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TOOL LIST

QTY.	TOOL
2	SAW HORSES (PLANS FOR THESE ARE PROVIDED IN THE WING MANUAL)
1	DIE GRINDER WITH CUTOFF WHEEL AND SANDING DISKS
1	12" RULER
1	16' TAPE MEASURE
1	AUTOMATIC CENTER PUNCH
2	36" LEVEL
1	DRILL MOTOR (CORDLESS IS HANDY BUT ELECTRIC OR AIR IS FINE)
1	ANGLE DRILL
1	#40 DRILL STOP
1	#30 DRILL STOP
1	#10 DRILL STOP
1	NUMBERED DRILL SET
1	CLECO PLIERS
30	NO. 30 CLECOS (COPPER COLOR)
30	NO. 40 CLECOS (SILVER COLOR)
10	NO. 20 CLECOS (BLACK COLOR)
10	NO. 10 CLECOS (YELLOW COLOR)
1	POP RIVET GUN FOR 1/8 INCH RIVETS (MARSON HP-2 RECOMMENDED)
1	RIVET GUN WITH NO. 30 RIVET SET AND BUCKING BAR
1	AIR COMPRESSOR AND BLOW NOZZLE
1	NO. 40 RIVET DIMPLING SET
1	RIVET SQUEEZER
1	DIGITAL LEVEL (SPI-TRONICS PRO3600 PN SPI 31-040-9 OR EQUIVALENT)
1	3/4 INCH UNIBIT (#1)
1	DIGITAL FISH SCALE (0 TO 15 POUNDS RANGE)
60	3" SPRING CLAMPS
6	VICEGRIP 6-SP CLAMPS
1	STRAIGHT TIN SNIPS (THESE TYPICALLY HAVE YELLOW HAND GRIPS)
1	TORQUE WRENCH (20 IN-LB TO 200 IN-LB)
1	12 INCH ADJUSTABLE SQUARE
1	1/4 SOCKET SET WITH, AT LEAST, 3/8 TO 9/16 INCH SOCKETS
1	DEBURRING TOOL
1	PAIR OF SCISSORS
1	#2 LEAD PENCIL
1	FINE FLAT FILE
1	TUBING CUTTER FOR PLASTIC TUBING
1	SHEET METAL NIBBLER

CONSUMABLE SUPPLY LIST

QTY.	DESCRIPTION
1	BOTTLE OF DENATURED RUBBING ALCOHOL
1	SOLDER ACID BRUSH
2	ROLLS OF 2" MASKING TAPE
2	ROLLS OF ¾" MASKING TAPE
6	WOOD BLOCKS
1	EXACTO KNIFE
5	SINGLE EDGED RAZOR BLADES
1	LITHIUM GREASE (STA-LUBE #SL3151)
1	TUBE OF CLEAR SILICONE SEALANT
1	LOCTITE #271
2	SCOTCHBRITE PAD (MEDIUM GRIT)
1	FINE POINT BLACK MARKER
10	PACKETS OF 3M AUTOMOTIVE ADHESION PROMOTER #06396

LEVEL ADAPTER

During the finishing steps, it is necessary to check the “level” of the wing. To accomplish this, it is necessary to use the level adapter as shown in the photographs below and Figure FN1. Construct one of these adapters.



Photo 001



Photo 002

The end of the beginning...the general discussions and preparatory work are done. It's time to start building the wings. Let's begin.

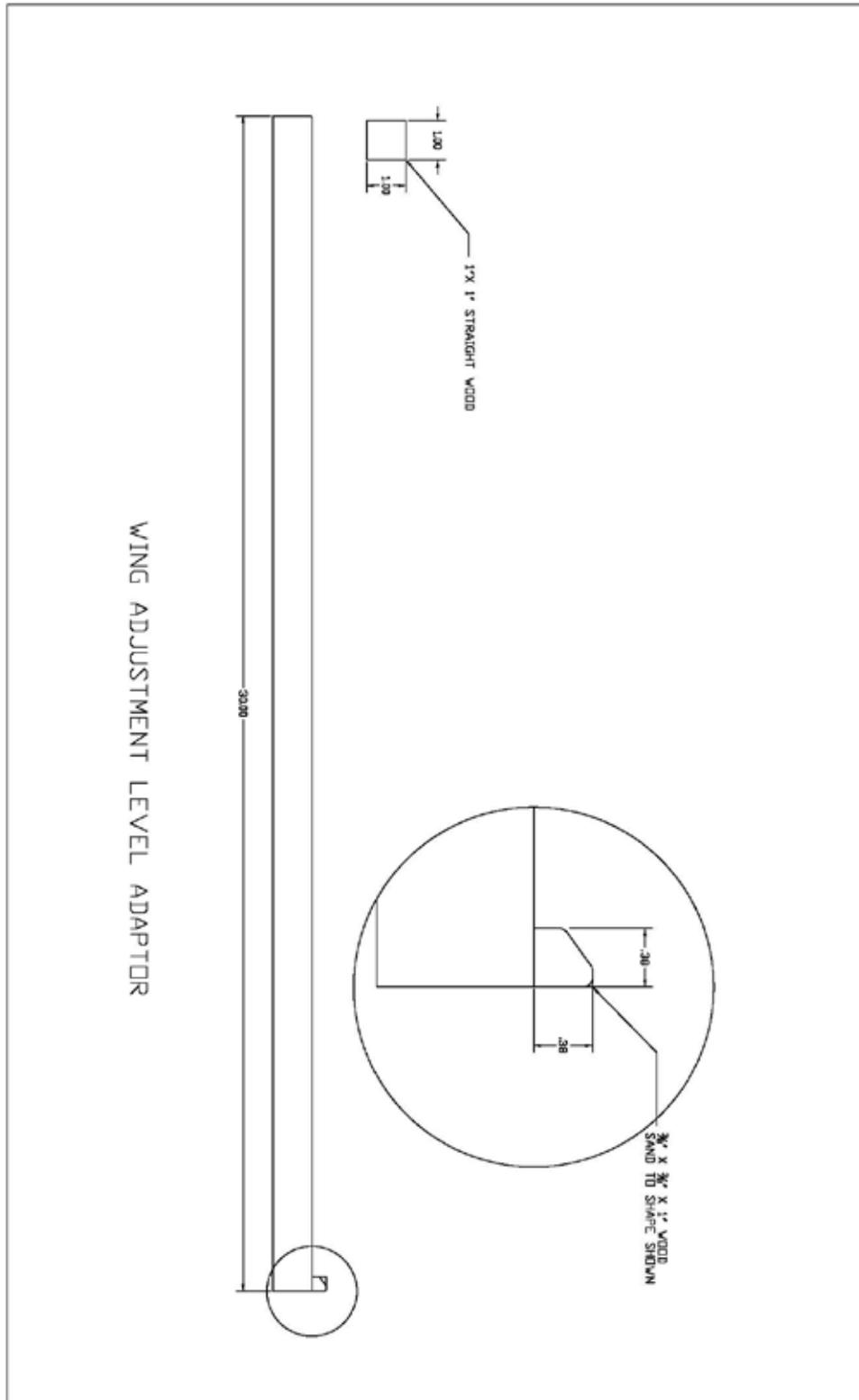


Figure FN1

BOOT COWL LOCATOR RODS

During fitting of the boot cowl in SECTION 3 of the **Carbon Cub EX** kit Finish Manual, locator rods are needed to help guide the boot cowl into place. These rods should be 32 inches long and 3/8" in diameter. The rods do not need to be threaded but a bit of chamfering on each end will help. The rods may be made from any stock of these dimensions. Steel rod, steel tube, or aluminum rod will all work just fine.



Photo 003

BULLETS

For the landing gear and wing installation you will eventually need to use a "Bullet". This doesn't have anything to do with the classic film of the same name (with Steve McQueen). The "bullets" are simply pieces of stock or bolts (no head and no threads) that have been tapered a bit. The bullets are used to hold pieces together before the permanent fasteners are placed.

Using a grinder, belt sander, or file to make the tapered end. Ensure that the tapered end is smooth and does not come to a point. The bullet should not act as a center punch.

Make up 4 of the bullets (about 3 inches long) using 3/8" stock for the landing gear installation.

Make up 4 of the bullets using 5/16-inch stock.

Here is a photograph showing a bullet inserted during landing gear installation.



Photo 004



Photo 005

At this point you should have a covered fuselage with fabric through “silver”. The fuselage should not have its final paint yet.

SECTION 1 SETUP

Place the fuselage on sawhorses with blocks of wood under each of the landing gear mounts. Short pieces of 4” x 4” material will work well for this. You want the fuselage to be stable (not rocking) and protected from damage on the underside. Avoid having your blocks as close to the fabric as those shown below.



Photo 006



Photo 007

SECTION 2 FUEL LINE ROUTING

Bring the fuel line through the fabric at the position shown here. Once through, apply chafe protection as shown. Application of chafe protection here uses the same technique as for the main fuel line installation (i.e. friction tape wrap on fuel line under the ends of the chafe protection, then zip tie chafe protection).

Apply a wrap of friction tape to the fuselage tube and then zip tie the fuel line in place.

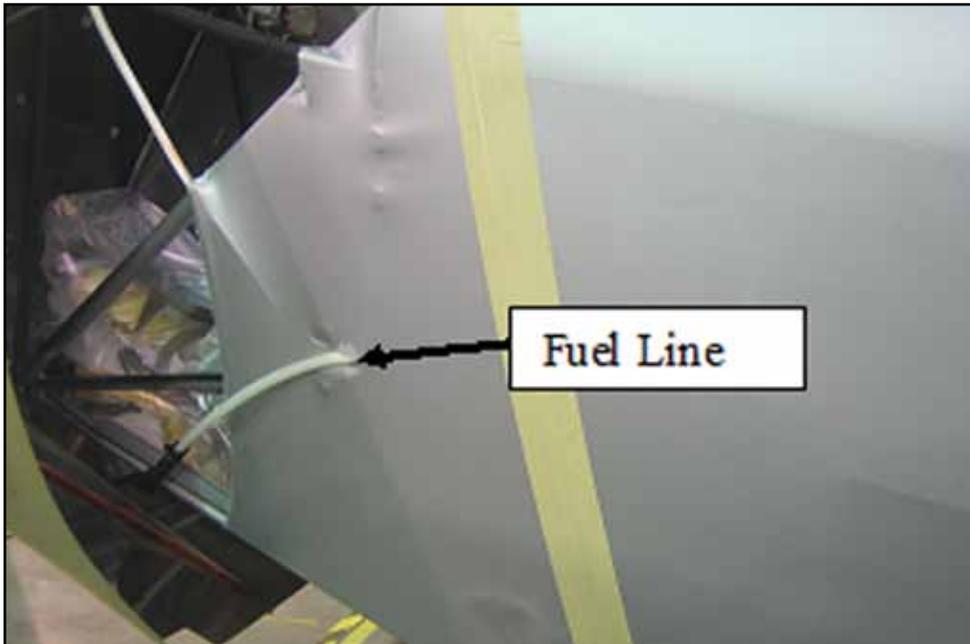


Photo 008



Photo 009

SECTION 3 INSTALL BOOT COWL

Begin by removing any masking tape from the front of the fuselage that may be remaining after painting. At this point the instrument panel and all the wiring should be installed and connected. A panel electrical check should have been performed. Remove the boot cowl hatch located near the gascolator. Put the hatch into a small plastic bag and tape to the front of the firewall.

Holding the boot cowl is a bit of an issue. It is recommended that locator rods be used. The preparatory steps of this manual included instructions for making a set of locator rods. If you made them then, go get them. The locator rods should be inserted into the engine mount lugs so that the rods extend forward from the mount lugs and through the firewall an inch or so (assuring full support).

Next, unwrap the cables and lines that were taped under the instrument panel during painting.

Then, remove the grommet for the oil temperature line.



Photo 010

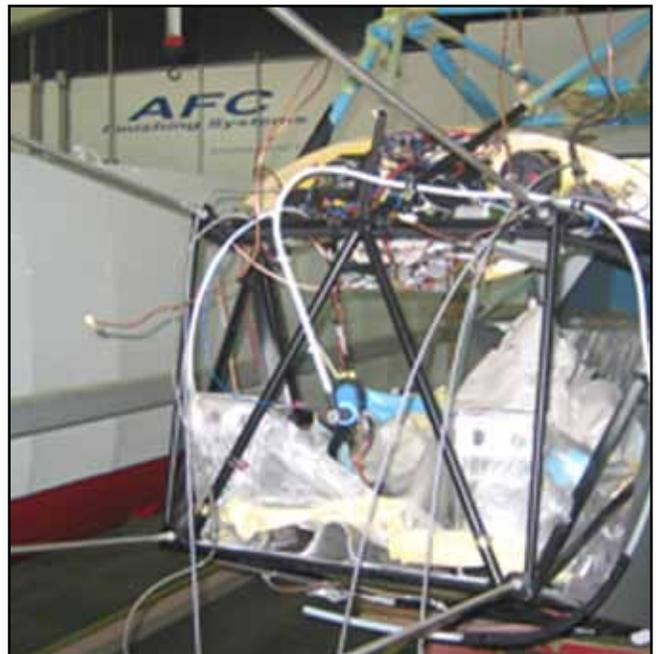


Photo 011

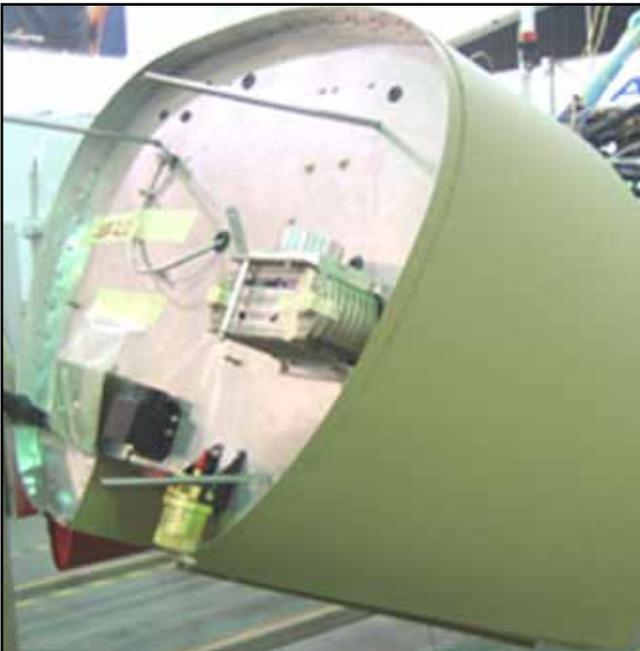


Photo 012

**Photo 013**

Place the boot cowl onto the locator rods. Get someone to help you, as this is a 2 person task. Once the boot cowl is on the rods, you can go back to the one-man show.

Work the boot cowl further onto the locator rods. Use spring clamps on the bottom rods to keep the rods from sliding into the firewall.

**Photo 014**

We just unwrapped the cables and it is now time to examine their routing. For any cables that may come into contact with the boot cowl or fuselage tubes we need to apply chafe protection. As such, wrap polyethylene spiral wrap (70509-202) around any cable that may come in contact with the boot cowl or fuselage tube(s).

**Photo 015****Photo 016**

We now need to apply some protection to the fuselage. Apply a layer of masking tape to the sides and bottom of the fuselage where the boot cowl will contact the fabric. This tape will protect the fabric while you are working the boot cowl into position.

You should also wrap masking tape around the two fuselage tubes above the instrument panel.

Now, ensure that all wires, cables and lines are through the firewall in accordance with Figure FN2.

We should be homing in on the boot cowl final fit. Check the cowl fit as you carefully ratchet the cowl into position.

Check the fit at both landing gear mounts.

Check the fit at both sides of the instrument panel.
BUT THE INSTRUMENT PANEL HASN'T BEEN PLACED YET!

Remove the masking tape from both sides of the fuselage and check final fit.

We're making the final trims. Mark to trim as needed above the landing gear mounts. The bottom of the cowl should match the line of the weld on the mount.



Photo 017



Photo 018



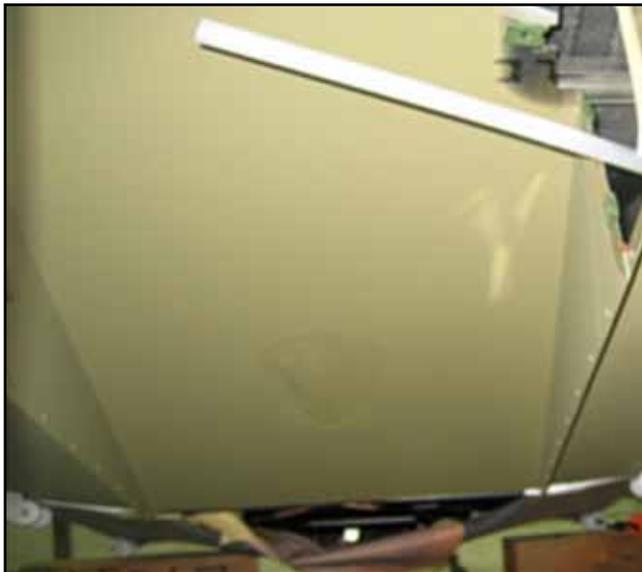
Photo 019



Photo 020

**Photo 021**

The boot cowl should be as close to its final position as practical (bearing in mind that some parts may need to be trimmed in order to move the cowl the last bit into position). Check the fit of the boot cowl at both the left and right forward landing gear mount. Mark and then trim as needed to allow the boot cowl to progress to its final fit. Be certain to smooth all trimmed edges. Trimming as much as shown here is NOT likely. Apply masking tape as shown to the right to protect the boot cowl from damage. Then, use two ratchet straps to pull the boot cowl into place. This is not a time for large amounts of force. You are just using mechanical assistance to put a steady pull on the boot cowl without deforming the shape.

**Photo 022**

As you can see to the right, the ratchet straps hook to the front bottom of the cowl and then to the rear landing gear mount.

Use lots of masking tape to protect the cowl.

**Photo 023**

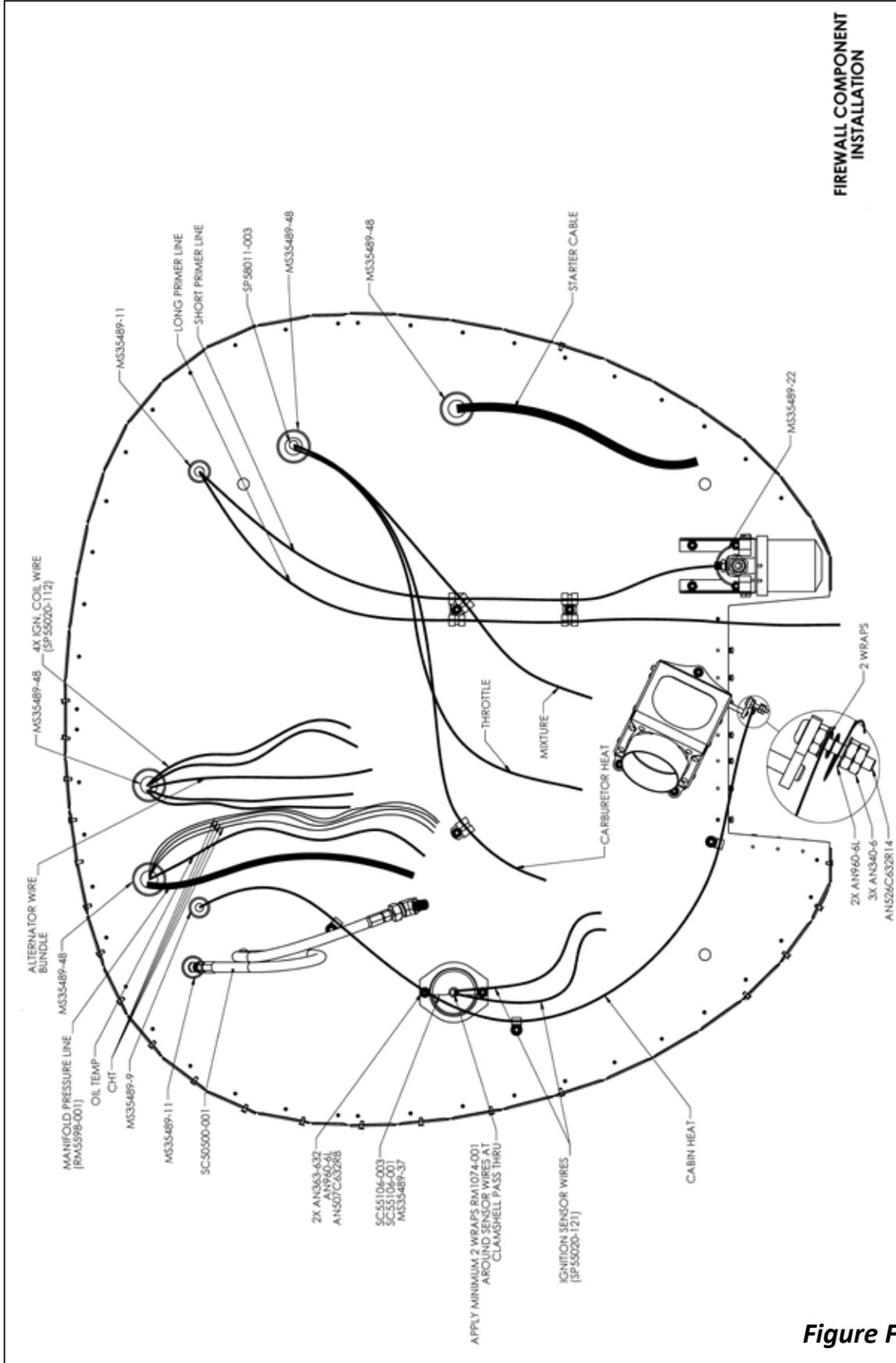


Figure FN2

We should be homing in on the boot cowl final fit. Check the cowl fit as you carefully ratchet the cowl into position.

Check the fit at both landing gear mounts.

Check the fit at both sides of the instrument panel.

Please note that this is not the best photograph as it shows the instrument panel populated with components. You panel should still be “bare” as it was during the boot cowl build.

Remove the masking tape from both sides of the fuselage and check the final fit.



