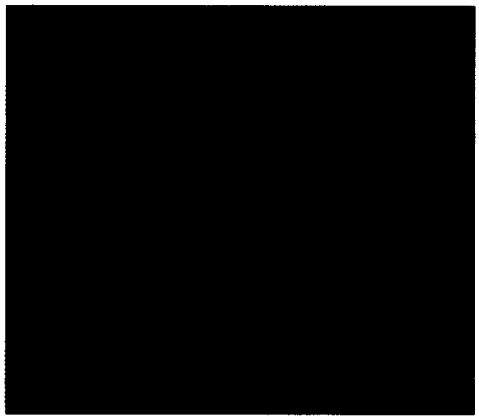
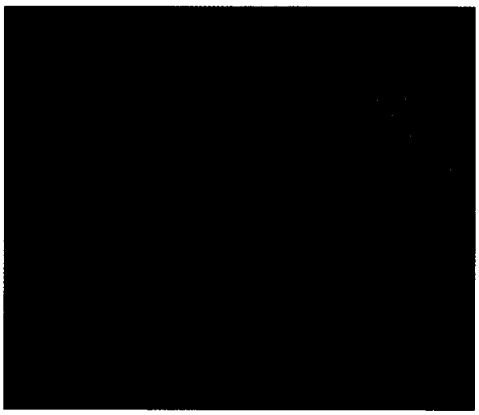
FINAL STEPS IN SEWING AND MOUNTING SEATS

With all the materials and equipment assembled, it's time to finish upholstering your aircraft's seats.

By DENNIS WOLTER



Single stitch plain seam.



Half topstitch fell seam.

Corded seam.

WE ended last month's interior article with all the various parts of an ergonomic seat patterned and cut out. At Air Mod, before we start to sew the various seat finish materials together, we like to bond a 1/4-inch or 1/2-inch thick layer of 40-density foam and one layer of the cambric backing material to the back surface of each seat panel. Adding these backing materials will give the finished seat a smooth, full look and help to eliminate unwanted wrinkles.

At this point, I would like to discuss the most common types of seams used in sewing seats. How the seams are done not only affects how the seat looks, but also how long it will last. As an example, if the folded edges of material and thread are exposed to sunlight and wear, the durability of the seam becomes an issue. So, here's the good and the bad of the seam game.

Types of seams

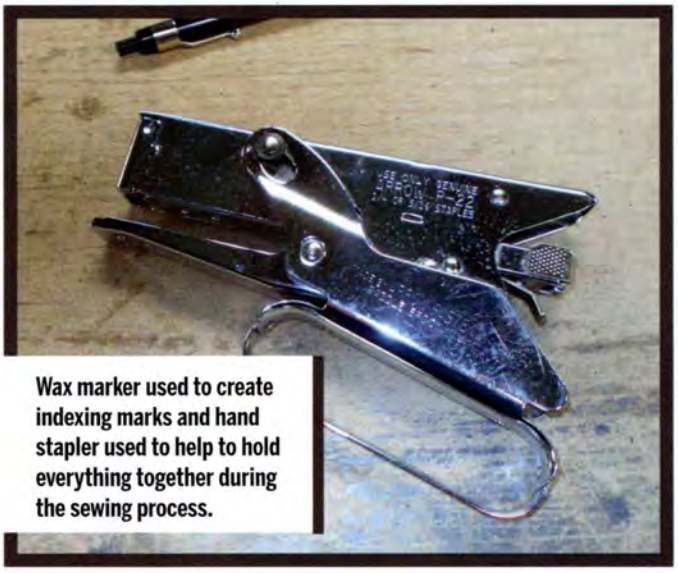
Single stitch

This is the easiest and fastest seam. One simply brings both materials together under the needle. No cording, no double-stitching. It's fast and provides a clean seam, with only moderate exposure of the folded material edge and stitching to sunlight and abrasion.

