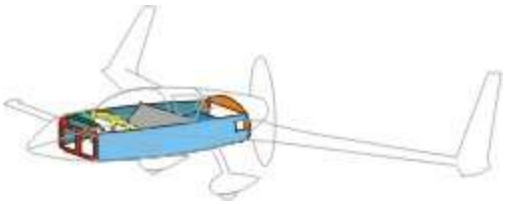


Picture by Bernard Siu

Chapter 6

Misc Techniques/Tools

(Rick Maddy):Threaded rod, a pair of matching nuts, and some big washers make it real easy to hold the boards against the fuselage sides when gluing in all the bulkheads.

(IRWIN): Measurements should be as accurate as possible. A 1% accuracy is good enough. Don't sweat being off an 1/8 inch over a 10 foot length. Don't let the perfect get in the way of the good enough. Wipe off any excess micro or resin where it is not needed. It's easier to do that than to file and sand later. Denatured alcohol works well for cleanup. I learned to heavily weight the bottom on to gaurantee a good bond across the whole bottom. It makes it nice. I saw this on another site first. I spent lots of time on the seat back support. I didn't like fuel lines in the cockpit. I eventually removed the fuel valve. I think it was unsafe where it was. I learned there are some opinionated people on the user groups that may be wrong. When I wasn't sure, I asked many people then formulated my answer. Paint brushes can be used again if I wrap them in saran wrap and place them in the freezer.

The most important technique I learned early on is to make bid tapes on foil. I learned I can save them in a freezer and use them when I need them. The aluminum foil helps mold the glass in the shape it is needed. The foil easily peels off once the tapes are pressed into place. I can draw lines on the foil with a pen before applying the fiberglass and resin. I can use that line to cut my tapes to the desired width once they are wetted. I cut the tapes with a "pizza" knife.

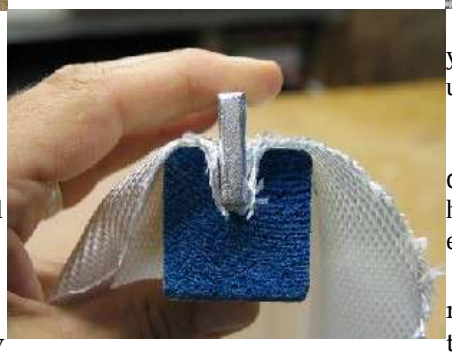
(Girrrls): If you look carefully at the second picture you will see our secret to getting holes through bulkheads to line up so perfectly. Figure out wher you want the center of each end to go and drill a small hole, then guesstimate where the intermediate holes go to the best of your abilities and drill a medium hole in each bulkhead, thread a string through all the holes and see which way you need to correct the intermediate holes with a dremel. Once the string goes all the way through without touching the sides of the intermediate holes you can put the paper pattern of the actual clearance holes on the string and mark the actual holes.

(SIU): The profile, where the seat back meets the lower longeron spacer was a tough one to determine. I got a carpenter's profile widget from Home Depot (picture left) to help to transfer the profile onto the edge of the seat back prior to trimming (picture right). It probably saved me many times in picking up, trial fit, take down, sand some more... and just one-last-time... Regardless, I did many... many... many... cycles of that until I was satisfied with the fit.

(SCHILDER): With the spacers cut and microed to the foam floor and the whole assembly fit checked to the fuselage, it's time to do the glassing. I'd seen that other builders had made a special tool to hold the end of the fiberglass as it comes off the roll, to

keep it from distorting. This is especially helpful when doing large layups because the fiberglass tends to distort when holding it with two hands, it sags in the middle and you don't tend to pull on each corner evenly with your partner holding the other end. Erik and I devised our own tool that worked very well. It's basically a 42 inch length of 2x2 with a slightly oversized quarter inch wide slot, 1/2 inch deep (using a stacked datto) that traps the fiberglass with a flat piece of 1/4x1 inch aluminum stock. The aluminum captures the cloth in the slot and holds it evenly when orienting the cloth on the part. With the glass and aluminium pressed into the wood slot it's a lightly snug fit, so when releasing the glass out of the slot it gets a bit distorted, but that gets trimmed off anyway. The smoother you make the slot the better, I put a couple of coats of shellac on it.

(SCNEIDER): Builder Hint: Get yourself a cheap set of kneepads from Cheapo Depot. Scooting around on your knees under the fuse taping and filling makes short work of knee skin.



(WILSON): Note - I use the "corner-cut sandwich baggy" method of Flox Dispensing. (SCHILDER): One useful hint here is to reinforce the corner of the baggy with duct tape or you'll surely experience a blow-out.

(BARNES): Building the bottom is much the same as the sides. In this picture you can see the Japanese saw that I use, purchased from Home Depot. It cuts on the pull stroke and has a very small kerf. Best saw in the shop

Step 1 – Fuselage Assembly

General – Trial Fit Bulkheads

(SIU): The plan called for trial fit of all bulk heads to each of the fuselage sides at the beginning of Chapter 6. However, I find it hard to do so without first marking their exact location on the inside of the fuselage sides - remember, the dimensions on the plan are parallel to the longitudinal axis and not along the curved longerons. In addition, I expect quite a bit of sanding on the bulkhead sides (where they meet the fuselage sides) for a good fit - sure hate to sand the wrong spot. I was especially concerned about the front seatback edges, since it rests along a ~45^{o} angle to the fuselage sides. I decided to hold off on that a bit. Instead, I laid out the foot print of the fuselage assembly on the work table first, marked the bulkhead locations, then performed a preliminary trial fit, marked the contact locations, then did the sanding.

(WOLFE): MISTAKE 1 - In my excitement, I did not test fit my parts to the fuselage sides prior to taking apart my jigs- (DON"T DO WHAT I DID) This caused me to have to deal with them freely on the table and I paid for it with some dings in the unprotected foam of the outer fuselage in doing so. Test fitting is very important and will determine how well things go together early in this chapter. Take your time and test fit while things are still jigged up.

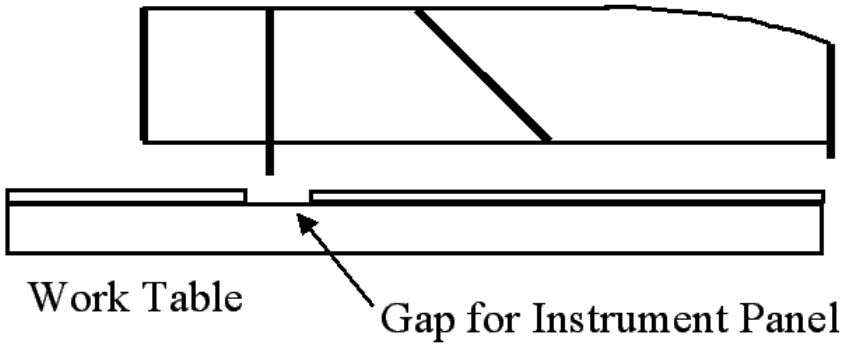
(Unknown): When trimming interior bulkheads, IP, and seatback to fit in the fuselage - make sure to take a little off of each side - not all on one side. It's easy to get focused on getting the part to fit in the fuselage and forget that it has to be symmetrical.

