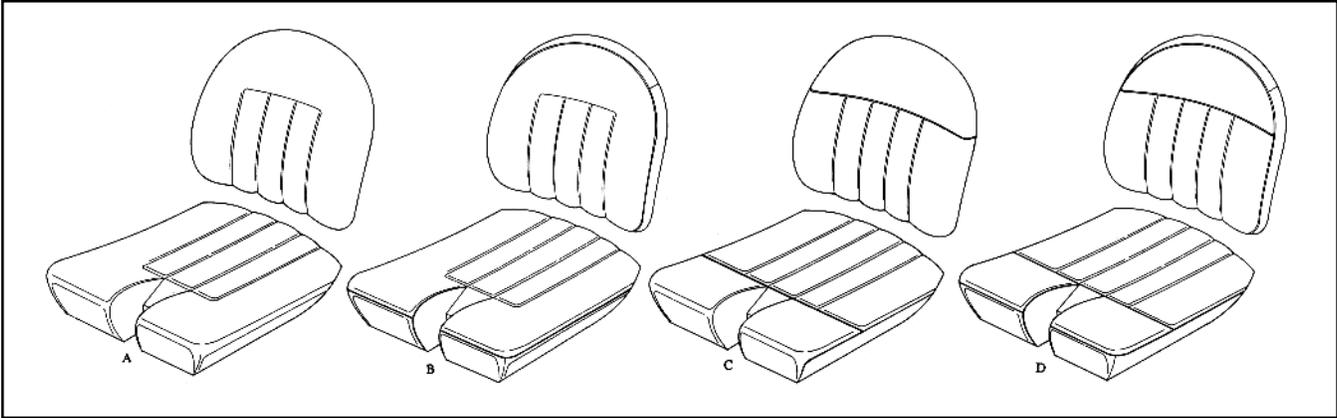


Figure 9. Seat Designs

Leather: smells good.

Pockets.

False panels to cover wiring.

Zolatone. Speckled paint for urinals. Used in VariEzes and urinals.

Books on automotive upholstery. Most of the people who do it are dolts anyway, so there can't be much to it.

Make patterns ahead of time.

Seek out people with a sense of color.

What to do yourself and what to farm out. Where to find a good upholstery shop. Do you need help in design? Do you know what sort of stitching pattern you want? Most builder should farm out the seats at a minimum and probably the side panels as well. Anyone can cut the carpet.

**The Seats**

The seat cushions should all be removable. It is essential that you do this with the bottom cushion since you have to take the cushion up to remove the seats from the seat tracks. Everyone installs the bottom cushion with Velcro.

The seat back cushion does not extend all the way down the the seat bottom cushion. There is a space of about three inches between the two cushions. This is an important part of the design and it is known as the "butt squeeze" area. If you look at any

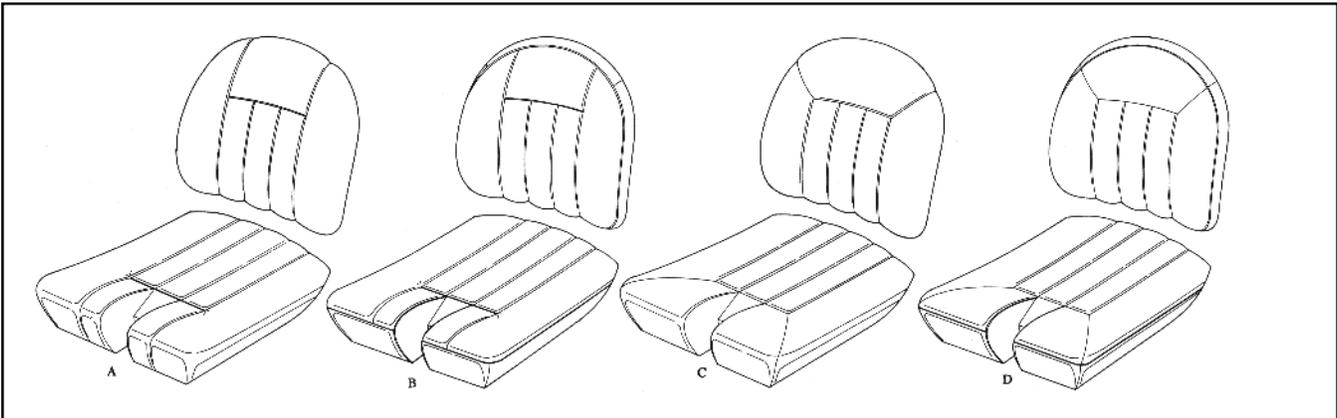


Figure 10. Seat Designs

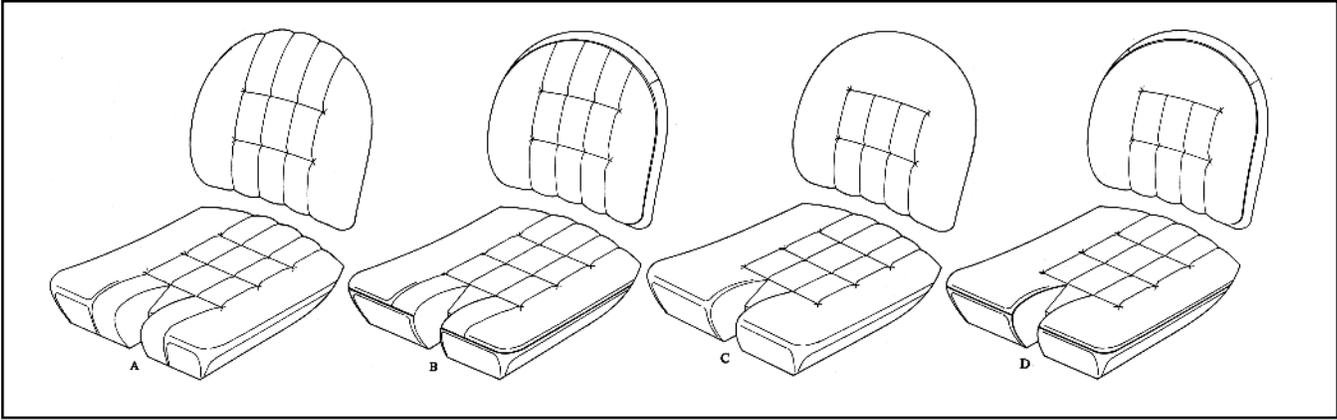


Figure 11. Seat Designs

secretarial chair you will notice that the back cushion does not come all the way down. This type of design makes for a very comfortable chair and putting foam in this area might look fine but it will detract from the comfort. Since this will expose the fiberglass seat frame, you should cement some fabric, leather or vinyl to the seat frame.

Journal of Bone Science. Marsupial seat back cushion.

The seat back cushion is upholstered with an upside-down pocket for the back of the fiberglass seat frame. Install some Velcro between the front of the seat frame and the back of the cushion—inside the upside-down pocket—to hold the cushion in place and to the curvature of the seat frame. It is also a good idea to install a map pocket on the back of each seat.

