

## The Windshield Bow (WB)

When I first received my kit, I was waiting for Team Rocket to get the plane re-engineered for the reinforced tail and the EVO wings. Consequently, I didn't get all of the kit parts. I have the second EVO kit produced at the Czech factory, but it did not come complete. The EVO wings are a completely new tapered design and the tail has been beefed up to tolerate much higher speeds. The parts aren't ready for delivery at the time of this writing (it took almost a *year*). At any rate I have to keep building *something* if I ever hope to fly this project, so I'm beginning the canopy construction as I get close to the end of the fuselage construction chapters. There's always more than one project or process going on at the same time.

The first step with the canopy is to attach the windshield bow to the canopy rails. Unfortunately, the plans are unclear and I have to wait yet again for clarification on minor details. Supposedly the "foot" on the bow is to be 1/8 inch from the doubler at the outside edge of the cabin. Well, the foot can't come within 1/4 inch due to the gusset on the bow (and foot) interfering on the side. I.E. the gusset is the outermost part of the bow, and I THINK the 1/8 should be measured from there, not the actual foot itself. Well, I'm not about to drill that thing until I hear from the big cheese on where the "foot" is supposed to be mounted. Call me "Nervous Nelly"!



So I got the good word from Mark at Team Rocket, and went ahead and drilled and bolted the primed windshield bow to the canopy rails. Work also continues on the windshield skins which become the glare shield. I botched one of those and had to re cut and remake one of those skins. I'm sure it won't be the last time.

The windshield skins are tricky. Part mirrors the curvature of the boot cowl, and part is nearly flat and bent back. The plans say use a 6 inch pvc pipe and a shrinker. I used a 3 inch pvc pipe, a roller/bender/brake, and my bare hands. Forming those skins takes a LOT of work. More than 2 hours each, and they are only close. I think they are ready to start drilling to the airframe, but more canopy work has to be done first.



I got out the canopy slider tracks from TR, and they are crappy. I laid them out, and put the "trucks" from the kit together and rolled them through, and I could tell I was NOT going to like the factory tracks. I also noticed in the plans almost every picture is of VAN'S RV tracks. So I ordered 2 sets. I could have gotten by with 1 set (pair), but I figured at 6 bucks each, the shipping was going to cost more than the parts, so I ordered enough to screw up a pair.

It takes about 10 days to get parts from the PNW (Van's, anyway), so I decided to start bending the sliding canopy frame front bow. That is a 3/4 thin walled steel tube that you re bend into and arch just a skosh bigger than the windshield bow. I was in a dilemma because I had no good way to bend the tubing (pipe). Mark emailed me with a great (CHEAP) idea: two blocks of wood screwed to my work table! Another EPIPHANY! I just bought a 3/4 conduit bender to do the job, but decided to take it

back. I screwed two pieces of 2x4 scrap to my table, and about an hour and a half later, I had the bow mangled into shape.

The windshield skins have to be either shrunk or cut to fit the bend around the area of the #4 & #5 bulkheads. The airframe goes from widening to narrowing as you go aft. I decided to cut a triangle out of mine. I think you can see in the pic above that this one turned out pretty good. And that was on the first cut by eyeballing it! You gotta get lucky every now and again. The one on the left side however had to be remade, and it was a bear to get positioned. And some hand filing was necessary to get it to sit properly.



That's a picture of my very own hand, just in case the FAA doesn't believe who actually did the construction on this plane!

I'm going to stop here and work on another project for a while, then I'll pick this process up again after the track's get here from Van's.

I finally opened the box of canopy tracks from Van's. I put them aside for about 2 months while I was working on the tail. I went ahead and rough cut them to 24 and 18 inches. My cuts are not as pretty as the factory cuts, so those ends will be placed in the middle where the two rail halves overlap.

The extruded tracks don't sit in place very well over the edge of the canopy rail, so I'm going to have to drill and cleko at least the aft ends of the aft rails to keep them in place while I'm working on them.

I did the "removable" mod, so I started by cutting an appropriate amount of the top of the track to allow the "trucks" (rollers) to be pulled up and out of the aft end of the tracks. A dremel worked well



here. That, and a file is what I used to cut them. I can see a real workout ahead for my dremel on this project.



With the removable notch made in the canopy track, I positioned the rear pieces against the #7 bulkhead and trimmed the aft end flush to the bulkhead so the tracks would be identical and to sit in position.

After carefully deciding where to put a nut plate and screw to hold the track to the canopy rail, I drilled a #40 hole in the center of the inside "slot" in the track. I planned that it would be centered in the canopy rail, too. The "removable mod" was long enough to allow access to the screw that would eventually go at the aft end of the rear tracks.

On the left side, I found I had a rivet in the rail that's going to interfere with a nut plate, so it's coming out. If I'm lucky I can incorporate this in the nut plate attach, but I dunno. It's a #4 rivet.

Having drilled the holes and clekoing the two rear 24 inch tracks in place, I measured between the two pieces and found that these parts needed to be 23 3/4 inches apart to be parallel. Theoretically, if they are mounted and clekoed identically, then the tracks should be parallel AND square to the airframe. But not necessarily. So I had to ASSUME that my rails were perfectly aligned. And ASSUME that my plane is square. Then ASSUME that the canopy bow is positioned properly. There's just no way I could think of to find a perfect center to assure that the pieces are parallel and square. Until I thought about carpentry, and just measuring "corner to corner". If the tracks are the same length (mine are), then if the measurement corner to corner is the same, then we are parallel and square. VIOLA!

Next I rounded the corner of the rear tracks and put them back to position ( I sharpied lines where they went). Then I assembled the canopy trucks and made sure that they rolled nicely. In both tracks. And guesstimated the amount of overlap between the front and rear tracks to make the transition for the trucks straight and true.

I put the front tracks back in place and used my four foot metal ruler to get them parallel and marked them to cut out the overlap where the front and rear track corners meet. I dremeled them close, then used my new scotchbrite wheel on my grinder to finish them. Then back onto the airframe to start tweaking them. I clekoed and clamped the rear tracks and fine tuned the position of the forward tracks.

My front tracks go right at the foot of the canopy bow. I might even need to do some trimming if there ends up being interference.

I'll make four little extruded angle brackets to go under the tracks against the canopy rails to hold them in position, then rough trim the "exposed" edges of the track on the outside at the rear, and inside the cockpit at the front tracks. Then, per plans, I'll rivet and screw the tracks down and get started on the canopy frame!



I used 2 NAS rivets in the forward track brackets to tack them to the tracks. First, I Epoxied all four angle brackets in place. I was unable to get a squeezer on rivets in the aft track, so I'm just leaving them epoxied. If they come loose in service, I may have to grind off the center spline in the middle of

the tracks so I can get a flat nose squeezer on a couple of rivets. The center spline doesn't matter much at that bracket location because the two tracks overlap there, so the wheels of the trucks are captured and cannot jump out.