Photo 024



Photo 025



Photo 026

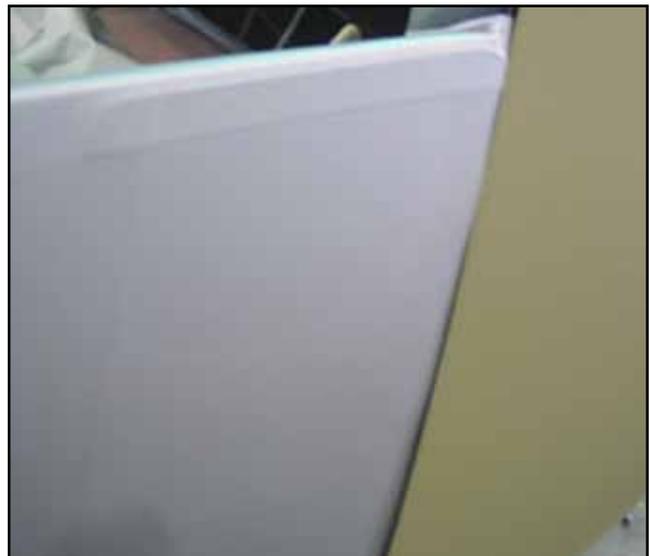


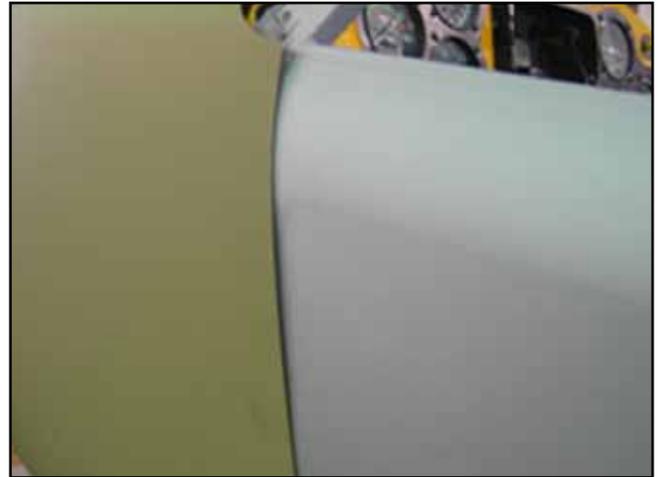
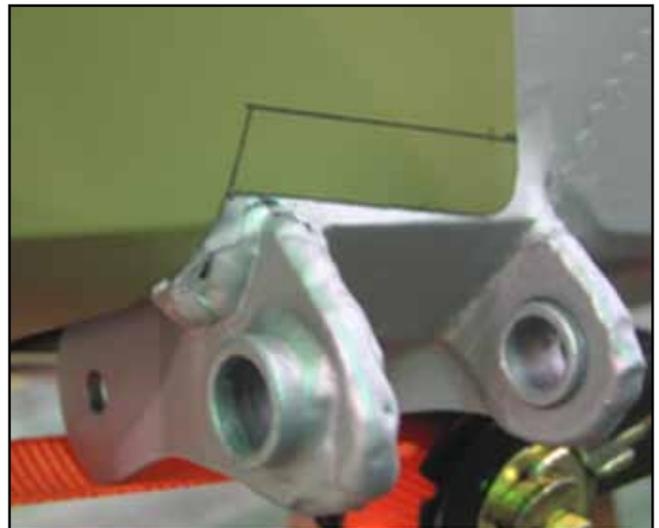
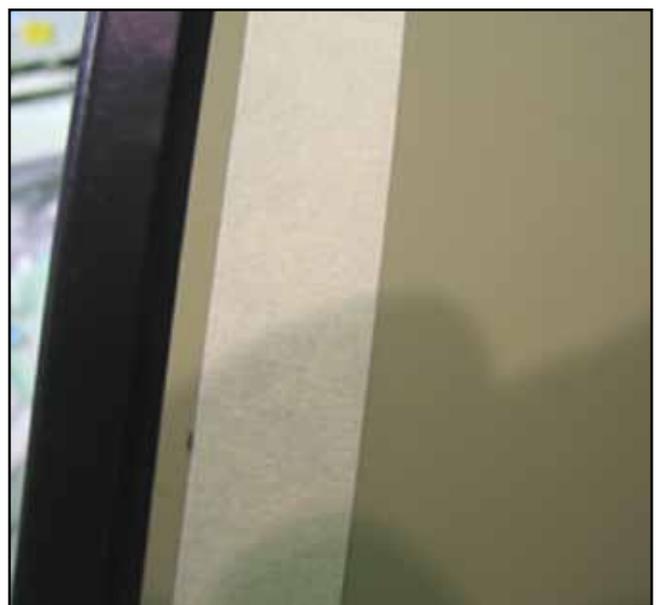
Photo 027

We're making the final trims. Mark to trim as needed above the landing gear mounts. The bottom of the cowl should match the line of the weld on the mount. Again, this large a trim is very unlikely if your original build of the boot cowl was on your fuselage.

Check the fit around the boot cowl spacer and mark to trim as needed. The goal is to have the aft edge of the boot cowl flush with the aft edge of the cowl spacer. Here some overlap needs to be removed.

Determine the amount of overlap to be removed. Mark the line with a Sharpie pen. Some builders like to then apply masking tape to form the trim line. This gives them a very clear line to trim to.

Once the line is determined, trim to fit and smooth the cut line. Here you can see a hand shear being used to make the cut.

**Photo 028****Photo 029****Photo 030****Photo 031**

**Photo 032**

Check the fit again. It should be very close to the sweet spot. Keep working it until it is right.

When all trimming has been completed and the boot cowl is in its proper location, apply a strip of $\frac{3}{4}$ " masking tape as shown here. Use a compass to mark lines for drilling the holes. You will be drilling holes on both sides and the bottom. The position of the line and the hole locations should be in accordance with Figure FN3.

The edge distance is 0.25 inch.

**Photo 034****Photo 033****Photo 036****Photo 035**

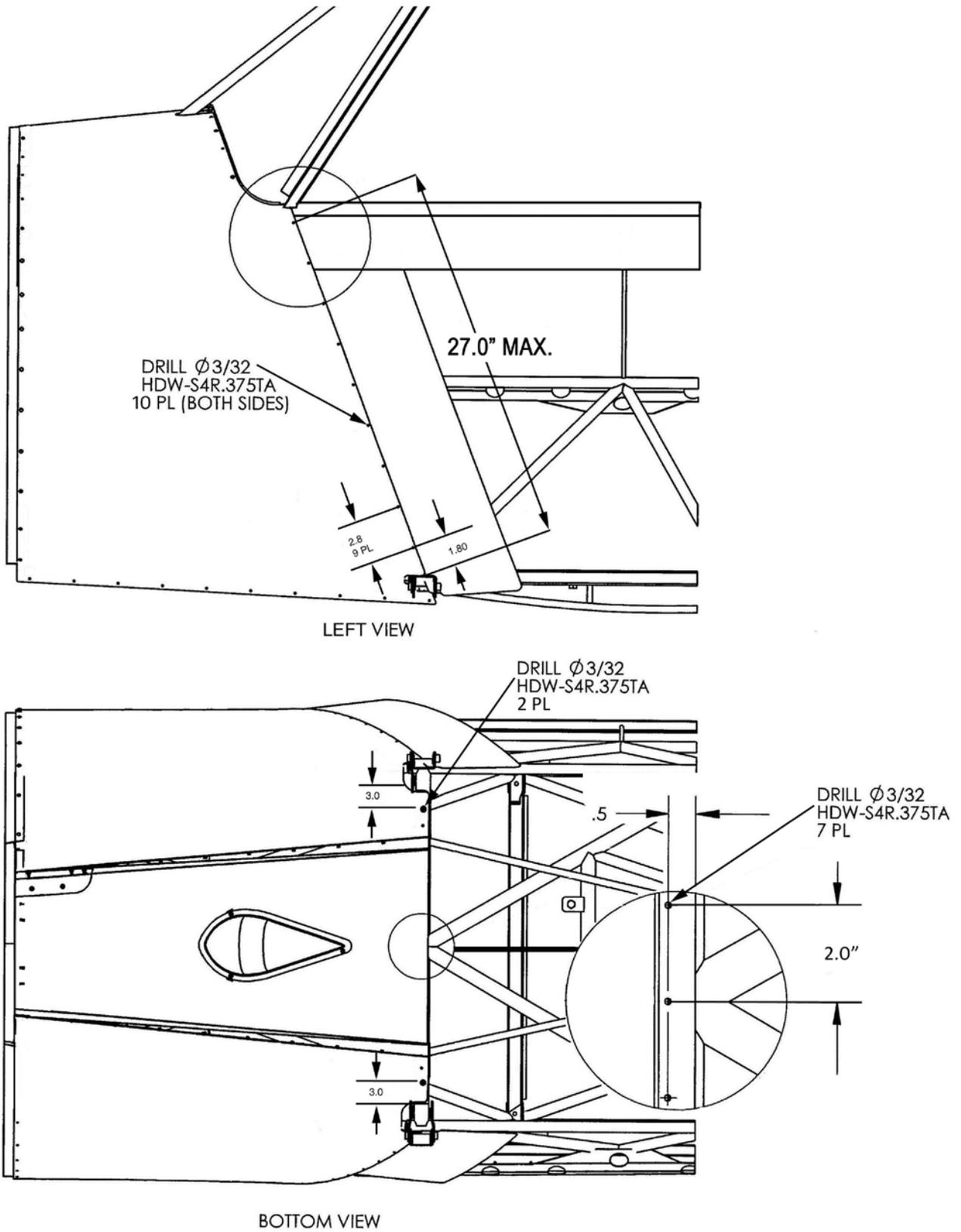


Figure FN3

It is necessary to drill the boot cowl holes to a larger size to allow the screws to be properly fit. To accomplish this, one-at-a-time remove a Cleco and place a piece of plastic between the boot cowl and the boot cowl spacer. Drill the boot cowl only with #34 drill bit.

Use an air nozzle to remove any loose chips remaining from drilling.



Photo 037



Photo 038



Photo 040



Photo 039

As on the previous page, one-at-a-time, insert screws into the boot cowl side drilled holes and hand tighten each.

Now cycle through the remaining drill hole by one-at-a-time removing Clecos, drill holes in cowl, inserting screws per Figure FN2 and Figure FN3.



Photo 041



Photo 042

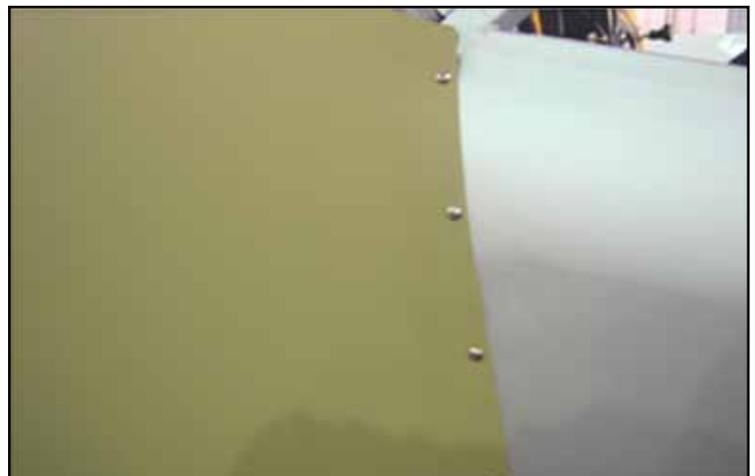


Photo 043

As set forth on Figure FN3, do not place screws in the bottom center section of the cowl.



Photo 044

SECTION 4 CONNECT FUEL LINE

Attach the fuel line to the gascolator. Mark the nuts with Torque Seal. Install the boot cowl hatch.



Photo 045

SECTION 5 SECURE LINES, CABLES, AND WIRES

Secure lines, cables and wires to firewall with masking tape.

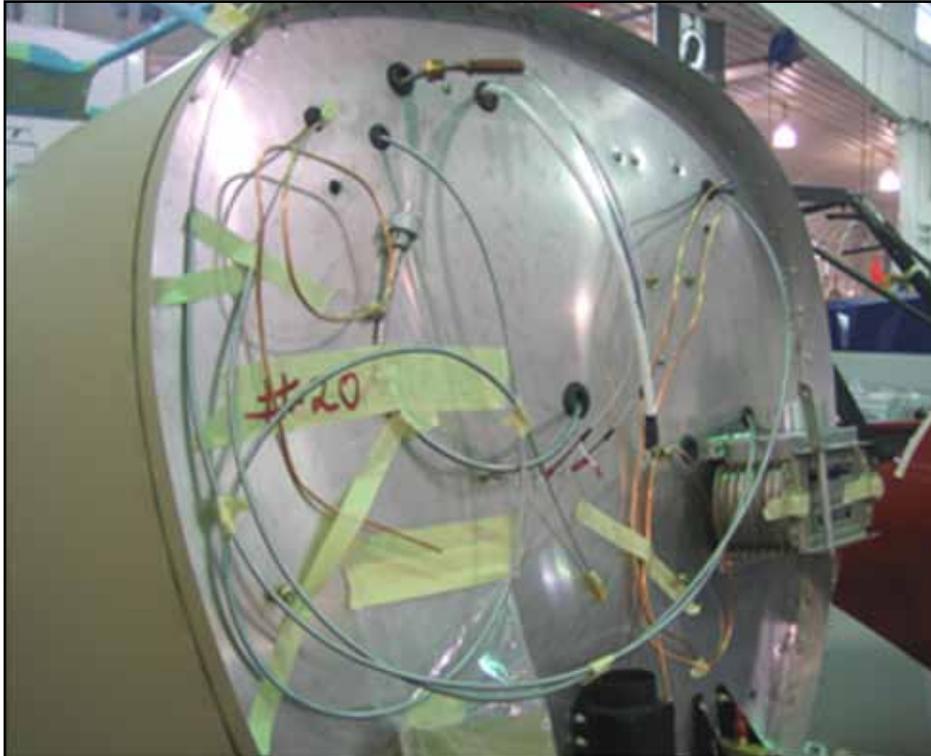


Photo 046

SECTION 6 PAINT FUSELAGE AND BOOT COWL

The fuselage may be masked and painted with final colors at this time. It is also acceptable to paint the fuselage and boot cowl separately, but it is necessary that you fit the boot cowl before painting. Step 7 and the remaining steps assume the fuselage is now painted. Be sure that your paint has cured for at least 4 days if your shop environment is warm. If your shop is cold, you need to allow additional cure time. Paint should be cured for at least 2 days before masking tape is used. Don't leave masking tape in place for long periods. Masking tape should be removed within 2 days of being applied to a painted surface. Advice: Buy the good masking tape from a professional paint supply store.

SECTION 7 DEBRIS PROTECTION

Apply masking tape to the top of each stringer and the top edge of the floorboard. This tape will help prevent debris from falling between the fabric and the fuselage tubes during the next steps.



Photo 047

SECTION 8 INSTRUMENT PANEL AND VINYL TRIM

The next step will address installation of the instrument panel. Begin by applying a band of 3/4" masking tape to the edge of the boot cowl that will be secured to the instrument panel. Use a compass to mark a line .25" from aft edge of the cowl. Then mark the boot cowl to instrument panel screw hole locations per Figure FN4.

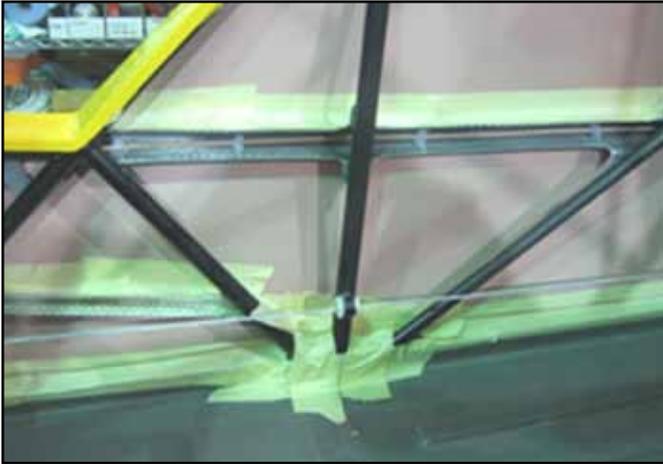


Photo 048



Photo 049

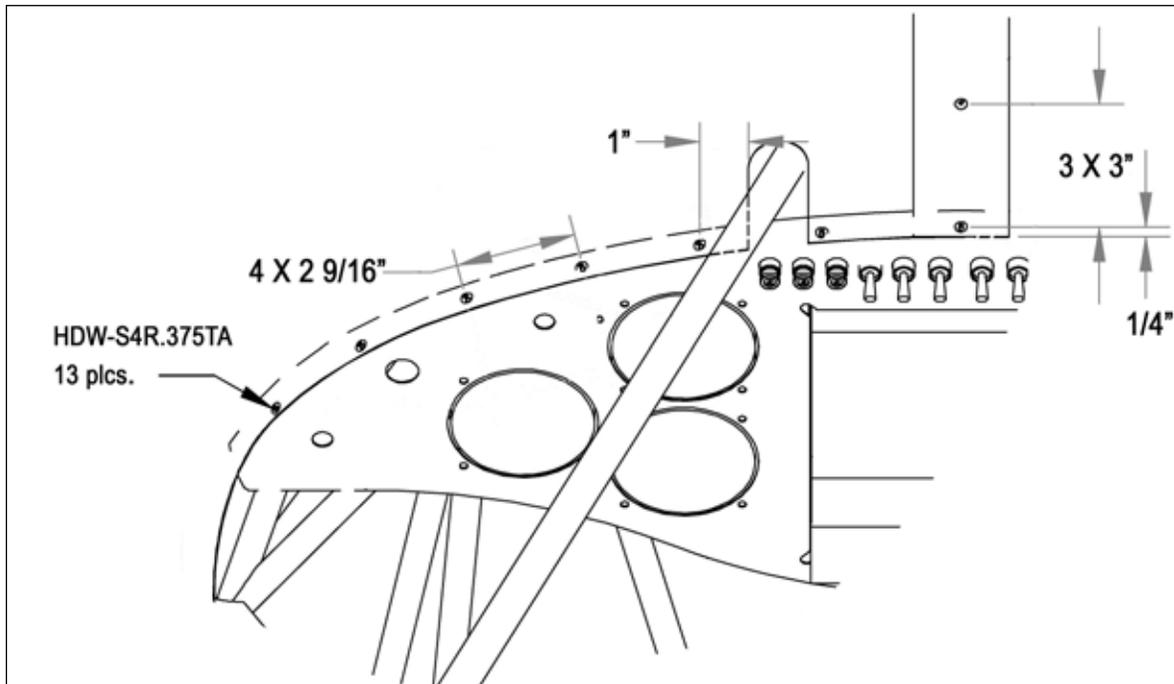
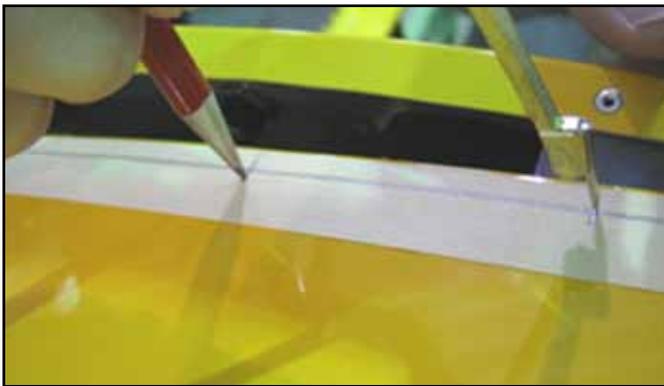


Figure FN4

It is now time to carefully work the instrument panel into position beneath the boot cowl. Next we will drill the holes through the instrument panel and boot cowl. Use a few short pieces of masking tape to hold the instrument panel and the boot cowl in proper position. Drill holes at the marked locations with a #43 bit and Cleco each hole. Be sure to use a drill stop on the drill bit. Start the drilling from the outside left, then the outside right, then work toward the center of the panel drilling left, right, left, right, etc.

Next we need to adjust the fit of the vinyl trim. Begin by removing the Clecos and masking tape from the boot cowl.

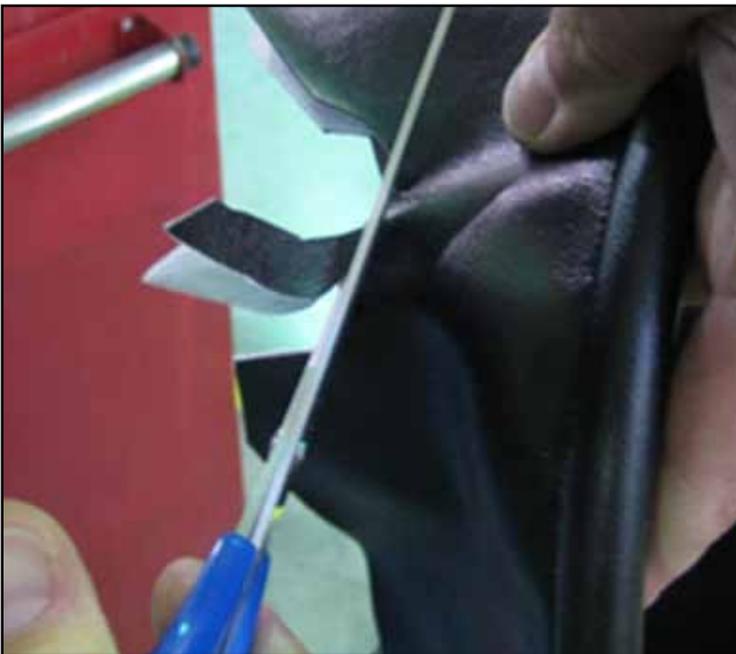
Lay the vinyl trim on top of the cowl to check the fit between the fuselage tubes.

*Photo 050**Photo 051**Photo 052**Photo 053**Photo 054*

**Photo 055**

Use a scissor and trim the vinyl as necessary to fit the fuselage tubes.

After you have the vinyl trimmed for the fuselage tubes, it is necessary to fit for the “A” posts. The A posts are the structural members in the left and right corners of the instrument panel. Lay the vinyl trim onto the top of the cowl and mark so that the vinyl will fit snugly around the base of the “A” post on each side. Use your scissors to cut the vinyl trim to fit.

**Photo 056**

Remove the top, side screw from the boot cowl where the boot cowl attaches to the top of the cowl spacer. This screw has been painted to match the fuselage. Set it aside in a place where you can find it again (one place that could work would be a small plastic bag, labeled and taped to the fuselage).

**Photo 057**

Now that the vinyl is cut to fit, we will insert the trim between the instrument panel and the boot cowl. Begin by working the vinyl trim between the panel and the boot cowl. Once you have the vinyl started under, you can combine your pushing with a little pulling. The pulling will be accomplished by reaching under the instrument panel to tug on the vinyl. Keep working slowly and methodically to not stretch the vinyl out of shape. You should be able to pull the vinyl trim into position without much difficulty.

When the vinyl trim, instrument panel and boot cowl are all in their correct positions insert a piece of scrap plastic and two putty sticks as shown to the right. These wedges are creating space so that you can re-drill the boot cowl and the vinyl without drilling the instrument panel.

Drill the holes in the boot cowl and vinyl trim using a #34 drill bit.

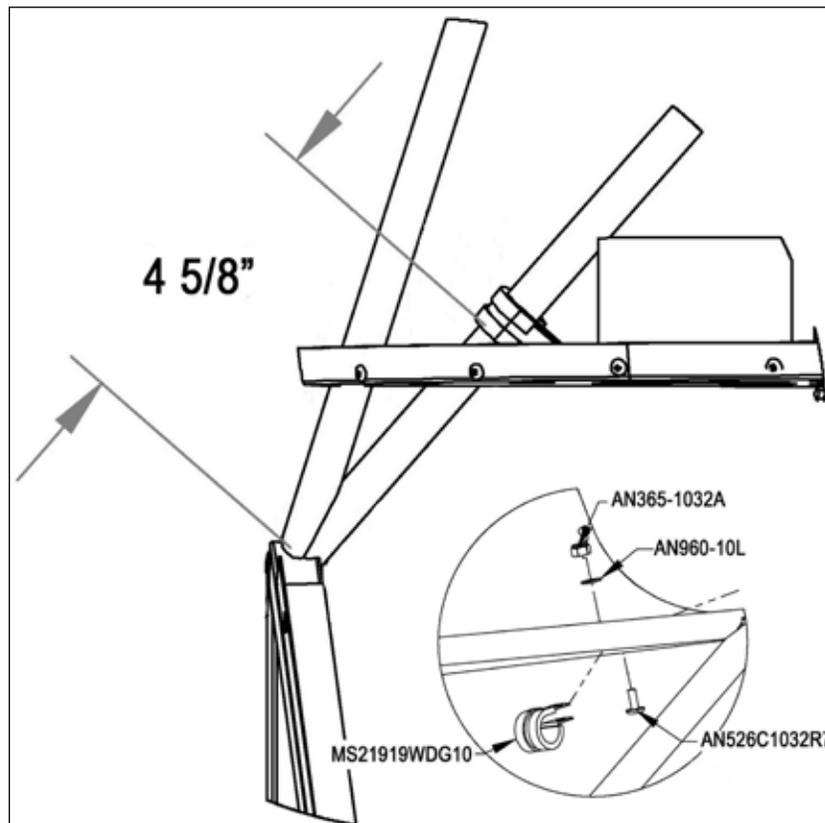
Remove the plastic and the putty sticks and insert Clecos. It is best if you work from the outside left, then outside right, continuing to alternate sides as you work toward the center of the panel.

**Photo 058****Photo 059****Photo 060****Photo 061**

**Photo 062**

Next we fasten the instrument panel by using Adell clamps as used during the boot cowl build.