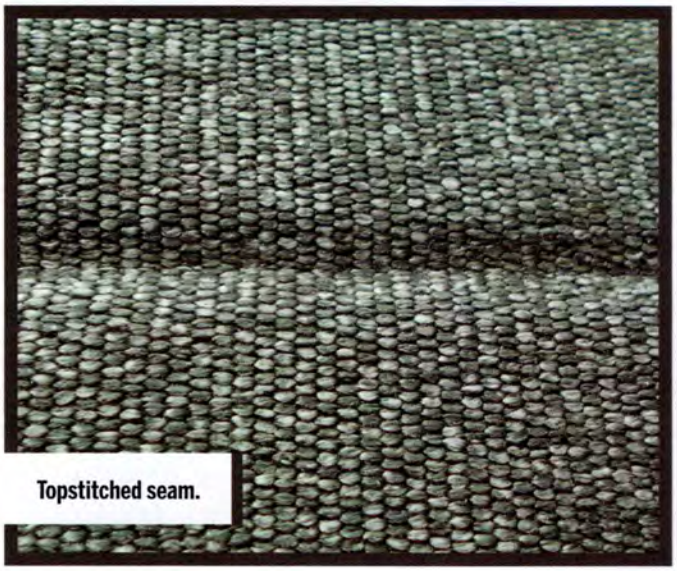
Fell seam

This is basically one-half of a double-stitched French seam that both increases the strength and aesthetic appearance of a single stitch. The first step in creating this seam is to do a single

Stapled and double-stitched seam with a light index mark.



Wax marker used to create indexing marks and hand stapler used to help to hold everything together during the sewing process.



Topstitched seam.

Folded and sewn pleated seam.

seam as described in the previous paragraph, then fold both sides of the selvage edge material to one side and stitch it down from the finished side of the cover.

Top or French stitch

This method involves first making a plain stitch as described in the previous paragraph, then folding both selvages or cut edges back on themselves and carefully topstitching the material on both sides and parallel to the single stitch seam. We apply a reinforcing tape on the backside spanning both sides of the cut edge to add extra strength to the seam. This gives a very nice looking finished appearance to the seam, however, both the double topstitched, French seam and fell seam are the least durable way to sew a seat. All of the French-stitched thread and the folded edge of the material are fully exposed to sunlight and abrasion.

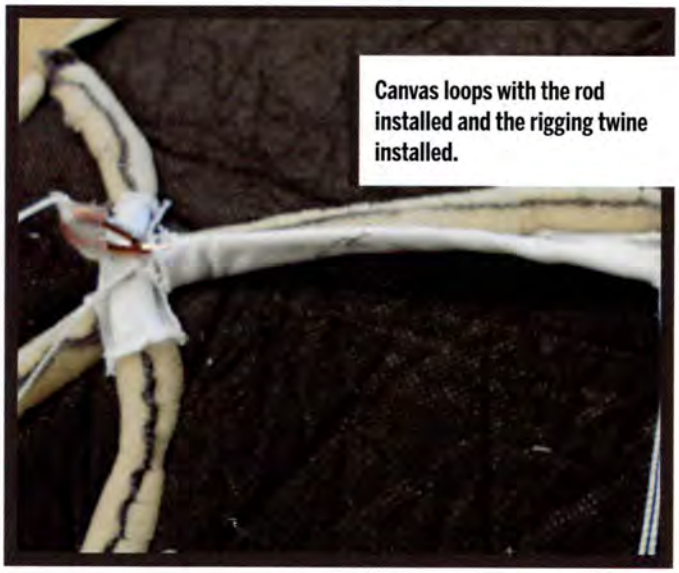
Once the edges are worn on a seat with straight stitching or French stitching, the entire panel of material must be replaced. The material will have worn through at the edge, or the thread may have failed. Re-stitching will only make unsightly new holes right over the old ones; a real compromise.

Pleating refers to the process of sewing a non-structural, decorative stitch to add design detail to an otherwise plain panel.