**Side Panels**

The canopy seal on the side is a strip of foam rubber that is glued to the canopy track. This makes a very good seal, but it is in a precarious spot. People sit on the side of the cockpit or rest themselves with their hands. Either way, the canopy seal gets a rough treatment. Any fabric upholstery installed here is also going to be given the same rough treatment. This is an ideal place for some leather or vinyl.

The usual practice is to use a strip of aluminum, wrap it with leather, and screw it into the cockpit coaming. This will pinch against the canopy seal holding it in place. It will also overlap the side panels of the upholstery. If the side panels are removable, it's nice to be able to stuff them up under a strip like this.

Another area that is difficult is the bow around the back of the cockpit. Most Falcos have the upholstery covering the inside face of the cockpit only. It's difficult to hold this upholstery in place without tacks or staples.

One solution to all of this is to complete frame the cockpit with leather or naugahyde. Up front you already have the glareshield,

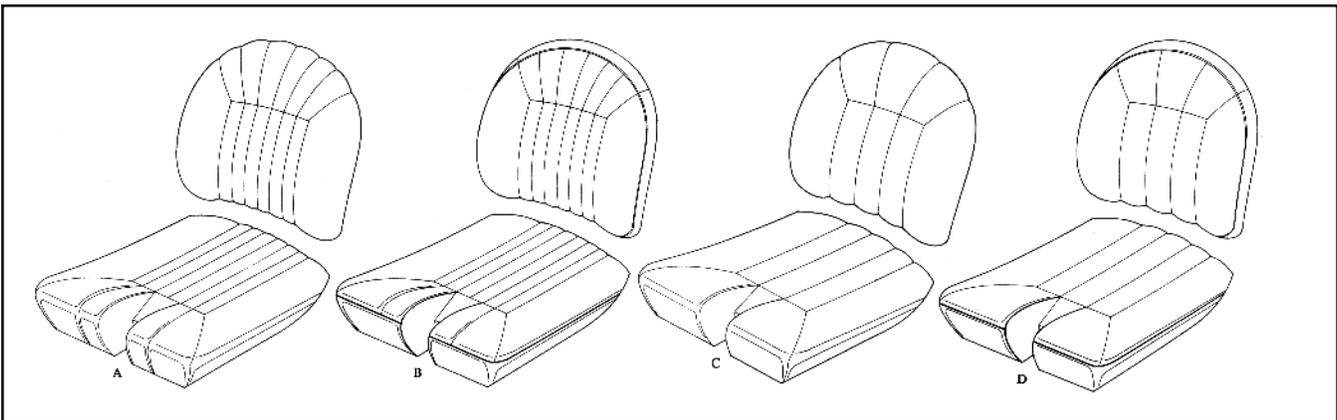


Figure 12. Seat Designs

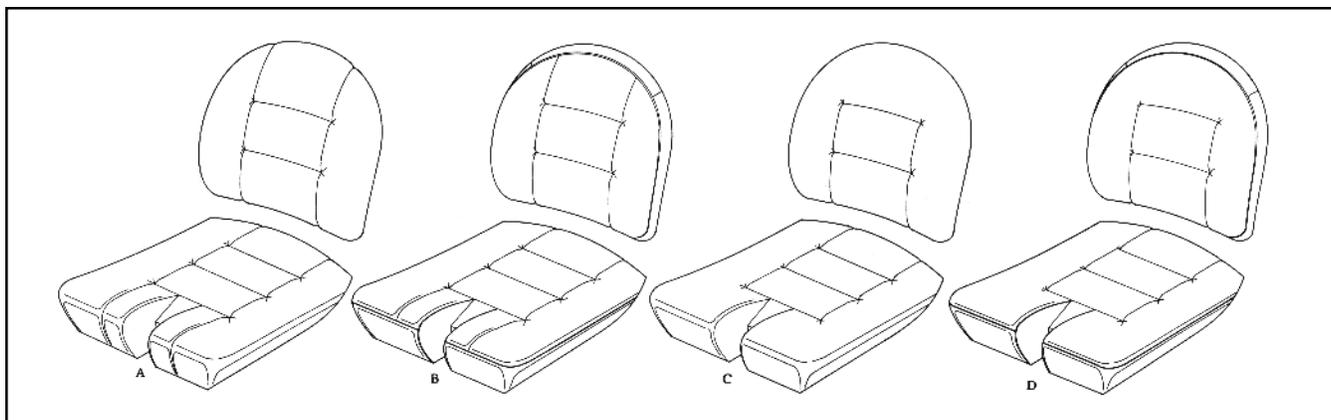


Figure 13. Seat Designs

and this looks very nice if it's covered with padding and leather. This same look can be done at the back of the plane, and you can carry the leather along the sides as well. Open cockpit biplanes frequently have the cockpit opening frames with a well-padded leather bumper and it's an attractive solution.

What you can do is to make up some fiberglass parts molded to the shape of the cockpit all around. If you are planning ahead, this would be easier to do before you install the windshield. Just cover everything up with Saran Wrap and lay up some fiberglass. On the bow at the aft end of the cockpit, you should first build up the thickness of the curved bow with strips of soft flexible foam, strips of an old blanket, or whatever, so that the fiberglass part will have enough internal clearance for tucking the leather and also room on the inside to push the upholstery panel into place. A border like this around the cockpit will be extremely attractive as well as serving a useful function, and it greatly simplifies the construction and installation of the side panels.

Side panels are typically made by sewing fabric, padding and fabric backing together with an attractive stitching pattern and then folding the edges over a foundation board and then cementing the fabric on the back side of the foundation board. This whole assembly is then installed in the airplane with screws.

For most production aircraft, the foundation board is a sheet of very thin aluminum (.012"-.016"), but you can also use thin fiberglass sheets (available from a local plastics supply company), cardboard or plywood. Birch plywood seems to be the most logical choice for Falco builders. If you have been planning ahead, you will already have made templates out of cardboard.

Most upholstery shops use 1/4" thick open-cell, fire-retardant polyurethane foam as padding, and they use muslin as the backing. The foam gives the upholstery a soft feeling, and it also absorbs noise. You should place the foam selectively, and in particular you should avoid putting foam right next to the seats. There is precious little room between the seats and the side walls anyway, and you do not want to make matters worse by adding foam needlessly to a place like that.

As with the seats, the stitching pattern on the side panels is very important to the appearance of the interior. Unbroken expanses of any material is dull and should be avoided. Most Falcos have pockets installed on the side panels for maps, pencils, etc.

### Carpet

The two styles of carpet that you would normally use are pile and loop. It is entirely a matter of personal preference since you can have an attractive interior with either type of carpet. Pile carpet is available in weights that vary from a short nap that's nearly a velvet up to a deep plush. Although they vary in thickness from about 5mm for the thinnest to 8mm for a thick Wilton carpet, there is a substantial difference in the feel of the carpet. Loop carpet is a nubby, knotted carpet often used in offices. It is not as soft as pile carpet, and it wears well. This should not be a consideration in your airplane—pick the carpet for the feel and look you are after.