Position a #10 Adell clamp between the bottom of the instrument panel and the fuselage tube in accordance with Figure FN5 using the holes that you drilled in your panel during boot cowl buildup and the Photo 063. Slide the clamp until the hole lines up with the instrument panel flange. Repeat for the other side (tubes are symmetric).

**Figure FN5**

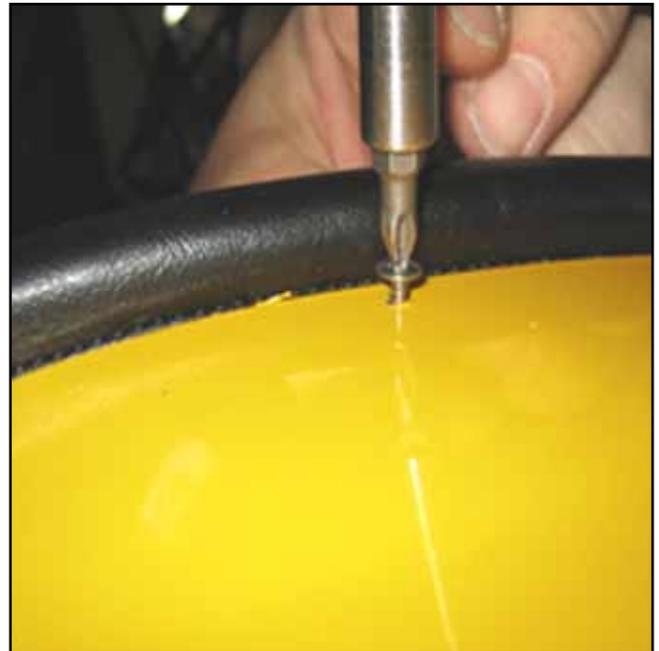
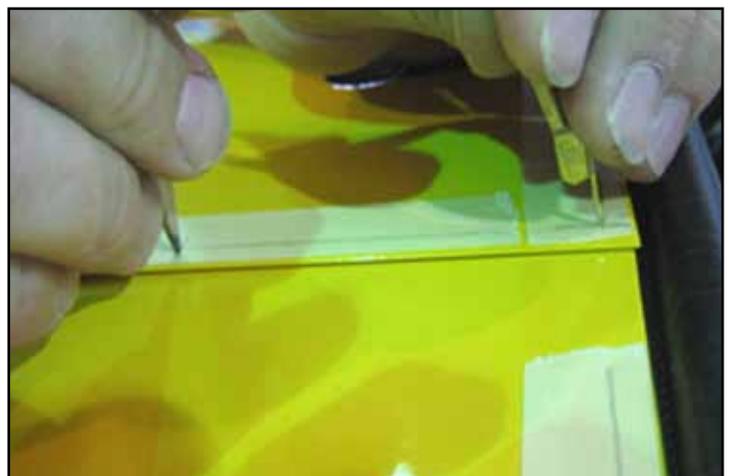
It is now time to join the instrument panel, vinyl trim and boot cowl. One-at-a-time, remove the Clecos and replace them with screws (HDW-S4R.375TA). See the next step for the center section of the cowl.

**Photo 063**

The boot cowl center seam is not yet finished. Begin by placing a band of $\frac{3}{4}$ " masking tape along the center seam of the boot cowl. Use a compass to mark a line .3" from the edge of the top lap on the cowl center. Then, along the length of the tape, mark the hole locations per Figure FN6. Note: the compass is a handy tool for marking repetitive spacing. The builder in the picture to the right is employing this technique.

Drill #34 bit holes next to the fuselage tubes through the boot cowl and the vinyl trim. Begin on the side for the top lap of the sheet metal.

Pull the masking tape back, remove any loose chips and insert the screw. Insert the two screws closest to the fuselage tubes and then insert the center screw.

**Photo 064****Photo 065****Photo 066**

Now drill the holes and insert the screws (HDW-S4R.375TA) on the center seam of the boot cowl.

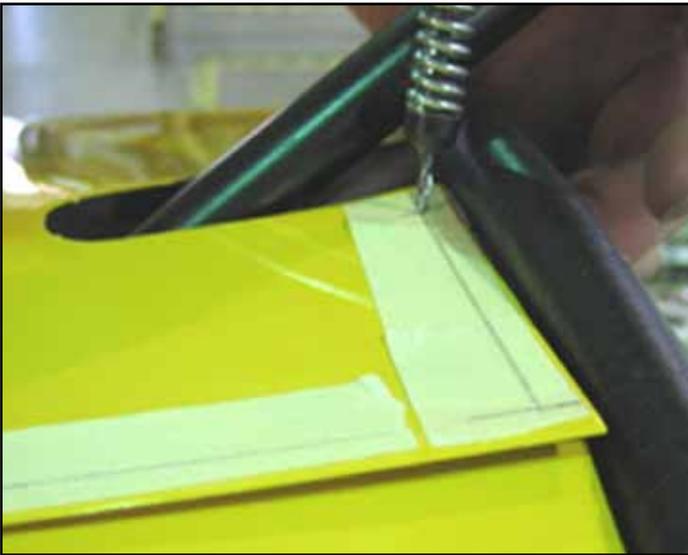


Photo 067



Photo 068

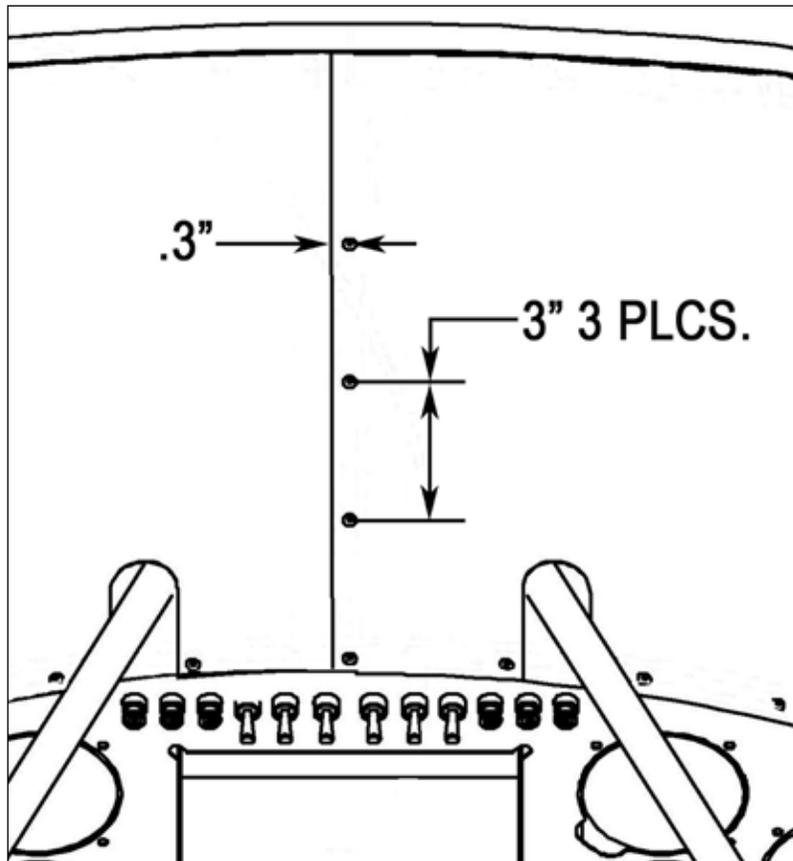


Figure FN6

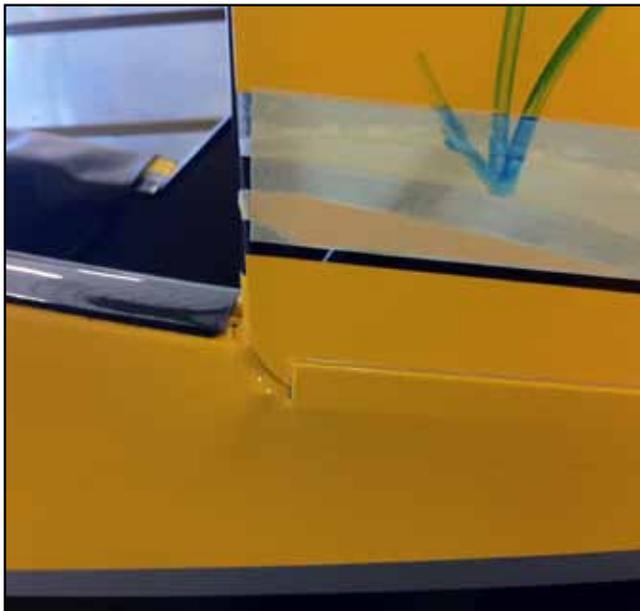
LOG & INSPECTION SHEET FINISH # 1

Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 24 Listed Tasks				
	Task #				
F15	Fabricate Fuselage Covering or Skin				X
F16	Assemble Fuselage Covering or Skin			X	
F23	Fabricate Mast and Strut Assembly	NA	NA	NA	NA
F24	Assemble Mast and Strut Assembly	NA	NA	NA	NA
F11	Fabricate Cables, Wire, and Lines				X
F12	Assemble Cables, Wire, and Lines			X	

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.1	Ensure boot cowl is free of dents and imperfections.		
1.2	Ensure all wiring is properly routed, chafe protected and secured.		
1.3	Ensure there is no metal to metal chafing on any push/pull cables.		
1.4	Ensure engine wiring, cables, and tubing exit firewall correctly.		
1.5	Ensure correct drilled hole edge distance on side holes and boot cowl spacer per manual.		
1.6	Screws installed on sides and bottom.		
1.7	Ensure fuel line connection at the gascolator assembled correctly. Fitting torque/Assembly Procedure with ferrule and insert.		

**Photo 069****Photo 070****Photo 071****SECTION 9 INSTALL "D" WINDOWS**

Begin this section by test fitting the "D" side window. Mark any excess material and trim the window to fit. For curved lines use a die grinder with a burr for trimming. For straight lines the abrasive wheel will work better.

The top edge of the side window must not extend above the fuselage because the turtle deck mounts flush to the tubes in this area.

Use a sanding block to remove material and/or smooth the final shape.

It is necessary to chamfer the D side window in the area near the rear fuel line. Use a die grinder and a sanding pad.

Front edge of the D window should be flush with the front edge of the forward tube.

**Photo 072**

Once trimmed, scrape the cut edge with a utility blade to remove burrs.

Repeat the trimming and smoothing process for the “D” side window on the opposite window. The “D” windows will be installed in a later step but prior to that you need to make a decision about paint.

There are lots of ways to paint a Carbon Cub. You’ll need to choose your favorite.

One method, as practiced at CubCrafters, calls for painting the “D” window Plexiglas as shown here. This simulates the shape of vintage Super Cub rear windows. Paint your “D” side windows now so that they are ready for installation in [Section 30](#).



Photo 073



Photo 074

SECTION 10
FLAP CONE INSTALLATION

While we're in the area of the "D" windows, it is a good idea to install the flap cones. Begin by gathering the parts needed per Figure FN7.

Wrap a piece of $\frac{3}{4}$ " masking tape around the bolt, under the nut to prevent the bolt from falling out of the installed flap cone. Install the flap cones with fasteners according to Figure FN7. After you have torqued the nuts, apply Torque Seal to the nuts.

**Photo 075****Photo 076****Photo 077**

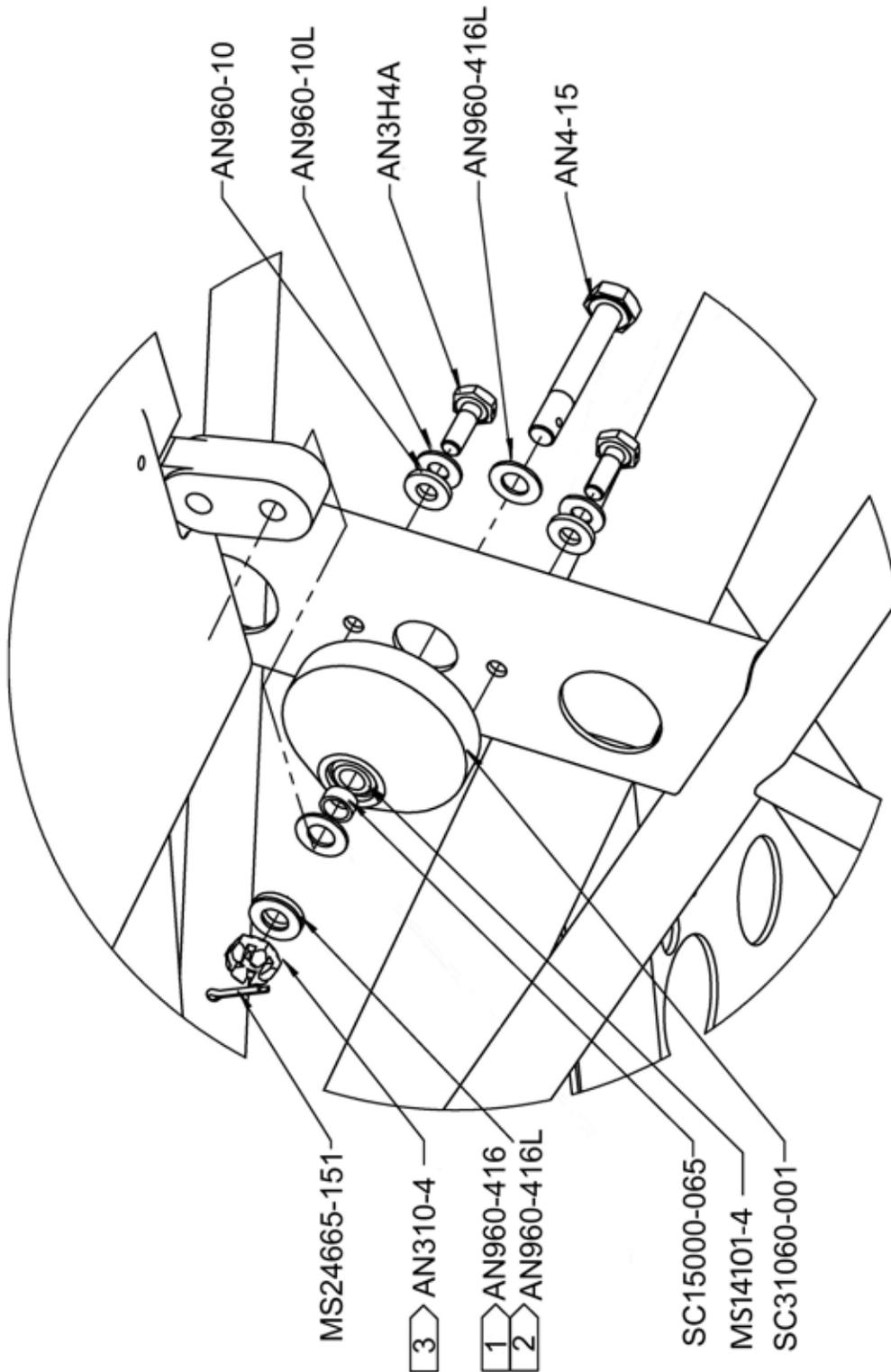


Figure FN7

**Photo 078****SECTION 11 SEAT BELTS**

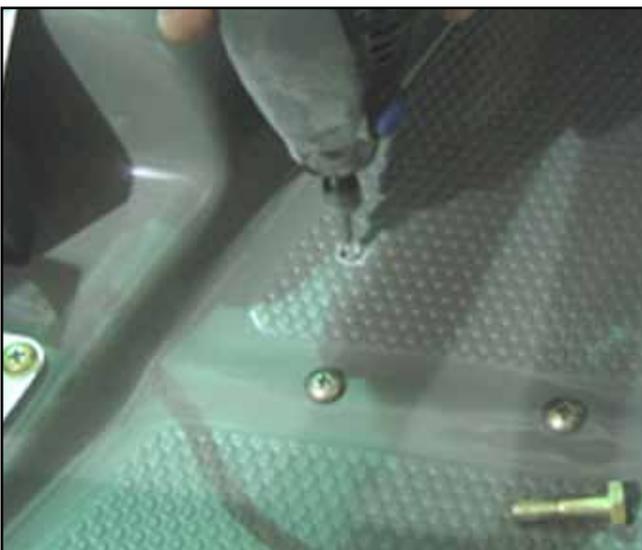
We're going inside the fuselage next for shoulder harness installation. Begin by using a small utility knife (like an Exacto knife) to open the bolt holes for the rear inertia reel.

Install the inertia reel and install fasteners per Figure FN8. Once the bolts are torqued apply TorqueSeal to the bolt heads.

**Photo 079**

Next we're going to the floor to install the front and rear seat belts. Begin by using a die grinder with a small burr (or a Dremel tool) to open the holes as necessary to allow the bolts to thread into the brackets.

Install front and rear lap belts with fasteners per Figure FN8.

**Photo 081****Photo 080**

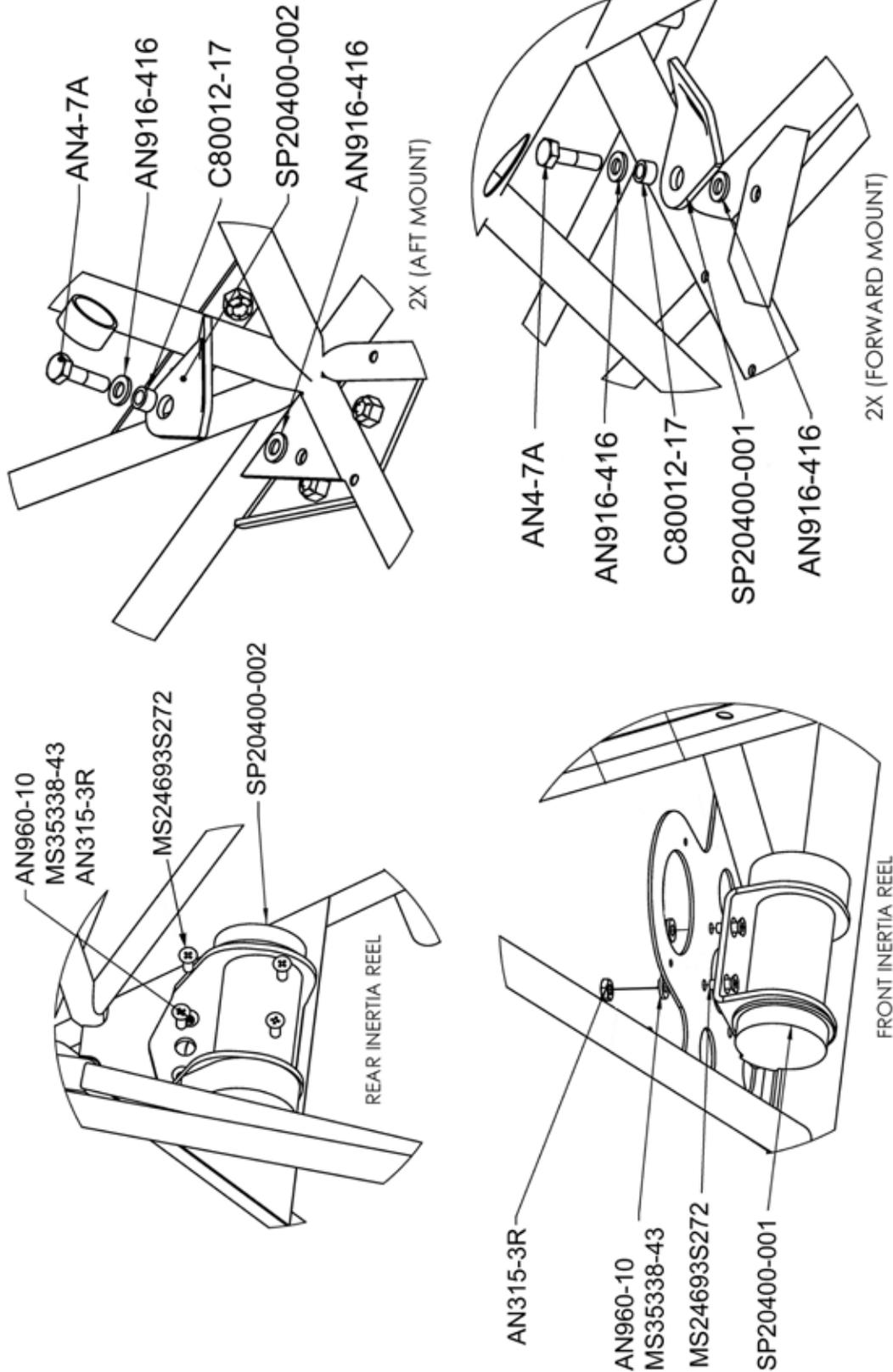


Figure FN8

**Photo 082****Photo 083****Photo 084****Photo 085****SECTION 12 INSTALL FLAP HANDLE**

Next we're going to install the flap handle and the flap handle lock.

The bolts are specified in Figure FN9. Begin by applying Loctite to the bolts. Then position the handle carrier on top of the fuselage tubes as shown. Install the bolts and lightly snug them. Check to assure that the flap handle moves freely. If things appear OK, finish torquing the bolts. Check the freedom of movement again. Once things are in order, apply Torque Seal to the bolt heads.

Next we will install the flap ratchet. Examine Figure FN9 and Figure FN10 and install the bolt and nut with the washers as shown.

Test the function – the flap handle needs to lock into all 4 stop positions. It is unlikely but possibly necessary to file the ratchet slots to ensure proper engagement of the pawl. The pawl must bottom completely in each slot. Once the engagement is correct, tighten the castle nut finger tight. From this "closed" position, you should turn the nut to the next tighter castellation.

Check to assure that everything still moves freely. Insert and set a cotter pin in the castle nut.