Since I attached all of the angle brackets permanently to the tracks, the tracks will come out "cleanly" if there is every a need to remove them. just four easy access #8 ss c/s screws is all it takes.

I beveled the outer edge to follow the exterior contour of the cockpit along the rear track. I rounded and smoothed all the corners with my scotchbrite wheel. The tracks are ready to prime. Yes, I am painting mine. I've seen some "natural" and I've sen some polished. Neither appeal to me. I realize that the trucks and track bottom are going to look crappy eventually, but that's the price I'll pay.

Once everything was glued and screwed, I put the trucks in and played canopy man. They seemed to slide through the tracks fairly nicely. Unfortunately, my measurements on the front tracks may be a bit narrow at the windshield bow. By perhaps a little over 1/16. Fortunately, I can reduce the thickness of the angle brackets by grinding off the backs if necessary, thereby widening the stance of the tracks.

I'll reconsider this dilemma (if it even is one) once I have the canopy frame more under control. I think the track is very close to parallel, certainly enough to carry on and fudge with later as needed.

I grabbed up the front canopy bow that has been sitting around for a couple months to recheck my manhandled bends. Not bad! I now have the trucks in the tracks, and I need to fit the canopy bow to the windshield bow and the trucks.

Randy Pflanzner is to thank for the process of assembling the canopy frame. Mark Frederick now uses Randy's method in the plans. And I'm using the plans on this one, because this may be the trickiest part of this entire project. I can tell this canopy is going to take a LONG time to install.

The only problem I'm having so far is that Mark dumped his part of the plans and it looks like both those guys left out a BUNCH of construction steps. When I come up against a situation like this, sometimes I get VERY frustrated. This time I just went ahead and figured it out as best I could. Sometimes you just have to duck you're head and go for it!

Per plans, I taped 9/16 worth of washers as spacers in 3 key locations on the WB. This is required to get the proper set back for the canopy latches, later on.

### **The Slider Front Bow (FB)**

Who needs BOWFLEX when you are building a ROCKET?!!



I set the front canopy bow (FB) in place and checked how far over the top of the windshield bow (WB) the FB extended. My factory length FB bent to match the WB was about 1 inch over the top of the WB sitting on the canopy rail.

Keep in mind, the WB sits at a pretty steep angle. How you take a measurement between the FB and the WB can influence the results at the end. I measured perpendicular to how the WB sits, not perpendicular to the floor. It may be hard to reproduce, no matter how you measure, especially if you do not use a template. But I figure Randy's measurements were made from drawing perpendicular to the template, and it looks like the template was right up against the WB.

My plans are to install the SPEED SLOPE windshield. It really doesn't add any speed, it just looks faster. Since it sits at a steeper angle, you are supposed to put the FB a little bit higher at  $3/8$  inch above the WB.

Since my FB sits on the trucks at 1 inch over the top, I did some pretty serious math and came up with a figure of  $5/8$  inch to reduce the "foot" of the FB. I grabbed my dremel with some heavy duty cut off wheels and let the sparks fly. I smoothed down the edges and tried to keep these areas pretty and flat/perpendicular/square/whatever... Then back to the airframe!

The FB looked really close in size and shape. It was not quite symmetrical, and it still could be a little bit too tall. It was also too narrow, and tended to be forcing the trucks.



I went back to my work table with the heaviest rubber "malletizer" that I had, and beat the FB into submission. I pounded both sides of the FB and improved the bends a bit, and straightened one side. I malletized it until it was REAL close, then bent the feet outward by hand to get them to seat onto the trucks passively. Keep that in mind! This bow has to sit onto the trucks passively for the trucks to slide along the tracks smoothly.



The FB and the trucks sit nicely in the track and against the WB as I have them configured. Just for fun I tried to run the FB/trucks back along the track. I was NOT happy with how well they moved. I'm going to have to do some adjusting somehow to get this thing to slide like its on grease. I still think it's pretty close, and the FB and trucks are loose. So I'm going to go ahead and drill and pin them as square as I can get them and move on.

I think there's a few pages missing in the plans! Here's some canopy stuff that's not in there:

Before you get too rambunctious about tacking together the canopy frame, you have to work on the Rear Canopy Bow (RB) a bit. Get the bag of canopy attach parts out and get out the H shaped nylon block. This is the slider for the turtle deck track, or center track as it may be called. Measure the flat slot side  $\frac{3}{8}$  in and  $\frac{3}{8}$  down and drill a hole through both sides with an AN3 sized bit. Don't worry about using the next size too big, either. That stuff is very flexible and will not drill out cleanly.

You can either used a really long AN3 bolt, two small AN3 bolts or a pin and cotter pin. These parts aren't in the kit. I had the small AN3 bolts so I temporarily bolted the nylon slider to the RB.



Also, you should take a grinder and round the corners off of the steel "pad" on the RB. That nylon block has to rotate a bit over that "front" part of the pad. Make sure that the block rotates freely, but not sloppily, before moving on to fitting the RB.

There are two pieces to the center track. The thick squarish one with the bend goes on the bottom, and the flat piece goes on top (and through the nylon block). Just duct tape this in position with the two pieces bent together and 1.5 inches off of the angle part of the #7 bulkhead as Randy suggests. So far all of his measurements work very well.