General – Jig Set-up

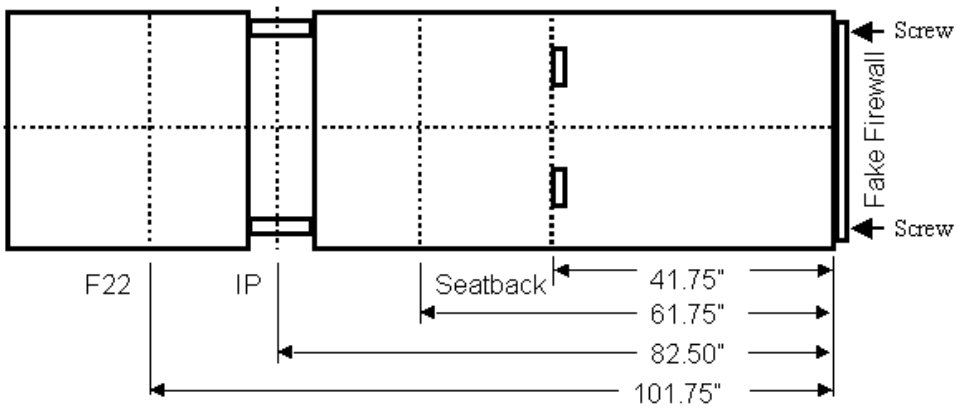
(HICKS): In my first departure from the plans, I decided to jig the fuselage upside down. What better way to keep the upper longerons nice and level than to put them against a flat, level surface? Logistically, jigging upside down is easier and I was able to guarantee level longerons without futzing with the jigging set-up. It was very simple and very reassuring to walk around with a square and spot-check things to ensure all bulkheads, centerlines, and perpendiculars were where they needed to be. It seems like it takes extra work to do this, but I guarantee it was faster, simpler, and more accurate than jigging upright. I wouldn't dare change the structural design. I just chose a different jigging procedure.

Sorry again. I didn't buy a new camera until after the fuselage assembly was completed. Please reference other Cozy websites for more information. You'll also notice that the F28 bulkhead is upside down. I only put it there for this photo op. I waited a while before floxing it in place.

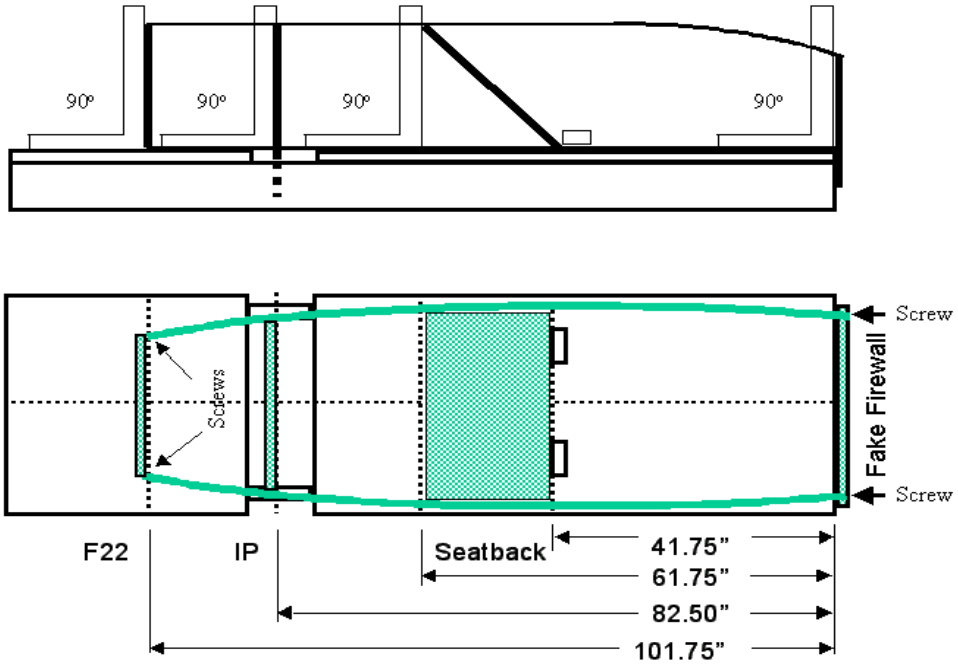
I removed my work table from its stand and placed it on the floor. (Remember that my work table is two solid core doors screwed to 8-inch roof rafters 10 feet long.) I moved one of the doors by 5 inches to make a convenient hole for the instrument panel to protrude through. I used my Smart-Level (a must-have tool) and used shims to level the table.



I drew a centerline along the length of the table, making sure it was square with the ends. I placed the fake firewall (upside-down) onto the end of the tabletop, made sure it was level and square, then anchored it in place with screws. Measuring from the firewall, I marked off the FS positions for F22, the IP, and the bottom and top edges of the seatback. I used a square to draw the perpendicular reference marks. I placed two small wood blocks just behind the 60-inch line to locate and hold the top edge of the seatback in place during assembly.

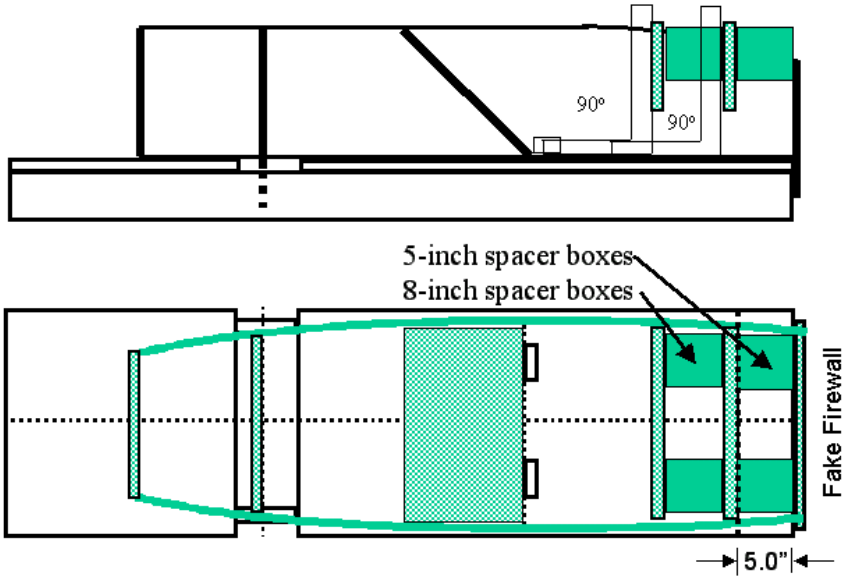


I trial fit everything first. I made sure the bulkhead centerlines lined up exactly with the centerline on the work table. (They did!) Once satisfied, I put two screws through the very front of the upper longerons. With the reference screws for the fake firewall and F22 positions, I could take everything apart at will and guarantee repeatability of the set-up.



Instead of using ropes, boards, and bungies, I used drywall screws to hold the sides and bulkheads together during fuselage assembly. I floxed the bulkheads in place and waited for cure. This all worked neat for me, but I would only recommend using the dry-wall screws if all your bulkheads fit perfectly to your fuselage sides. As it turns out, there were absolutely no gaps between the bulkheads and the sides during trial fit, so I didn't have to overly squeeze the fuselage sides anywhere to take out any gaps. Even F22 fit right on the money. I don't credit the good fit to workmanship as much as I credit it to just staying on the lines as per the drawings.

After cure, I followed the same process to install the landing gear bulkheads. These bulkheads are easy to locate by using those gage blocks. Still, I used my square and the FS position marks on the work table to ensure they cured in the correct positions.



(Norm Muzzy): This is how I did all of the assembly. Upside down, on the table, in the air.(a la Maddy) A bit of climbing up, but not too bad a job. The instrument panel hangs over the end of the table.

Work Bench Setup

(SIU): I chose to follow Wayne Hick's up-side down assembly approach as many have done before me (Thanks Wayne). I replaced the regular legs of my work bench with 8" legs that have adjustable feet for leveling. Then I mounted the mock firewall against the back end of the work bench. I didn't realize the extra height between the upper longerons and the top of the firewall, I had to raise the work bench some more - to ~12" above ground. See the extra 4"x4" blocks under the table legs and the clearance I got from the floor! I also screwed in a vertical 2x4 onto the table frame to provide a rigid support for the firewall. Note the 2 holes in the firewall (where the upper longerons will fit) are lined up to the surface of the work bench. Un-be-knownst to me, I ended up taking this fuselage on and off many... many... many times before getting serious in the assembly process!