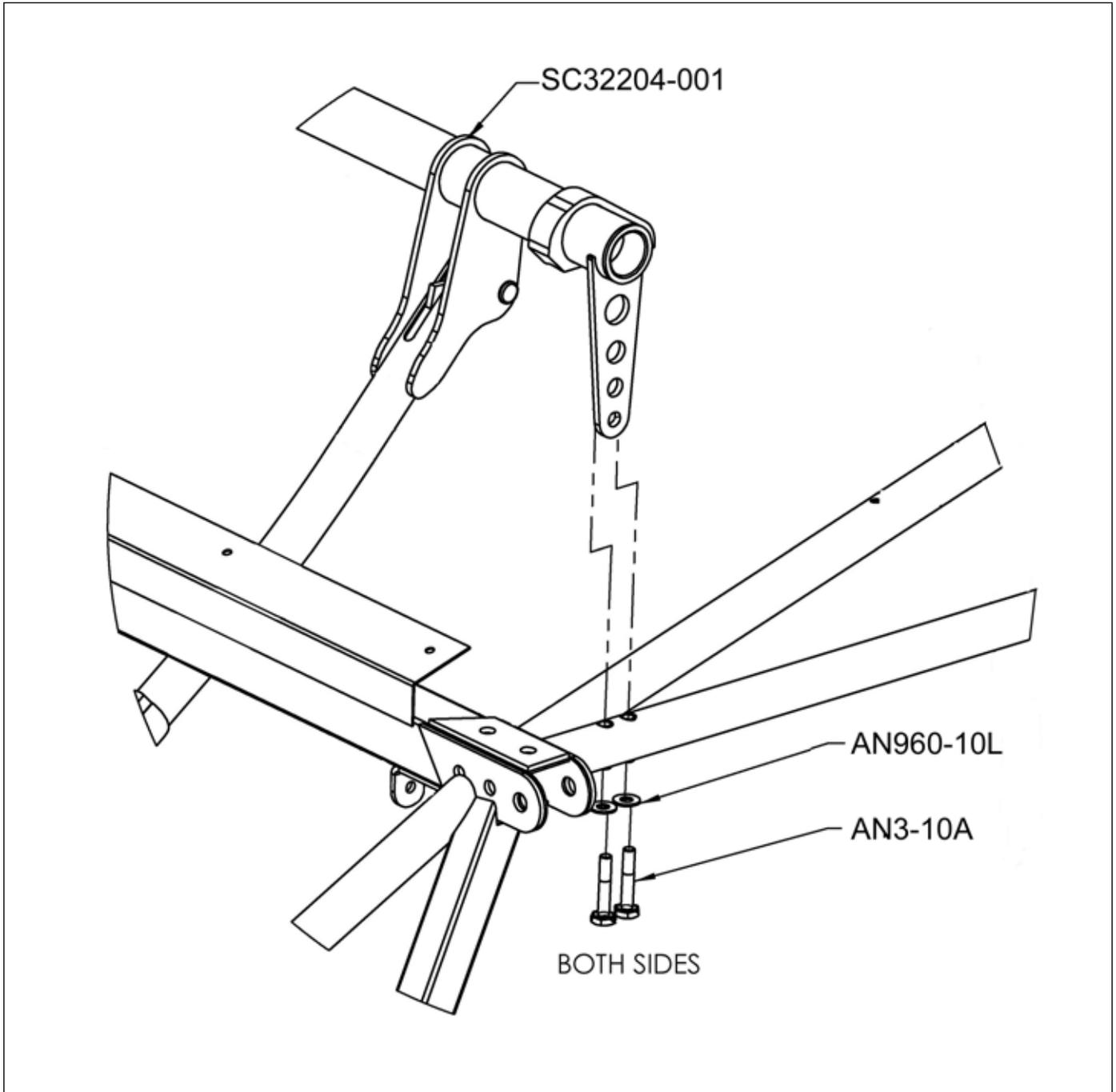


Figure FN9

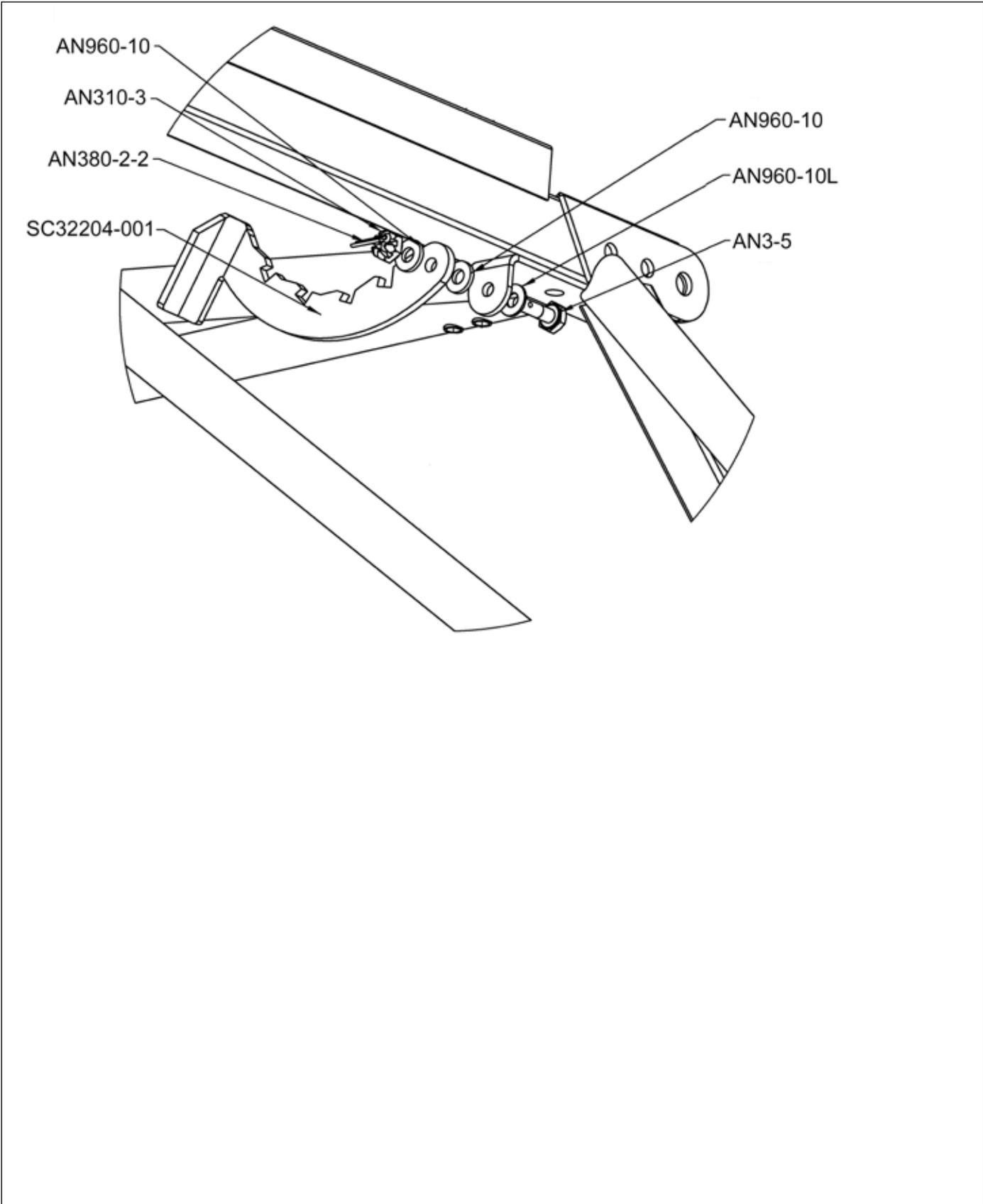


Figure FN10

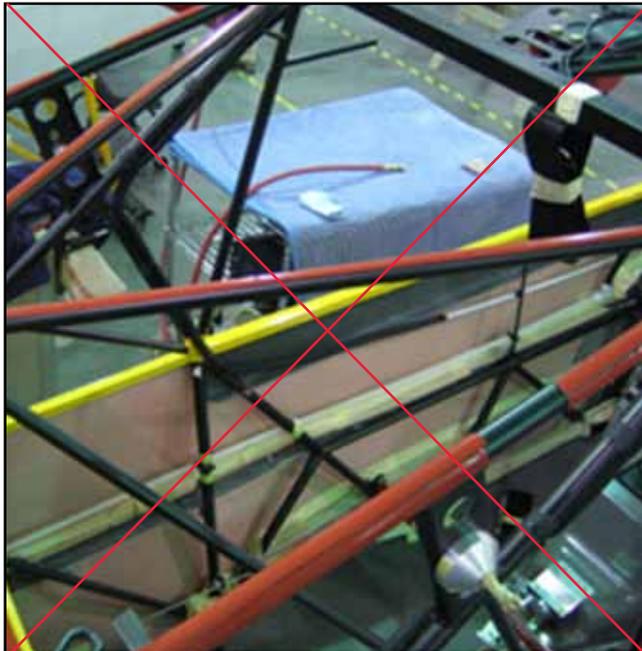
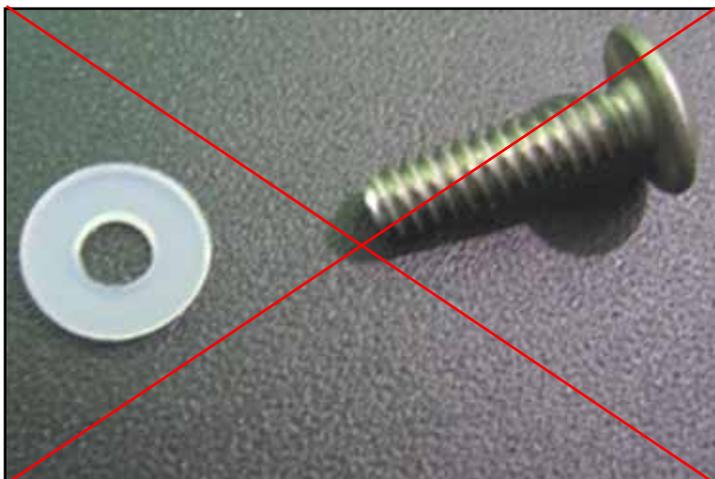
LOG & INSPECTION SHEET FINISH # 2

Log sheet

FABRICATION AND ASSEMBLY TASKS		A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 11 & 24 Listed Tasks				
	Task #				
C5	Fabricate Seats	.5			.5
C6	Fabricate Seat Brackets and Fittings	X			
C7	Assemble Seats to Cockpit			X	
C8	Fabricate Seat Belts Fittings and Shoulder Harness Fittings	X			
C9	Assemble Seat Belts and Shoulder Harness to Structure			X	

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.13	Install flap cones.		
1.14	Install flap handle.		
1.15	Use red LocTite to install/torque flap handle bolts.		
1.16	Verify clearance between front down tube and flap handle.		
1.17	Note: do not safety the castle nut for the flap handle lock plate at this time.		
1.18	Ensure front shoulder is installed properly.		
1.19	Ensure front seat belt is installed properly.		
1.20	Ensure rear shoulder is installed properly.		
1.21	Ensure rear seat belt is installed properly.		

**Photo 086****Photo 087**~~**Photo 088**~~**Photo 089****SECTION 13 INSTALL PLEXIGLAS**

The next step addresses installation of the "D" side windows and the turtle deck Plexiglas. The Plexiglas is held in place with a double stick tape made by 3M. Before the tape can be applied, the tubes where the tape will be applied needs to be cleaned. Examine the Photo 086, Photo 087, Photo 089 and clean the tubes framing the windshield, framing the turtledeck, framing the "D" side windows by wiping the tubes with rubbing alcohol (or denatured alcohol). Next, apply the 3M Foam Tape (RM4095-002) to the turtle deck. You can see an "M" pattern. Allow a gap of approximately 2.5" for the rear sling seat strap.

Apply a double row of 3M Foam Tape at the forward edge of the top of the fuselage.

~~In preparation for the windshield liner installation you need to gather the screws and place plastic washers onto the screws per Figure FN48 and Figure FN49.~~

SECTION 14 SIDE DOOR

The next step installs the right side lower door hinge onto the fuselage. The hinge pin is not in place for this installation.

However, before we can install fasteners, we need a method for holding a nut and washer on the tip of your finger. One method uses fuel sealant or heavy grease to hold the nut and washer. Begin by putting a dab of sealant on your finger and then sink the nut into that dab. Then use a small additional bit of sealant to stick the washer to the nut. By trial-and-error you will figure out how much sealant to use. If the amount you're using isn't working, try using less.



Photo 090



Photo 091

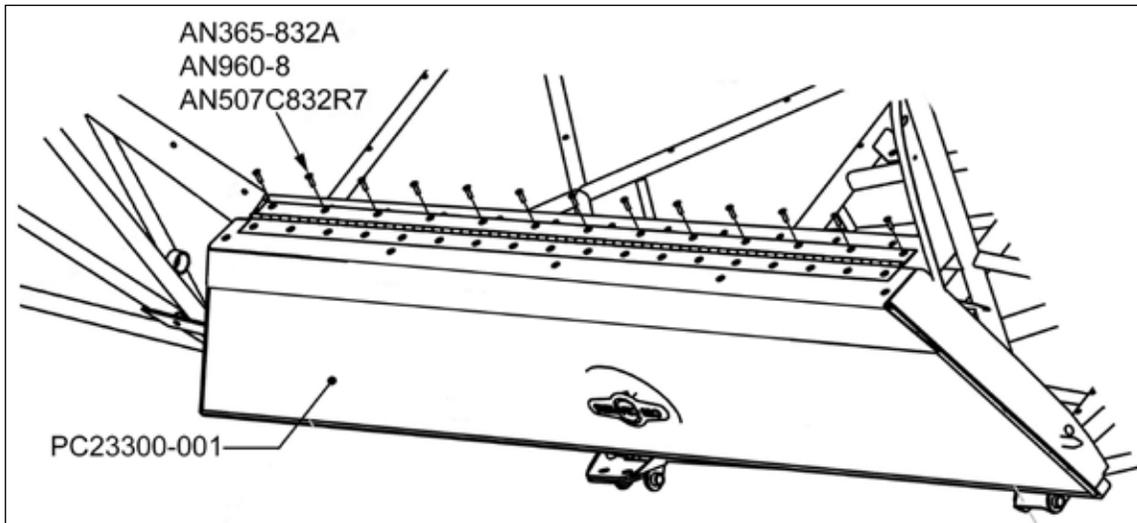


Figure FN11

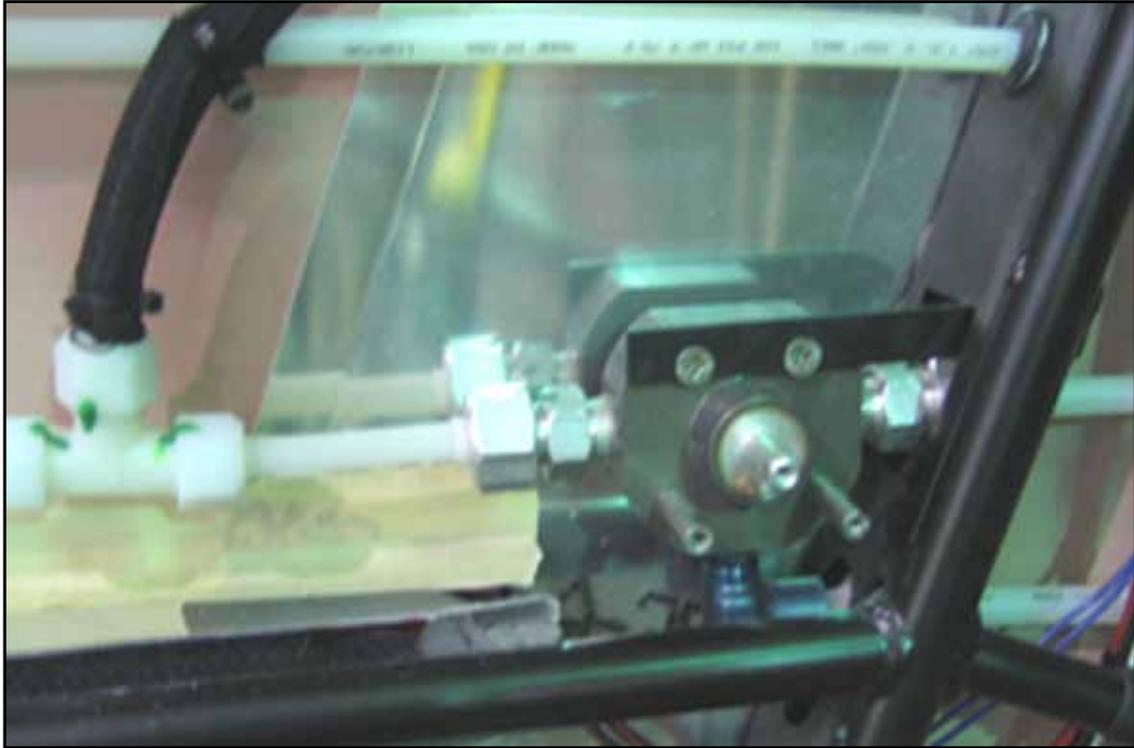
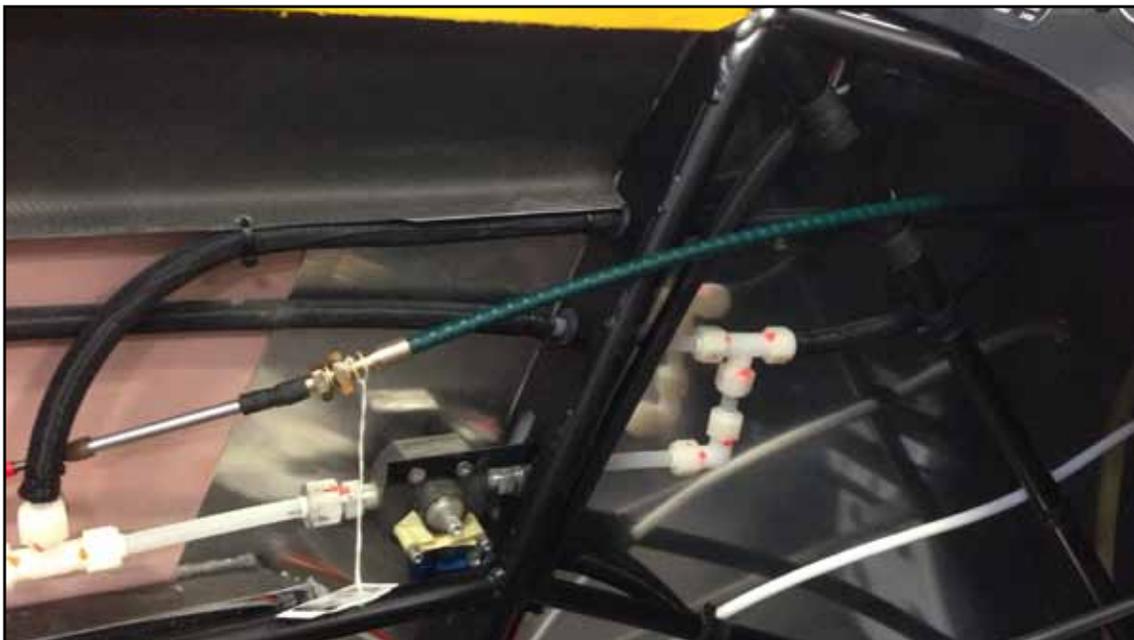
**Photo 092****Photo 093****Photo 094**

Now, with the nut and washer held on the tip of your finger, bring them into position under a hinge hole. Push a screw down through the hole and start the screw into the nut. After all screws are started, carefully work an open end wrench onto the nuts and tighten the hinge screws. Ensure that all hinge screws are tight.

SECTION 15 THROTTLE CABLE

Next, we address installation of the throttle cable. Begin by removing the masking tape from the fuel selector where the tape was holding the plungers in place. We'll be back to the fuel selector in the next pages,

Now, install the throttle cable as shown in the Photo 096, Photo 097, and Photo 098.

*Photo 096**Photo 095*

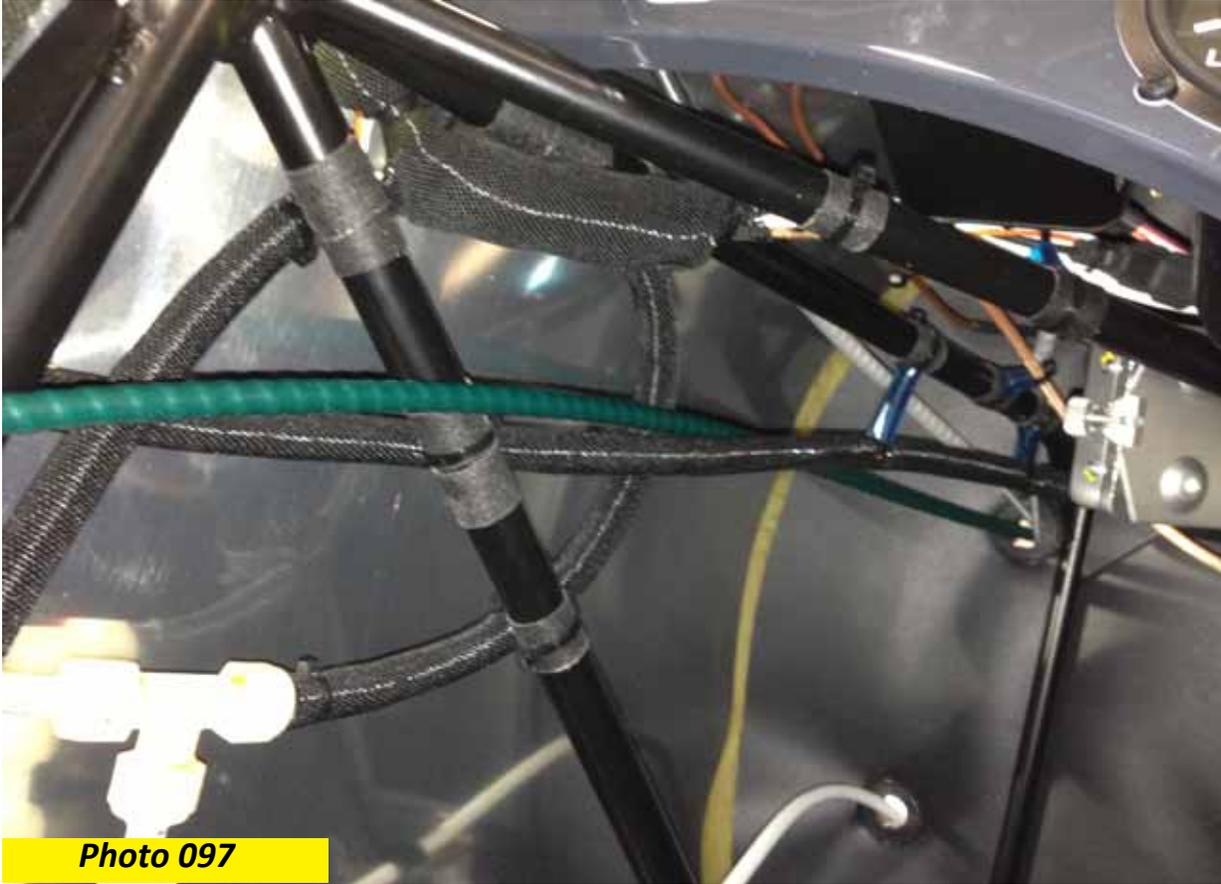


Photo 097

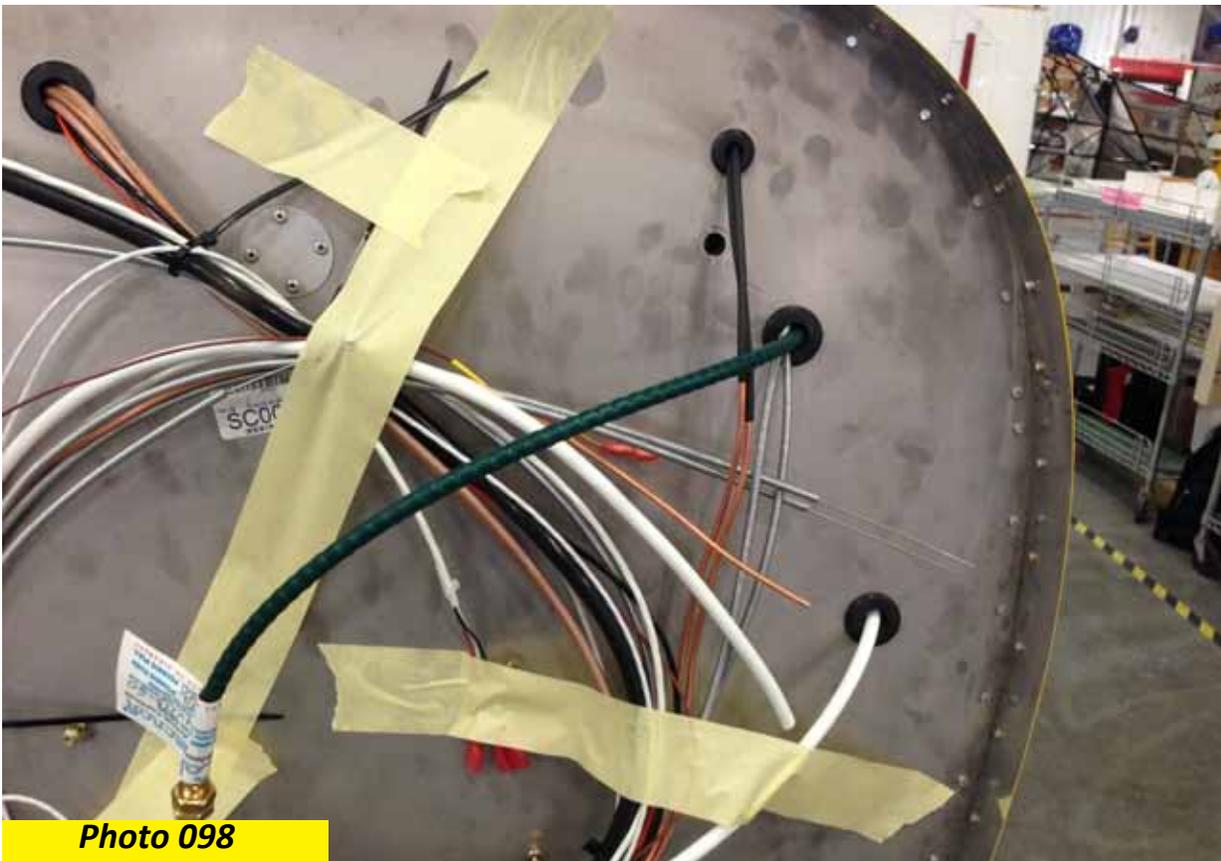


Photo 098

SECTION 16 RUDDER CABLE

For this section the rudder cables need to be slack. Use wire cutters to cut the zip tie that is holding the rudder cables at the aft end of the fuselage.

