

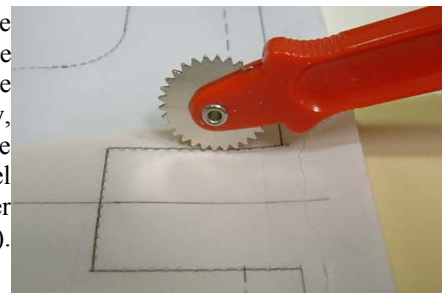
Picture by Bernard Siu

## Chapter 4

### GENERAL-

#### Transferring Drawings/Templates

(Bernard Siu): I transferred the drawings onto the foam using a tracing wheel they use for sewing (I learned this from the Cozy forum & various web sites). First, I tack the drawings on the foam with a thumbtack and run the tracing wheel along the lines of the drawing. The spokes on the wheel put a string of 'indents' on the foam. Surprisingly, the tracing wheel tracks a straight line quite well even in free hand. Remove the drawings and connects up the dots with a fine felt tip pen. Though the tracing wheel leaves a bunch of holes on the drawings, they are readable and can be reused – wonder how I know (hint... you normally have to re-trace & remake a part if you screw up). Regardless, this method worked very well!



(Wayne Hicks (FAQ)): - What is the best method for creating the other half of the templates?

There are as many solutions as there are builders. Most builders simply trace the reverse image, then tape the two halves together. The best (but most expensive) is to have a blue-printing shop make a reverse image. Be careful of using Xerox machines, as they distort the image and can result in longer or shorter dimensions. Check the archives for other ingenious techniques, including the availability of CAD drawings.

(Balderston): I used carbon paper under the M-drawings to trace patterns on the Clark foam, then cut with a razor. For the hard Clark foam, I tapped a razor blade to get a good straight edge.

(Will Simmons): I used the AutoCAD files on the Unofficial Cozy Web site to plot drawings. I cut out the drawings, attached them to the foam and cut out the foam. I cut all of the openings before applying the fiberglass.

(Wayne Hicks (FAQ)): - I have noticed that some of the dimensions shown on the templates do not match exactly to the lines shown. What should I do?

As with any plans-built aircraft, it is always good practice to verify dimensions when given. In general, panel dimensions should be usually symmetrical about the vertical match lines. Do not waste too much time worrying about exact dimensions. Just "stay on the lines" and your fuselage assembly will go well in Chapter 6.

(Jerry Schneider): Early on, I decided to peel ply everything I could. Some say it saves little weight, but apart from that, I like the smooth "non-weave" finish you get

(Jerry Schneider): I would also like to mention, when you're starting to glass, I've found out through trial, error, and asking other people, that when applying micro to foam in prep for glassing, it seems to work best if you use the squeegee to scrape as much of the micro off as you can before laying the cloth. My seatback was nearly 1 pound heavier than average because I wasn't scraping it off because I thought it would make moving the cloth easier. Wrongo!!

(Chad Robinson): Cut the peel ply at the same time as the cloth. I keep forgetting to do this.

(Chad Robinson): Find a cheaper source for peel ply. I spent about \$20 on a bunch of it and it's not lasting as long as I'd hoped. It would be nice to cut this cost in half.

(Amendala): Another trick I used was to glass the bulkhead, peel ply, then put 2 layers of wax paper down and flip over and glass the other side all in one sitting. Worked great

### Tip - Bulkhead cutouts

(Rick Maddy): When cutting foam for the bulkheads you may wish to put off cutting the corners until chapter 6. In most cases you will need to trim the Instrument Panel, Seatback, and F-28 when you get to chapter 6. If you cut the bulkhead corners in chapter 4 you could find gaps later in chapter 6. Given all this it is easier to just put off all this until chapter 6 and make your corner cutouts to match your fuselage sides.

(Chad Robinson): The third picture shows a foam cutting technique I stumbled across while working with this foam. It only works for thinner (1" thick or less) foams but it works so well I intend to use it wherever possible. Basically, I just use a hammer to tap a razor blade into the foam along the cut line. This produces a perfect cut that requires no sanding, and it goes faster than you'd expect because of the width of the blade. It doesn't work on Last-A-Foam, though, it's just too dense and there's a danger of it chipping. I've also done this with 4" long snap-off-tip blades for long straight lines.