Since our fuselage is 101.75" long - which is much longer than any T-square I can pick up from Home Depot, I chose to use a laser for most of my alignments. As shown, I used a straight line laser to set a center line from the center of the firewall to the front of the assembly (picture below left). I then used a cross-hair laser to mark the left and right positions of all the bulkheads per plan. With a straight edge, I drew a straight line joining the left & right marks on the work bench. I then double checked to make sure they were square to the centerline. All bulkhead positions are now established and drawn on the work bench per plan.

My next step was to secure some stops to help in the bulkhead placements. You can see the 2 wooden stops I screwed down for the front seat back (60" from the front) per Wayne Hicks' recommendation. At the front end, I mounted 2 holding blocks for positioning and securing the F22 at exactly 101.75" from the face of the firewall. The vertical laser (at the foreground) helps to line up the center of the F22 to the centerline of the fuselage. With the center line established, the front (F22) and the back (firewall) secured, and the bulkhead positions marked, the fuselage sides are ready to go on the work bench.

Surprisingly, it took a lot of sanding and wrestling to get the longeron ends and LWYs through the firewall holes. I was debating if I should trim the longerons OR change the hole sizes in the firewall. After reading the plan instruction several times, I think the instruction means adjusting the hole sizes - I could be wrong here... but I did make sure the inner edge of the longeron ends (at the firewall) are equal distance from the center line.

Once the longerons were in place, I extended the bulkhead positions (from the workbench surface) up the fuselage sides with the help of a self-leveling vertical laser line . You have to look real close to pick them out. I am confident with the bulkhead positions because I had established the front, back and centerline of the fuselage assembly footprint on the table earlier. I double checked their positions from the front and the back - because Nat used the word EXACTLY in the plans! You can also see the double 45 degree outline for the edges of the front seat. Now, I have a better idea where and how the edges need to be shaped for a good fit...

The next step was to clamp everything down snug and tight, make sure everything is leveled both horizontally and vertically. Here's where the SmartTool becomes very handy. I also measured and marked the distances of the longeron edges to the center line at several critical locations to make sure the fuselage sides are symmetrical and lined up. You can see some of the "push" blocks along the outside edges of the fuselage - just for that purpose.

Generally, my SmartTool showed 0.0^{o}, 0.1^{o} and 0.0^{o} along the top of front seatback, IP and F22 respectively. It also measured 89.7^{o} and 89.8^{o} vertically along the face of F22 and IP respectively, and 47.7^{o} on the front seat back. I did a calculation on the slant of the seatback according to the plan dimensions with consideration to the thickness of the material, it turned out to be 47.63^{o}. I'll say that's close enough. I then pre-drilled and put 4 screws through the F22 onto the upper and lower longerons.

At this time, trial fit is complete! I re-checked all dimensions one more time and was ready for the next step - floxing!!! The floxing effort was not too bad. The left fuselage moved a tiny bit forward but I did not realize it until I was done. It was late and I did not push for perfection...again. I sweated over the night (after I got home) thinking about it and hope that I do not have to cut out the bulkheads and re-do the assembly.

(WOLFE): MISTAKE 2 - I decided to assemble the fuselage on the table - (DON'T DO THIS EITHER) I HIGHLY recommend that you do this on the ground (down lower) where you can reach everything without having to climb on the table. I ended up unfastening everything and building jigs on the floor and costing myself about 3 hours of frustration and lost time trying to re-invent what Nat and others have already worked out.

(WOLFE): DEPARTURE FROM PLANS 1 - This I do recommend. There is a method for assembling your fuselage upside down described here on Rick Maddy's site. I used a combination of this method and the plans method for jigging and assembling the fuselage. I don't know that there is a "right" or perfect way to do this but this way is definitely good.

I first assembled the jig similar to the plans on the floor using a 2" x 12" x 10' piece of lumber left over from my deck building this summer. After marking an accurate centerline to work from I then fastened the 2" x 4" x 4' wood to the end and measured the length of the fuselage and fastened 2 more. Measure - Check - measure more... I eventually got what you see here. Not too hard so far... While doing all of this check for level both ways and be accurate about it because you are going to jig your fuselage upside down on this and it will determine the straightness of the upper longerons. I just kept thinking about the canopy later on matching the upper longerons. That's pretty good incentive to make it straight.

I then fastened the firewall to one end of this jig. To do this I had to cut off the top of the temporary firewall. I proped it straight and added a stiffiner (in the form of a 2 x 4 piece) to the bottom of the firewall so that it was more rigid and easier to level and jig straight.

Now the test assembly begins. Starting with the seat back, then the Instrument Panel and finally F-22. You assemble, sand, fit and make perfect here all the while leveling and making sure that everything is PERFECTLY STRAIGHT. My recommendation here is take your time and then walk away from it and then take some more time making sure it's right. It will be perfect and this is where the rest of your plane will either be straight or... well... not straight. I don't like not straight.

Eventually you will want to block and fasten everything in so that when you do a final assembly it will be easier. To accommodate this I build up some wooden blocking to hold things like the seat back and F-22 and such.



Once I was comfortable with everything I took it all appart and prepared to put it together for good. This involves a lot of flox and rope and jigs and other stuff to help hold the bulkheads in place and squeeze the sides together while the whole lot cures.



(MATCHO): I don't know what it was, but I over-thought how to begin this chapter. Finally getting off my dime, I decided to follow the plans (imagine that!). There are a lot of people following Wayne Hick's upside down technique, which has just about become some sort of standard. However, after asking a handful of builders what they thought and thinking it through myself, I saw no real benefit. In fact, I am very happy I didn't do it upside down, and here's why:

1. Wayne assemble upside down, on a door. I didn't have a door.
2. Wayne cut his table top (the door) to fit the instrument panel (remember, upside down). I didn't want to cut anything.
3. The plans way has the longerons on top, which are supposed to be perfectly flat. I found it VERY EASY AND CONVENIENT to be able to lay my level in various positions to verify I had everything set right.
4. The last thing I need when reading these plans is to have to flip measurements in my head. It was a beautiful thing seeing the fuselage come together as it will eventually sit -- right-side up.

All things considered, there's no real issue with the plans method -- it works as-is, and quite well. This is not to take anything away from Wayne, who does fantastic work and has been very helpful to me whenever I've been fortunate enough to visit his project. He's definitely going to produce a fine airplane.

I actually did make a slight change to the plans approach. The plans call for a 10' 2"x10" "plank". I was worried about warping, and what a 10' plank would do once its warping gear got in motion. I was imagining my fuselage twisting up like the Wright Brother's wing warping setup. So all I did was to by a 6" wide board instead of a 10" wide board. The purpose of the board is only to establish the length of the jig, and to allow securing of the lateral 2x4 boards. In reality, you only need a 10' 2x4.

(SPRINGER): Here is a picture of the fuselage assembly jig I built. My daughter Emily is "showing me how strong it is." I followed the plans, basically, but put in on legs so it sits off of the floor. I read on another builder's web site that doing some of the taping and other assembly steps is easier if this jig is off of the floor. I also put adjustable feet on it to make leveling easier later.

The adjustable feet made it really easy to level the jig - both in pitch...

and in roll!

I did, however, have to use my belt sander and grind a bevel on the horizontal members to accomodate the way the bottom of the fuselage is shaped.

(MADDY): Here is the basic fuselage jig made up. A 2x10x10' and four 2x4x4'. I later found I needed to cut the upper 2x4 at the front a bit shorter. When putting the fuselage sides in place the plans say to use a block to prop up the front of the sides. As it turns out, just sitting them on the 2x4 makes them too high. Two 2x4 is 3". The front of the fuselage sides are 20.1". This is 23.1". The longerons are supposed to be 23". Oops! I cut the upper 2x4 shorter and blocked the fuselage sides up a bit and all was well.