By the way, we've noticed that people have a tendency to judge carpet by flexing a sample in their hands and examining the backing. Once installed in the airplane, you will not see the backing, so you should lay the samples on a flat surface and

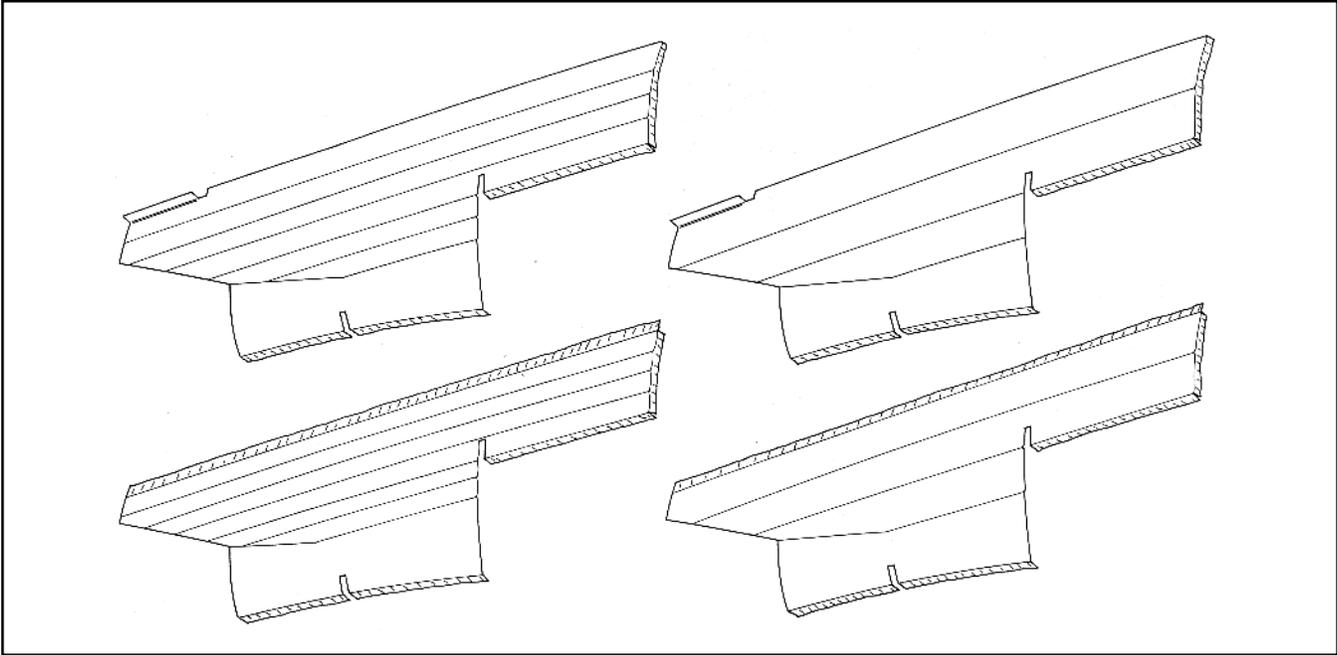


Figure 14. Side Panels

imagine how the carpet would look installed on the floor. This is material for a *floor*, not a fur coat.

Many carpets have a problem with fraying at an edge. The carpet will unravel and look like a mess. Wilton I will do this. It's a deep plush pile carpet, but you've got a problem at the edge. If the edge is not going to be in view, you have to bind the edge. This is done with leather, cloth or a vinyl that looks like leather. Because of this problem, many automotive carpets are made with a rubberized backing which prevents this fraying and unravelling. You should consider this when you choose your carpet. Think about all of the edges of the carpet that will show and will need binding. The bound edges will look a little busy, and you can avoid this by selecting a carpet that will not fray.

We think the carpet should be removable for cleaning and maintenance of the aircraft. The most common methods are Velcro, screws, snaps and "Lift the Dot" fasteners. Velcro is probably the easiest installation, but it means that you will have to position the carpet accurately each time you put it in the airplane. "Upholstery screws" are just No. 4 x 3/4" or No. 6 x 3/4" Phillips oval head sharp pointed sheet metal screws with nickle plated finishing washers. You can get these at your local hardware store. You can buy snap fasteners at hardware stores as well. The bottom snap is installed with a screw and the top half is sewn to the bottom of the carpet. "Lift the Dot" are frequently used on English cars. A little stud—it looks like a grease fitting in puberty—is screwed into the floor. The upper part is sewn to the carpet and requires that you lift and tilt one side to remove the carpet.

If you want to glue the carpet permanently in place, there are a number of appropriate cements. 3M General Trim Adhesive 08080 or 08090 are aerosol adhesives. Airtex sells their Duraseam Trim Cement which is a permanent quick drying cement that will not stain the fabric or vinyl.

Many builders install a heel plate of aluminum or stainless steel. Don't do it. You don't have your feet on the pedals all of the time, so there is not much wear. The carpet is installed for comfort, so go ahead and put your feet on the stuff. It takes a lot of scuffing to wear through a good piece of carpet—take a look under a desk that doesn't have a plastic mat, and you will not see any real wear from the shoes. Forget about heel plates. Who wants to kick off their shoes and then rest their feet on a piece of metal?

One of the most troublesome design details of the Falco interior has to do with the break between the side panel and the carpet in the front. Most installations have the bottom of the side panel extending forward from the top of the main wing spar. The carpet wraps up and the edge is covered by the side panel. If you extend the side panel all the way to frame 2, then you have a new horizontal line introduced. If you stop the side panel at the instrument panel, then you have a line going forward from the top of the spar then turning up. Either way, the cabin fresh air vent installation is complicated since you must cut an opening