Next, apply several layers of masking tape to the outboard side of the rudder pedals. This will protect the interior panel during the fitting process.

*Photo 099**Photo 100*

SECTION 17 INTERIOR PANEL PREPARATION

Next we will test fit the left side interior panel. Begin by examining Figure FN12 to see the panel layout. The perimeter fit and the fit at the fuel selector are both important. Begin by ensuring that the fuel selector center shaft and plungers do not touch the interior panel. Ensure the plungers moves freely. Next fit the perimeter of the panel. Mark, trim and smooth as necessary.

Remove the interior panel from the fuselage but keep it handy. It will be worked on again on the next page.



Photo 101



Photo 102



Photo 103

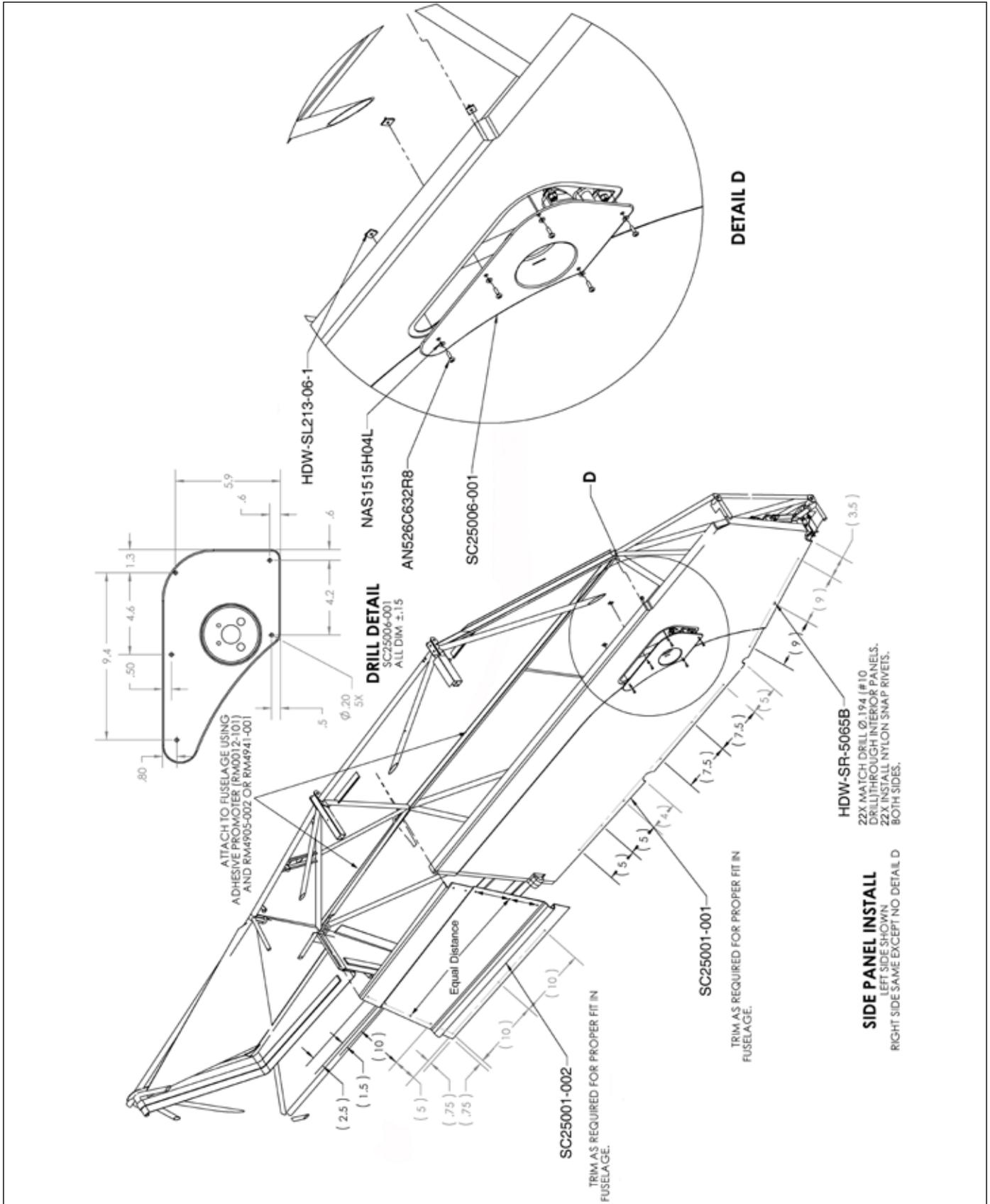


Figure FN12

**Photo 104****Photo 105****Photo 106****Photo 107**

A LOT OF CARBON CUB EX BUILDERS ARE USING VELCRO WITH THE ADHESIVE BACKING FOR ALL OF THE PLACES WHERE RM4905-002 IS USED. IF YOU DECIDE TO USE VELCRO, BE SURE TO USE A QUALITY VELCRO WITH THE EXTRA STRENGTH ADHESIVE BACKING.

Next we will apply felt and 3M tape that will fix the interior panels in place. Begin by wiping the left side fuselage tubes with rubbing alcohol where the 3M Foam Tape (red RM4905-002) and the anti-vibration felt (white RM1002-003) will be applied. Apply the tapes as shown in these Photo 104 and Photo 105.

In addition you will need to apply the RM4905-002 tape to the top flange of the left side interior panel. See Photo 106 for the correct position. You don't want the tape to show when the two panels are joined.

Next we need to clean the left side interior panel. Begin by wiping the backside of the interior panel with rubbing alcohol. At minimum, wipe the panel where the panel will contact the RM4905-002 foam tape. Better yet, clean the entire inside surface. Next, brush on a light coat of RM0012-01 Adhesive Promoter to areas where panel will contact the RM4905-002 foam tape. While the adhesive promoter dries, we'll finish the throttle cable installation.

SECTION 18

THROTTLE CABLE ATTACHMENT

Assemble the throttle cable as shown in this Figure FN13. Fasten the cable to the throttle assembly that is connected to the left side-panel.

Then, place the left side panel into position in the fuselage.



Photo 108

Work the sheath of the throttle cable through the bracket as shown in the Photo 108. Next tighten the cable lock nuts. After tightening, apply Torque Seal to the nuts.



Photo 109



Complete the throttle cable installation by tightening all the fittings. After tightening, apply Torque Seal to the nuts. Press the panel into place. Do not remove the top cover tape at this time. It will be removed in the next step.

Photo 110

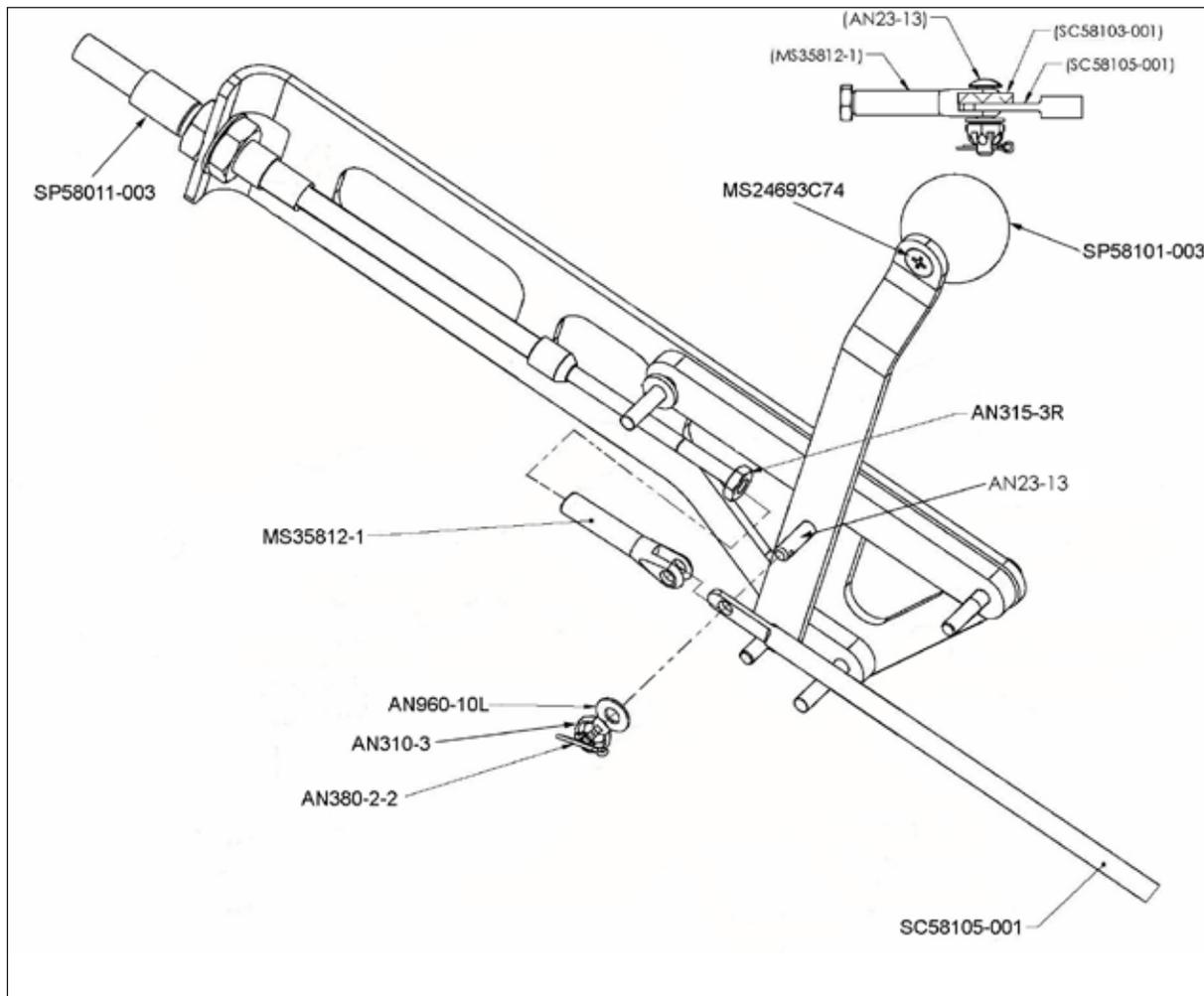


Figure FN13

SECTION 19

LEFT FRONT INTERIOR PANEL

Now it is time for the left side panel installation. Starting by pulling a short piece of the red cover tape loose from each end of the piece on top of the side panel. Tape the end of the red cover tape to the outside of the fuselage with masking tape to hold its position. Next, press the left side interior panel into place as you pull the remainder of the red cover tape from the double stick tape. Now pull the aft end vertical cover tape. Press the panel firmly into position against the foam tapes.



Photo 111

It is time to finish the fuel selector installation. Begin by checking the fit of the small fuel selector panel insert. In the next two Photo 112 and Photo 113 you can see the selector position without and then with the panel insert. Trim the fuel selector panel insert as necessary to achieve a proper fit.



Photo 112

Next insert one of the screws through plate, bracket and into the fuel selector. Then follow with the second screw.



Photo 113

**Photo 114**

Next, fasten the panel insert to the interior panel with screws per Figure FN14.

**Photo 115**

We finish this section by installing the fuel valve handle. The parts for the fuel selector assembly can be seen in Figure FN14.

Begin by installing the springs on the plungers. Then install the plunger cover with two screws.

**Photo 116**

Lastly, install the fuel selector handle by inserting and tightening the center screw.



Photo 117

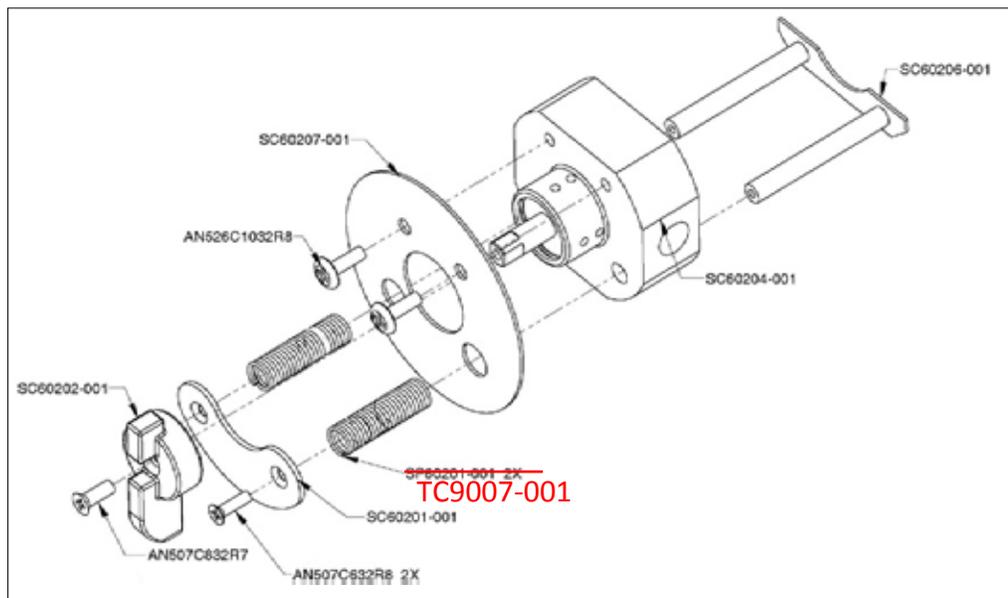


Figure FN14

**Photo 118****SECTION 20 REAR SEAT BAR**

Locate the position for the rear seatbar and drill a hole in the side panel. The hole must be located inside the rear seat bar retaining bracket. The hole for the left and right side rear seat bar must be opened to allow proper fit of rear seat bar into the interior panels.

**Photo 119**

Use a circular file to open the hole as shown in Photo 118.

Here is the left front interior panel with the enhanced hole Photo 119. Photo 120 shows the right panel cutout.

**Photo 120**

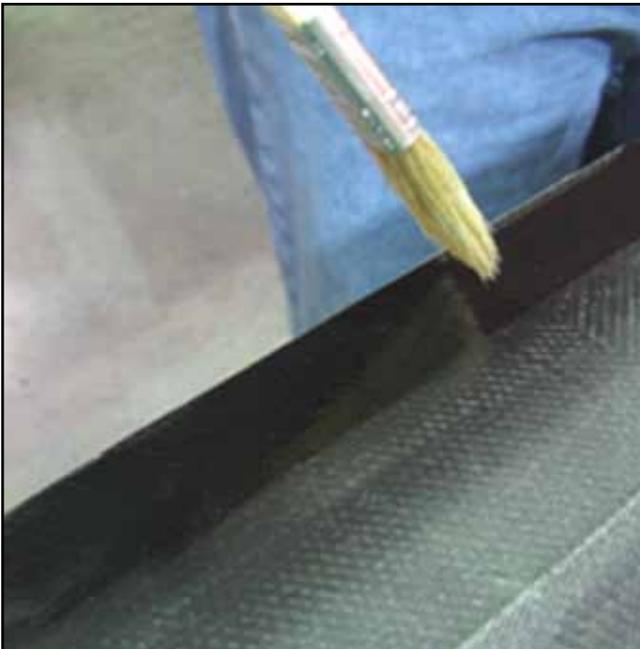
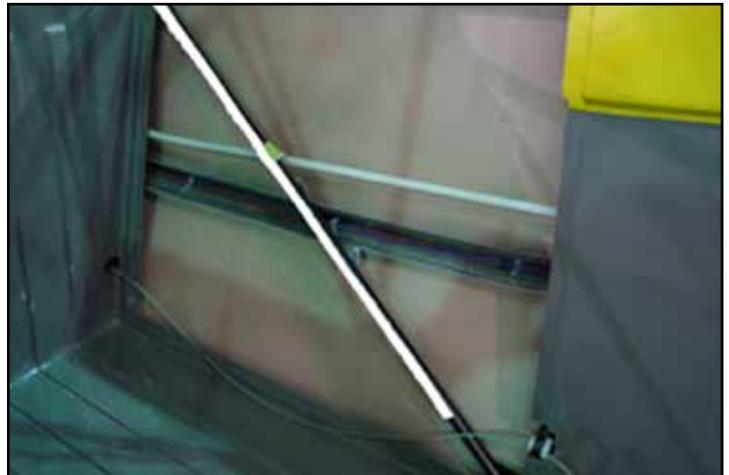
SECTION 21
LEFT REAR INTERIOR PANEL

Test fit the left rear interior panel. As in similar fitting before, mark to trim as needed. Use a die grinder or Dremel tool to trim the panel. Smooth the edges with sandpaper.

**Photo 121**

Next clean the inside of the left rear panel with rubbing alcohol. Then, apply the 3M Foam Tape (red RM4905-002) and the felt tape (white RM1002-003). The felt tape goes on the diagonal tube. The red tape goes on the top flange of the left rear interior side panel.

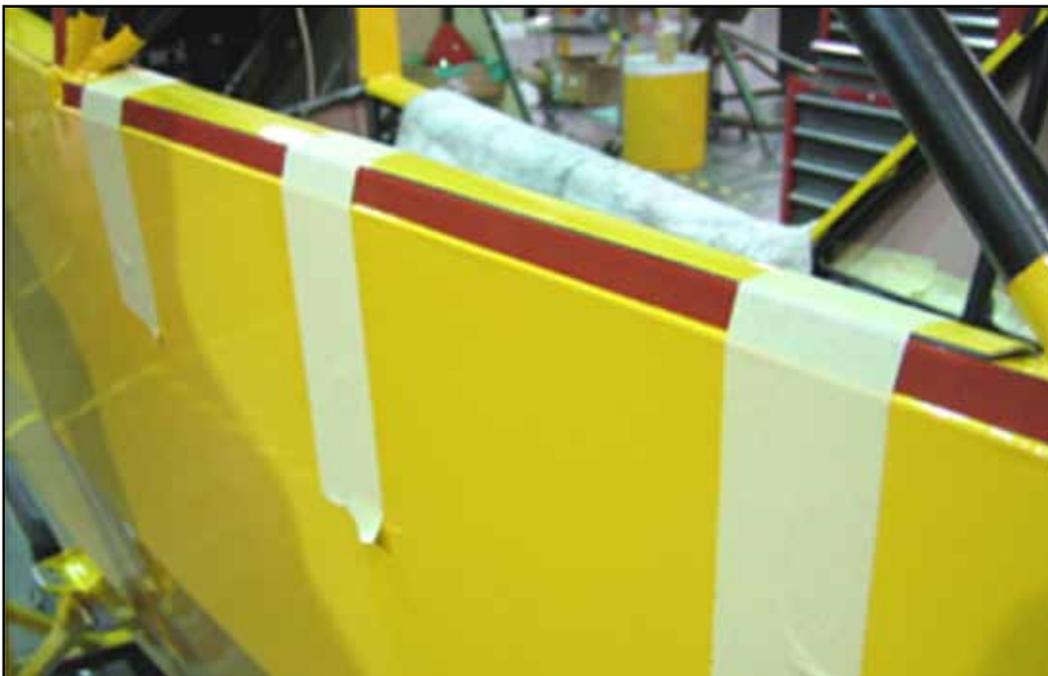
Brush on light coat of Adhesive Promoter where foam tape will contact panel.

**Photo 123****Photo 122**

**Photo 124**

Start peeling the red cover tape on each side (at the ends) and hold the ends in place with masking tape.

Finally, install the left rear interior panel by pulling the red cover tape from the top of the panel. Apply pressure as tape is pulled. Secure the panel in place with masking tape until foam tape sets.

**Photo 125**

The last step for this panel is installation of the 22 interior panel push rivets per Figure FN15.



Photo 126



Photo 127

LOG & INSPECTION SHEET FINISH # 3

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.22	Ensure door hinge is installed and secured per manual.		
1.23	Ensure proper fit of side panels before installation.		
1.24	Install/connect throttle cable to interior panel.		
1.25	Ensure Bowden clamp has been secured.		
1.26	Verify fuel system is connected correctly with no low spots.		
1.27	Install Left side throttle panel.		
1.28	Ensure fuel selector installed per manual.		
1.29	Install left side rear panel.		
1.30	Install lower door.		
1.31	Install right side panel.		
1.32	Install right rear side panel.		

SECTION 22 RIGHT SIDE INTERIOR PANELS

The left side has been dealt with and it is now time to address the right side interior panels. We begin, as we did on the left side, by cleaning the right side fuselage tubes. Use rubbing alcohol to clean each of the places that the 3M Foam Tape (red RM4905-002) and the anti-vibration felt tape (white RM1002-003) will be applied. Next apply the felt tape as shown here.

Please note the difference in the shape of the hole for the rear seat bar. Make the right side hole like the “key hole” shown in Photo 132.



Photo 128



Photo 129



Photo 130



Photo 131



Photo 132

SECTION 23 DOOR HEADER

The door header installation begins with the installation of a grommet (MS35489-14) for the bottom of the fuel gauges on both headers (left and right).

Apply 2 strips of 3M Foam Tape for the door headers (one per side on top of the fuselage tube).

Now it is time for the door header installation. Test fit the header. No adjustments should be necessary but it is always good to check. Next, as previously described for other panels, pull the ends of the red cover tape loose on both ends of the tape. Place the header and then pull the cover tape while pressing header into place.

Cable tie mounts are small plastic pieces that have adhesive on the back and slots for fastening cable ties (zip tie).

Place a cable tie mount on the right hand header and zip tie the harness in place.