General – Installing Bulkheads

(MADDY): For assembly I removed the seatback, IP, and F-22. Spread the sides apart at the forward end. I then applied epoxy to all mating surfaces. I then applied flox to all mating surfaces. Next I placed the seatback into position and put the nails into place on one side. I did the same for the IP. I slid the sides back into position and replaced the nails on the other side into the seatback and IP. Finally I repostioned F-22 and added nails and clamps. I then added the boards and threaded rod to give a good squeeze. I proceeded to remove all the excess flox and fix areas that needed more. Lastly I tweaked and checked and double checked that all was straight, level, plumb, and true (any others?).

(MADDY): I used two boards (per plans) to squeeze the sides of the fuselage together while it cures. I used threaded rod through the boards. Making a tight fit was as simple as turning a nut at the end of the rod. Home Depot only had 2' rods so I bought two each with a coupler holding them together in the middle. Large washers inside the nut against the board ensures good pressure on the board.

(Terry Pierce (FAQ)): When installing bulkheads, double and triple check the measurements. Check to see if you are supposed to be measuring from the front or the back of the bulkhead, especially on the landing gear bulkheads.

F-22/28

6.1 - Where should I locate the *F28* bulkhead?

(Terry Pierce (FAQ)): Many builders have found that when installing the canard in Chapter 12, there is not enough room between F22 and the F28 cut-out for the trailing edge. Most builders have moved the F28 to the 6.25 position instead of the 5.9 inches called out in the plans. (See Chapter 12 of this FAQ).

(Amendala): I read and re-read the FAQ's from the Unofficial Cozy Page, but still ended up placing the F28 doubler too far aft. I had to cut out the doubler and flox a new one in its place. If I were to do it again, I would leave the doubler in the plans location, but make it 1" longer on each side. This is what I did the second time. In chapter 7 when I cut out the canard section of the fuse sides, I cut off a little more doubler than normal, but I have plenty remaining to attach

(Wayne Hicks): I should have moved the F28 upper longeron doubler back a half inch or so to correspond to F28 being mounted at 6.25 inches from F22 to provide enough room for mounting the canard wing. A lot of builders find out later that they have to move their F28 bulkhead back a bit to make room for the trailing edge of the canard.

(HICKS): You might want to think seriously about moving the F28 to be 6.25 inches behind F22. (See Zeitlin FAQ 12.1 and 12.2.) You'll find out later in Chapter 12 that you may not have enough room between F22 and F28 to fit the canard. My canard trailing edge hit the fuselage sides and I ended up cutting out and moving my F28 to the 6.25-inch position.

(SIU):The 4 ply enforcement turned out to be quite simple. Again, I used the BID tape method and tapered the edges with peel ply. I did have to come back to trim and smooth out the edges after cure.

(SIU): Installation of F28 took a bit more thought and alignment. First, I had to open up the width of the gap on work bench to accommodate F28 since it protrudes above the upper longerons. Now the gap is ~12" wide - enough to handle both the Instrument Panel and F28. Following general consensus, I moved F28 from 5.9" (per plan) to 6.25" from the forward face of F22. Since F28 is hanging over the gap, it was difficult to set and square up the 6.25" position on the upper longerons. I did the following:

I first projected a straight line from the forward face of F22 down onto the workbench. If you look closely, you can see the fine F22 projection line intersecting the center line. Using a square against the 'cross-hair', I found the 6.25" position over the gap. Using 2 large clamps, I clamped a straight piece of 2x4, with its aft face at 6.25" and parallel to the F22 projection line. Then I slipped the F28 against the aft face of the 2x4 and clamped against it with 3 small clamps. They kept the F28 at 6.25" position as well as vertical. I added 2 more clamps at both ends of F28 and double checked their distance from the F22 projection line. I also confirmed the center line of F28 lining up with the fuselage center line and verified the vertical face with a bubble.

I then disassembled all the clamps, floxed the mating surfaces, re-clamped and re-verified. After cure, I added the 2 layer BID and peel ply.

(MADDY): F-28 was pretty easy to get into place. I only had to do some minor trimming to get a good fit. I floxed it into place and added the BID tape to the aft face in one session. I couldn't see a reason not to. I came up with a simple way to hold F-28 into place without gluing any blocks or using any nails. I clamped a block to the fuselage side and then attached a clamp to the block under F-28 holding it up into place while it cured.

Instrument Panel

(SIU): The second challenge was the positioning of the Instrument Panel since it will be sitting at the cut out of the table top. Since the front position of the fuselage is known, I clamped a straight edge (board) at 19.25" for the IP (picture left) to push against. I then clamped a small board, flush to the upper longerons, assuring the IP will rest flush with the top (it will be the bottom here, since I am working upside down) of the upper longerons. The top clamp pulled the fuselage sides in, snug with the IP sides. I made a couple of blocks with a slot just the thickness of the IP to make sure the clamps won't slip during cure.

As many builders ahead of me, they found their instrument panel was about 1/4" too short. When I laid the foam for the fuselage bottom, it rested along both edges of the lower longerons but sagged a bit to make contact with the IP bottom, heat duct and seat back (at the center). This is the time for spacers... I cut up strips of high density Clark foam (~1/4") and microed them along the bottom of the IP, the heat duct and seat back. Then I weighed them down for cure. After cure, I rested a straight edge across the lower longerons and sanded down the spacers until they were perfectly level with the longerons - providing a nice flat support for the fuselage bottom. Then I performed the tracing and trimming per plan.

Seatback

(DOVE): The front seat back bottom corners, cut during Chapter 4, did not fit properly into the bottom longerons, as I had removed too much material when trying to cut the corners as per plans to 45°. I had to repair the corners by sticking about 3/4" of extra blue foam onto the corners and reshaping using a profile gauge. Once I was happy with the fit I then re-glassed the extra pieces of foam as per plans for the front seat. I would recommend other builders not to cut the bottom corners in Chapter 4 as stated in the plans, but to wait until Chapter 6 when you can obtain the exact shape from the fuselage sides using a profile gauge and get a perfect fit.
The front seatback was 47.3°. I was very happy with these readings and my final setup. Generally I achieved a good fit between all the bulkheads and the fuselage sides and very little force was required to squeeze everything together. As can be seen in the above photos I used stop blocks screwed into the workbench to hold vertical batons in place, whilst being pulled together at the top with a threaded rod or nylon straps. Before moving onto the aft bulkheads I taped the corners of the seatback, IP and F22 using the Bid tape method detailed in the plans.

(ANDRES): I installed my Seat back 1" aft of plans location…good move, I could use more. I compiled a list of issues that I have ran into due to this mod, you can find it here.

LG Bulkheads

Trick - 5" spacer for aft gear bulkhead
(Rick Maddy): Instead of gluing a block in place on the fuselage side as a guide for the aft landing gear bulkhead, I glued a square of masonite to the temporary firewall. This square was 5" wide. This makes it

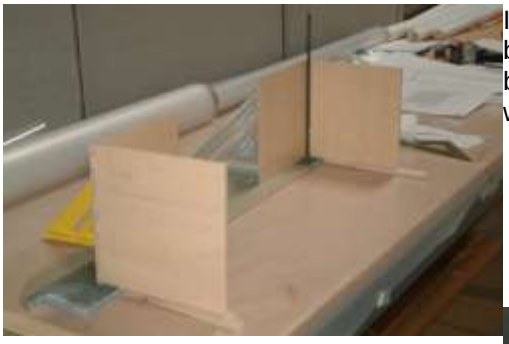
easier to get the bulkhead straight and vertical.

Trick - 8" spacer for forward gear bulkhead
(Rick Maddy):The plans say to glue 8" squares to the forward bulkhead. I chose to avoid this by making a standalone jig I could clamp to the bulkhead. The total lenght of the spacers and the base are still 8".

6.2 - Do you need to tape the landing gear bulkheads to the sides of the tub with 2 plies of BID?
(Terry Pierce (FAQ)): Yes. As with the other bulkheads, tape these joints with 2 plies of BID tape.

6.3 - Should I lap the multiple plies of UNI that are added to the landing gear bulkheads onto the sides of the tub?
(Terry Pierce (FAQ)): No.