### **The Slider Frame Rear Bow (RB)**

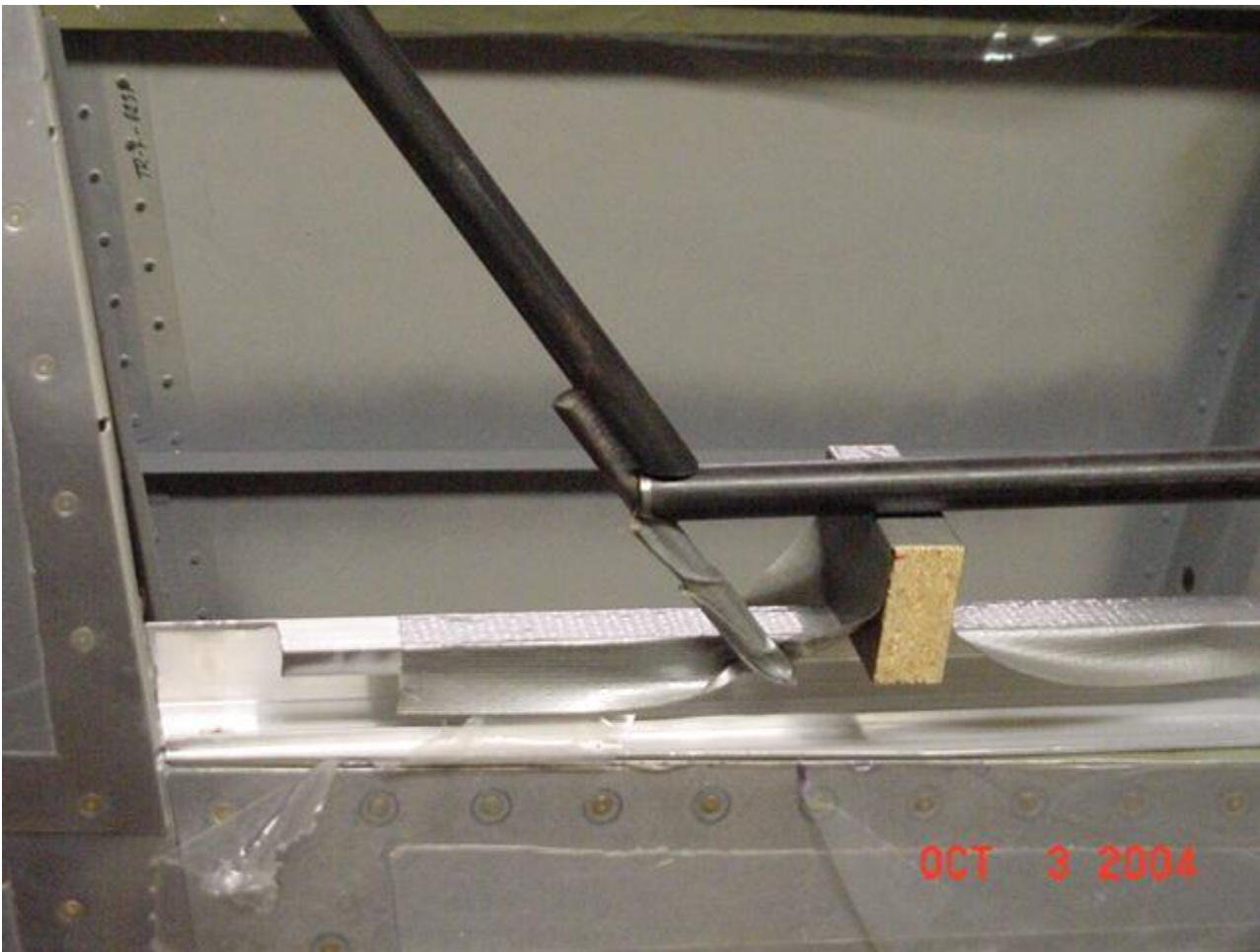
The RB takes some bending. I bent the bow with the feet more closely together. The kits come with the anchor pin (closure/ lock pin?) already welded to the RB. I took some duct tape and covered it because I was banging that pin all over my pretty canopy track.

I got my RB where it would sit with the tips of the anchor pins resting on the canopy track, just clearing the upper part of the track. The nylon block is on the center track at this point. Keep checking to see if that RB clears the turtle deck. If it raises properly as it goes back, it should clear without any problem, and allow those anchor pins to be right against the center of the canopy track.



My FB was marked from the factory with a deep scratch precisely where the Horizontal Canopy Bar goes (HB). The horizontal bar sits with the large round weldment parallel to the welded closure pin on the Windshield Bow. These parts need to line up to latch the mechanism later on.

I used Randy Pflanze's (and now the plan's) 3 3/8 inch tall block idea at the front (sitting on the canopy rail, not track) and the 1 1/4 inch at the rear (has to sit on the canopy track). With these blocks taped in place, and the FB and trucks taped in place, amazingly, the HB sits RIGHT AT the scratch mark in the FB. In other words, it appears the factory location indicated for welding the HB to the FB is spot on!



The RB slider sits on the center track and the way the factory has prepped the parts, the HB kind of locks against the anchor pin and under the very end of the RB tube. Again, with Randy's measurements and the factory cuts, this all fits together beautifully. By this I mean if you hold the frame together this way, you also get that 1/8 inch clearance between the extended line from the top of the center track and the top of the rear bow. Neato, bandito!

BTW, my nylon block on the RB sits in this mated position around 1/2 inch up the track or so. Not much chance of that baby coming off the front of the center track.



Notice the high quality steel used in the part above, not. That thing has been sitting in my basement, which is usually very dry. The part came rusty like that. It's kind of a pain in the ass to clean up that stuff, but what are you gonna do? I knew I was going to have to weld this stuff, so I just left it alone. Pretty soon I'll be doing some serious scotchbriting and painting on that canopy frame.

OK, the frame is ready to weld! I tried to do it myself with my buddy's acetylene torch, but didn't get the job done. Started two fires. Scorched my windshield bow. Cut part of the HB off at the end (just a mm or two). Couldn't get anything to stick. I need a lesson. This ain't just like soldering, now is it! (But it was fun!)

The frame is on hold until I can coax my friend Bruce into coming over and cleaning up my mess. I have plenty to do in the mean time. I still haven't really finished anything. Still working on the tail and the fuselage. So I will certainly stay busy.

My buddy Bruce, the Master Craftsman, came over and welded up my canopy frame for me. Not only that, he helped me get the trucks aligned so they rolled better. We had to disassemble the trucks and bend the brackets a bit on each side to get them to track parallel and sit square in the tracks. I'm going to have to re drill the attach holes to the truck on one side, as well.





Again, I have to thank Randy Pflanzner for the canopy work he did. His measurements and instructions, now incorporated in the TR plans were very accurate and most helpful.

We set the parts in place and based on the measurements in the plans, got everything in alignment. My buddy tack welded it in place, then he finish welded in on the ground. We put the frame back on the airframe (it just drops in and out thanks to the "removable mod") and it didn't sit right?!

Evidently as the metal cooled, the joints pulled and the pieces moved. No big deal, drop the frame back in the tracks, set up the wood measuring/support blocks and heat the joints until the frame sits properly.

Again, when sitting properly, it's sitting against the temporary spacers on the windshield bow, the horizontals measure per plans, the center track is about 1.5 inches from the turtle deck, and the nylon block sits about 1/2 inch up the track.

My building buddy Bruce Dallman finished welding my canopy frame for me. He and I played with it a bit to improve it's characteristics. I re drilled one of the trucks to keep the "axle" perpendicular to the track. It rolls a bunch better. And the frame is more symmetrical. And the stainless pins protrude sufficiently to grab the retainer that I will put on the track later.

\*\*\*Note: At this point you would be well off to make sure the stainless pins are straight with the frame and that they are VERY close to the track. This will become important later on when you are trying to close the canopy into the pin retainers, and when you are trying to fit the canopy skirt, which needs to be flush with the side of the ship. So get the slider frame to just clear the turtledeck, and get the aft lower corners of the frame bent so that the pins sit very close to the track.

I expected a slow day at work doing paperwork, so I took my frame with me. Over my lunch hour and then some, I dremeled off the goobers of weld where the tubes meet, just to make them prettier. I also hand filed a bunch. Then I sanded a bunch. After that I scoured and cleaned the whole frame. I shot it with self etching primer and later that day shot the first coat of smoke gray Rustoleum on it. That ought to hold it for a while.