**Photo 133****Photo 134****Photo 135****Photo 136****Photo 137**

SECTION 24 WINDOW FRAME ASSEMBLY

Assemble the window frame as shown in Figure FN16. **DO NOT INSTALL THE SIDE WINDOW PLEXIGLAS AT THIS TIME.**

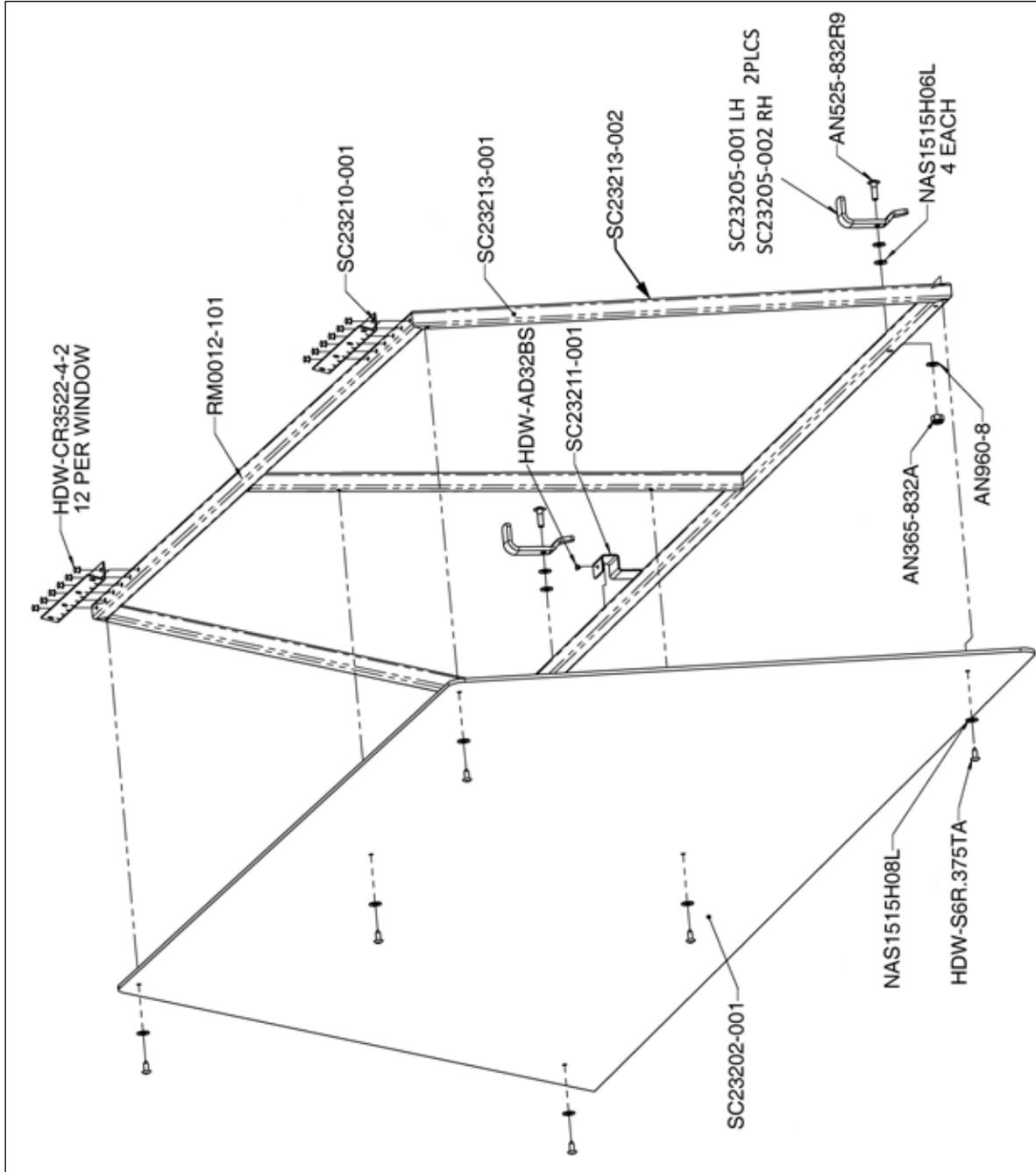


Figure FN16

SECTION 25 WINDOW HINGE

The next step addresses the upper right side door/window hinge. Begin by placing a drop cloth or packing quilt into the cockpit to catch chips and shavings.

**Photo 138**

Next we will match drill the door header hinge holes. Figure FN17 depicts the drill hole locations.

**Photo 139**

Use a long #40 bit to match drill pilot holes for the hinge mounting holes in the header. Once these pilot holes are drilled, finish drill the holes with a #18 bit.

**Photo 140**

Repeat the drilling on the opposite side.

**Photo 141**

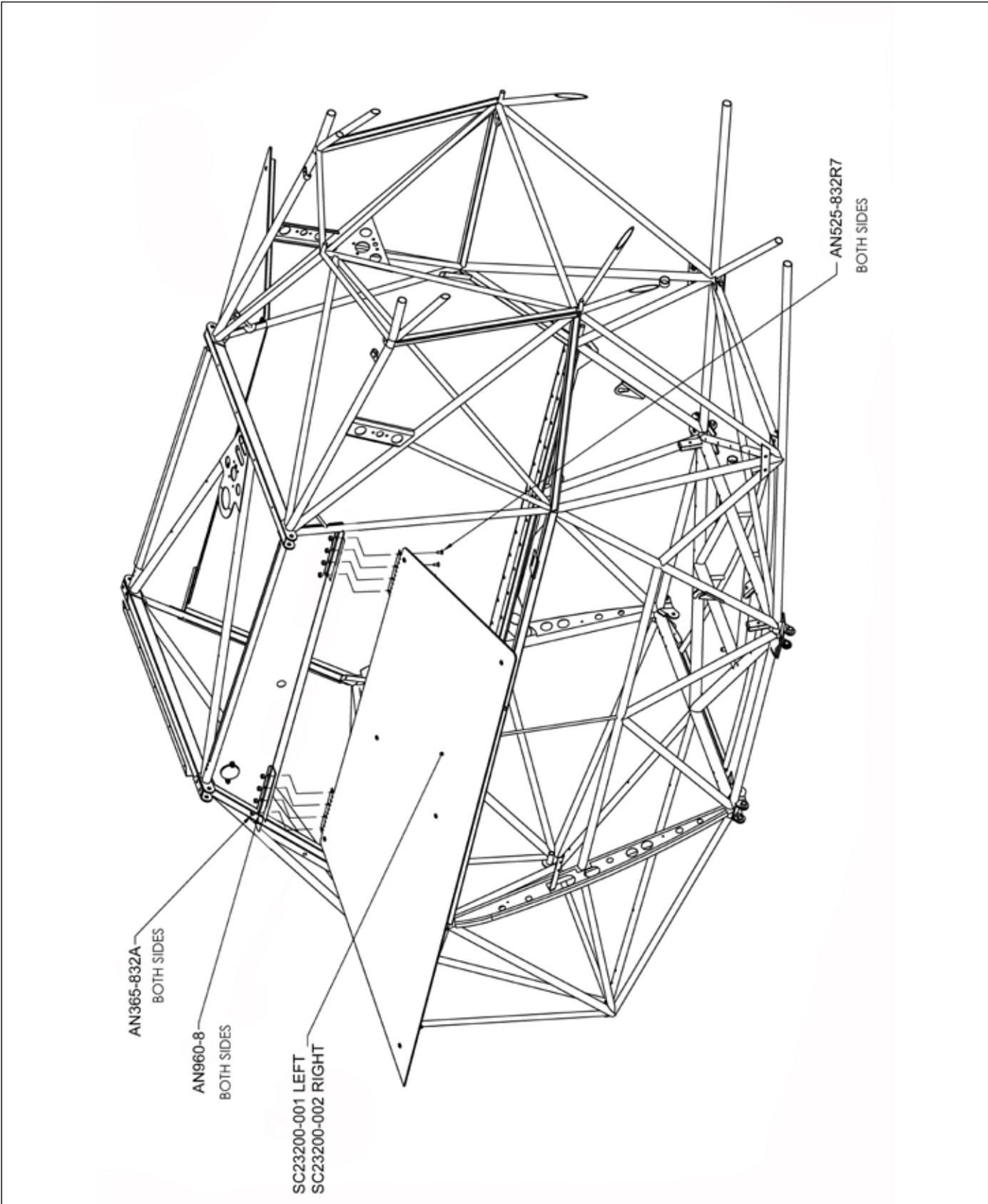


Figure FN17

SECTION 26 INSTALL WINDOW FRAMES

Next, it is time for the side window mounting. Begin by installing the left hand window into the opening. Ensure that the reveal (the gap between the frame and the fuselage) of the window frame is consistent top to bottom and fore and aft. The window frame sides should be parallel with the fuselage.

Once your happy with the position, fasten the window frame with 2 bolts (one each on the forward and aft hinges) consistent with Figure FN17.



Photo 142



Photo 143

SECTION 27 RIGHT REAR WINDOW

Once upon a time you installed the 3M Foam Tape for the "D" side windows. You also painted the "D" window in your choice of pattern (or no paint). It is now time to install the rear "D" windows.

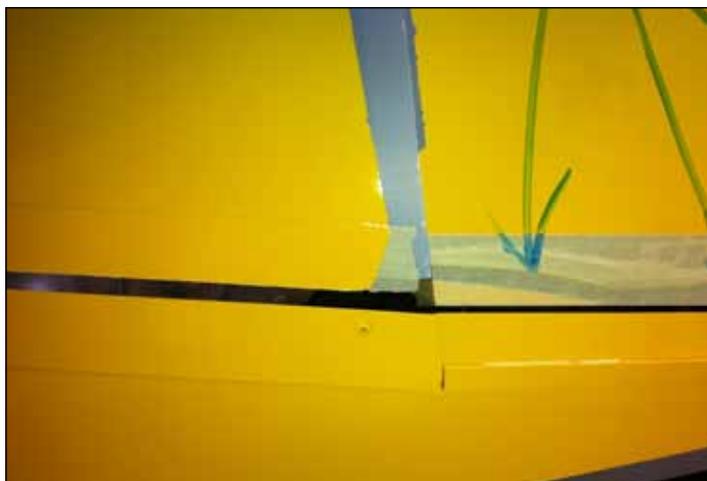
Let's work the left side first. Begin by pulling the ends of the red cover tape loose from the foam tape. Fasten the tape tails to the side of the fuselage with masking tape. Fit the "D" window into position and then pull the cover tape off the foam tape (top and front sides) to secure the window.

Photo 145 is an example of the tape tail fastened to the fuselage.

**Photo 144****Photo 145**

Repeat these steps for the right side "D" window.

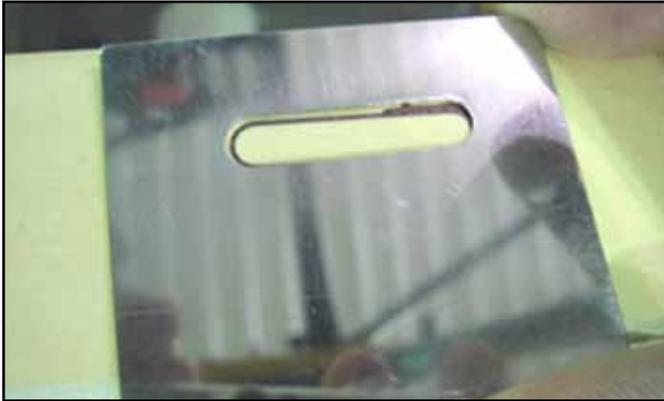
Move to Section 13

**Photo 146****Photo 147**

SECTION 28 WINDOW LATCH

Next we install the window latches. Begin by placing a piece of 1 ½" masking tape over the location of the window latches. You can discern this position by noticing the closing position.

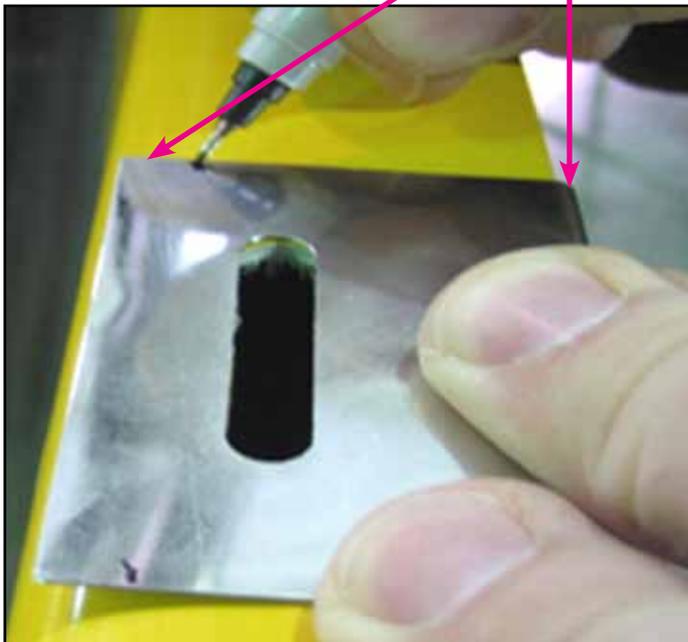
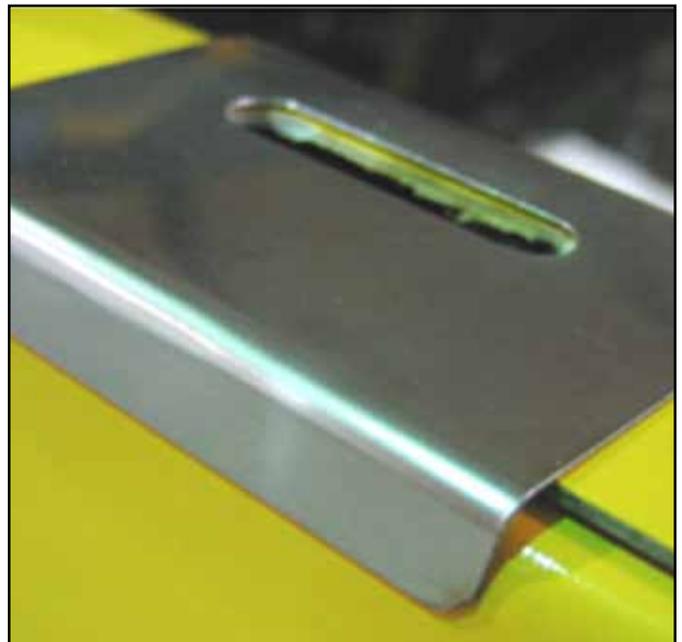
Close the window and make a mark where the latch will be in the closed position. Next, use the strike plate and trace the cut out needed for the latch.

*Photo 148**Photo 149*

Make cut out with the die grinder or Dremel tool and a cutoff wheel. Use a combination of round and flat files to trim the edges of the cut. You may wish to finish the edge by sanding the edges smooth. Assure that the latch works smoothly.

Next we tackle the window latch plate installation. The latch plates are SC23012-001 for the left side and SC23012-002 for the right side. Position the window latch plate over the slot you just cut and mark the location of the bend on the outboard edge.

Use a hand brake, bench or floor brake or other bending method to bend the piece.

*Photo 150**Photo 151*

Test fit the plate. The bends should roll over the edges and fit snugly on the sides. If you like the fit, take the plate to a belt sander, round the corners and smooth the edges.

Now, apply 3M Foam Tape (RM4905-001) to the backside of plate. Remove the tape completely from the slot the latch will go through.

Remove the cover tape and press the plate into position.



Photo 152



Photo 153

SECTION 29 SEAT AND SEAT HOLDER INSTALLATION

Next we install the front seat. Begin by placing the polyethylene tape (RM1072-001) on the seatbase as shown in Photo 154. Next you need to gather the hardware shown in Figure FN18 for seat installation. Install the front seat as shown in Photo 155 and Figure FN18.

**Photo 154****Photo 155**

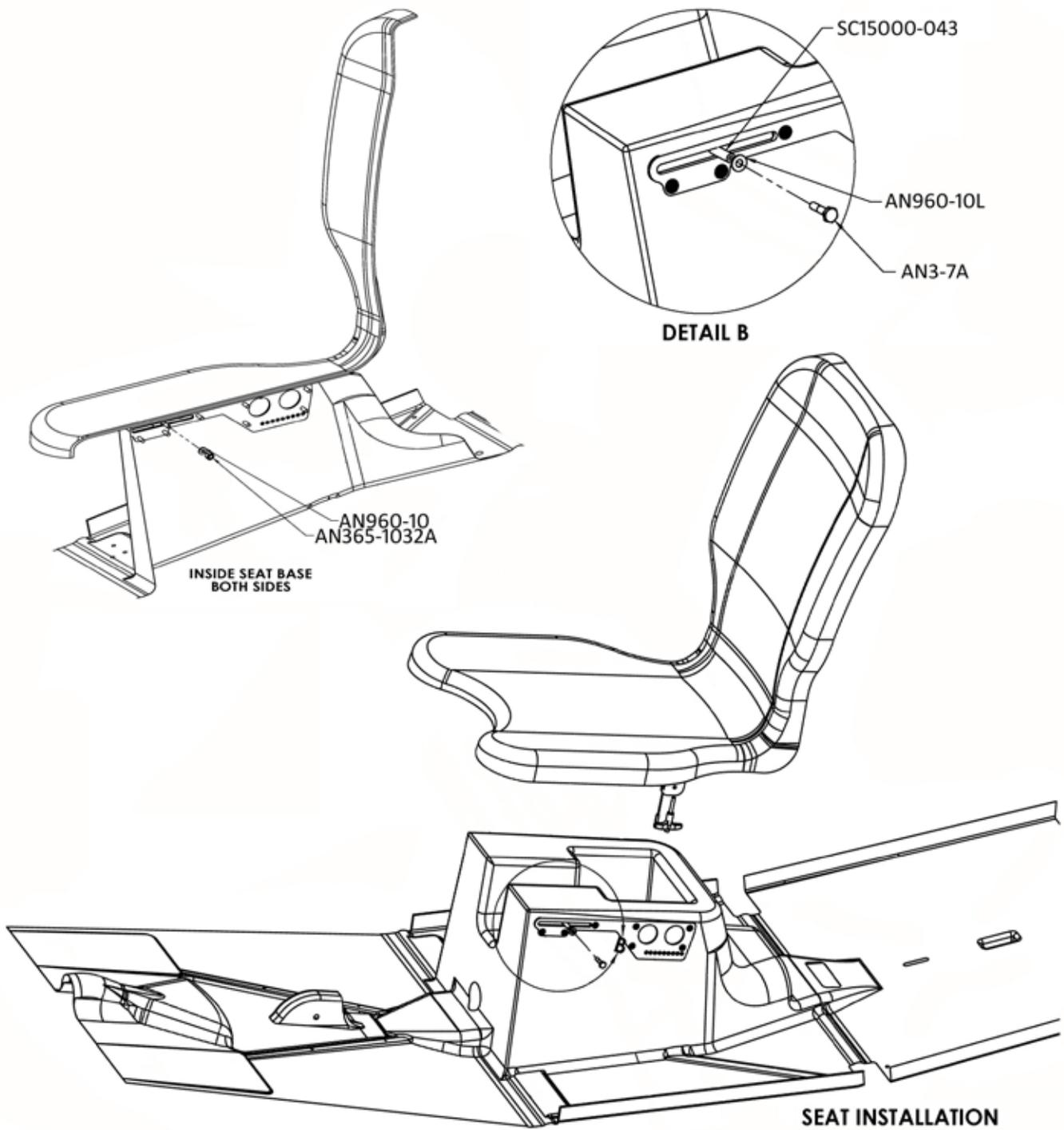


Figure FN18

Install the rear sling seat upper straps as shown in Photo 156 and Figure FN19. Do not fully loop the strap through slide adjuster, you will need to adjust the straps after the seat is installed. Next slide the rear seat crossbar through the bottom front of the rear seat. Ensure that you have installed the rear seat tiedowns around the rear seat bar as shown in Photo 157 and Photo 158. Install the rear seat crossbar into the cutouts previously made in the side panels. Connect the rear seat tiedowns to the floorboard and pull the strap tight. Adjust the upper straps so the bottom of the seat is level in the aircraft and complete the slide adjuster installation as shown in Figure FN19. **YOU WILL NEED TO FOLLOW THE LOOPING INSTRUCTIONS IN Figure FN19, OR THE REAR SEAT WILL MOVE IN THE SLIDE ADJUSTERS.**

**Photo 156****Photo 157****Photo 158**

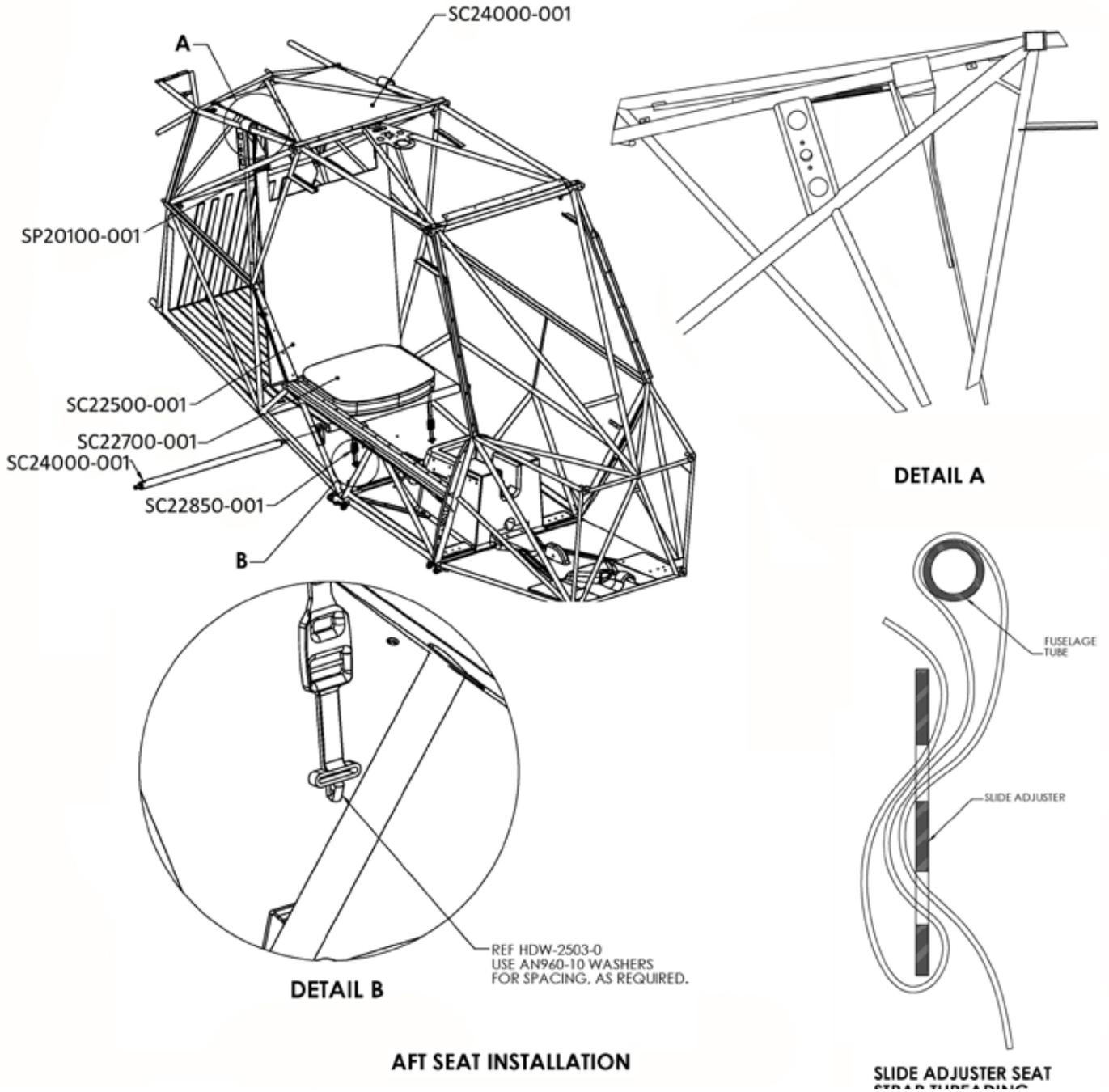


Figure FN19

Install the rear seat holder as shown in Figure FN20 and Photo 160. Just hook the loops over the hooks. You will notice that the chart holder faces forward and the POH holder faces to the right side of your aircraft.