*The other things I've tried include:*

1. Using a coping saw to rough-cut the shapes, then sanding to the lines. This is still my preferred method for curves but it's much slower for straight lines.
2. Multiple passes with a long razor blade and a straight edge. For really thin foams this is OK, but at the bottom of the cut, especially on thicker foams, it's hard on the hands. (I have arthritis.) And it's still slower.
3. A Dremel and a spiral-cut bit goes through foam like butter, but it's hard to get perfectly even lines that way so I still usually cut a bit oversized and sanded to the lines. This also produces the most dust.

(Bob Tilley): If you are careful you can use the BID that is removed from the leg cutouts to build the 8 x 12 lay-up for the hardpoints in the landing gear bulkheads combine these with the instrument panel cutouts you can save a lot of glass later. Lay the sheet of BID over the whole panel so it sticks into place, then use your Dritz sissors to cut out the holes. You can see them on the board. Then you can apply the epoxy. The F-22 gets 2 BID and 1 UNI per side. The F-28 gets the same but then adds a foam doubler and 9 layers of UNI and BID alternated on each side.

(Wayne Hicks (FAQ)): - Should I cut the electrical duct holes and the torque tube holes in the bulkheads now, or is it better to wait?

It is definitely easier to cut the holes before the bulkheads are assembled to the fuselage, but most builders wait to figure out the actual placement of the holes. The final hole locations will vary depending on how accurately you have assembled the fuselage and precisely where you run your control linkage, etc.

## Forward Bulkheads



(Bernard Siu): The forward bulkheads consist of 3 pieces – the F22, F22-doubler and F28. The high-density foam was difficult to cut with a blade – especially with any precision around the curves. I ended up using the Dremel tool with the router bit. Instead of raising the foam above the table – such that the router bit will not gouge onto the tabletop, I did the following:

I set the **depth of cut** by placing a thin paper between the tabletop and the end of the router bit as shown. Once set, I routed along the traced lines. When completed, only a paper-thin foam is left connecting the bulkhead cutouts and the residual foam. Break off the bulkheads pieces as needed. Just a slight brush off with 100 grit sandpaper will result in smooth edges for the bulkheads.

### F-22 Bulkhead Doubler placement

(Rick Maddy): When you put the F-22 doubler in place make sure each side is 3/8" from the side of F-22. This will be important during assembly in chapter 6.

(Wayne Hicks (FAQ)): - Is the *F22* doubler supposed to be shorter width than *F22*?

Yes. There should be a 3/8" gap between the outside edges of *F22* and the *F22* doubler. Ditto for all the 4-BID/5-UNI alternating lay-ups that lie over the doubler. The 3/8" gap is needed to provide room for the 3/8"-foam sides during fuselage assembly (Chapter 6).

(Wayne Hicks (FAQ)): - For the *F22* doubler, do I overlap just below the sloped edges, or do I overlap the top edge as well? The overlap is on the bottom edge only. The canard is mounted onto the top edge and as will become apparent in Chapter 7, the top edge of *F22* and *F22* doubler are flush with the canard cut-outs. (See Chapter 6, Figure 8, and Chapter 7, Figures 20 and 23.)

(Wayne Hicks): Be very careful at keeping the F22 center post to be 3.5 inches wide. This dimension is critical because the nose gear bulkheads get attached to the F22 center post in Chapter 13. Also, if you're thinking about installing the Steve Wright electric Noze-Lift, you need 3.5 inches at the centerpost for there to be enough room for the mechanism. My centerpost started out at 3.5 inches, but I guess it got inadvertently whittled down to less than that because of the repetitive sanding between lay-ups.

## F-28 Bulkhead

(Wayne Hicks (FAQ)): - What is the purpose of adding an extra inch to the overall height of the *F28* bulkhead?

Rounding *F28* or leaving it flat is purely a personal choice based on aesthetic value. Builders desiring a pointy nose opt for the flat *F28*. Those that want a round nose generally opt to raise *F28* the extra inch (or more) as depicted on the template. It is simply a builder preference!