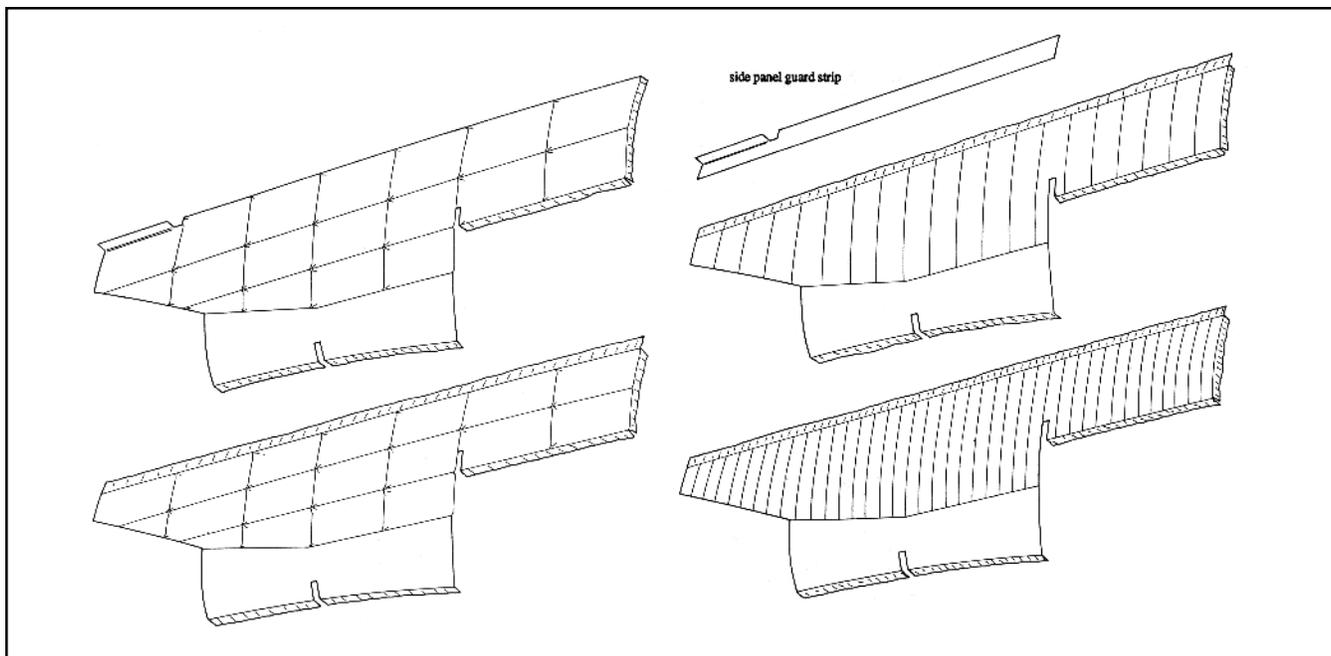


Figure 15. Side Panels and Side Panel Guard Strip

in the side panel and install the vent over the side panel.

One solution to this problem is to build on the natural lines of the cockpit. In addition to the canopy tracks, one of the dominant lines in the cockpit is the upward-curving outer edge of the seats. You can break the side panel by extending this line up to the bottom of the instrument panel. You can then de-emphasize this line by installing a pocket along this diagonal line. The entire bottom of the airplane would then be an amorphous area of carpet.

### Control Stick Boots

Almost everyone will want to install little boots around the bottom of the control sticks. This is done primarily for appearance, but it has a practical function as well. In the winter, cold air will come up around the stick, and this can be particularly distressing to your passenger if he or she is wearing a dress.

The thing you have to be careful about is to insure that the boot does not restrict the movement of the control stick. One early Falco had such a boot, and it would bind. It makes no sense to build an airplane with featherlight controls and then wrap the stick with a tight boot.

Exotic car gear shift levers usually have a grossly oversized upside-down knicker leg that looks like one of those dogs with far too much skin. You don't need to go to that extreme, but this scheme will allow the stick to move freely. The boot for the right stick must have additional room for the nut, and you should make sure that when the stick is removed the boot cannot jam the controls.

### The Luggage Compartment

The floor of the luggage compartment can be covered with carpet, leather, vinyl or fabric. The luggage compartment floor takes a fair amount of abuse so it's a good idea to go with carpet, and with carpet, it's quite easy to install in one removable piece. Remember that you will be removing the luggage compartment floor frequently for maintenance.

The rear bulkhead is quite easy to cover since it is removable. This looks best if you use a layer of 1/4" foam for padding and use an imaginative stitching pattern. We've seen some nice subtle patterns. One interior used the same stitching pattern as on the seats and then used the round Sequoia Aircraft Corporation logo in the center. Since the logo was only a stitching pattern, it worked very well. Another Falco had the stylized "Falco" logo from the cover of the Falco brochure. That, too, was very successful.

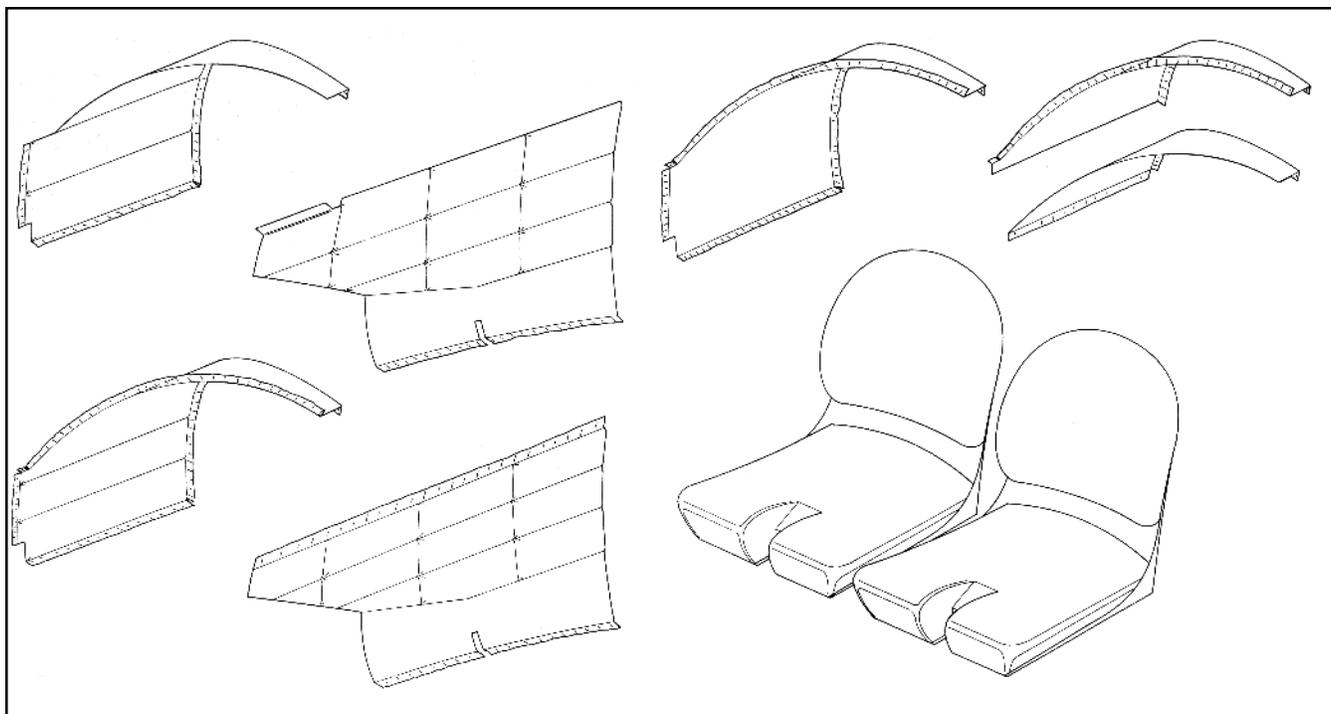


Figure 16. Side Panels, Seats Layout and Headliners

Don't forget that the tail cone is shaped like a megaphone and it will augment any wind and engine noise. The rear bulkhead should have sound-absorbing insulation installed on the aft face.

### Flammability Requirements

With production airplanes, the FAA requires that all upholstery materials be self-extinguishing. Homebuilt aircraft are not required to do this, but it is a reasonable requirement and one that you should strive to meet. There is probably a government mil-spec flammability test that the industry uses, but we use a simple test. Cut a quarter-inch wide strip of the material, hold it in a horizontal position with a pair of pliers, light one end with a butane cigarette lighter and then hold the strip at 45°. Note if the flame goes out or if it continues to climb the sample. Note the behavior of the material—does it melt and drip in flaming balls to the floor.