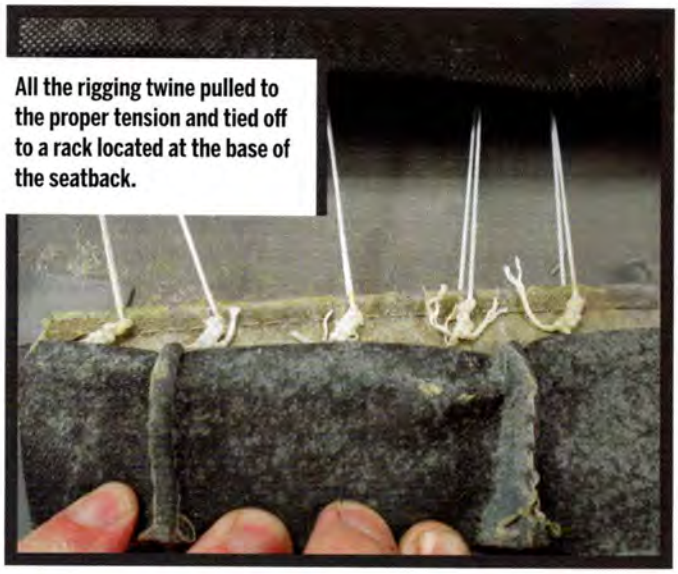
Cording

Last, but certainly not least, is the good old corded seam, that we believe is the most durable way to sew a seat. This method employs the use of cording, made by folding a 1 1/2-inch wide strip of finish material (usually leather or vinyl) around a 5/32-inch polyethylene foam cord (available at upholstery supply stores) that is then single stitched to become a flanged cord. This cord is then placed between the two materials temporarily held with staples. Once sewn together, the cord provides complete protection of the stitching and the folded edge of the upholstery material, eliminating exposure to sunlight and abrasion. If, after a long time, the cording begins to show signs of wear, the seam can be carefully cut open and the damaged

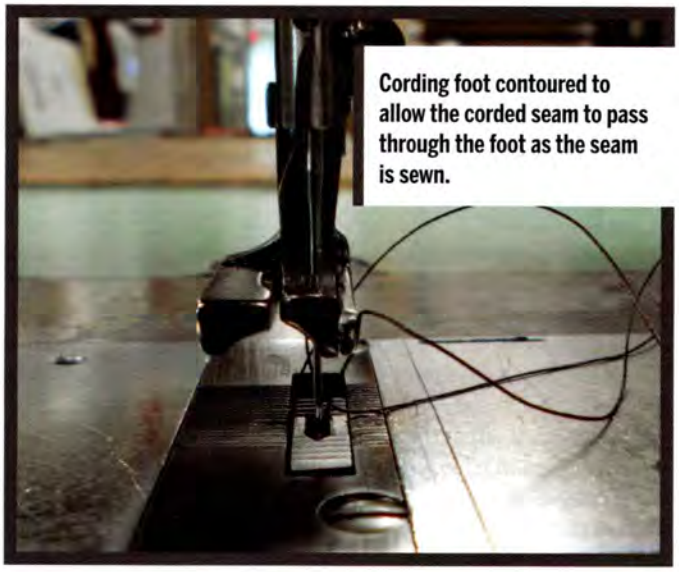
Back surface of a folded and sewn pleated seam.



Canvas loops with the rod installed and the rigging twine installed.



All the rigging twine pulled to the proper tension and tied off to a rack located at the base of the seatback.



Cording foot contoured to allow the corded seam to pass through the foot as the seam is sewn.

cording replaced with new.

A word about thread. Upholstery thread is available in four types: cotton, nylon, polyester, and Dacron. Without question, the most durable and strongest thread is Dacron, with polyester coming in second. If you are considering topstitching, use Dacron or polyester. The other two will more quickly fade and degrade in sunlight.

Pleating

Now that we know how to stitch the seats together, let's talk about pleating. Pleating refers to the process of sewing a non-structural, decorative stitch to add design detail to an otherwise plain panel. There are two basic ways this type of stitching is done. The first and most common is to simply topstitch through the finish material, foam, and backing fabric, resulting in the thread showing on the surface of the finished pleated component. The beauty of this method is it allows total freedom of stitch pattern and provides a nice relief and appearance.