## Instrument Panel

(Girrrls): Instrument Panel - Everyone complains it comes out about .100"-.125" short on the bottom edge; check the archives and adjust, easier to trim off than to add.

For the ribs on backside of the instrument panel; bond them in place with flox first and do the upper BID tape between the rib and the panel. Let cure then make some Styrofoam blocks to support the lip. Cover foam with cello tape or duct tape. We held these in place with double sided carpet tape.



(Wayne Hicks (FAQ)): - Is the bottom of the instrument panel supposed to be flat?

In general, yes. You might find that when you match up the templates for the Instrument Panel, the bottom edge at the match line is lower than the sides. You can elect to redraw the bottom line straight or leave it as is. If you leave it as is, the curvature will be so slight that it will not be noticeable after the fuselage bottom is installed in Chapter 6. During fuselage assembly (Chapter 6) some builders have found that the bottom of the instrument panel is .2" to .25" too short. This depends greatly on builder accuracy. You might consider extending the bottom by 1/4" and trimming to fit during fuselage assembly (Chapter 6).

(Wayne Hicks (FAQ)): - For the instrument panel stiffeners, should I flox the corner where the two lay-ups come together at 90 degrees?

No. In this case, use dry micro to form a radius to help the BID cloth to bend during the lay-up. Flox corners are generally used for structural joints where glass to glass bonding is required. The plans are pretty good about calling out flox corners when they are needed. If you need a radius in a corner, use micro unless told otherwise.

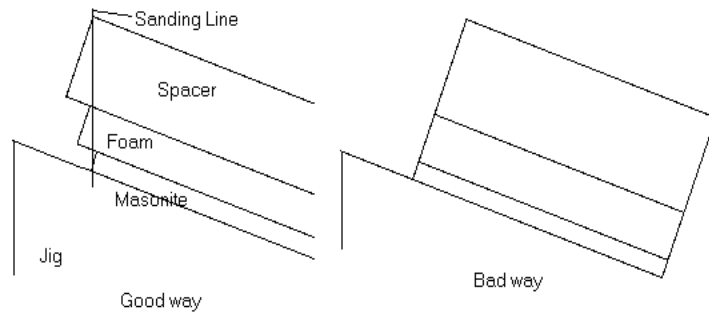
(Wayne Hicks (FAQ)): - Can the structural integrity of the airframe be destroyed by installing too many instruments on the instrument panel?

Most canards have instrument panels that look like swiss cheese. The panel is very flimsy until the instruments are installed. Many builders do not experience problems, but others are more comfortable having installed complete aluminum panels over the foam IP, or having installed aluminum ribs behind the IP. Regardless, you should not cut instrument holes until you have nearly completed the bird since new technology might make your holes obsolete by the time you are ready to fly.

## IP Electrical Channels



(Rick Maddy): I've read how some builders had a lot of trouble getting the two layers of BID to form the channel. Some built elaborate jigs to hold the glass in place. I found a simple solution. Lay the IP face down and add the 2 BID lay-ups on the underside of the two channels. Let it sit for an hour or two. Work on something else. Every now and again take a brush and coerce the glass around the corner. Eventually it begins to sit at an angle. Now lay some plastic over both channels and then put a board over the plastic. Make sure both are big enough to cover the full length of both channels. With the board in place the glass is held in position. When cure you just need to sand it a bit to get the correct height on the lip. Simple. In fact you could probably do this without waiting for it to stiffen up a bit.



(Rob Tester): Most people (including me) cut wood the same length and height of each stiffener, wrap in duct tape (or clear packing tape) and use these as a guide. This method works out great! If I did this again I would use BID tape to create the channels as it doesn't have the tendency to unravel like cut bid strips. But since I used cut bid, I made the channels a bit larger than they needed to be and then cut them to size with my dremel and a cut off wheel.

(Wayne Hicks): Get acquainted with making BID tapes prior to making the strengthening ribs. It makes the job so much easier. I took one-inch pine stringers, wrapped them in clear packaging tape, then clamped them into position. I then glassed the cloth over the stringers. Being unfamiliar with making and using BID tapes, I cut out thin strips of BID instead, and tried to wet them out in place over the ribs and stringers. All the BID edges frayed and the BID tended to move around a lot. Next time, I'm going to use BID tapes for laying up over the stringers. BID taping is much easier and neater.