And what about the smoke? Wool burns with the smell of burning hair—stinky but not poisonous. Some synthetic materials give off a poisonous, sooty black smoke. Many natural fibers burn with barely any smoke at all. Before you install any carpet or fabric in your airplane, it's a good idea to know what sort of smoke it will produce in the event of a fire. A simple burn test can have a profound effect on your opinion of the flammability requirements!

While the strip burns, you can also note the behavior of the fibers. Natural fibers such as wool, flax and cotton just burn, while synthetic fibers contract, curl and often melt before burning.

Wool and leather are naturally self-extinguishing. But be careful when you are dealing with wool. If the material is 80% wool, the rest of the fabric is likely made of an inflammable synthetic so the fabric may not be self-extinguishing. Carpets may be 100% wool-faced, but the backing is certainly made of another material and may render a wool carpet inflammable. The same is true of fabrics, velvet is made like carpet and the synthetic backing will sustain a flame although the wool pile will not.

Nylon is ordinarily self-extinguishing. The threads melt into a black liquid which burns slowly, but it does not burn as readily as other synthetic fabrics. Polyester (Dacron is just one of many trade names) burns very readily. Many synthetic materials give off poisonous gases.

Vinyl "synthetic leather" products are usually a sheet of polyvinyl chloride plastic sheet bonded to a synthetic fabric. They will

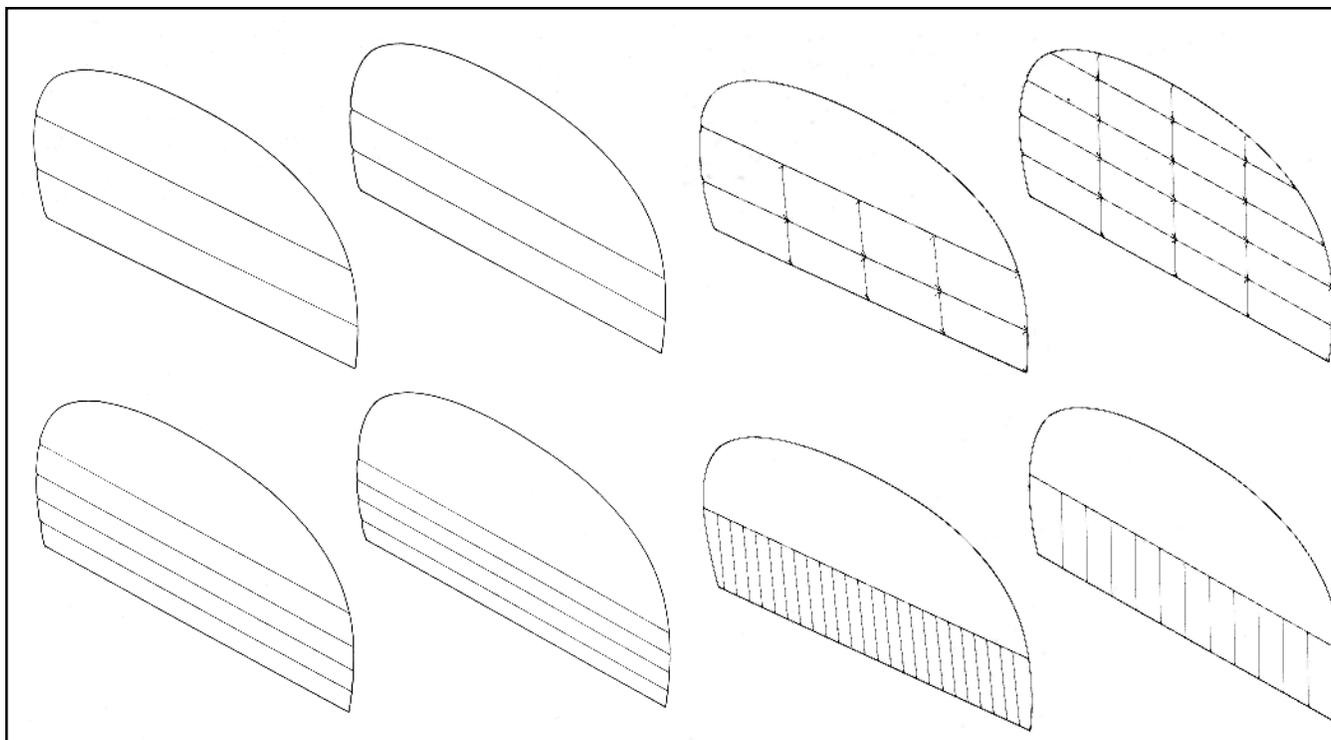


Figure 17.Rear Bulkheads

burn, and the smoke is toxic. Vinyls are used in production aircraft. Apparently, the philosophy is that vinyl does not ignite easily, and—if it does—you and your clothing are probably on fire as well.

**Flame Retardants**

If the material is just what you want and is not self-extinguishing, there is help. You can treat fabric, carpet, leather and any porous material with a fire retardant. Fire retardants do not work with vinyls since they are not porous.

We recommend PTE International’s Duo-Gard flame retardant and soil protection treatment—“double protection for all fabrics against flames and stains.” The flame retardant puts out fires. The soil protection treatment is similar to Scotchgard in that it protects the material from staining from spilled foods. Duo-Gard is non-toxic and is applied by sponging, dipping, rolling or spraying. Duo-Gard lasts for the useful life of the treated material, meets FAA flame resistance tests, has an indefinite shelf life and treated items won’t support combustion. (PTE International also sells Formula 111 flame retardant, the same as in Duo-Gard but without the soil protection treatment.)

Duo-Gard has certain limitations. Since it is water based, it cannot be expected to retain its effectiveness if treated materials are washed or laundered with water-based cleaning solution, but solvent cleaning or “damp dusting” will not change the effectiveness of the fire retarding or soil protection qualities. Solid plastic, painted or lacquered wood, metal or other materials that will not absorb the liquid chemical cannot be treated. A limited number of fabrics may have a rubber or synthetic coating on the underside that will not absorb the liquid chemical.

Application of Duo-Gard is normally made by spraying with an airless paint sprayer or with a simple finger operated hand sprayer—like those used to spray the leaves of plants in your house.

Preparation for application: Remove all items (that are not permanently installed) to be treated from the aircraft. Make sure the materials are clean and free of dust, grease and unsightly spots. Mask off all areas that will not be treated—thin plastic sheets and masking tape are recommended for masking. Apply a coating of lacquer or other permanent protection to all exposed brass fittings or decorative trim to avoid tarnishing by adjacent treated materials under humid conditions.

To apply with a finger operated hand sprayer, shake the container for 5 seconds or more. Adjust the sprayer nozzle so that Duo-Gard is discharged in a heavy mist. Apply Duo-Gard with smooth, even strokes, holding the sprayer nozzle about 4" from the

material. Overlap each sprayed area to insure complete coverage. On most fabrics, apply enough Duo-Gard to thoroughly saturate the fabric, but not so much that it is dripping. When treating soft or delicate fabrics such as velvet or velour, apply two very light applications about five minutes apart to avoid a feeling of stiffness after drying. Apply extra amounts of Duo-Gard to insure thorough penetration in any high risk areas (such as where a lighted cigarette might be accidentally dropped.)