(SIU): Aft Bulkhead Installation
My aft bulkhead was a bit wider than the width of the fuselage especially at the ears. I had to sand the edges (bulkhead) down to fit. I just used a sanding block to remove the excess while keeping a close eye on the center line - to make sure I am not taking too much from one side of the bulkhead than the other. Picture shows a fitted and glassed aft bulkhead. I glassed both the forward and aft corners using BID tape method. I measured their orientation after cure and it registered 90^{o} vertical...perfect!



Forward Bulkhead (Lower) Installation
I built the 8" box fixtures and hot glued them onto the lower forward bulkhead per plan. You can see the 90^{o} squares I used to prop up the box fixtures to make sure they stay perfectly vertical. A 12"x1/4" drill bit was used to check out the fit at the corners.

Just as the aft bulkheads, the upper forward bulkhead has to of sanding on the 'side ears' at bulkhead is perfectly horizontal

be sanded down a bit to fit. I also did a bit the lower longerons to make sure the

as well. I had to use many clamps to keep the bulkhead level and square for floxing. After cure, I taped all 4 corners with the 2" BID tapes - though I did not see specific instructions in the plans. I think it is a prudent thing to do. Just hope it won't bite me later. After cure, the next day, I drilled the holes with the 12"x1/4" drill bit. I then removed the fixture box as directed.

Forward Bulkhead (Upper) Installation

My upper forward bulkhead was about 1/8" wider on both sides - a bit more than sanding can do to fit. I trimmed both edges with the table saw instead. The fortunate part is that the edges turned out to be nice and straight - they fit snuggly against the fuselage walls. Once I floxed the mating surfaces and fit it, it stayed up in place on its own. But I know better than leaving it alone through the night for cure. I clamped a couple of 2x4s under LWX for support. I also taped up the middle sections to make sure the part stayed put during cure.

After cure, I prepared the 2" BID Tapes and the 6 layer UNI for the aft corners and face bulkhead are symmetrical and perfect rectangle (as shown). layers of rectangular shaped drew out the required shape & mil plastic). I trimmed along viola... my UNI tapes are ready

respectively. Since the 'ears' of the if I flip them head-to-toe, they form a To make life a bit simpler, I cut out 6 UNI and made a 6 layer UNI tape. Then I dimension on the sandwiched UNI (by 4- the lines with my electric scissors and for glassing.

I glassed the BID tape corners first, then the UNI tapes and then peel ply. The one thing you must be careful is the orientation of the UNI per plan. The diagonal cut edges need to be laid against the fuselage sides for the correct UNI orientation. I caught it in the last minute and had to make minor trimming to compensate. Otherwise, this method worked well for me.

(WOLFE): I have installed the all of the Landing Gear bulkheads now though. I must say that doing this part upside down has made this much easier than I can imagine it would go right side up. Gravity helps keep everything in place and since you can hang the bulkheads on the lower longerons with it like this all you need are a couple clamps to make sure that it doesn't move during cure. I did the Forward bottom and and Aft landing gear fuselage first. Once this cured (it was warmer those days) I installed the forward top landing gear fuselage. (above right) Both weren't too bad. I had some help from another builder on the first two and we worked on it until it was perfect. This made the later much easier to install. I used an elastic bungie cord (orange in the picture) and a couple of clamps to hold the ears in place and things went quite nicely.

(MADDY): Here is the aft landing gear bulkhead freshly put into place. Before doing so I spent a bunch of time measuring the bulkheads, the firewall, and the longeron cutouts in the firewall. Everything seemed to match the drawings but the edges of the bulkhead were at a slightly different angle than the fusealge sides. The tops of the ears were too wide but the base of the ears had a small gap. In the end I trimmed the edges

of the ears on the bulkhead to match the angle of the fuselage side. Once floxed into position I made a small fillet with the flox and added BID tape to the forward face joint. I will do the aft face tape later - just before putting the real lower firewall into place. As it turned out the vertical brace I put on the firewall was about 5" wide. I ended up cutting part of the bottom off so it wouldn't interfere with the bulkhead.

To fit the bulkhead in place I made two spacers that were 5" wide. I hot glued them to the firewall. When the bulkhead was put into position I just needed to hold it against the spacers and it would be vertical and properly spaced from the firewall. I then drilled a hole in the temporary firewall to allow the clamp to go through. This was applied lightly to hold the bulkhead in place against the spacers. Finally I placed some blocks under the bulkhead to hold it up into position.

Not wanting to hot glue the spacers directly to the bulkhead I decided to clamp a piece of masonite to the bulkhead. To this I hot glued the 8" spacers. The other minor change was not making the spacers 8" square. They are 8" long but the width is whatever the scrap happened to be. Here you can see the spacer clamped into position. A 1/4" drill bit is in the hole to properly position the spacer.

The lower forward landing gear bulkhead has been floxed into position. I decided to do the 2" BID tapes at the same time I do the multi layer UNI layup later. As usual I had to trim the bulkhead a bit to get it to fit properly. Again the edges were a bit too wide but not very much. A little sanding of the hardpoints and the bulkhead fit fine. The biggest problem was the top edge. When the bulkhead was in position the top edge was a little high. I had to trim about 1/8" off the top to make it flush with LWX. I'm wondering how this will affect the location of the holes in the hardpoints.

Just prior to floxing the firewall in place I taped the aft side of the aft landing gear bulkhead. This gave me a lot more room to do this than when the temporary firewall was in place.

(DOVE): The hot glue method recommended in the plans for securing the guides onto the surface of the bulkhead wouldn't stick properly, so I resorted to using 5-minute epoxy. To get the aft Bulkhead setup accurately, I used 1"x1" wooden batons, clamped to the inside of the fuselage and used the digital level to ensure it was perfectly vertical. I then trial fitted the aft bulkhead and used a second set of clamps to clamp the bulkhead to the wooden batons. The initial fit was pretty good and I didn't need to file too much, in order to get the bulkhead nice and level. I then floxed the bulkhead into place and used a nylon strap over the wooden batons, to apply a little inward pressure against the aft bulkhead.

(MATCHO): A question I have in this area is that the top edge of the forward LG bulkhead is above the stringer on the left (see 2nd picture). This issue can likely be traced back to the LWX/LWY stringer section in Chapter 5, where my length of the diagonal stringer was a touch short. The plans say to cut this down, but there are many stories of builders who have trouble fitting the landing gear in this area anyway. I don't want to cut it down.

The plans have you fit the upper LG bulkhead flush to the *inside* of the stringer, but it happens to fit perfectly above the stringer, mating perfectly with the top edge of the bulkhead. Given that I want to keep the height of my forward LG bulkhead per plans, I am planning to install the upper LG bulkhead above the stringer. There's a Canard Zone discussion on the topic here.

Firewall

(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.

Taping Corners:

(SIU): Glass All Corners
The next step is to glass side corners with 2 plies of BID. This effort took a bit longer than expected. I followed the plan instructions and had no major problems. The only thing I did not like was that my flox fillets (around the corners) were not perfectly rounded. To correct that - I wrapped a piece of 80 grit sand paper around a 1/4" diameter wood dowel and gave them all a nice sanding. There's got to be a better way to do this!

I used the BID tape method for all corners. However, I made the length of the BID just a tad short of the vertical lengths. It is because the BID tape method leaves sharp edges around the tape (since they are cut to dimension after multiple layers) and I like to leave a nice tapered edge all around. The extra space allows me to form the tapered edges by the use of peel ply as called for by the plans. All in all, I did not have much problem with this operation.

Step 2 – Center Keel and Seatback Brace

Seatback Support

(HICKS): There was nothing difficult with building the seatback support and keel/heat duct. I tried to lay up all 7 UND layers for the seatbelt attachment points on to plastic first, then transferring them over the seatbelt attachment tube. It didn't work. Too much glass, too many bends. So I separated them into 2 layers max and reapplied.