## Seatback



(Bernard Siu): This is the first REAL part since the practice lay-ups. The foam I got from Aircraft Spruce was large enough to accommodate the entire seatback and I did not have to glue two pieces together. I cut the foam with a hot wire except the center hole for the maps.

It worked especially well for the 45° angle cut. I placed the foam flat along the edge of my workbench. I then clamped an aluminum straight edge on top of the foam, parallel to the table edge and recessed .75". Ran the hotwire along the entire length of the seat back – straddling along the table edge and the straight edge; a perfect 45° cut can be made. I did make a directional error on one of the side-angled cuts but was easily repaired. Getting mad at myself was more damaging than the repair work itself. The lay-up part was straightforward.

(Joe Hull): IP. If I had it to do over again...I might just glass a large square of foam rough cut to size. Then transfer the outline of the finished panel and cut to size with Dremel or Rotozip. I spent a lot of time trimming and retrimming after glassing to get rid of lumps of micro and overhanging glass.

(Girrrls): Seat Back - Other than the rectangular holes you make for the electrical conduits, don't bother to cut the ovals for the control tubes. Where the aileron torque tube holes are specified on the plans is not remotely close. We are glad we heeded other peoples comments on this and only marked where they are supposed to go and did not cut them out. When I got to the point of needing the holes I came up with a nifty method for getting them in right.

(Wayne Hicks (FAQ)):- How do I cover the backside of the seat back?

Being 42" wide, you will need to use two pieces of BID cloth. Remember to overlap the adjoining sides by 1" as stated in Chapter 3.

(Wayne Hicks (FAQ)):- Do you cover the cutout areas (notches) in the seat back with BID or leave them uncovered?

There is no need to cover the notches or exposed foam. You will apply flox to the exposed edges and 2-BID tape the entire seat back in place during fuselage assembly (Chapter 6).

## Landing Gear Bulkheads

(Wayne Hicks (FAQ)):- How important is it to use exactly 22 layers for the landing gear hard points?

The important point is that the hard points be 1/4" thick. The "22 layers" referenced in the plans is a guideline of how many layers it typically takes. You may use more or less depending on you lay-up technique and by how much weight you use to squeeze out the excess epoxy. Do not worry if your hard points are slightly thicker than 1/4" (within reason). Add more layers if not thick enough. Note: some builders have avoided this step altogether by buying a scrap of 1/4" G10 material from their local plastics supplier.

(Clark Canady): If you have never cut thick fiberglass before find several carbide jigsaw blades so you can cut the 22 ply hard points from the single sheet of this stuff you will make. This step will be a lot more fun if you don't have to cut 1/16 of an inch every 5 minutes. There are over 50 linear inches to cut. Get the blades they work great!!!

(Wayne Hicks (FAQ)):- Should I go ahead and drill the pair of 1/4" holes in the forward landing gear bulkhead now (as per plans)?

Definitely yes! It is easier than doing it after the bulkhead is installed. Note: the pair of holes in the AFT LG bulkhead hard points are not drilled until after installation so that a drilling jig can be fashioned to assure alignment of the two sets of holes.

(Wayne Hicks (FAQ)):- Which is the correct location for the holes in the hard points for the forward LG bulkhead -- 1.2" from top per the written dimensions on the drawing, or 1.45" from top per measuring the full-size drawing?

The hardpoint quarter-inch holes shown on the drawing do not match with the dimensions given. Most builders are drilling the holes at the stated dimensions (1.2" from the top). Drilling the holes too low will cause an interference later between the

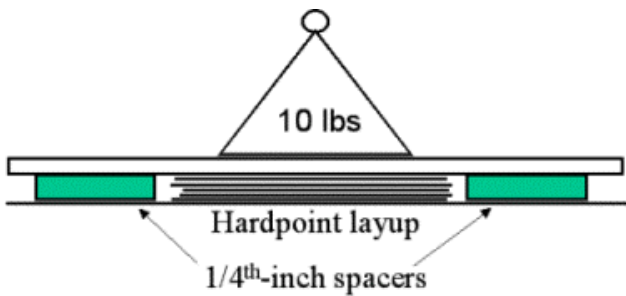
landing gear strut and the landing gear cover (Chapter 9). You get another chance in Chapter 9 to line up the holes correctly when the gear is installed (Chapter 9), so do not sweat it!