Time to get back to the windshield skins and move forward towards getting some glass on there! There's still a BUNCH to do!

I got gutsy and went back to the windshield skins. Did I mention I hate those things? Well, I do. But I finally figured out that what you have to do is roll the lower front corners along the skin edge. Then at the rear you essentially fold the "tail" of the skin under and up. And you have to do it "vigorously". Try not to roll the tail, it just works against you. And when you fold it under, you try to emphasize bending it (not kinking) from the angle at the bulkhead (where Mark recommends you shrink it) back to the canopy bow.

The right side fit pretty well already and I had marked it for drilling. I went ahead and got it to lay in place better then started drilling those #40 holes 1 inch apart. I actually started in the lower front corner and drilled and clekoed every 5th hole. That was just to get it to stay put with the proper skin gap (.040-ish). Then I went back and drilled every hole from the lower front corner all the way back and up, alternating each time. That laid the skin out very nicely.



After some time, I got the left windshield skin ready to drill. I tried my shrinker to try and get this one to lay in the angle part of the fuselage better. It was to no avail. I don't have a vice anchored down, nor a handle sturdy enough to operate the shrinker. In the end, I used a hand file and my 3in1 bending break to cut the wonky angle at the bottom of the skin.

The skins get drilled initially at #40. The holes are 1/2 inch in from the edge all around, and 1 inch spacing. Once I had the left side clekoed down, I marked a centerline and cut the right windshield skin. The two halves meet in the middle. I used my break again to cut a very clean line amidships.

I was fast realizing that once I installed my speed slope windshield I would be "stuck". The windshield skins and windshield are permanently installed. They are not easily removed. There for it's important to get some of the difficult chores like painting done under and behind these areas before riveting and gluing everything down. This thought came to me as I sat the Plexiglass in place to see what the ship might look like some day. It was a little depressing. There's SOOOOoooo much still to do!

OK, it's election night and I voted. Came home and watched some returns on TV. Got bored and decided to knock out a couple little F1 projects. So I grabbed the center canopy track and clamped it down in 4 places. I was going to just use the little NAS tack rivets to hold it together, but you need at least a #7 length rivet to go through the two pieces. I don't have any #3 or NAS tack rivets that long.

I drilled the pieces in three places: aft end, center and just aft of the bend at the front of the track. I started #40 and clekoed as I went. Drilled #30 and clekoed. Then I machine countersunk both sides of the two piece assembly. Have to get those heads and tails completely out of the way, you know. Then I used a 4-7 countersunk rivet and started squeezing in the middle, then the two utter ends. I essentially mashed those rivets down until they were at least flush with both sides of the track. It took MANY squeezes with the Main Squeeze to do this.

After having the track nice and stable, I used two clamps and closed the curved part and drilled the tip end up to #30 for another countersunk 4-7 rivet. I re taped the assy back on t he turtle deck. Since my canopy frame is all welded up and pretty much in it's final shape, I could go ahead and rivet down the track. But I think I'll wait until the plexi is actually cut and perhaps even the skirts on and finished before I stick down the track.

I've painted the interior of the fuselage, and now it's time to get back to the canopy. I need to finish the windshield skins and then rough fit the glass. I also need to cut the boot cowl after I know the final position of the front of the Speed Slope Windshield (SSW).

I may have over trimmed the windshield skins. And I'm having trouble getting the skin to lay flat where the jog is at the bulkhead. I have to decide what to do: Press on or start over.

The decision is to press on. I put the canopy over the fuselage and looked at the windshield skins, and they will just barely fit. Those babies are nearly mirror images of each other. I'm going to put them back to back and TRIM them to be mirror images. As glare shields go... I can always COVER them or I can ADD to them or even trim them more later. For now, though, I just want to make them fit in place. Once they are riveted down, they are as permanent as it gets. At least after the windshield is glued down. And it'll be a while before I get to that point.

Even though the engine mount and landing gear legs are ready to mount to the airframe, I've decided to hold off for now. I don't have an engine yet, anyway. No sense in getting the darn thing up off the



ground and have to use a step stool or platform to work on the tallest part of the plane. Man, you don't realize how tall this thing is until you stand next to one on the ramp or in a shop/hangar. And I'm only 5' 6", so it doesn't have to be very tall to make my life miserable.

So I'm leaving the fuselage on the two storage tubs and saw horse it's now temporarily sitting on. They are REALLY heavy duty tubs. Still not strong enough to risk me climbing in, but working by standing aside the fuselage should be much easier. I don't think the belly is even a foot off the ground. That's good for us short guys. Back to the windshield skins and the Plexiglass.

I'm going to reinstall the windshield bow, the canopy tracks and the canopy frame. I'll follow the plans to begin installation of the SSW. Now that the canopy parts are all painted, I can install the canopy closure mechanism and the start cutting the glass.

### **Speed Slope Windshield (SSW)**

Today was perhaps the most brave day of all... well next to the FIRST day of building. I CUT the Plexiglass SSW! That's scary. A good warm up before cutting the bubble for the slider plexi. But I was a bit nervous to say the least.

Keep in mind, I set the canopy up initially just like I was going to do the standard windshield. The dimensions and the transition between the SSW and the slider bubble turned out fine. Just start the process like you were installing a stock windshield and it all works great.

I left the SSW as long as I could keep it. I did not cut any length from the nose end of the SSW at all. Don't shorten the length of the SSW at the front. Just round it. You can shorten it from the aft end as needed to fit it to the slider once it is set.

The windshield skins (WS) and the SSW should come to about the top of the WB triangular weldment, which is also at the same level as the horizontal cross member in the slider frame. If you cut the WS below this weldment, there will more than likely be a BIG gap between the SSW and the WS. Not the end of the world, by any means, but it won't look very clean from the inside. It'll be covered on the outside, but I want to get mine pretty close so it would look OK on the inside.

Cut in small increments ( or excrements, if you will...as in "ooh SHIT!"). I cut about a 1/2 inch off the bottom of each side of the SSW with a dremel and a reinforced fiber type cut off wheel (not the brown brittle ones). Then it got down to about a quarter inch per cut. Lastly, it's just down to filing and sanding and smoothing. I made four passes along each side in all with the dremel on the SSW, and about the same on the slider bubble. A 3.5 or 4 inch side grinder works well for rough shaping.

On the sides of the slider bubble, just clamp it fore and aft and make the initial cuts right at the level of the horizontals on the slider frame. As long as you're sure about the position of the bubble on the bows, the horizontals make a good reference for cutting. Make the 1/4 inch above cut after the bows are clekoed. This cut on my ship later on was extended to about 3/4 inch. I think the side skirt parts have been changed, but not the plans. So no need to pussy foot here.