(SIU): I laid out the seat brace per drawing shown in Chapter 2, page 5 to maximize the use of foam, but I misunderstood the instruction in Chapter 6, page 4, second paragraph - I glassed one side of the seat brace BEFORE cutting them apart. By the time assembly comes along, one side of the seat braces has the glass on the wrong side. Fortunately, both sides of the seat brace will be glassed anyway, I went ahead and glassed the other side prior to assembly.

I floxed in the inside spacers using blocks and clamps instead of nail method as suggested per plan. I am just not comfortable with putting nails through the glass and foam for positioning parts for cure. I think nails in foam allows room for the part to shift during cure compared to clamps. That's just me. As shown, the blocks are there to make sure the spacers stayed vertical to cure - I am not sure

nails will do the same. To attach the second half of the seat brace, I added a longer 2x4 along the hypotenuse edge of the triangle (shown right). The top just 'drops' in place for a good fit - no nails. I laid a couple 5 pound weights on top for added pressure. You can also see a couple of wood block spacers along the edges to make sure there is no sagging on the edges.

The 2 BID layers on the sides of the seat brace went smoothly. However, I did not round off the edges along the back and the sides when I did the back layers. I knew that could be a problem, but figured I can force the glass to conform. Well, they have better will than I do - I ended up fighting it for 2.5 hours and gave up. I ended up removing the 2 BID layers and peel ply, waited overnight for the epoxy to dry out, then rounded off the edges. The 2 BID layers and peel ply went on nicely in 30 minutes. Lesson learned - no cheating!

(WOLFE): IF I HAD THIS TO DO AGAIN. - The plans call for you to layup one side of the spacers and then layup the otherside while you put the keel together. Had I thought about this more I would have summarily ignored this bit and layed up both sides prior to putting them in the keel. This would avoid a slightly tricky layup after all of the spacers have been placed and 5-minute epoxied in place. All you would have to do then is use a bit of 5 minute epoxy and flox the sides and corners making for a much easier setup. A TRICK TO PASS ALONG - Pieces of 2x4 work great to act as spacers here.
I cut out some perfectly sized spacers for the main body of the front heat duct. These I screwed to the table with one edge on a line to align them perfectly. At the front where the duct widens to meet the control panel, I cut a wedge out of foam and inserted it until I had the right width.

I actually waited to join the keel and heatduct. I installed the heatduct and let it cure in place after making sure that it was perfectly level.. I was then able to install the lower seatback keel against the seatback and heatduct. I clamped it in place and filled in the little spaces with flox that inevitably show up when you build parts away from each other. I then taped everything together per plans. Seatback to keel, heatduct to keel, heatduct to control pannel... etc. It turned out perfect.

(DOVE): When marking out the pieces for the seat brace as per the drawing in Chapter 2, page 5, I noticed that the 2 braces and the 2 duct side pieces were not laid out as opposite to each other, as stated in Chapter 6, page 4. I ended up cutting out all the pieces and glassing the 2 triangles together with bid and all the straight duct sections together with uni. After cure I cut all the pieces out with the Fein. I cut out the ¼" birch plywood insert with the band saw and removed the foam from the 2 triangles with the blade of a utility knife. I found that the dimensions given for the placement of the braces, which formed the map pocket weren't even close and I ended up placing the braces to suit the hole I had cut in the seat, back in Chapter 4.

(SCHILDER): To start off, I made a common mistake, which is not making right and left sides for the seatback brace. In the beginning of the plans it shows the optimal layout of the parts on the sheets of foam and it appears that the sides of the brace can be made by bisecting a rectangle along the diagonal, don't do it. Because the base and the vertical legs of the triangle are different lengths you need to lay them out on the foam separately and then make sure you glass the correct inside surface of each side, if that makes any sense. If you do make two right or left sides, don't worry there is enough foam to cut out another side. Just include another sheet of foam in your next order, because you will need more of that foam later.

Fuel Valve

(HICKS): Don't bend that fuel valve bracket yet! All bends must be perpendicular to the grain in the metal, or the bracket will crack. I made mine successfully but decided not to use it. I chose to mount my fuel valve in the center console, just aft of the throttle quadrant.

(Remi Khu): The other change I made was to omit the fuel valve on the seatback brace. It will be relocated to the center console, in front of the throttle quadrant.

6.4 - How do I bend the 1/16" thick 2024-T3 aluminum sheet for the fuel valve mounting bracket without cracking it?
(Terry Pierce (FAQ)): First you might consider using a softer type of aluminum (like 5052). Otherwise you need to make sure that the radius of your bend is 3/16" or greater. Do this by bending it around something with this radius (e.g., sand the radius

into a piece of wood, then bend the aluminum around the wood). Also make sure that you make the bend perpendicular to the grain in the aluminum (not parallel to the grain).

(SIU): Forming the aluminum fuel valve bracket was not too bad. I cut out the flat pattern with my band saw and bent the 2 sides (90^{o}) carefully without causing a crack in the bend. I used a vise and wood block with appropriate radius. I also drilled the required holes with my drill press. I was not able to find my countersink bit for the rivets, therefore, I used a 3/8" drill bit instead. It turned out OK.

(WOLFE): I have decided to depart the plans here again with regard to the aluminum bracket that holds the fuel selector valve. The plans call for an aluminum bracket that you bend and manufacture yourself, but I recently read on another builder's site (name eludes me right now otherwise I'd be happy to give credit) that they decided to make one out of 8 plays of bid. This makes a ton of sense to me since I have very little in the way of metal handling capabilities at this time. I am geared for composite manufacture. I know how to work with composite and it's easier to make a complex bracket out of this stuff than aluminum. I have also read that many builders have had problems with this piece of aluminum cracking on them. No complaints about the composite one though, but I am sure that the sample size would be much smaller though.

(HALL): I opted to make the fuel bracket out of fiberglass as some others have done. A male plug of MDF 1.5" wide, seven ply's of UNI, three of BID. Trim where needed, rivet the nut plates on, install in the seat back brace sides with flox.

(SPRINGER): There's a ton of discussion in the archives about the fuel valve mount. Made of 2024 T3 aluminum, most people make about three of them after getting cracks in the bends of the first two. One builder said he'd made one out of fiberglass - what a great idea! This is a non-structural, not a flight control, not an airfoil surface so I thought it'd be okay to make the materials change. I started with a piece of 2x4, cut it to size, rounded the corners and covered it with packing tape for easy release of the fiberglass. Then, I made a 6 layer BID layup inside two layers of waxed paper (like tapes are made), trimmed it oversize, then removed the waxed paper and squeegeed it onto the form/jig. I then let this cure.

After the fiberglass "blank" was cured, I used double-sided tape to stick on a paper copy of its dimensions/shape/holes from the plans. This was then cut and sanded and drilled to final dimensions. The jig I made came in very handy for drilling the holes that were needed as well - the wood served as backup to prevent too much fraying as the holes were drilled and the jig, since it was square and true, held the part nicely for drilling vertical holes.

Here's the final part. The rivets even went in nice since they're brass. Given I've just spent 300 or so hours making fiberglass parts (and not working aluminum) this thing turned out pretty nice! I'm actually a little more comfortable that it will "stick" when floxed into the seatback brace as compared to the aluminum. No cracked aluminum either!

(DOVE): My first attempt at making the fuel valve-mounting bracket failed with the one side snapping clean off, when I tried to bend it around a 4mm radius using the Vice. My second attempt using the Wicks supplied 2024 T3 aluminum also cracked. After reading the many issues other builders have had trying to bend this stuff, I decided to use 6061 T6 instead. I adapted a door hinged screwed down onto a wooden block as a temporary bending brace and my 3rd attempt was successful.

(SCHILDER): Many builders have had trouble bending the 90 degree legs on the ends but I seemed to luck out there. Nut plates are riveted to the braket using very small 100 degree countersunk rivets. You need to use a 100 degree counter sink on the rivet holes otherwise the rivets won't seat properly. You don't normally find A 100 degree countersink in your typical hardware store,

I was able to borrow one from a friend. Also the holes for the rivets need to be drilled with a #40 drill bit which is also not found in the hardware store. Wicks and Aircraft Spruce have all these tools and they're not expensive, I've since ordered a microstop (which lets you set the depth of the countersink very precisely) and several 100 degree countersinks with various pilot sizes and several numbered drill bits. I alodined the fuel valve bracket, safety belt mount tube and brake pivot tube (which gives aluminum a gold color) to prevent corrosion and provide better adhesion for the epoxy.