The second method of pattern stitching is the folded pleat method. First, a single topstitch is sewn as just described. We fold the material together on the line of the top stitch, finished sides facing each other. We then run a second parallel line of stitching on the backside of the material about 3/8 inch from the folded edge.

When unfolded and viewed from the finished side of the material, the pleat looks as though two separate pieces were sewn together, giving a more defined design line in the upholstered panel. Not only do I think the pleat looks better, but the thread is hidden between the two joined materials and therefore protected from sunlight and wear, enhancing durability.

We typically use this folded pleat method on seats, however, the material thickness created by the folding process makes for an awkward appearance when the pleated panel is bonded to a hard surface such as a side panel. For that reason, we usually use plain, topstitched pleats for side panels.

Rigging

The final concept to discuss before the cutting and stitching begin is how to structure and secure the finished cover to the sculpted foamed seat shape. Once an ergonomic seat shape is created, we are challenged with the task of securing our aesthetically appealing assembly of soft finished materials to a complex, compound-curve shaped foam form. What this techno-speak means is that since the seat isn't flat, we need to devise a way to securely hold the finished cover to the complex seat form, particularly at

Seatback ready to have the cording stapled and sewn to the edge before the seatback sides are sewn on.

Screw securing the map case to the seat frame.

low points.

The best way to do this is to sew canvas loops into a pleat or panel seam at the location of a low point in the seat. A stiff steel wire is run through the loop of canvas and bent back on itself at the ends to keep it from working its way out of the canvas loop. Several lengths of Dacron rigging twine are tied to the wire. These pieces of twine are poked through the foam and seat sling before we pull the sewn cover over the seat.

After the cover is pulled over the formed seat, the strings are carefully pulled and tied off on the frame, adjusting the pulled-in contours of the finished seat cover as we go, much like pulling puppet strings, until we create just the right contour that results in a wrinkle-free sculpted seat.

Of equal importance to the aesthetic beauty of this contoured seat is the structural connection achieved through this rigging system between the upholstered cover and the seat frame. Every time you get out of the seat it is pulled back to its designed shape by all of this structural interfacing.

We've tracked countless seats constructed this way that have been in service since the 1970s, and thanks to good materials, proper fitting, double stitching, all of this rigging—and good cleaning—they still look as good as the day they were first done.

Sewing preparation

With all of this theory covered, and all your seat materials cut out and backed with foam and backing fabric, it's time to start sewing it all together. To make things simple, let's assume we are using the corded seam method. To properly sew cording, you will need to use a cording foot. It allows the sewing machine to hold the cording and mating materials close to the needle for more precise control of the stitch. Sounds difficult, but practice makes perfect. You *will* get the hang of it.

For those attempting to do this sewing yourself, this is where I suggest that you practice with some surplus material. Fabricate some cording and sew together a sample that replicates the actual assembly you will have in your final pieces. This will allow you to develop the skill needed to sew the various components together without risking the expensive aircraft materials.

With your practice panels finished to your liking, I would next sew the cover for a small, easy-to-sew component in the airplane like a baggage door cover or a headrest. If you make a mistake, you won't be damaging much of your expensive material.

Also, flat-surfaced panels are easier to deal with, and the more confidence you build when you take on the challenge of sewing the seats, the better. After sewing a couple of smaller side panel pieces, it's time to get the hang of sewing a cover for a compound shaped seat. Again, small steps first.

With headrest material patterned, cut, and backed with foam and fabric, lay out the face and sides. Index and mark with chalk exactly how the pieces are oriented to the shape of the foam. If cording is being used, sew the cord to the side panel of the headrest first. Next, use the indexing marks to properly align the side of the headrest to its face panel and staple the two together. Now it's time to carefully run a stitch close against the cording (remember the cording foot). Use only pencils or chalk to mark your materials. Over time pens and markers can bleed through leather or vinyl.