Having the FB of the slider 3/8 higher than the WB is quite correct. My FB is maybe a bit more than that, and it turned out fine. Sliding the SSW aft will raise the glass to match the slider if necessary. You could also put a spacer/"gasket" under the glass if you needed to raise it some more. I thought I might have to do some fudging, but if you stick to the plans, everything should work out beautifully.

The cuts along the bottom of the SSW should create a very flat arc all the way around . On my last cut, I used a straight edge and tried to dremel it as straight as I could up to the nose. Then I ground the nose to sit it all down very flat. It sits very nicely and should be easy to "clean up".



OK, Thanksgiving 2004 is over and it's time to get back to work. I haven't touched an F1 thing for about a week... ever since Verizon dicked me on my web space. Now I have this new domain and website, and I'm back in action.

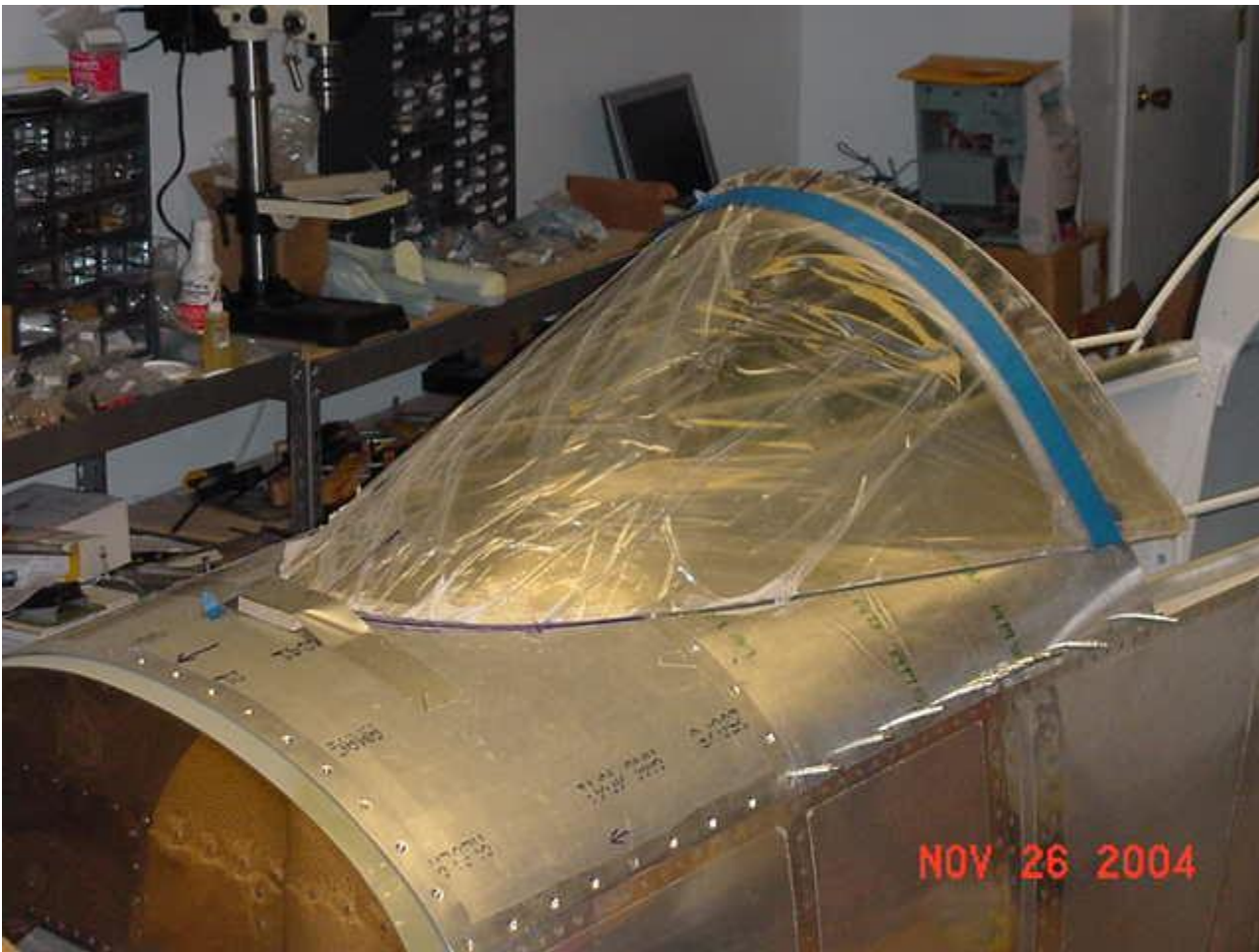
I went back to the SSW and worked it down with a 3.5 inch side grinder. Stock grinding wheel. Got the SSW to sit quite nicely at the front. I used the grinder at pretty low speed and I had my basement auxiliary ceramic heater running right at the Plexiglass. I tried to keep looking along the entire edge from the front center to the back edge. That thing is really a fairly flat arc. You could set your SSW on a tabletop and work it straight and probably do OK. I just started going back and forth a bunch from the grinding area (what a mess) to the ship.



I wanted to keep the SSW oriented the same through this trimming process, so I took a big wide marker and traced the arc around the SSW down on the vellum. I also put a couple hash marks from the shield down onto the boot cowl for alignment purposes. Another thing I did was take one of the wood blocks I used to orient the slider frame pieces and duct taped it to the boot cowl for a front edge stop.

After having ground the SSW down, I put one of those stripper.grinder/paint remover wheels in my air drill and buffed the lower edge. It smoothed out the big nicks and defects pretty well. Probably not a finish edge, but a decent intermediate step prior to sanding/buffing. I don't want to clean it up too much so that the glue/ProSeal/whatever will stick to the bottom. But you are supposed to sand the edges to remove nicks using 360 grit.





A couple more notes on the SSW. My shield is full length as it came from the manufacturer. I did not cut or shorten the forward end of the Plexiglass at all (so far). My SSW sits about 9.5 inches onto the boot cowl. I originally planned on having it more like 8 inches onto the boot cowl or even less. I've already cut the lower edge of the plexi, so I am limited to what I can do, i.e. I can't just scoot the glass backwards and use it there because the gap at the bottom of the glass gets HUGE quickly. I may pretty much be stuck with a longer snout. Shortening the front end doesn't seem to have that much effect on the lower edge against the WS, and I could just cut it back and that would lower the bottom edge somewhat. It sits so nicely as it is, and to shorten and smooth it would probably take a couple hours.

One thing I WAS happy about was that the angle of the glass over the WB and the FB of the slider is just about perfect! And remember, I think my FB was a little OVER 3/8 inch beyond the WB. I may still have to modify the slider plexi and the fiberglass fairing to compensate down the road. That windshield fairing will hide some mismatch.