Heat Duct

(SIU): I laid out the heat duct the same as the seat brace and ended up with glass on the wrong side for one of the sides. Just as the seat brace, I glassed the other side and proceeded to the assembly step. I should have known, when both sides of the foam are glassed, it is stiff as a board and it is not going to bend for the front opening. I ended up using the FEIN tool to 'fillet' the glass off the foam. Surprisingly, it went ok! I had to do a little bit of patching on the surface foam - but nobody will ever know when it is covered with 2 layers of glass later. It also saved me a trip to Aircraft Spruce to buy extra foam. I cut up a straight 1.5" x 40" wood core to shape the heat duct (left). I kept the wood core a bit short (in height) such that it won't make any contact with the seam above or flox. It would be a real fun job (if not impossible) to separate them if they got floxed together. After cure, I sanded a groove on the foam for the 2" seat belt anchor and the opening for the fuel lines per plan.

When installing the 7 layers glass over the 2" seat belt tube, I had a lot of difficulty to get the glass to lay down nicely over the tube - even with a single layer. I can just see a 'king size' delamination will erupt right above the tube. I eventually removed all the glass layers and re-floxed the 2" tube with a heavier than normal build up at the fillet. The resultant lay up turned out much smoother. Picture (right) includes the 2 BID layers as well.

Attaching Heat Duct

Instead of attaching the seat brace to the heat duct per plan, I decided to flox the heat duct to the instrument panel / seat back first. It is because I will have more flexibility to maneuver the heat duct for perfect alignment and perform minor shaping of the seat brace to the slope of the seat back if required. I used multiple blocks and clamps to hold the heat duct (both front and middle) to perfectly level (0.0 degrees) position for curing. You may not be able to see my alignment laser beam that is dead on the alignment mark at the end of the heat duct (recall my alignment laser beam runs along the middle of the fuselage, connecting the mid point of F22 to the mid point of the firewall).

Attaching the Seat Brace

After the heat duct was cured, I trial fit the set brace. As expected, I have to make a bit of trimming to the diagonal edge for good fit. Basically, I have to change the slope of the seat brace to match the slop of the seat back. With the band saw, I took ~1/8" of materials (max) to eliminate all gaps. I used three clamps to hold the seat brace in place (do not forget to apply packing tape on the surface of clamping blocks). In addition, I used a 1"x1" pole to prop up the seat brace at the bottom (as shown). Once the seat brace is aligned and held up tight in place, I floxed it in. After the flox is cured, I applied the 2 layer BID tapes along the sides and to the heat duct.

Completed Seat Brace & Heat Duct

Generally, the heat duct and seat brace assembly was not too difficult. The 2 mistakes I made were not rounding off the back edges of the seat brace before glassing and not having a heavy enough buildup of flox at the 2" seat belt tube. They both required me to re-do the operation. However, they were valuable lessons which I used in subsequent steps. The resultant heat duct is lined up along the center of the fuselage (center laser) and leveled (0.0^{o}). The seat brace is measured at 90.0^{o} vertical.

On to the fuselage bottom ....

(TESTER): After the tub was built it was time to build the heat duct and seat back brace. This would have gone a little smoother but I goofed and glassed the wrong side of one of the pieces of the heat duct. Hmmmm...time to recut?? No! I just used it as is, now one side has a lot more glass than it is supposed to, just a little stronger and a little heavier. Everything else went smooth with the exception of installation. I decided instead of assembling the brace on the duct and curing I opted to build it in place. This worked out very well and cut a cure day out of my life...this is always good.

Step 3 – Installing the Fuselage Bottom

Landing Brake

(HICKS): If I were building the plane again, I'd cut out the forward edge of the landing brake to be full width across. Although the plans hinge length is strong enough, extending the hinge full length makes the brake easier to fabricate in Chapter 9.

(Terry Pierce (FAQ)): When cutting out the landing brake make sure the brake starts 2" from the front of the front seat back (not the back as it might appear in the drawing). Some folks are widening the landing brake hinge from the original 10" Long-EZ width to 16" or more inches.

(SIU): Due to the excellent glide characteristics of the Cozy, a speed brake was designed to slow it down in flight. The speed brake consists of a 14"x22" door located at the fuselage bottom which can be deployed electronically. Construction of the speed brake requires a 45^{o} beveled cutout at all sides with 1" radius rounded corners - carved out of the fuselage bottom foam. I dreaded this cut for days because I didn't have a good grasp of how to achieve a perfect cut. The beveled cuts along the straight edges would probably be OK, but the transition from straight edge to rounded corner concerned me a bit.

With a bit of pondering, I finally made the leap of faith. I first drew the outline of the speed brake on the foam and with the 1" rounded corners using my round corner template. I then marked the quadrant lines and center of the rounded corners (as shown). If you look closer, I also placed a red mark on the jig saw alignment plate. It happens that the distance between the mark and blade is exactly 1". I also found a smooth jig saw blade - perfect for smooth cut on foam materials.

I first precut the jig saw entry point with a regular razor blade. Then I slipped the jig saw blade in and started with the beveled straight edge. As I approached the round corner cuts (pre-marked by the quadrant lines), I started the turn by following the cut line along the radius and at the same time making sure my mark on the jig saw alignment stays right on top of the center of the radius. The result is a nice rounded beveled corner for the speed brake. Since the blade is thin and has no teeth, hardly any foam gets removed - just like a razor cut. When I placed the door back in place, you could hardly see the seam.

(MADDY): I was quite pleased with how nice the landing brake cutout came out. I used a sabre saw tilted at 45° to cut all the edges. The brake is sitting on a flat surface so it doesn't warp between now and when it is

needed again. I'm doing the bottom in three steps as described in the FAQ. I did the BID layup on the bottom one night and peel plied where all the tapes will go. Then I floxed the bottom into place another night. Later I will do all the tapes.

Spacers and Glass

(HICKS): Here's a view of the bottom showing the Clark foam spacers micro'd in place and the lattice structure I used to hold the bottom curvature during glassing. Check closely and you'll see the drywall screws used to secure the big honker piece of clark foam (under the landing brake) to the PVC foam.

I almost forgot to add the 3rd layer of BID for the rear passenger floor area, but caught it just in time. According to Nat, orientation is not critical, so to avoid a seam, I merely rolled out the BID cloth from left to right across the aft section of the floor. I did not have the stamina to attempt the 2-BID taping all in one session. So I floxed the bottom in place, crawled underneath to scrape away the excess flox, then collapsed. I finished the 2-BID tapes the next morning.

(Rick Maddy):Follow the FAQ and put the bottom on in three steps. First - apply the BID to the bottom as directed. Follow this will peel ply where ever a tape will be applied. Allow this to cure. Second - flox the bottom into place. Wipe away excess flox so all is neat. Allow to cure. Third - Add all the tapes. Take as long as is needed. I found laying the fuselage on the side was the best for applying the tapes. All the while ensure the fuselage is straight, level, and twist free overnight during each cure.

6.5 - Do I really need to lay-up and attach the bottom of the fuselage in one, uninterrupted session?
(Terry Pierce (FAQ)): You could do this in one step, but it really takes away from the "fun factor". Just laying up the BID on the contour of the bottom is a big job (a lot of time, even with a couple of helpers). People who have done this in one step say they would never do it this way again. Most suggest:

a. Lay up the bottom and peel ply where the the bottom is going to meet the sides and the bulkheads.
b. Let cure.
c. Remove peel ply, sand, and flox the bottom to tub
d. After flox cures, turn tub on its side or bottom, and tape all the joints at your leisure.