(Jerry Schneider): Watch out you don't use the wrong foam for LG bulkheads! There are 2 different types of foam which have the same dimensions

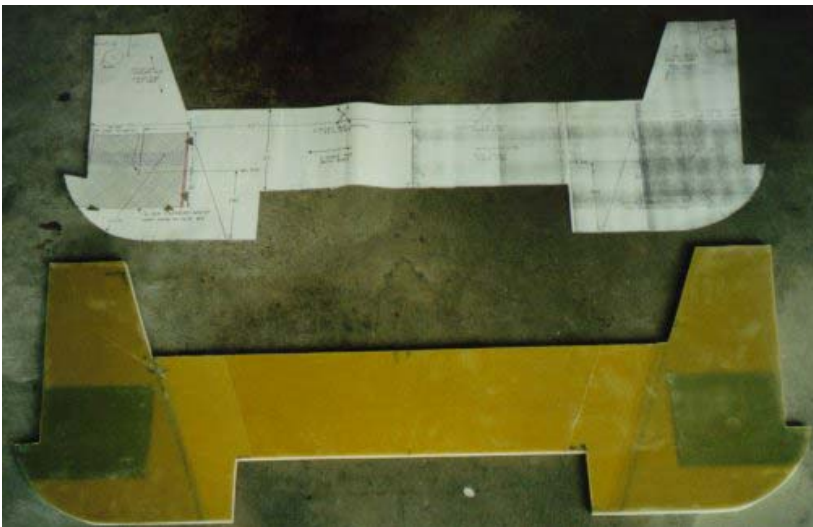
(Wayne Hicks): Don't worry too much about the appearance of the bulkhead edges. They get 2-BID taped to the fuselage sides and bottom in Chapter 6. At this point in the game, every new builder is trying to be so careful. While admirable, you can save a few hours by coarse trimming the taped edges rather than trying to fine sand them.

(Wayne Hicks): I drilled the holes for the control torque tubes in the forward landing gear bulkhead only. ***This is a mistake! Go ahead and drill all holes now! It will make the Ch. 16 control system installation much easier.***

(Wayne Hicks): The plans say to use 22 layers for the hardpoints. This is an approximation. Use enough layers to make up the ¼ inch thickness. I used 28 layers. It all depends on how hard you squeezed the lay-ups to remove the excess epoxy. A good tip is to place some quarter-inch spacers between your tabletop and plywood/weights to limit the “squeeze” to ¼-th inch. The hardpoints are easily cut to shape with a regular hacksaw. There's a discrepancy on the M-drawing of where to drill the hardpoint holes. The hole shown on the drawing differs from the dimensions given. I chose to locate the holes using the stated dimensions and I had NO trouble with the gear installation later in Chapter 9. If your holes are drilled too low (as in too close to the bottom), you will have interference problems between the main landing gear strut and a cover piece that gets glassed in between the forward and aft bulkheads. When dimensions are given, I tend to follow them over the picture.



(Wayne Hicks): This is my interpretation of the UND orientation for the aft landing gear bulkhead. The UND lay-ups are the structural tie-ins between the hardpoints, fuselage sides, and bottom installed in later chapters.



## Firewall

### Temporary Firewall

(Rick Maddy): Don't worry about making the temporary firewall perfect. There are only a few important aspect of it. Mark the centerline. Mark the location of the longeron holes, and the hole for LWY. The rest can be rough cut.

(Wayne Hicks (FAQ)): - Should I Alodine the aluminum engine mount inserts before glassing?

The general consensus is to clean and treat any exposed aluminum pieces. Sand with 220 grit for a good mechanical bond, clean with something like Alumiprep, then Alodine. You can buy the cleaning and treating agents from an auto paint store or order the aircraft quality stuff from Wicks or Aircraft Spruce.