Slick or "shiny" materials usually require two or more light sprays at about five-minute intervals. Heavy sprays simply run off. If you have a problem obtaining satisfactory results with a nylon or polyester fabric that will not readily absorb Duo-Gard, simply heat the Duo-Gard to 140°-150°F and promptly treat the fabric. Be sure to stir the chemicals before spraying, and hold the nozzle three to four inches from the material so that the Duo-Gard will retain most of its heat when entering the fabric.

Carpet requires special consideration. You must get the fibers wet all the way down to the backing on the top side and then turn the carpet over and treat the underside.

When using an airless paint sprayer with a fan spray nozzle, such as a Krebs or Wagner, adjust the pressure to medium to high to provide good flow and penetration. Hold the nozzle approximately 8" to 10" from the material being treated. Be sure the nozzle is perpendicular to the plane of the material to obtain a uniform application of all areas. Apply in the same manner as with a finger-operated sprayer and then disassemble and thoroughly clean the spray gun with warm water and detergent, and apply a light coat of oil to the metal parts.

Always allow treated materials to thoroughly dry before use. This could take from 6 to 24 hours depending on air circulation, humidity and temperature. To accelerate drying, use a fan or hair dryer. Be sure to clean Duo-Gard from all windows, plastic or metal parts to avoid the objectional appearance of white chemical deposits on their surfaces. Use a wet cleaning cloth and then wipe dry.

To test the effectiveness of the treatment, dry a sample and then try to burn it by holding the flame of a butane cigarette lighter or wood match against the lower edge of the treated material held in a vertical position for 10 to 12 seconds. If the treated material does not continue to burn 3 seconds after removal from the flame, the treatment is effective. If the material continues to burn for 3 seconds or more, you should re-spray to get enough fire retardant in the material to flameproof it.

One gallon of Duo-Gard will treat approximately 400 square feet of fabric or 200-250 square feet of carpet, or 10 to 12 passenger seats. A pint is sufficient to treat a Falco interior. Duo-Gard is manufactured by PTE International, Inc., Lafayette, Louisiana. PTE sells only through distributors. Aviall sells the product and Wicks Aircraft is currently looking at the possibility of carrying it as well.

## **Sources of Upholstery Material**

Before you buy materials for your Falco, first decide if you are going to use an upholstery shop. It's best if you know what you want, colors, materials and the general appearance of the interior. The actual execution of the basic concept will have much to do with the overall appearance. You can get good workmanship but the little design touches like knowing how to break up an broad area with a stitching pattern can make or break the interior.

If you are going to use an upholstery shop that specializes in aircraft, first pay a visit and discuss your plans. Look at their materials and see what they have to offer. It's bad etiquette to arrive with a load of materials in your arms, particularly if the shop already sells the same materials! You don't want to start things off by alienating the shop. If they don't have the materials you want, ask if they mind if you supply your own.

One source of materials for aircraft upholstery is Airtex Products. In keeping with the interiors installed in production aircraft, the carpets are nylon only, "leathers" are vinyls and fabrics are the usual. Let's face it, even the very best aircraft interiors suffer by comparison with the best automotive interiors, both in design and in materials.

The pre-eminent supplier of upholstery materials for exotic cars is Bill Hirsch Auto. This company carries leathers, leather-like vinyls, carpet and materials. If you want to use the materials installed in Rolls-Royces, Bentleys, Ferraris, Maseratis, Packards or even Model T Fords, this is the one and only place to go. There are a few other shops which sell to the classic car restorers, but they all just carry a more limited selection of the same materials.

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## Upholstery Materials

Bill Hirsch, 396 Littleton Avenue, Newark, NJ 07103 Phone (201) 642-2404, Telex: 642099

### Leather

Bill Hirsch carries a full selection of leathers, all of which are approximately the same thickness and weight. Connolly Leather is the ultimate British snob-appeal leather since it is used in Rolls-Royce, Bentley, Jaguar, Ferrari automobiles. This expensive leather is available in a very large selection of “designer” colors and the finish of the leather is uniformly flat. Bridge of Weir Leather is a premier grade of Scottish leather which competes with Connolly. It has a good selection of colors like red and green.

*Talk about types of leathers, top grain, vat died, lacquered, burnished, applied finishes, etc. Include prices of leathers, by the foot. The importance of getting an upholstery shop to do the cutting and stitching.*

Bill Hirsch also carries a selection of domestic leathers called “fine automotive leathers”. The SKN and A series are attractive and include normal “leather colors” of brown, tan, grey and black—look elsewhere for reds or pastel colors. The BH series is attractive. The CO and HA series are less attractive due to their glazed finishes—the HA leathers have a smooth, shiny finish since the leather has been sanded and buffed. Bill Hirsch’s “special low price leathers” are a series of overruns and discontinued colors available at bargain prices. The samples we have seen look very nice. Hirsch’s “DB Leather” is a duplication of Mercedes-Benz leather—good quality leather in muted M-B colors. Hirsch’s “H. G. Hides” are low priced custom-dyed in colors that are not particularly attractive.

### Fabric

Mohair. This is an attractive, high quality wool velvet—“velour” in the current parlance. This plush material will be comfortable to sit on and easy to clean. The original Mohair used in cars in the 20’s and 30’s was a true mohair—made from the long silky hair of the Angora goat—and it would smell like an old dog when it got wet. Bill Hirsch’s Mohair is made of lamb’s wool and is a modern replacement with none of the problems of the original material. Available in two types: imported Mohair (with a three numeral part number such as #180) is 100% wool-faced and has the appearance of normal velvet; domestic deep pile Mohair (with a two-numeral part number, such as #21B) is a wool blend and is considerably thicker. None of these is self-extinguishing according to our tests, apparently because of a synthetic backing. 1987 price: \$34.50/yd.

Mercedes Benz Velour. This is an attractive wool velour. It will wear well and can be used to make a very attractive interior that is also practical. Not self-extinguishing according to our tests. 1987 price: \$65.00/yd.

Mercedes Benz Striped Velour. This is a ribbed, corduroy-like wool-faced material that borders on being tacky. Not self-extinguishing according to our tests. 1987 price: \$65.00/yd.

Broadcloth. Sometimes called coachcloth, this is similar in appearance to flannel or felt. Broadcloth is a traditional wool material used by Rolls-Royce for headliners. It is an excellent material to use in conjunction with leather, but probably not appropriate as the primary fabric to cover the seats and side panels. Available in the following models: super heavy weight grade #1 is 60" wide and available in three colors (1987 price: \$53.00/yd); super heavy weight grade #2 is 57" wide and available in 26 colors (1987 price: \$47.00/yd); heavy weight grade #3 is 60" wide and available in 17 colors (1987 price: \$46.00/yd); heavy weight grade #4 is 55" wide and available in 13 colors; (1987 price: \$40.00/yd) and light weight grade #5 is 55" wide and available in 31 colors (1987 price: \$28.00/yd). The colors are a variety of car-ceiling tones: tans, light browns, light grays, beiges, light green, and purple (for your Pierce-Arrow restoration). Grade #5 is considered a headliner material—too light for seats. Grade #5 (or all with a Bill Hirsch part number starting with “X”) is 80% wool—these are self-extinguishing according to our tests, but just barely so. The rest are 100% wool and are self-extinguishing according to our tests.