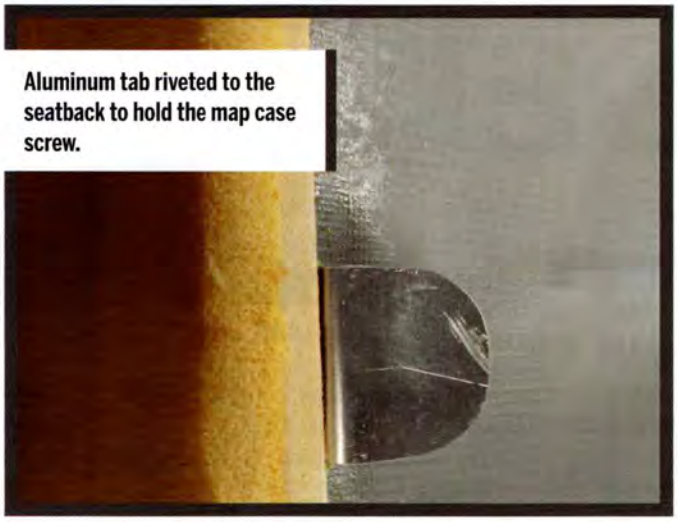
For corded seams, don't forget to take advantage of the double-stitching step we described earlier. With the headrest (or armrest) now sewn, remove the staples and turn it right side out and pull it over the foamed shape. If it's too loose, either cut it down and re-sew it or add foam to the headrest. Never stuff loose filler material between the cover upholstery and the foam. It will shift around over time and the entire piece will look bad.

Sewing upholstery is a skilled endeavor, the full explanation of which goes far beyond the scope of this article. However, if you adhere to some basic concepts presented here and use old upholstery as a technical guide, you can do it. Your old upholstery can be a great learning tool. Study how the stitches were made and how the components were assembled. It's how I taught myself to sew 40-some years ago.

Sewing and finishing up

I know I've probably told you how to build a watch when all you wanted to know was the time. I'm trying to write this stuff for readers doing an interior on all levels. For those who have no intention of ever sewing a stitch, you will be relieved to know that sewing school is almost over and we will shortly see how to assemble and mount a seat.

Sewing the actual seat starts with assembling the face panels. Pleated sections are done first, and mating panels



Aluminum tab riveted to the seatback to hold the map case screw.

are sewn together with a structural pull loop sewn in where needed. Then the adjoining side sections are sewn in place. Next, the cording is sewn on to the seat facing panel and the seat side is stapled in place and then sewn to the seat facing panel. Finally, each seam is flipped over and sewn from the opposite side, creating the double stitch mentioned earlier—good insurance.

The staples are removed, and we now install the retaining rods and rigging twine. At this point, the finished cover is ready to be mounted on the foamed seat. With the seat cover inside out, poke the rigging twine through the foam and seat sling. Then lightly tie the lines to the rack that is secured to the seat frame. The cover is then turned right side out and pulled over the foamed seat frame. Pull the rigging twine through until you get the precise seat contour you desire, and all the wrinkles are out of the seat. Secure the rigging with two extra knots and stand back and take pride in a job well done.

There is one other seat detail to discuss. It is very important to physically secure the upper outer corners of the seatback map case to the seat frame with upholstery screws and finish washers. This will prevent the elastic seam from deforming the edge of the seatback (how many times have you seen that in the field?). Often a seat frame is either too small or the wrong shape to properly accommodate this needed fastener. In this case, we rivet a mounting tab of 0.050 inch aluminum to establish a good attachment for the map case. Trust me, a map case cannot be properly secured by thread alone.

If this sewing stuff is not for you, I suggest you buy presewn, ready-to-mount seat covers and foam.

We will continue next month. Until then, fly safe!

Industrial designer and aviation enthusiast **DENNIS WOLTER** is well known for giving countless seminars and contributing his expertise about all phases of aircraft renovation in various publications. Wolter founded Air Mod in 1973 to offer private aircraft owners the same professional, high-quality work then only offered to corporate jet operators. Send questions or comments to editor@cessnaflyer.org.