Random thought: I keep looking at the shield and thinking it's going to be a pain in the ass to get up under that thing on the glare shield and clean the dead bees out of it. That angle under the glass is going to be really hard to get to. I may just make some kind of fairing or gasket to go under the SSW at the front. TR recommends you paint the inside of the fairing and the glass. I think I may just block mine out with a vertical strip of some sort. That would close off the deepest part under the SSW and also block out the fairing/windshield junction.

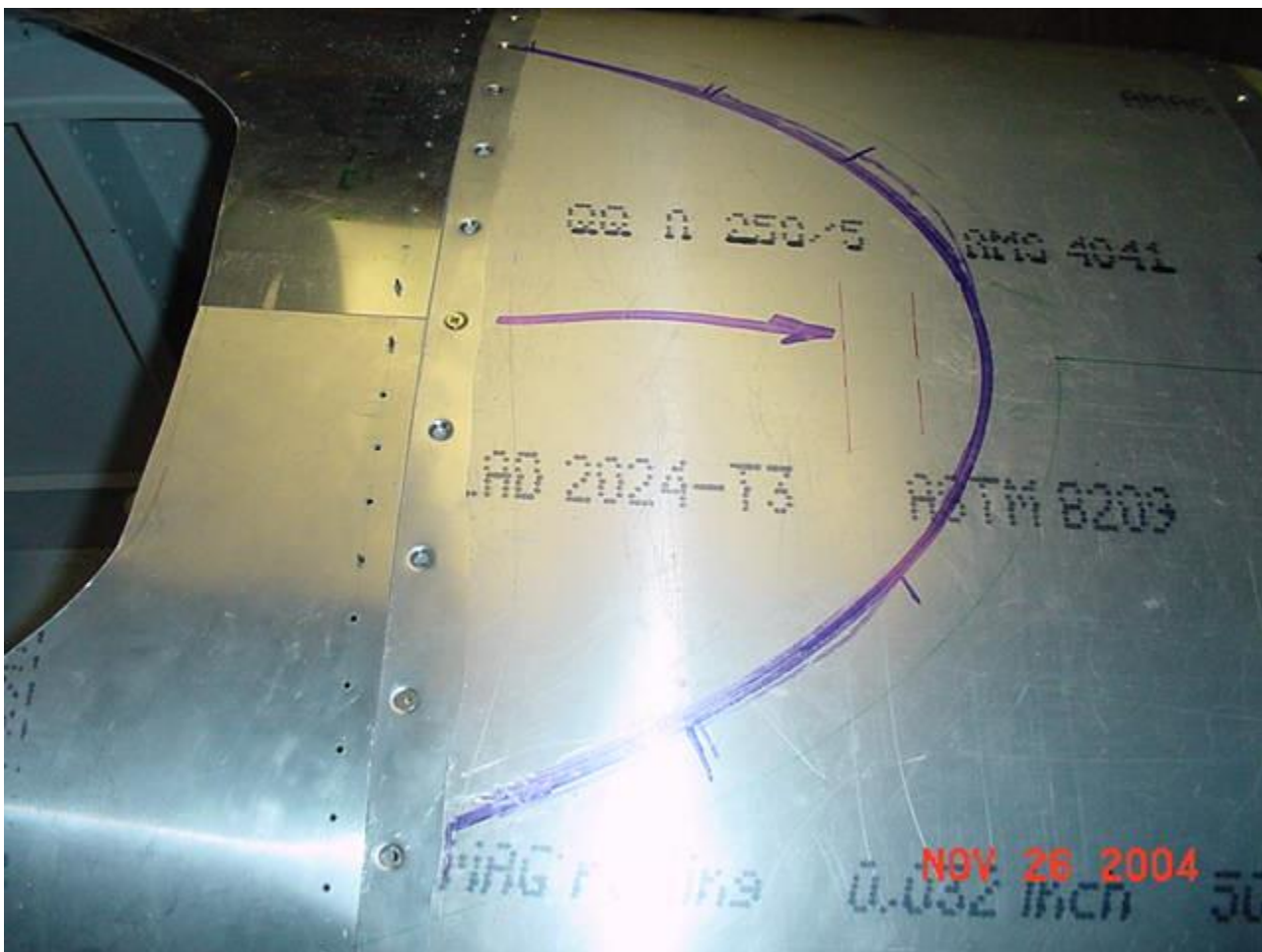
Now that I feel I am really close to spec (whatever that means... in this case.. looks good to me!), I'm going to cut the aft end of the glass. I was going to use Vince Frazier's idea and get a laser level.

Lowes didn't have any that I liked while I was there shopping today, so I just marked the bow with blue painting tape. I'll take my dremel with the reinforced cutting wheel and trim that baby back.

The reinforced cutting wheel on my dremel sure is getting a work out. I went ahead and cut the aft end of the SSW at my taped edge, which is parallel to the FB, not the WB. You might be able to tell that the aft edge corresponds with the FB on the slider frame, and also the 9/16 stack of washers I still have taped to the WB. This leaves lots of meat if I need it.

I tried to play with the windshield position and angle and didn't like the results again. That's going to make the SSW longer than Mark shows in the plans, perhaps 3 inches farther forward. I don't think it's going to make the instrument panel much harder to work behind,. And who knows, maybe the longer more acute slope will help the airflow. I doubt it. If it's anything like my Decathlon and Citabria there is a big area of dead air at the lower 1/2 of the windshield. I know those planes aren't works of tremendous aerodynamics, but you get the idea that there's dead air along most windshields.

Again I took advantage of some scrap. I used one of the two wood blocks of the slider frame construction which just happened to be 1 1/4 inch wide and used that to slide around the plexi and mark the boot cowl for cutting. Then I got my 4 foot metal rule and marked a center line to the arc. Now that puppy is ready to cut. I just need to figure out the best technique to use so I don't flub up the boot cowl. I want to use the original parts over again.



You might be able to see the red lines aft of the green and purple arcs. These red lines are the midpoint on the boot cowl; and the 1 1/4 mark in front of it. Those locations were my goals for the front edge of the SSW and the fairing/boot cowl cut. I've emailed Mark to ask about the optimum

locations for the front edge of the SSW. I'll stop here and wait for help, then decide which to cut: plexi or aluminum.

Note: The 1 1/4 inch line scribed in front of the SSW is probably too wide. I think you only need about 3/4 inch or less of a flange in front of the SSW. The 1.25 inch may be a good figure when you're trying to fiberglass a fairing for the standard windshield, but it's not necessary at all for the SSW, IF you are going to cover the cut line with the fairing. If you plan on leaving the cut line and rivets exposed, then 1.25 is probably correct. But I'm planing on hiding the cut under the fiberglass fairing. Knowing that now, I would have cut the arc much closer to the glass.