Bedford Cloth. Like broadcloth, this is a traditional material used in classic cars. It has a slight ribbed texture, and this material can be used to good effect in conjunction with leather. Probably not appropriate as the primary fabric to cover the seats and side panels. Available in three models, which are distinguished primarily by the width of the ribbing: Fine Rib Bedford cloth, grade #1 (1987 price: \$37.00/yd); Wide Rib Bedford cloth, grade #2 (1987 price: \$37.00/yd); and Medium Rib Bedford cloth, grade #3 (1987 price: \$37.00/yd). Ribbed Cloth Grade #5 (1987 price: \$39.00/yd) is similar, essentially a broadcloth with a very subtle ribbed texture. Bedford cloths and Ribbed Cloth are all wool and are self-extinguishing according to our tests.

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## Loop Carpet

*Square Weave #1 and #2.* Our favorite loop carpet. This is a high quality German carpet used as original material in many Mercedes-Benz and Porsche automobiles. The extra thickness makes the carpet softer under foot. This is good looking carpet available in eleven variations of tan, brown and grey. All of this carpet is made from a blend of slightly different shades of fibers for an attractive tweedy look, which will be good looking with leather but difficult to match with a fabric. Practical, good looking and rugged. Square Weave #1 has a rubberized jute backing and does not fray or unravel when cut and includes the following models: #502, charcoal grey; #501, tweedy light grey; #506 & #510, tweedy light tan; #507, tweedy medium tan; #508, a medium brown; #503, a dark brown; #504, a reddish brown; and #509, a brownish grey. Square Weave #2 has a jute backing and will unravel and fray when cut and includes the following models: #701, a slate grey and #707, a light brown. Both versions are available in 36" widths. Not self-extinguishing according to our tests. This appears to be made of natural fibers—it maintains a flame, smells like burning hair but does not give off the sooty black smoke of synthetic carpets. This appears to be a good candidate for flame-proofing. 1987 price: \$37.00/yd.

*M.B. Carpet.* This is a thin, knotted loop carpet available in ten attractive colors. A tough carpet which will wear well. Its light weight makes it especially attractive for an airplane. The carpet has a rubberized fiber backing, but unfortunately it does fray and unravel when cut. Available models are: MB-9, solid black; MB-6, solid brick red; MB-7, a dark brownish red; MB-3, light brown blend of fibers; MB-4, a bluish grey; MB-5, a tweedy green-grey; MB-2, a two-tone mixture of light brown and beige yarns; MB-1, dark grey with some lighter grey fibers to give it a tweedy texture; MB-8, a medium grey with some lighter grey fibers to give it a tweedy texture; and MB-10, a tweedy brownish grey. Self-extinguishing according to our tests. 1987 price: \$36.00/yd.

## Pile Carpet

*Wilton Carpet.* This is the premier pile carpet used in exotic cars—if you want a deep, soft pile carpet, this is an excellent selection. Wilton I is 80% wool, has a jute backing, and is available in lots of colors in 36" widths (1987 price: \$43.00/yd). Wilton II is 100% wool faced, has a jute backing, and is available in twelve colors in 36" widths (1987 price: \$47.00/yd). Wilton III is 100% wool faced, has a very flexible rubberized "Alcathane" backing and is available in a very large selection of colors in 40" widths (1987 price: \$35.00/yd). Wilton III does not fray or unravel when cut, so you can eliminate the expense and trouble of binding the edges, but it is a "velvet faced" carpet and doesn't seem as attractive as Wilton I and II. Wilton I is used in Rolls Royce and Bentley automobiles, and Wilton II is used in Ferrari and Maseratis. All three Wilton carpets are self-extinguishing according to our tests.

*Haagarn Carpet.* This is a German carpet that is a new, improved version of the original English "Hogshair" carpet. At 6mm thick, this is a thin, light weight pile carpet. This is about the minimum thickness for any feel of soft carpet under foot. Latex backing and does not fray or unravel when cut. Eight selections available: the black and three greys are attractive. The others—a brown, blue, red and light brown—are less attractive. Recommended for someone looking for a thin black or grey pile carpet. Material is a "blend of fibers". Self-extinguishing according to our tests. 1987 price: \$37.00/yd.

*M.B. Nylon Velour.* This is a thin, soft nylon pile carpet available in 14 unimaginative solid colors, with a woven, rubberized backing. It does not fray or unravel when cut. Since it is nylon, it is easy to wash and will be a low-maintenance carpet. The carpet has a soft feel to it. If you can find a color to your liking, this will make a practical, floor covering. Not self-extinguishing according to our tests. 1987 price: \$35.00/yd.

## Carpet, other

Cloth carpet binding. 25 colors, 1-1/4" wide, 72 yard roll. 1987 price: \$16.00/roll.

Leather carpet binding. 23 colors to match 21 Connolly or 2 Bridge of Weir leathers only, 1-1/4" plain edge, skived to .025" thick. 1987 price: \$3.45/yd.

Everflex carpet binding. 12 colors, 1-1/4" plain edge leather looking non-stretch vinyl. 1987 price: \$1.25/yd.

Rolls-Royce Type Carpet Snaps. Brass 2 piece collar and ring. 1987 price: \$0.90 per set.

## Vinyls

MB-*Tex.* A very wide assortment of good looking leather-like vinyls. Attractive colors and a lot of different textures. Not self-extinguishing according to our tests. Suggest a black sample for covering the glare shield. Black vinyls are: MBT-1, MBT-17 and MBT-69 are leather-grain; MBT-2, MBT-18 and MBT-68 are perforated texture. 54" wide. 1987 price: 25.00/yd.

Porsche Vinyls. A good assortment of attractive materials. Many are very thin, perforated vinyls—they have little 1mm holes punched through every 6mm or so. Black vinyls are: PV-1 is lightweight leather-grain; PV-4 is a heavy leather-grain; and PHL-2 is perforated. 51" wide. 1987 price: 25.00/yd.

British Vynide. This is the vinyl used in Jaguars. Lots of colors. Does not have the variety of textures as MB-Tex or Porsche Vinyls. A plain vanilla naugahyde. According to our tests, British Vynide is self-extinguishing but puts out a lot of stinky smoke. LC-1, AM-16 and AM-1 are black leather-grain vinyls. 51" wide. 1987 price: 25.00/yd.

## Supplies

Airtex Products, Inc. 259 Lower Morrisville Road, Fallsington, PA 19054. (215) 295-4115.

3M General Trim Adhesive. Comes in two versions: 08080 is the regular blend and 08090 is the stronger adhesive. Get it at your local auto paint store. Useful for installing upholstery and carpeting.

Tremco 4385 spray trim adhesive. \$6.95 from The Eastwood Company, 147 Pennsylvania Ave., Box 296, Malvern, PA 19355. (215) 644-4412.

Tremco 4310 Black Weatherstrip Adhesive. \$4.95 for 5 oz. tube from The Eastwood Company, 147 Pennsylvania Ave., Box 296, Malvern, PA 19355. (215) 644-4412.