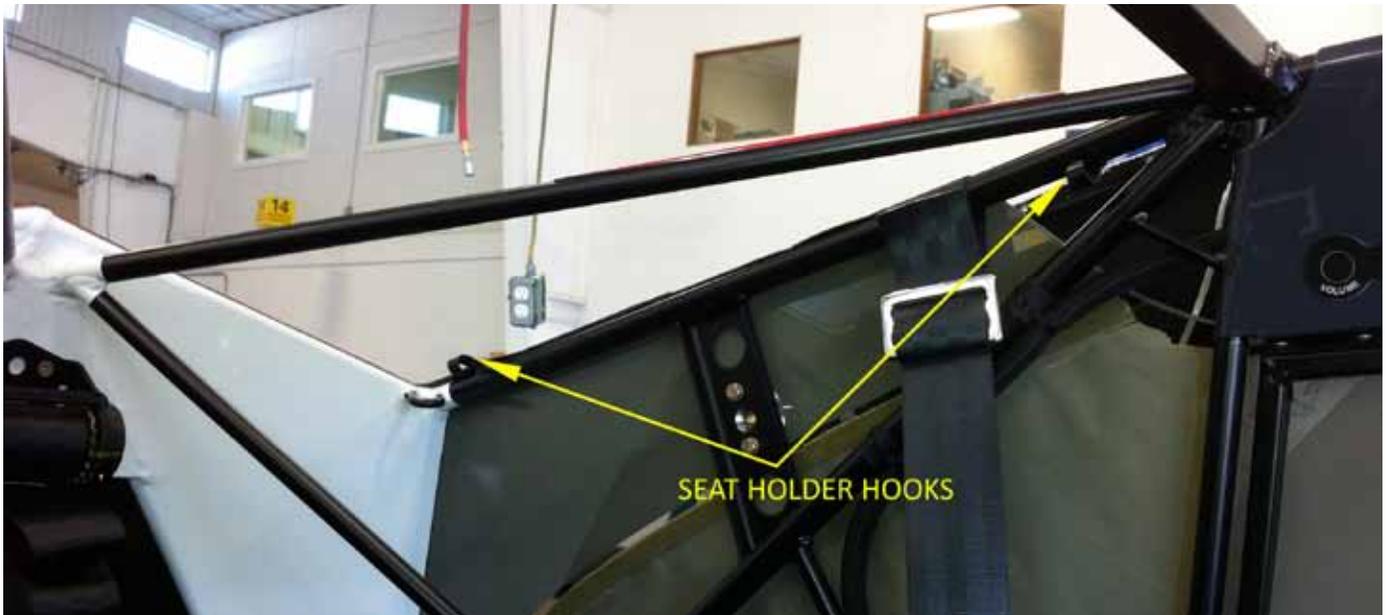


Photo 159



Photo 160

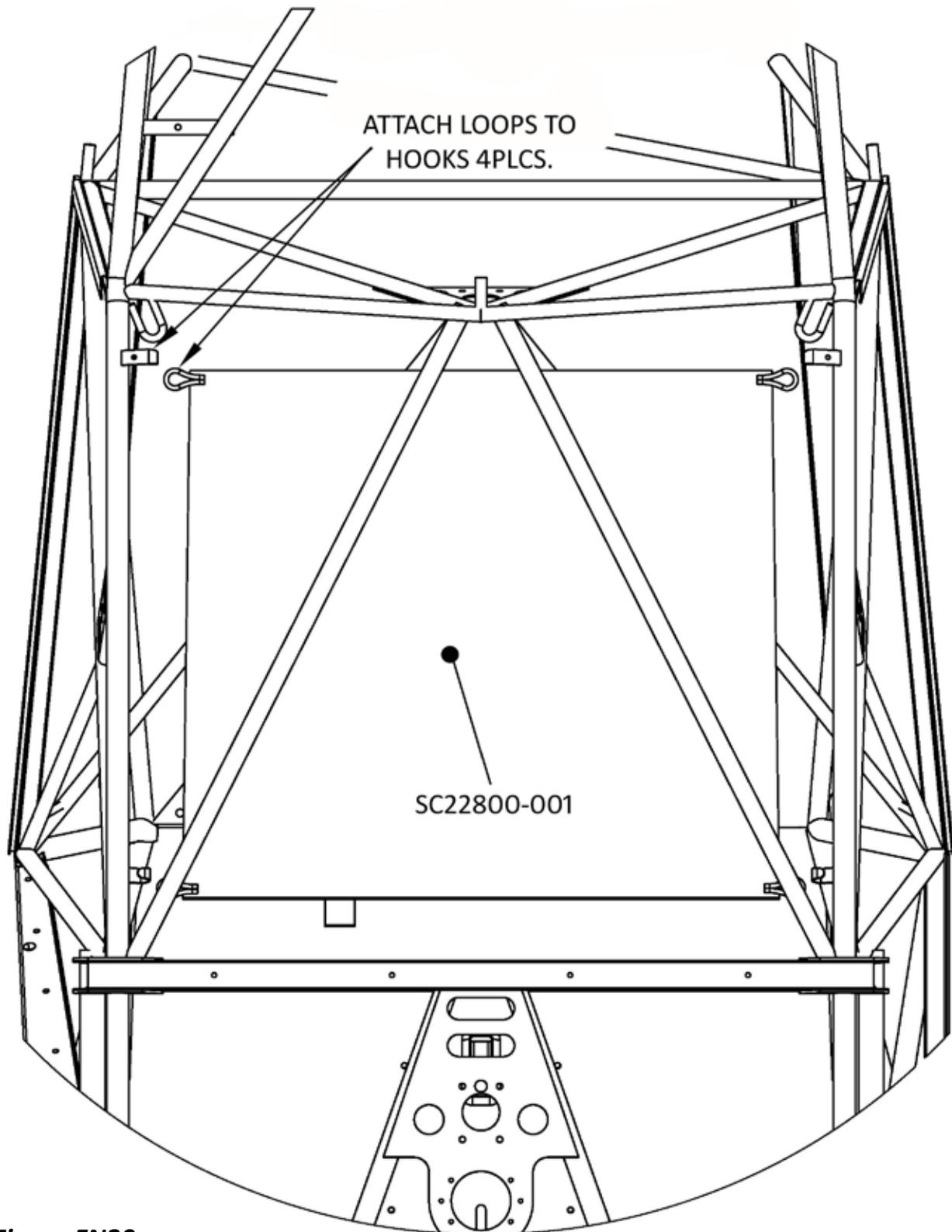


Figure FN20

SECTION 30 FUEL LOW POINT DRAIN

Carefully trim the fabric from the center of the rear fuel low point drain fitting that was installed during the pre-cover work on the fuselage. An Exacto blade will facilitate this work.

**Photo 161**

Next, once the hole looks like the picture to the right, apply Loctite 567 to the threads on the drain assembly. Then thread the drain fitting (SP60100-001) into the low point fitting.

**Photo 162**

Firmly secure the quick drain into the fitting.

**Photo 163**

LOG & INSPECTION SHEET FINISH # 4

Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 24 Listed Tasks				
	Task #				
F19	Fabricate Windows				X
F20	Assemble Windows to Fuselage			X	
F21	Fabricate Doors/Canopy				X
F22	Assemble Doors/Canopy to Fuselage			X	

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.33	Install rear windows.		
1.34	Install window strike plates and adjust window latches per dwg.		
1.35	Ensure all windows are sealed per drawings.		
1.36	Install side windows.		

SECTION 31 HORIZONTAL STABILIZER

It is time to make this fuselage look a lot more like an airplane. Let's get the horizontal stabilizer ready. Begin by identifying the left and right side stabilizers. This can be accomplished by observing the bottom fabric seam. The bottom will be rougher than the top. The top looks very smooth compared to bottom. Once identified, write "right" and "left" on some masking tape on the appropriate stabilizer.

Next, go to your parts storage and locate the front and rear stabilizer tubes. These are part number ~~SC15004-005~~ **TC3004-003** for the front and ~~SC15004-007~~ **TC3004-001** for the rear.

Be sure that they are clean and then insert the tubes into the front yoke and rear support.

Next we will mark the stabilizer tubes. The goal is to have the both tubes centered in the fuselage. Use a rule to measure the amount protruding from each side and then mark the tube insertion point (both sides) with your Sharpie pen. Remove both tubes and ensure that the lines are clearly visible. There are more photographs on the next page.



Photo 164



Photo 165



Photo 166



Photo 167



Photo 168

Next we will be drilling the stabilizer. Begin by locating the hole in the stabilizer leading edge in accordance with Figure FN21. Center punch and drill the holes (left and right stabilizer) with a #30 bit. Be careful to have the holes centered on the tube.

Even with use of a center punch, the drill can have a tendency to wander because of the curved surface. Once drilled, clean the hole with your Exacto knife to remove any loose fibers from the fabric cover.



Photo 169

You can see the lines marked on the tubes here.

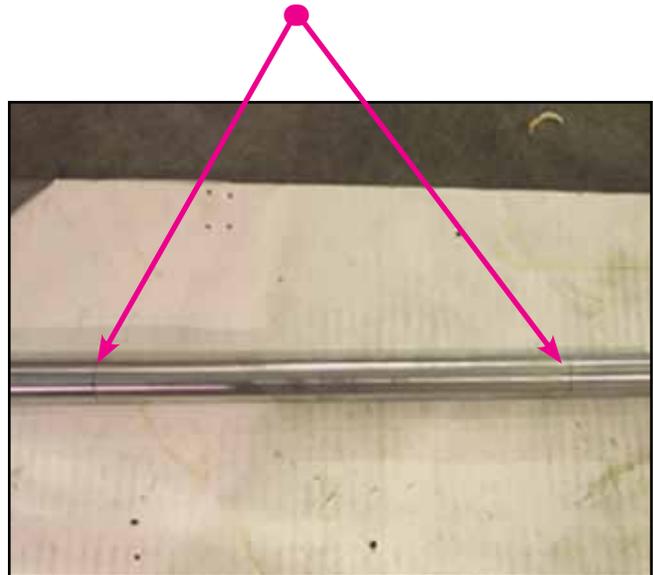


Photo 170



Photo 171



Photo 172

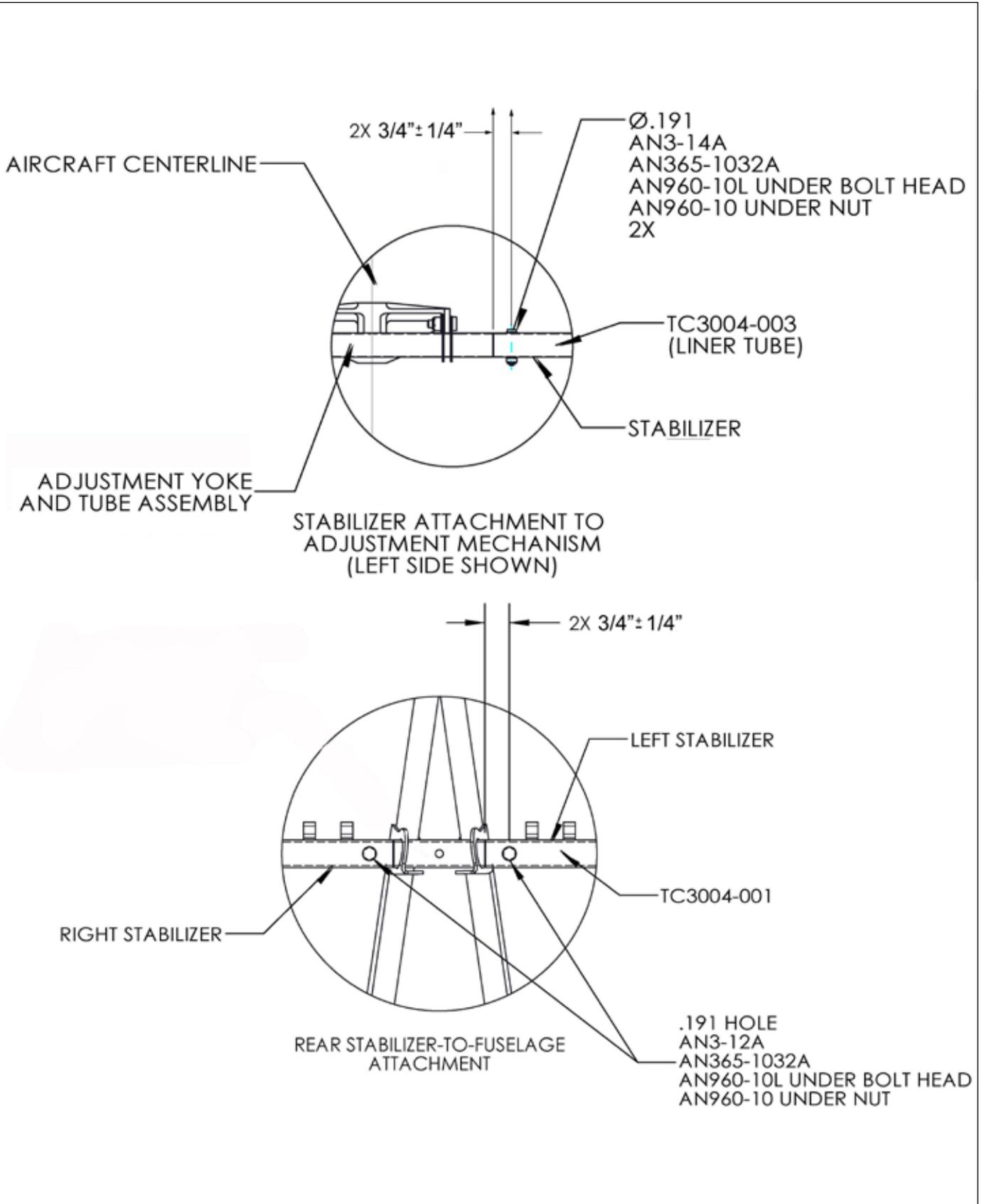


Figure FN21

**Photo 173**

Then de-burr the hole on the inside of the tube. Turn the stabilizer over and drill a matching hole on the opposite side. Repeat this process for both stabilizers.

Next we will be drilling and bolting the stabilizers to the stabilizer tubes. Begin by inserting the front tube into the leading edge of the stabilizer. Insert the tube until the Sharpie line on the tube is just showing. Use some masking tape to hold the tube in place. Then center punch the tube through the hole in stabilizer.

**Photo 174**

Drill the center punch mark with #30 bit. Apply a Cleco to hold the tube in place and turn the stabilizer over. Center punch the tube again and drill the punch mark (one side only) with a #12 bit. Place the bolt (see Figure FN21) into the hole using a piece of tape to hold it in place. Now, turn the stabilizer over and remove the Cleco. Now drill that hole using #12 bit.

**Photo 175**

Now feed the bolt all the way through the holes and secure with the washers and nut. Torque the fasteners to specification and then apply TorqueSeal to the nut.

The process for the front stabilizer tube needs to be repeated for the rear stabilizer tube. Repeat the placement and insert the stabilizer tubes, marking and drilling the stabilizer tubes steps for the trailing edge of the stabilizer. Use Figure FN21 to determine the fasteners.

Next, lube the front and rear stabilizer attach points on the fuselage with lithium grease (on both sides of fuselage).

**Photo 176**

Now we're going to insert the stabilizer into the attachment points.

**Photo 177**

It may be necessary to adjust the trim yoke a little bit up or down to allow the stabilizer tubes to slide in correctly. It may also help to have assistance from a second person during the insertion.

**Photo 178****Photo 179**

**Photo 180**

With the first stabilizer positioned correctly it is time to install second stabilizer. Start by assuring that there are no burrs on the end of either tube. The inside of the stabilizer tube may need to have burrs removed with a file in order to fit properly.

Clean the ends of the protruding tubes. They do not need to be greased.

Now, slide the second stabilizer onto the clean tubes.

The two stabilizers may slide together fairly easily but it is not unusual to need a little “persuasion” to draw the two stabilizers together. A pair of simple clips as shown below will allow you to pull the stabilizer to the center. Fold a pair of the clips using a piece of safety wire (with an exposed loop).

Place masking tape over the end of the stabilizers,

Then connect a ratchet strap to the clips (just made) on the front edge of the stabilizer. The ratchet strap runs along the leading edge of the stabilizer through the fuselage opening to the other side.

Draw the stabilizer together using a minimum of force. You may want to jiggle everything a bit as the stabilizer slides. The ratchet strap will hold everything together while the holes for the bolts are drilled.

**Photo 181****Photo 183****Photo 182**

Now, it is time to bolt the other side of the stabilizer. The following steps will be repeated for the front and rear stabilizer tubes. Begin by drilling a pilot hole using a long #30 drill bit. Be careful to not touch the drill to the fin as you can easily scratch the paint. Masking tape may be handy to protect the surface.

Drill from the top and the bottom. Then drill again using a #12 drill from the top and the bottom. Lastly, drill all the way through from one side.

Trim fabric around hole just drilled with a sharp hobby or Exacto knife.

**Photo 184****Photo 185****Photo 186****Photo 187****Photo 188**

Now, install the fasteners in accordance with Figure FN21. Torque the nuts to 40 Inch-pounds using a torque wrench.

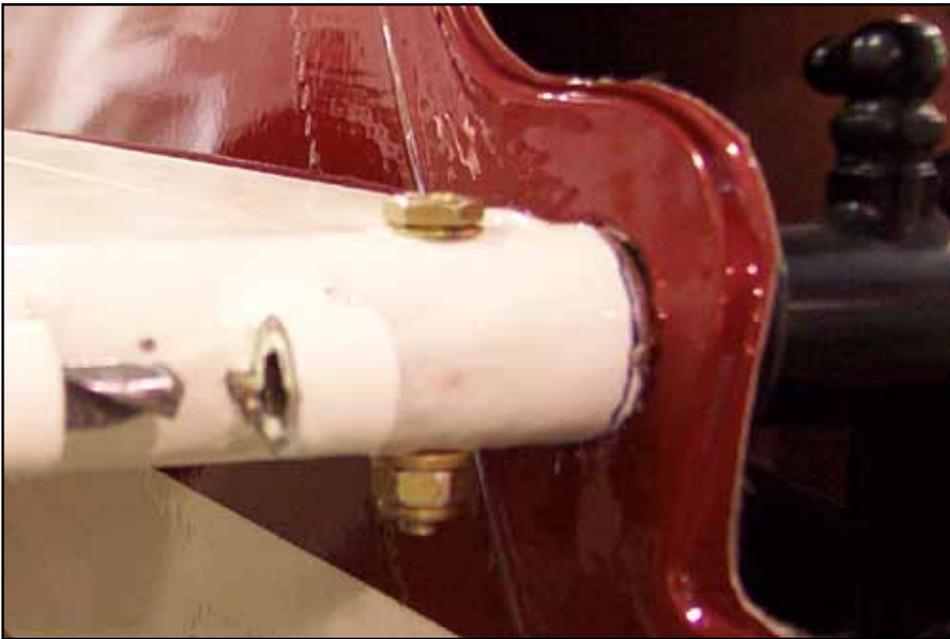


Photo 189



Photo 190

SECTION 32 TAIL BRACE WIRES

Now that the stabilizer is in place and is bolted into its horizontal position, it is necessary to add the tail brace wires. If you haven't already, remove the ratchet strap and put it away. Next, using the Exacto knife, trim away the fabric/paint from the flying wire attach points.



Photo 191



Photo 192

There are 3 places to trim:

One on the vertical stabilizer

One on each horizontal stabilizer

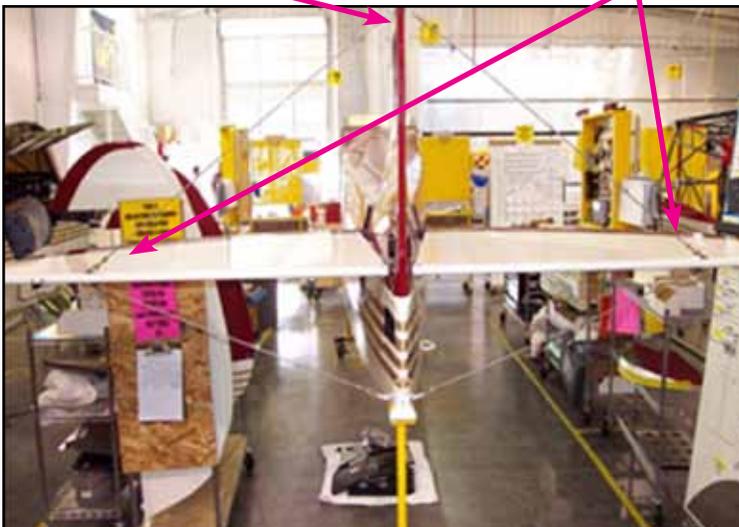


Photo 193

**Photo 194**

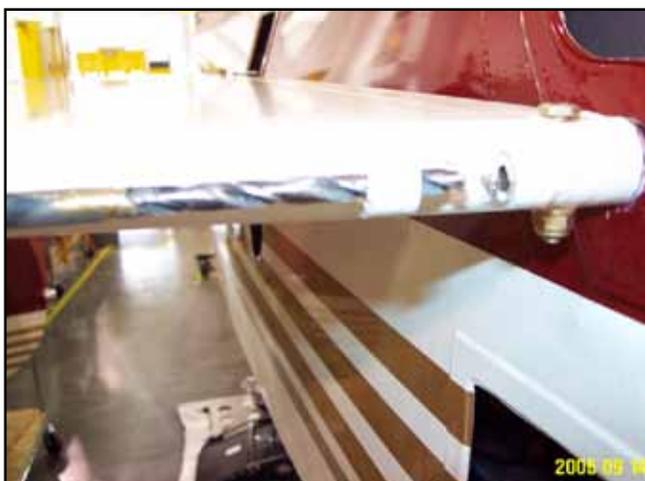
Begin the actual installation by consulting Figure FN22 to identify the hardware to employ. Now install 4 flying wires.

Long wires go on top,

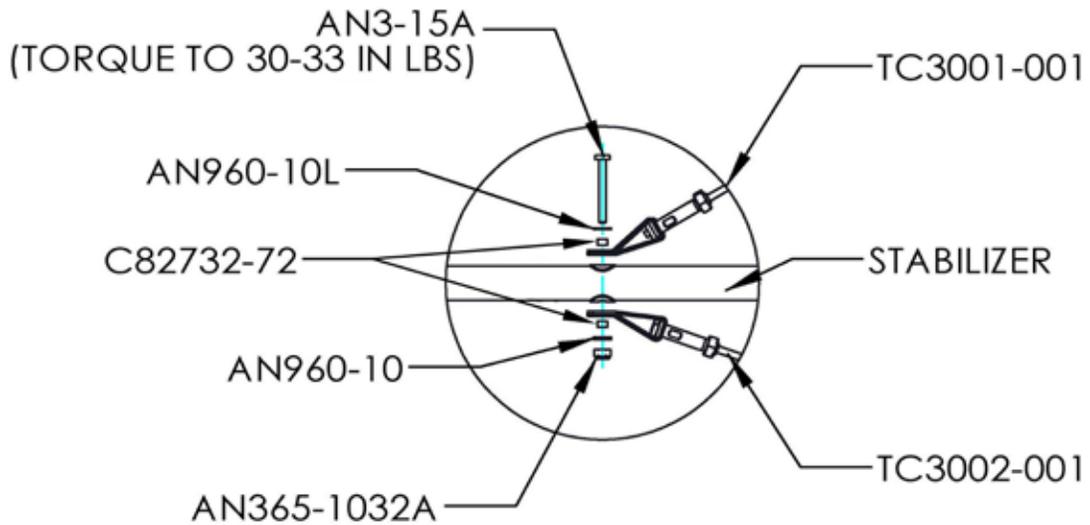
Short wires go on the bottom.

**Photo 195**

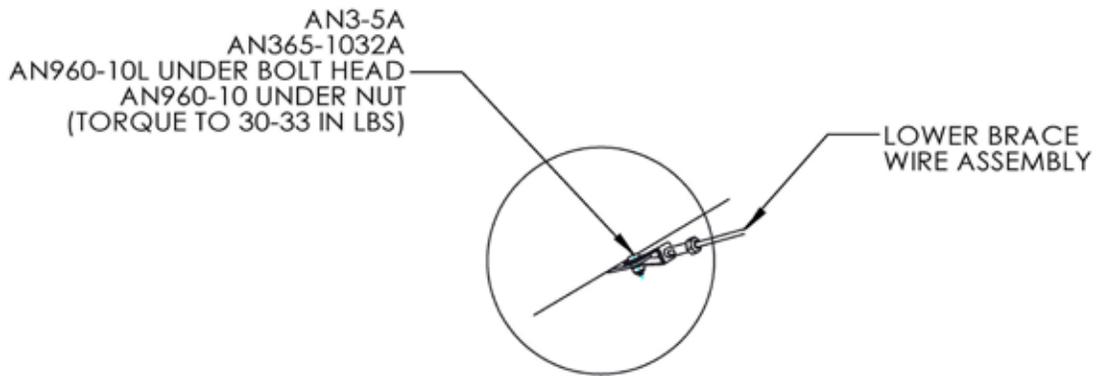
Begin with all the bolts loose at first. Make sure that the bushing (C82732-72) gets seated properly between both halves of the flying wire brace. You don't want the bushing to get 'pinched'.