(Wayne Hicks (FAQ)): - On the temporary firewall, do I leave the cosmetic pieces in?

It does not matter as you use the fake firewall only for fuselage assembly (Chapter 6). In fact it only really has to be a piece big enough to accommodate the four longeron holes. On the real upper firewall, the cosmetic pieces are removed prior to laying up the wraps for the turtleback/fuselage and firewall/engine mount hard points. The cosmetic pieces are reinstalled after that.

(Wayne Hicks): If I were to build the firewall again, I'd oversize the aluminum laminates for the engine mount from 1 inch square to 2 inches square. I found out later in Chapter 23 that it's hard to make an engine mount that will fit to the exact dimensions shown in the plans. Welding creates a lot of heat, thus causing the engine mount also bends and contorts with the heating and cooling cycles. Thus, the footpads on the mount won't exactly be on center. Mine were very close to falling outside of the laminates.

### Tip - Blind screws

(Wayne Hicks): I used bolts instead of screws for the blind installation into the firewall. I carefully chiseled out hex holes into the firewall to fit the bolts, drilled and safety-wired the heads, then glassed over them with the 1-BID. I did this so they won't turn on me when installing the rudder pulleys in a later chapter. If you don't know this story, the Long EZ drivers have complained for years about the bolts turning. The only remedy is to slot the bolts at the thread ends, then install the pulley and nuts. I'm not going to chance it.

(John Slade): The plywood came from Finland and it is HARD. I read lots of ideas about the blind screws. I'm learning to stick with the plans. No music wire or welding for me - but I made a point of floxing those screw heads GOOD, since some people have had trouble with the screws turning later. Mine will never turn ever. No way. *(Later note: They turned and gave me a couple of days of annoyance! Wayne Hicks called me a "sorry sack of doggy poop!" for ignoring him. Since our Golden Retriever had just had eleven puppies we had a good supply. I offered to send him a couple of sacks) - maybe welding music wire on them was a good plan after all.*

### Tip - Longeron cutouts in Firewall

(Rick Maddy): Don't make any cutouts in the firewall except for the engine mount hardpoints. During chapter 6 you will make these cutouts in the temporary firewall first. Once everything fits properly you can transfer the location to the real firewall.

(Nate Wolfe): I made another mistake on this part in cutting out the longeron holes on the permanent fire-wall. I hope that this doesn't bite me later. I am confident that I can adjust but I'd rather have it right the first time. I'll let you know when I get there. I probably should have mentioned this earlier, but you should definitely buy a roto-zip tool with a router handle for this job. If you use this combo with a laminate bit to trim your pieces you will always have perfect trims.

There is one moderately nerve-racking part here in having to install the engine mount hardpoints. The only thing that goes through your mind is, "Man i hope I measured everything PERFECT on this sucker" They are only 1" x 1". You also have to install 16 blind screws here. I have read about people saying that the heads break free and cause the screws to turn in doing it the plans method but I did it that way anyway. I floxed them in there pretty well and I trust Nat (not me the designer of the plane).



(Bernard Siu): I traced out the drawings for the firewall as the other bulkheads and cut out both the temporary and permanent ones per plan. Once made, I clamped the firewalls together and performed the edge sanding and hole drilling together. This way, hardware positions on the temporary and permanent firewalls will be the same.

You're probably wondering what in the world are those round inserts – instead of the 1" square inserts per plan. Based on the Wayne Hicks' and others web site, it was suggested that a larger insert (~1.25" sides square) might be worthwhile. Therefore, instead of the 1"x1" square inserts, I had 1.75" diameter (diagonal length of a 1.25" square) aluminum discs made in their place. Besides, it was easier to cut a round hole in the firewall (using a hole saw) for a nice clean fit.

As I pushed the MS24694-S54 screws into the blind holes, they felt quite snug. Therefore I did not do anything more than per plan. I ground a flat on each screw head, countersunk the holes and installed with flox. Waited for the flox to cure and glassed the forward sides.

(Girrrls): We were nervous about the screw threads hanging out where they would either inevitably get bent or damaged or where they would bend or damage one of us, so we fashioned these protective wood blocks to keep everything out of harm's way.