## Upholstery Shops

The Upholstery Shop, 14871 Pioneer Trail, Eden Prairie, MN 55344. (612) 944-9690. Tim Oberg. This is a top quality shop that has installed the interiors on many award-winning antique airplanes. They did the spectacular interior on Dave Aronson's Falco.

## Books on Upholstery, The Best Books

### *How to Restore Upholstery*

By Tony Fairweather. If you intend to do your own upholstery, this book is a must—clearly the best single book available. The 125-page book is heavily illustrated with drawings and photographs. \$14.95. Order book No. 109493AE from Classic Motorbooks, P. O. Box 1, Osceola, WI 54020. (800) 826-6600. WI, AK, HI or Canada use (715) 294-3345. Add \$2.95 handling fee for all orders.

### *Step-by-Step Upholstery Guide*

By Kent Horne. This is an excellent, 40-page, step-by-step manual for upholstering seats, and well worth buying if you plan to upholster your seats. Over 100 illustrations. \$10.95. Order item No. 6658 from The Eastwood Company, 147 Pennsylvania Ave., Box 296, Malvern, PA 19355. (800) 345-1178 or (215) 644-4412.

### *Essentials of Upholstery and Trim for Vintage and Classic Cars*

By Lee Jordan Locke. A book that is impossible not to like. This 170-page book was originally published in 1920 as *Motor Car Upholstery . . . A Plainly Written Book on the Fundamentals of Motor Car Trimming and Upholstery*. It gives detailed instructions on how to upholster a horseless carriage with all the styles of the day including French plaiting, diamond and bisquit tufting, negligee and plain work, fabric top construction, etc. The 90-odd photographs are of many beautiful interiors of the best classic cars. It's doubtful that this will be of much use to a Falco builder, but it is a wonderful old book just to appreciate how far we have all come with cars and upholstery—and how much we left behind. \$8.95. Order book No. 107440 from Classic Motorbooks, P. O. Box 1, Osceola, WI 54020. (800) 826-6600. WI, AK, HI or Canada use (715) 294-3345. Add \$2.95 handling fee for all orders.

## Books on Upholstery, Other

### *Car Interior Restoration*

By Terry Boyce. This book is directed at the restorer of a classic car. While it has some merit, the book only deserves a "fair" rating. Almost everything covered in this 144-page book is covered in better detail in Tony Fairweather's *How to Restore Upholstery*. \$7.95. Order book No. 107461 from Classic Motorbooks, P. O. Box 1, Osceola, WI 54020. (800) 826-6600. WI, AK, HI or Canada use (715) 294-3345. Add \$2.95 handling fee for all orders.

### *How to Restore Car Interiors*

By Peter Wallage. This 125-page book has over 120 illustrations, and it is a very good guide to the cleaning and refurbishing of automotive interiors. The emphasis is on *cleaning*, not on doing the upholstery—no help at all to a Falco builder. Not recommended. \$14.95. Order item No. 6683 from The Eastwood Company, 147 Pennsylvania Ave., Box 296, Malvern, PA 19355. (800) 345-1178 or (215) 644-4412. Or order book No. 107703AE from Classic Motorbooks, P. O. Box 1, Osceola, WI 54020. (800) 826-6600. WI, AK, HI or Canada use (715) 294-3345. Add \$2.95 handling fee for all orders.

### *Coach Trimmer's Art*

\$12.95. Covers the making, fitting and maintaining of all kinds of automotive upholstery, interior trimmings, including roof and wheel covers. 112 pages with 125 illustrations. Order Book No. 8873 from Carbooks, 175 Hudson Street, Hackensack, NJ 07601. (201) 488-7204.

### *Auto Restoration Tools & Techniques*

The Eastwood Company, 147 Pennsylvania Ave., Box 296, Malvern, PA 19355. (215) 644-4412. Catalogue \$2.00. Auto body repair supplies and includes a section on upholstery tools.

### *Skinned Knuckles*

This is a magazine devoted to auto restoration. We've never seen a copy, but it is highly regarded by die-hard car restorers. \$10.00/year. Skinned Knuckles, 175 May Ave., Monrovia, CA 91016.

## **Carpet (Not Recommended)**

*MB-Nylon Loop.* We don't like this stuff and doubt many of you will either. It is unattractive carpet more appropriate to father's waiting rooms than a high class airplane. We don't like the colors, and the carpet has a slightly iridescent appearance that clearly reveals its synthetic origins. Some samples are foam backed. Not recommended. Self-extinguishing according to our tests, although the foam-backed samples are not. 1987 price: 35.00/yd.

*Porsche Sliver Knit Carpet.* This is a very soft, fluffy material that looks like someone's failed attempt to make an artificial sheepskin. If you want your airplane to look like a boudoir, this is the stuff. It has a thin, flexible, stretchy knit backing. Porsche probably makes this for young studs who get laid in their car and want something easier on their knees than a rubber floor mat. It is a tacky material that looks cheap. This carpet gets a strong negative recommendation. Not self-extinguishing according to our tests. 1987 price: 35.00/yd.

*RB 200 Carpet.* This is a thin pile wool blend carpet available in a variety of solid colors—black, browns, red, blue, and green. At 5mm thick, this is the thinnest of the pile carpets and if anything, it feels too thin. The colors are fine. A nice thin carpet, but it is not our favorite. This a low-priced "Wilton Type" pile carpet made for Jaguar, Rover and other English car companies. Does not fray or unravel when cut, so you can eliminate the expense and trouble of binding the edges. One piece, the solid black RB-220, has an extra-thick rubberized backing—you certainly do not want that one. Not self-extinguishing according to our tests. 1987 price: 27.00/yd.

*Hogshair Carpet.* A medium-weight carpet available in three colors only. Good material, probably wool, with a jute backing available in 40" widths. Does not fray or unravel when cut. Available models are: #305, a dark grey with some white fibers—interesting; #308, a brick red with some white fibers; and #409, a green suitable only for army trucks. This material was used almost exclusively in Chrysler, Packard and GM cars in the thirties, forties and fifties. Bill Hirsch advises that the company went out of business, and he only has these three colors left. Self-extinguishing according to our tests. 1987 price unknown.

## **Fabrics (Not Recommended)**

Packard Shadow cloth: MSS says good looking. All wool. Only 4 colors, so probably not worth mentioning.

Packard striped cloth: Latest the 40's look. No. All wool.

Model T cloth. No. All wool.

Two tone Bedford cloth, grade #4. No. Too busy. Zoot-suit. All wool. Brenda likes this.

Ribbed Cloth, Grade #5. MSS says no.

## **Other Things to Avoid**

Top Material: Assorted vinyls and cloths for convertible tops. Can't see any use for this.

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Headlining: Lightweight cloths and vinyls for the ceilings of automobiles. Too thin to take any wear.

HD-Carpet: This is a vinyl-like material, apparently for running boards. Tough, ugly material.

TL-1. Trunk liner: 100% polyester. Not self-extinguishing according to our tests.

Everflex. This is PVC on a non-stretch cotton backing designed for folding convertible tops. Everflex is not self-extinguishing according to our tests. 1987 price: 22.00/yd.