6.6 - What do the plans mean by "lay one ply of BID at 45 degrees on the fuselage bottom, then run the second ply the other way"?
(Terry Pierce (FAQ)): Apply the first ply of BID at 45 degrees to the longitudinal axis of the bottom (the long direction). Now, imagine standing at the front edge of the bottom and suppose that the selvage is ascending away from you as you look from left to right. Now, the second ply of BID is also positioned 45 degrees to the longitudinal axis but this time the selvage would be descending towards you when looking from left to right. This insures that your 1" BID overlaps in the first and second plies do not lie on top of or parallel to each other. Your BID overlaps from the first and second plies will make an "X" pattern if you do things correctly.

6.7 - Where should the 3rd ply of BID on the fuselage bottom be placed and how large should it be?
(Terry Pierce (FAQ)): The 3rd BID layer is to provide extra strength and scuff protection in the areas where the rear passengers will stand when entering and exiting the plane. In general, the 3rd layer can cover from the aft edge of where the seatback will be to all the way aft. Some builders only apply the 3rd layer from the seatback brace aft. Orientation does not really matter, but a 45-degree orientation to the fuselage centerline is probably best.

(SIU): I thought the fuselage bottom frame was going to be tough to build, but it turned out simpler than expected. I started with the two 1x2 stringers. I cut them to length - from aft face of F22 and forward face of the forward landing gear bulkhead. Then I laid them on the flat spots on the fuselage bottom with the overhangs at both ends.

Then I placed the two end cross beams (against F22 & FLGB), making sure they are leveled and clamped tight. Then I added a bit of weight (such as a couple 2x4s) across the stringers at the flat spots. The 2x4s keep the strings from moving as I add shims at the overhangs. I found the wooden stir sticks with some sanding make excellent shims for this application. I put a digital level across the stringers as I added the shims. Once leveled, I tacked them all down with a glue gun.

The spacers for the fuselage bottom were not too difficult because we have gone through a similar process when building the fuselage sides. I set up the band saw and trimmed the spacer strips to 30^{o} as needed. Don't forget to round off the top edges of the spacers before glassing!

I did not glass the fuselage bottom, flox and tape it to the fuselage in one operation per plan. I glassed and peel plied the fuselage bottom first and waited for it to cure overnight. I wondered if I should have floxed and taped it to the fuselage all at once - that would save me time on the peel ply. Nonetheless, I had the opportunity to inspect the glass work and filled a few small air bubbles that crept up along the spacer edges while I wasn't looking!

I double checked the leveling of the fuselage before floxing the fuselage bottom on. I checked the leveling again after everything was weighted down for cure. As you can see, I put a lot of weights on to weigh the edges down. Can you see the kitchen sink? (Got you looking...). I was a bit concerned that the fuselage may collapse on me. Pipe clamps would have been prefect for the task - since I only had 2, I had to use everything that amounts to any weight for it. I waited for almost 24 hours (around 80^{o}F throughout the day and night) before I took the weights off. I double checked the leveling of the saw horse and the fuselage, they both registered 0^{o} - that means nothing moved during cure. My next step is to BID tape all edges.

BID Tape All Edges

Instead of putting the BID tapes on edges with the fuselage up side down, I turned the fuselage side ways. That made the task much easier and I got better quality results. Up to this point, I never felt I had a good grasp of the whole floxing process. The surface of the flox was always rough and I always had a tough time with air bubbles. UNTIL I caught one of John Slade's write ups where he suggested smoothing it out by brushing epoxy over it with a brush. I applied this technique throughout the BID tape operation. I first applied medium dry flox along the edges and smoothed them out (the best I could) with a mixing stick. Since the flox is somewhat dry, the surface will not be very smooth (as expected). Then I followed up with a brush with just a bit of epoxy. The flox absorbed the epoxy and smoothed out nicely - almost like magic! I then laid down the BID tapes and peel plied over it. I turned out the best flox radius since the start of the project.

BID Tape Seatback (rear edge)

The instructions did not say much about what to do with the rear edge of the front seatback. It has an acute angle (~47^{o}) and its almost impossible to get to as far as BID tape is concerned. I searched through the archives and someone did post the question a while back. The only response was from Nat; to flox some foam to it. Here's what I did:

I set up my band saw and cut out two strips of foam about 20" x 1.5" x 1.5" (that makes a 45^{o} angle). I shaped the ends to fit into the outside corners where the seat meets the fuselage sides and bottom. Its a bit of a complex angle, but foam is not too hard to shape - you just need patience. Then I floxed them in and BID tape them all in one operation. The foam spacer made the job a bit easier, but you still need triple jointed elbows and 10 inch long fingers to reach those far away places to keep the bubbles out. The end result was better than expected, but I ended up with a headache for the rest of the night...

(WOLFE): Then I took the fuselage off it's mooring on the floor and moved onto the table so that the new "Height Impared" sawhorses could be leveled and leveled and leveled and leveled and bondo'd to the floor. Move the fuselage. Then out with the blue foam. Cut to size so that the pieces fit. Then weight the whole deal down and crawl under, do a bit of tracing with a pencil and back off with the foam to cut the sides to size.

We then threw the whole lot back on the airframe and built a small frame out of 1" x 2" x 8'.(left) Touch it with a bit of 5 minute epoxy to keep it there. Take that off and put it on the table with the frame now glued to it and then start that whole making spacers thing again like the last chapter. I am MUCH better at this now. It all got done in a couple hours and I even got to micro all of the spacers in place. Now all I have to do is wait for the cure overnight and do a bit of reading about the next couple steps.

Well after such a good day on Saturday, I had to get right back out there and finish this Chapter up. I trimmed up the bottom and test fitted it again to the fuselage with the help of my wife, Julie. Everything looked pretty good, so I mixed up some epoxy and flox and began the process of floxing the lower longerons and all the other parts that touch the bottom, so that the bottom could mate to it. Again, with help, I placed the bottom perfectly in place on the fuselage and weighed it down - See Below. (I am so glad to be getting some use out of that weight set I bought :-)

After that more flox to fill in the little gaps here and there and then begins the process of taping all the joints. I used the "wax paper with lines on it" method to lay out my 2" tapes. But then you have to crawl under with a couple tapes and a brush and scissors (just in case they're a bit long) put them in. (REPEAT PROCESS ABOUT 100 TIMES) At least that's what my knees told me when I was done. Then begins the peel-ply process on the tapes. (REPEAT PROCESS ABOUT 100 TIMES - AGAIN) But this time with 3" peel ply.

(TESTER): Finally, it was bottom time, There are a lot of spacers to cut for this. I used John Slades method of cutting the foam spacers. Too cool, thanks John! I went ahead and put the additional layer of bid covering from the back seats forward, my thinking is that my kids don't always listen and I would hate for them to break my toy!

(Springer): I went ahead and built the rotisserie here. I had seen a couple of other builders sites and noted that they had done this. You can see some of the BID tapes installed here with peel ply strips over them. The rotisserie really made doing this much easier.

(SCHILDER): Before laying the glass on the foam I made some thick micro to make smooth fillets as needed and let that set up for about half an hour so that when applying the micro slurry to the entire foam surface it would not dilute the thick micro fillets. I let the micro slurry also set up for about half an hour and had lunch since the actual glassing would take awhile, (about 5 hours). The glassing went fairly easily, the only difficult part was when laying the glass down on the foam it would create a flat roof over the depression created by the spacers, you really need to make sure that there is enough cloth to press into the corners. I needed to lift up the cloth to create some excess and push it into the corners otherwise you'll end up with bubbles because there won't be enough cloth laying down in the square depressions created by the spacers. Once the cloth is wetted out it doesn't want to move much without distorting. The plans have you glass the floor, flox and tape it to the fuselage all in one session. I'm going the route like many before me and breaking this down into three separate steps, 1. glass the floor and peel ply where the joints to the fuselage will be, 2. flox the floor to the fuselage and 3. tape all the joints.