Now the aft end of the SSW is rough cut at about 9/16 inch behind the WB. I went ahead and electrical taped the shield to correspond with the actual aft edge of the WB. Once I decide that I can actually go with the overall length of the SSW as is, I'll final cut and smooth the aft end down to 3/8 inch. So far my SSW sits on my WB very nicely, but at the south end by the WB foot, it sticks out about 1/2 inch on each side. The SSW also overlaps the WS a little in this area. As you can tell, they still aren't finished and need to be trimmed, smoothed, primed, painted and riveted to the ship.

### **The Slider Bubble Canopy**

I was getting antsy to keep going on the canopy, so I got out the big bubble. I removed the SSW and the WS, and set the bubble in place. I went back to the plans and set up the bubble canopy per instructions. I first cut the aft end of the bubble just forward of the bulkhead, and cut a little arc around the track so the bubble would sit on both canopy frame bows. I placed the front end about 1 inch from boot cowl aft edge. Then I put the SSW on top of the bubble canopy just to get an idea of what it looked like. I thought the slope and transition looked pretty good. So I ran a piece of electrical tape



from side to side along the forward edge of the slider FB and cut the bubble in two.



The "stock" windshield was set aside.. just in case. At this point, I haven't done anything irreversible, and I could even put on the stock windshield. But the front canopy piece went back to storage. I rough cut the bubble all right on the ship. I took a 4 foot rule and marked the horizontal of the slider frame on the glass. I made the mark just below the frame, but in retrospect, I could have made the first cut at or even slightly above the horizontal. As the bubble relaxed, it sank lower on the frame. The bubble looked almost as low as it did before the first cut! I expected it to sink a bit, but not this much! Looks like I still have to cut another inch and a half.



At this point, I have not drilled anything, only duct or dental cover taped things to position. Nothing with either plexi is "finished". I wasn't sure about the SSW/bubble relationship, and I wanted to get both roughly in place to see if it was going to be OK. Well, I LIKEY! So I taped the SSW in place and started trimming the bubble a second round. I taped the bubble in place, too. And had to trim both the front and rear again. The front is nearly where it should be, it will get finished against the SSW before committing to the final aft position.

More Plexi notes:

I plan on fitting the aft edge of the SSW to the finely finished (and exposed) forward Plexiglass edge of the slider "bubble".

I should have marked the centers of both Plexiglasses before I cut them. Thankfully, they want to sit in the proper position. But I would have preferred to be more sure about getting the glass centered and symmetrical. If I get a turning tendency, it could be the windshield or the canopy!

The vellum on my plexi sucks. I should have taken it off and stuck it back down. After having cut them several times, the protective plastic has separated and the shavings have gotten under the plastic. I tried to remove the shavings, but I could tell I was scratching the crap out of the surface of the glass. I can tell already that I'm going to have to buff the glass from the get go. Dammit. Do a better job than I did and make sure that film coating is stuck down tight everywhere! I'm ready to final trim the SSW to 3/8 from the WB. That's first from this point. After that, it's time to clamp and final ROUGH cut the rest of canopy bubble. Then I may be ready to drill it so I can REALLY start getting it close. After those tasks, I'll square up the front of the slider glass. Back to the basement.



.These pics are all starting to look the same, aren't they?! And I only post about 1/4 or less of what I take. Eventually I'll send them ALL to Mark and perhaps he can supplement the plans. Or make lots of references like: "here's how NOT to do it!" :-)

Alrighty, then! I went back to the dungeon and marked the slider bubble for the final cuts. Man did I cut it close. Cuts on the front and rear of the bubble are no longer permitted. Only finishing. I made the final cut on the SSW, too. All this done with a dremel and the reinforced cut off wheel. I used three of them so far. Could have probably done it with one if I hadn't pushed so hard. Cut on the tangent and they'll cut all day. Push it through the perpendicular (cut straight through) and they melt down like "buttah".





The final cuts on the bubble were done on the floor. My dog walked through the canopy while I was cutting it. On the glass! She's a nut. Up went the bubble onto the bench for squaring of the leading edge. I used an 11 inch Permagrit sanding block on the ends. It's the coarsest one they have. Next stop will be the other side which is the fine side. Then I'll step through sandpaper sides as needed. Not going to do that quite yet.



The bubble is now in its final resting place. Well, it's sitting on the slider frame, anyway. It doesn't sit still very well. Nearest I can figure is that the gap I created between the glasses is more like  $\frac{1}{4}$  inch. OOPS, too much. Oh well... remember, nothing is locked down yet, and I can move the SSW a bit to close the gap. This also tips the top of the SSW up a bit, but guess what? Yep, my FB on my slider was in deed a little over  $\frac{3}{8}$  too tall, so the slider bubble sits up about  $\frac{1}{16}$  or so too high over the edge of the SSW.

On the other hand, if I want to bring the slider bubble forward to close the gap, I'm going to have to bend the rear bow to compensate. I don't wanna do that, but you certainly could. My slider frame works beautifully, and I don't want to mess with it. See, I knew what I was doing when I left that SSW unattached. Wink wink, nudge nudge.



That's it for today. I'm getting tired and that's when I make (more) mistakes. I'll start fresh tomorrow AM, unless I find something better to do... like go flying! I'll try to drill the slider bubble to position and begin to finish it out, then back to finalize the SSW. With a lot of luck, I may get started on the skirts. Sometimes just standing back and examining what's going on is helpful. If you have a beverage in hand, it's even better! This beautiful fall morning the beverage of choice was coffee. Seems every time I start working on my F1 though, I forget about it and it gets cold. Today, I didn't get a chance because there's Plexiglass shavings in the cup! And I look like Frosty the Snowman again. Cutting Plexiglass gets pretty messy.

I slid the slider bubble into its best position and checked the clearances. It's going to be close to get the proper edge distance all around the bows. I knew I had my forward edge of the bubble the way I wanted it, so I sanded it down to 400 grit (I didn't have 360). I placed the bubble back on the frame and checked it again. Looked good. Clamped it down with soft plastic spring clamps and speed clamps, then checked around it again. It was clamped for and aft, 2 places in each corner. Still looked good (after I changed it 2 more times). This time I only clamped the rear of the bubble. Mistake.

Another of many moments of truth. This one was false. I drilled the REAR of the bubble at TDC with a #40 and clekoed it down. I checked entirely around the bubble again and something didn't look right. I shifted the bubble until it was right and then clamped it down again. Next, I used a tape measure to find that my front bow from transverse to transverse over the bubble was 43 inches (YMMV). I made a TDC mark at 21.5 and drilled a #40 hole into the frame, and clekoed the front. The mistake became apparent when I released the cleko and the ass end of the glass shifted a little. I went back to the back and played with the glass to find where it wanted to sit the best. Well it turns out, with the hole in the front center of the bubble (more critical IMO) that the best bubble position was about 1/2 inch off



to the side. Here's where I got lucky: at the rear, according to plans, you are supposed to drill a hole 1/2 inch to either side of the top center hole, THEN use 2 inch spacing for the other rivet holes. I just left the bubble scooted over to the side, checked the edge distances and started drilling all the holes per plans. I drilled the front bow first all the way out, alternating sides, then I did the rear bow. I tried to get at least a 1/2 inch edge distance from the rivet line to the edge of the Plexi. Also mind not to put a rivet hole within 1 inch of the horizontals.



The canopy center track had to be moved forward about 1/8 inch to raise the rear bow a bit. I think the weight of the Plexiglass was enough to sink the frame on the unsecured track (just duct taped at the aft end). Not a big deal, but the ss latch pins at the back were dragging on the side tracks. Not good. I'll probably have to adjust this again later, it still isn't fixed in place, and it's a good thing.

After the slider canopy bubble was set, I went back to the SSW. I didn't like the aft edge relationship to the slider. There was no gap at the bottom and about 3/8 inch gap at the top. I eyeballed the SSW edge, marked it and cut it with my dremel. Back on the ship, I slid it rearwards and butted it up against the slider bubble. The transition and clearance between the SSW and slider looks great, and the slope angle of the SSW looks very cool! Next job will be to finish tweaking the SSW and drill it down to the WB.

It's a good thing I was able to scoot the SSW back toward the slider, and I'm darn glad I hadn't committed to a set SSW position. Not only did it make the gap between the two Plexiglasses more uniform, but it raised the top edge of the SSW a bit. That made it more uniform transition at the aft/top edge of the SSW and the forward/top edge of the slider bubble.

The slider is pretty well set, but the center track it slides back on, is not. There is substantial weight

on the slider frame now with the plexi clekoed in place, and it's causing the track to bow. Before moving on, I'll need to locate the final position of the slider canopy using a straight edge. According to plans, a rule held on edge on top of the track should just touch the top of the plexi directly above the RB of the slider frame. Once that is achieved, I am going to drill and cleko the track to the fuselage in 3 places, with at least a temporary support under the curved end of the track above the back seat. That way I'll have the final position of the slider frame and bubble fixed. Then I can finish the aft edge of the SSW to the slider with a nice even gap. I'll double check the dimensions against the windshield skins and final finish the lower edges as well. After that, I can drill the SSW to the WB. I didn't get nearly as far with all this the other day, but I hope to start the side skirts after that. "Best laid plans..."

The SSW was very close to it's final shape. I put it in it's best position and started drilling holes through the plexi into the WB at 4 inch spacing, starting at TDC. I found that I needed to finish the edges on the right side a bit more, and smooth it up. I used the dremel, the side grinder, the paint scraper wheel and sandpaper all around the edges.



## Canopy Track



While working on the slider, I had to attach the frame to the canopy track. I installed the plastic "glide" block that bolts to the frame and slides along the track. During the early phase of slider construction, I just had the track duct taped to the turtle deck. After a while, as the slider became more complete, I contemplated attaching the track to the ship.

The center slider canopy track was near its final position once the slider frame was complete and the glass was cleoked to place. I went ahead and supported the "tongue" of the track with a wooden block, and then got at the rear of the fuse and eyeballed the top center of the empennage. The rivets in the fuse skins don't necessarily coincide with the TDC, so I lined it up and drilled it from back to front as best I could. Here's where another bit of the empennage twist and potential for a turning tendency in flight can come into play.

The first rivet went just in front of the rear most "involved" bulkhead, just so I wouldn't have to crawl any farther back in the empennage than necessary. I started to drill the next forward hole in front of



the next bulkhead for easy access and stopped! I looked at the RB of the slider to make sure it was symmetrical and would clear the sides of the fuse, double checked that the track was centered, then drilled it just behind the tongue. Again, I drilled it away from the bulkhead so I could get to it more easily when working inside the ship.

Originally I had hoped to put the track attach points in the bulkheads, but the rivets were such that even drilling out the factory rivets would not work. I had to make the attach hole locations easy to access. I drilled and clekoed 4 holes total along the outside part of the track, two either side of the forward baggage bulkheads, one way back at the rear, then one more evenly spaced between the last and third hole. This 4th hole is where the track wants to bow up as the slider lifts rearward on the tongue. It might even be advisable to put an extra rivet or screw in this area.

BTW, regular clekos are not long enough to hold through the track and the skin, but they do keep the track positioned. Perhaps I should have bought 10 extra reach clekos. They would have come in handy more than once.

All that's left now is a little (a LOT more...) more tweaking and smoothing of the edges of the Plexiglass. Actually, in this case, there are a bunch of parts that aren't going to be final assembled for quite a while. I have to finish the side and rear skirts, and the closing mechanism, then paint (or repaint) everything before final riveting.

Almost a year and an half later, I'm ready to stick the canopy track down "permanently". I only put four screws in the track, and not so many more rivets. Mostly, the screws only have to keep the track from blowing away, it doesn't need to be super strong. The vast majority of the time, the canopy will be resting all the way at the front, supported by the rails and locked to the windshield bow.



I typically don't have anyone to assist me while working on my F1. Putting fasteners inside the ship under the canopy track would normally be a two person job. I wanted the track to be relatively easy to remove, so I decided to put nutplates in now, rather than nylock nuts, back in the empennage under the canopy track. I also wanted to install a fasteners by myself without resorting to bucking anything

on the skin if at all possible.

My solution to this one man problem was to rivet a #6 screw nutplate to a piece of .032 that is about 1" long by 2 inch wide and bent to match the contour of the turtle deck. I flush riveted the nutplates to the inside curve of the little rectangle and then took the parts inside the ship to make sure it laid flat under the screw hole. Then, I prepped the little nutplate assembly and the area around the canopy track screw holes. I placed a light outside the ship over the hole so that it would shine through the hole. Then I mixed up some JBW epoxy and slathered the perimeter of the little assy, making sure to keep the epoxy away from the screw hole. The JB is so tacky, it would hold the assy against the "ceiling" inside the baggage area. Then I crawled outside the ship and carefully screwed into the nutplate assy and left it alone to harden overnight.

The riveted nutplates are really only anti rotation devices in this case, not any kind of structural component. They allow you to put the screw in one handed without having to use an extra tool or an extra hand. So all the JB is doing is locking the nutplate assy in position to free up a hand and person.

The only problem I had was that one of the screws had a hard time getting started, and it spun the assy about 45 degrees, creating a little mess on the ceiling. I climbed inside and straightened the plate and cleaned up around it with some lacquer thinner. I still didn't get it cleaned up as well as I would have liked, but I hardly fit back in there and my shoulder was beginning to hurt quite a lot so I quite before I really hurt myself again.

Now at least I won't have to crawl back in the empennage to get on a nut if I decide to remove the canopy track. When the plane gets painted, the canopy and track can be removed very quickly and easily. So the two hours I spent on the canopy nut plates should save 30 minutes over a period of about 30 years. Pretty effective use of time, huh!?!