**Photo 196**

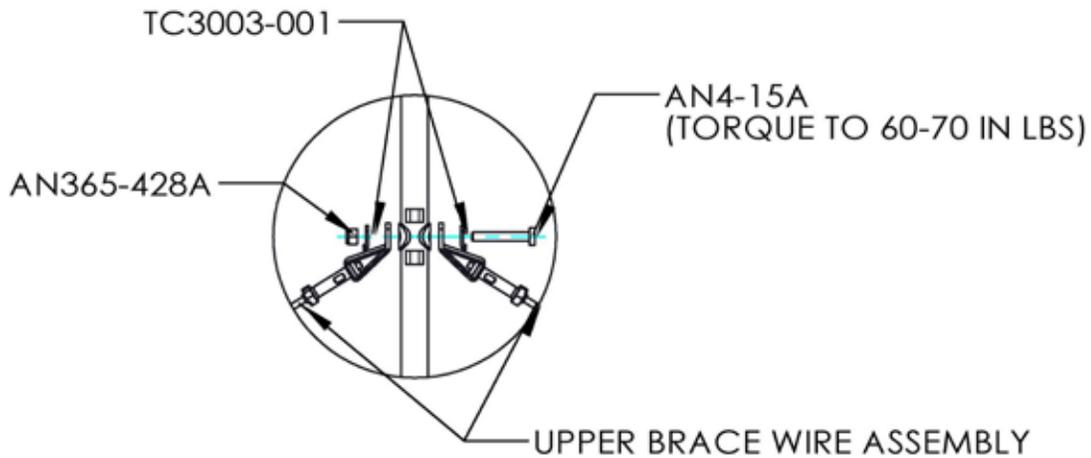
Next we need to check and possibly clean the elevator hinge points. Start by examining the hinge points. Any hinge halves that have paint in the bolt holes will need to be cleaned. For any with paint, use a drill with a 1/4" bit with 4' shank to re-drill the holes. Be certain to check the hinge halves on the elevators and the stabilizers.



STABILIZER BRACE WIRE ATTACHMENT



**FUSELAGE BRACE WIRE ATTACHMENT
(LEFT SIDE SHOWN)**



FIN BRACE WIRE ATTACHMENT

Figure FN22

**Photo 197**

It is now time to level the fuselage. Begin by tying a plumb bob to a string. Attach the plumb bob at the upper rudder hinge point such that the plumb bob point is positioned just above the lower rudder hinge point.

Now, place a 3' level across the width of fuselage at the position of the cabane vee attach points.

Check to assure that the fuselage is level. If it is not, use shims or small blocks under your 4x4 blocks to achieve level. The photograph here shows the fuselage up on gear stands but don't let that bug you. Your fuselage is still up on blocks!

**Photo 198**

Now that the fuselage is level, we can undertake the tail brace wire adjustment. Begin by placing a 36" level on each side of the horizontal stabilizer.

Now loosen all the jam nuts. Then, adjust the lower flying wires to bring the horizontal stabilizers (left and right) to approximately level. Then adjust the upper flying wires to bring the vertical stabilizer to approximately vertical in comparison to the plumb bob. When adjusting, try to keep the number of threads protruding on each end of the wire approximately equal (balanced left and right). This is not for strength but for aesthetics.

**Photo 200****Photo 199**

All 4 of the flying wires should have approximately the same initial tension. You can pluck them and listen to the sound to estimate this. All of the deviations from level or vertical should also be fairly small. If this is so, it is time to tension the tail brace wires.

We will only check the tension on one wire. When one wire is tightened, the other 3 should come to the same tension.

You have your choice: You can tension either of the top flying wires. The tension gauge has 3 components:

- 1) A reference line that is parallel to the flying wire;
- 2) A gauge for measuring the displacement of the flying wire (at its midpoint) from the reference line; and
- 3) A gauge for measuring the spring tension in the flying wire when it is displaced the correct distance.

This is the flying wire.

The procedure is basically to hook the scale to the wire and pull until the wire is in the black area on gauge while reading the tension value in the scale readout window.

This is very similar to what was done for the drag/anti-drag wires in the wing.

The tension needs to be 10 lbs. at a displacement of 0.44 +/- 0.13 inches.

Tighten all jam nuts when done. Pluck the wires for a qualitative test. The top left and top right should sound similar and the bottom left and bottom right should also sound similar.



Photo 201



Photo 202



Photo 203

**Photo 204****SECTION 33 INSTALL ELEVATORS**

We're hanging parts and it's definitely a satisfying part of the build. Let's move to the next big parts and install the elevators. Begin by applying a coating of white Lithium grease to the 4 clevis pins. You can identify the pins in Figure FN23.

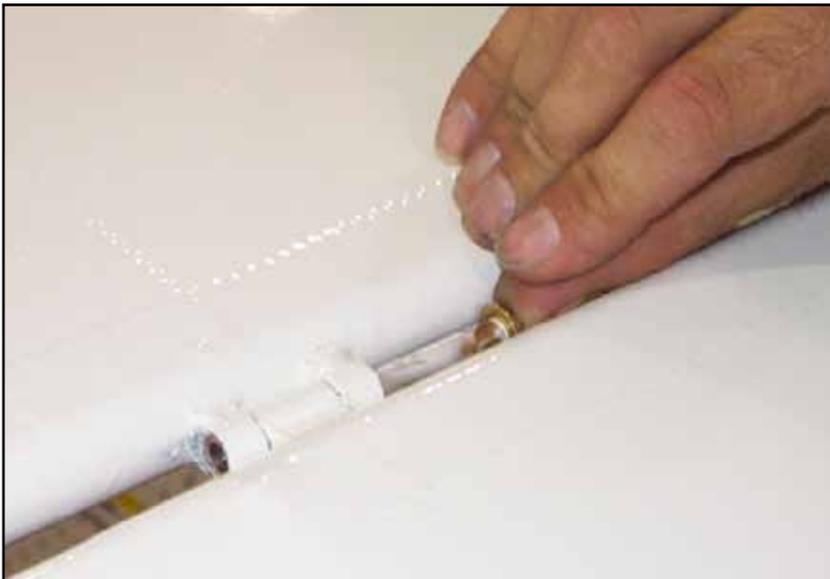
Next, place one flat washer on each pin.

Next take an elevator, a pin/washer and place the "horn" end of the elevator tube into the hole in the fuselage. Now line up the hinge points and place the first pin in the first hole. The pin should be inserted from the outboard side, pointing toward the inboard side.

Now, place the second pin in the same way.

Repeat this procedure for the second elevator.

This is the horn end of the elevator tube.

**Photo 205****Photo 206**

The elevators are in place but the pins are not yet secured. To secure the pins begin by placing a flat washer on each pin and install the cotter pin as set forth in Figure FN23.



Photo 207

Photo 208 shows the cotter pin oriented vertically with the closed end up. This is the preferred method.



Photo 208

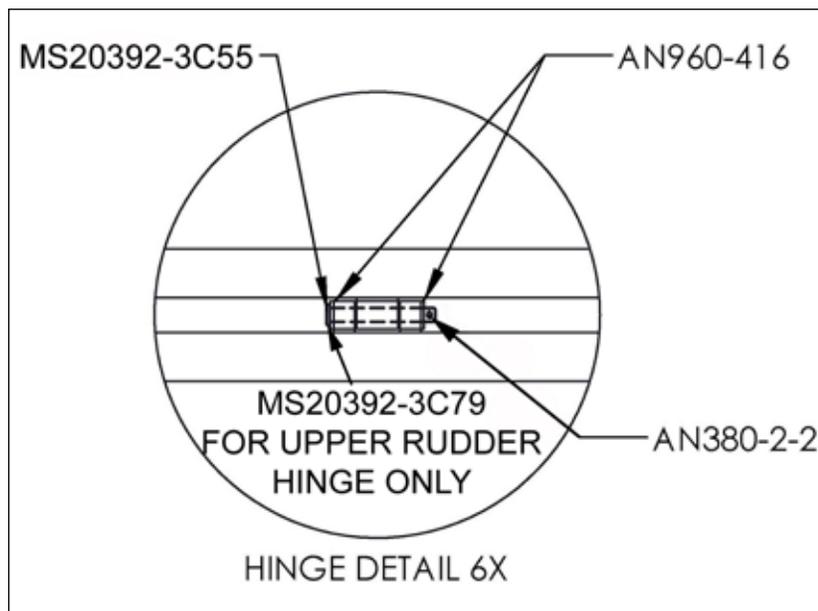


Figure FN23

SECTION 34 ELEVATOR CABLE



Photo 209

Next the cables need to be attached to the elevators. Begin by making certain that the attachment hole in the elevator horn does not have any paint in the hole. If there is paint, scrape it out with a knife blade. Attach the bungee cable spring to the top of TC2524-001 using Figure FN24.

Next, attach the top elevator cable using fasteners as set forth in Figure FN24.

Next, attach the lower cable to the elevator.

While you are installing the turnbuckle and tightening the cables, pay attention to how many threads are exposed and how many threads are inside the barrel. The amount threads showing or inside the barrel should be the same on both ends of the barrel.

THE MAXIMUM NUMBER OF THREADS SHOWING OUTSIDE OF THE BARREL IS THREE THREADS.



THE MAXIMUM NUMBER OF TURNS THAT THE CLEAVISES SHOULD BE SCREWED INTO THE BARREL IS FOUR THREADS.



Photo 210

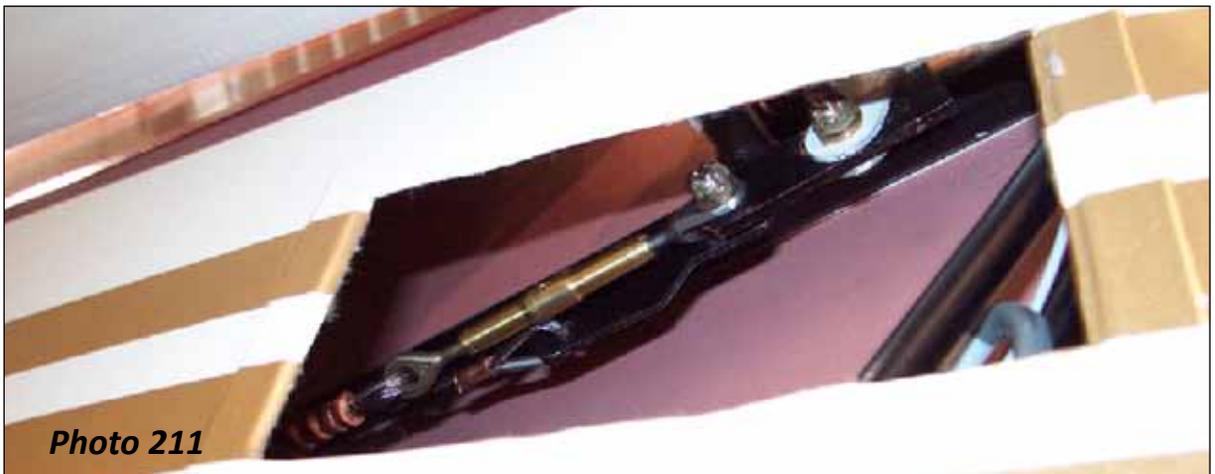


Photo 211

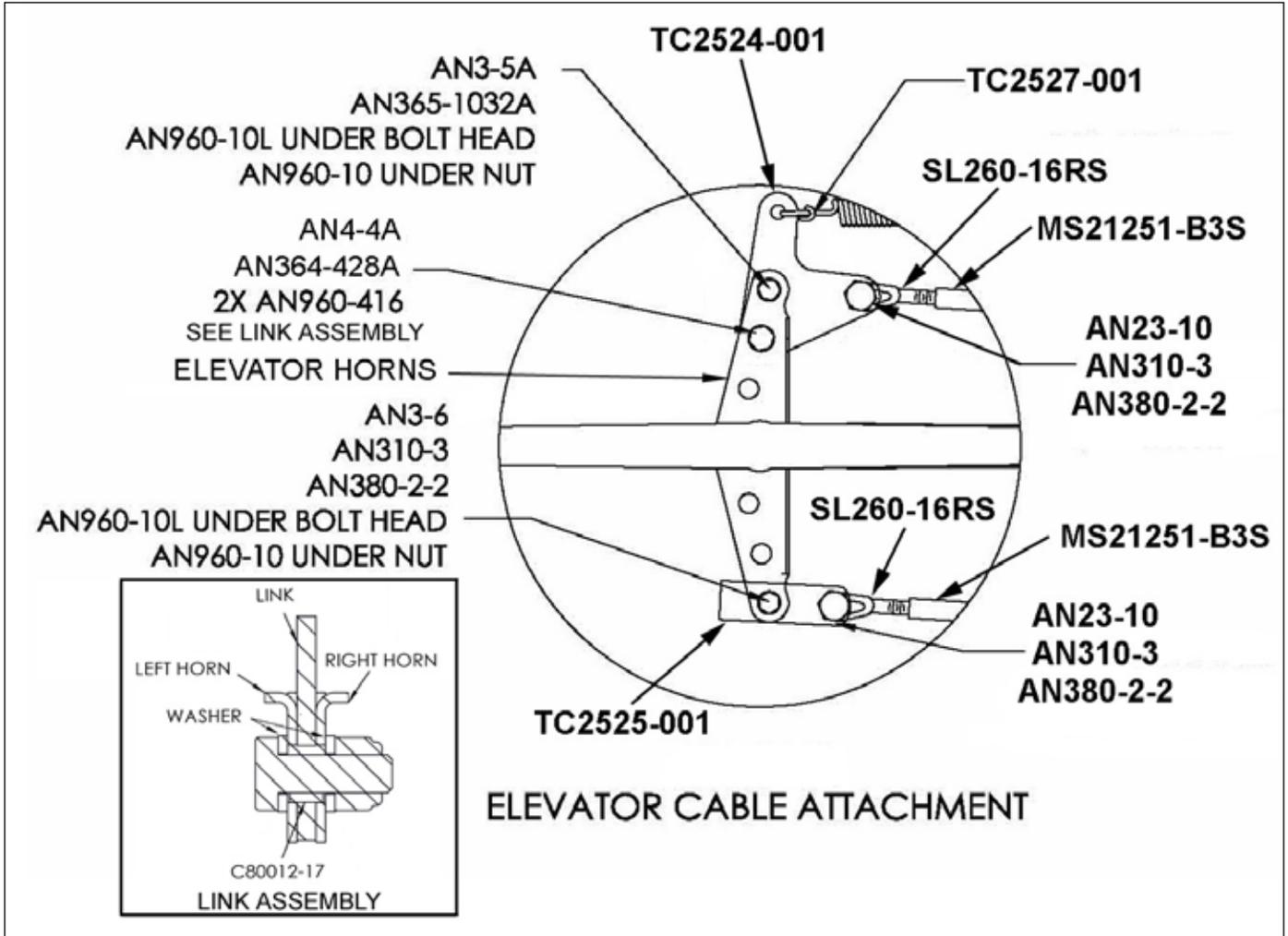


Figure FN24

SECTION 35 RUDDER

Next we address the rudder installation. The fasteners are set forth in Figure FN23. Begin by applying white Lithium grease to the pins.

Next check for paint or fabric in the hinge area. Remove any foreign material where the hinge pins will touch. When clean position the rudder and install the pins (with washers) in the hinges pointing down as in the photograph to the right.

Install the bottom washers and the cotter pins.

**Photo 212****Photo 213****Photo 215****SECTION 36 RUDDER CABLES**

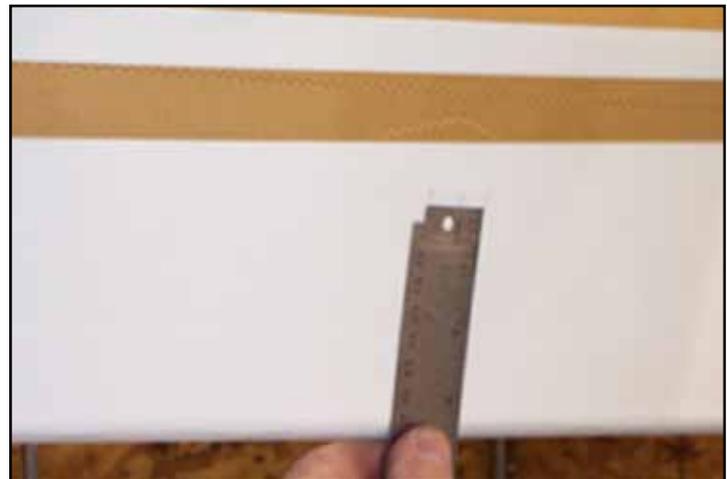
This step addresses the rudder cables. Begin by locating the rudder cable exit holes in accordance with Figure FN25.

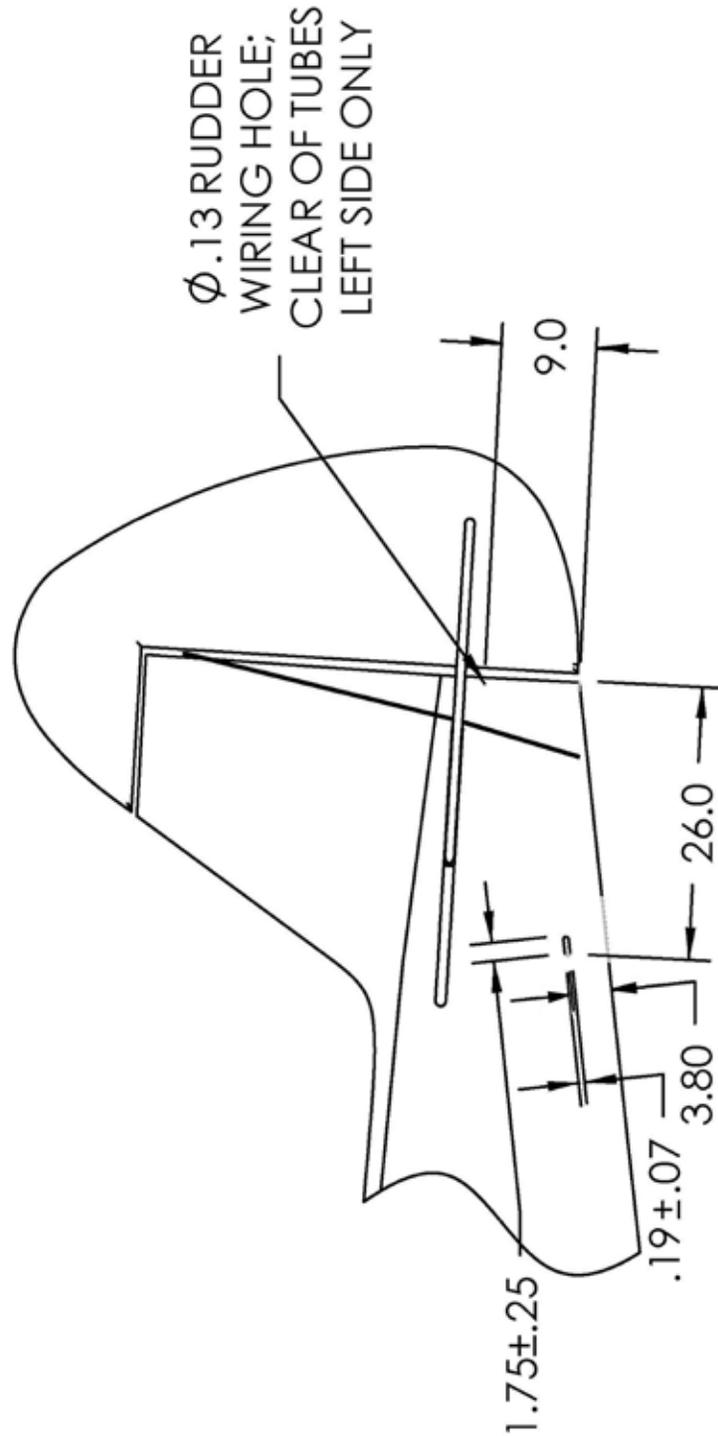
Measure and mark the slot on the fabric with a pencil.

Next, make sure all cables and wires inside the fuselage are moved away from the cut location.

Then, using a hot soldering iron, burn the slot thru the fabric. Use the point of the soldering iron. You do not want to burn a wide slot (as you would get if you burned the width of the shaft of the iron).

Next we route the rudder cables through the slot just made. Make sure the cables are not binding or wrapped around anything that would hinder their movement. After the cables are through, touch up any rough spots along the slot with the hot soldering iron.

**Photo 214**



RUDDER CABLE & WIRING HOLES

Figure FN25

Now we'll undertake the rudder cable connection. Refer to Figure FN26 for the fasteners. Attach the left and right control cables to the rudder. Lock the cotter pin when done. The attachment should look like this.



Photo 216

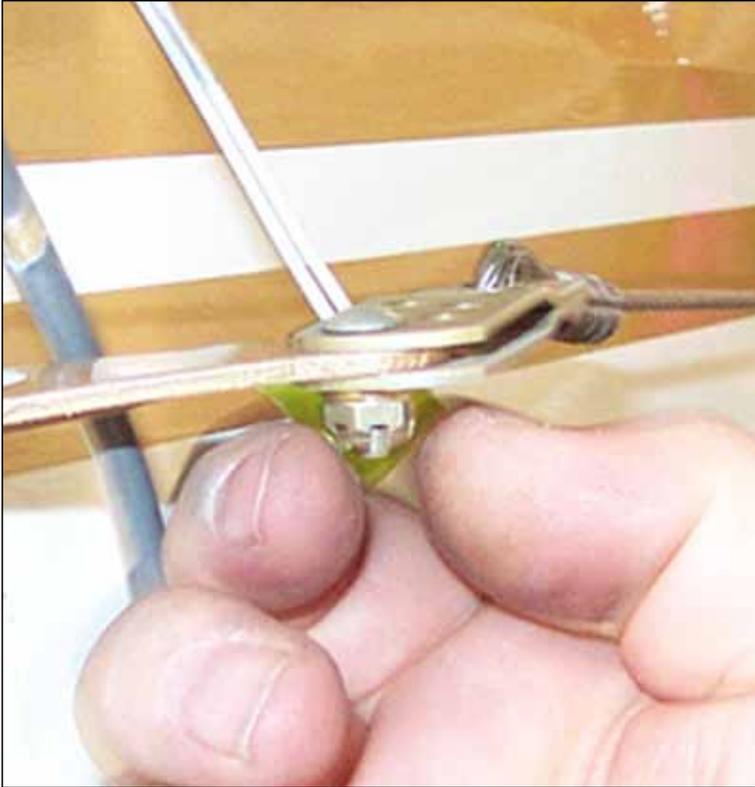


Photo 217

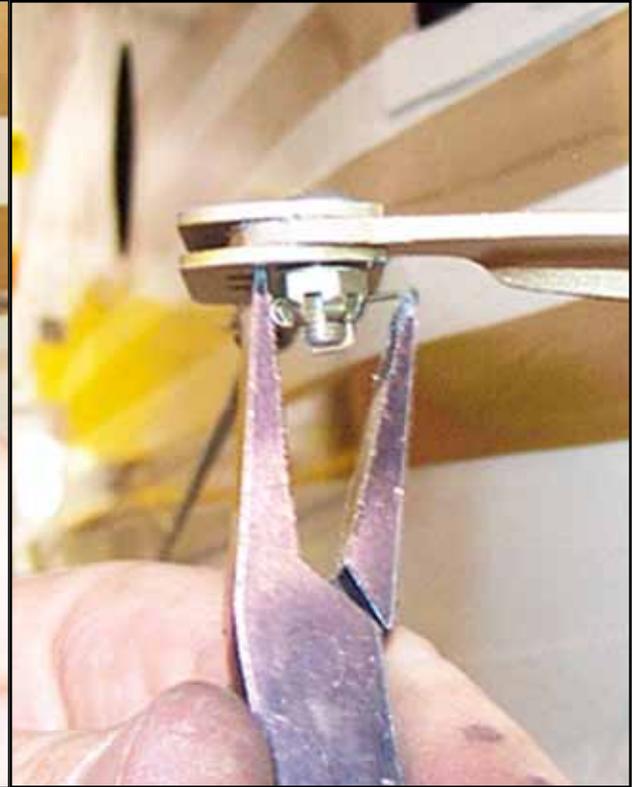
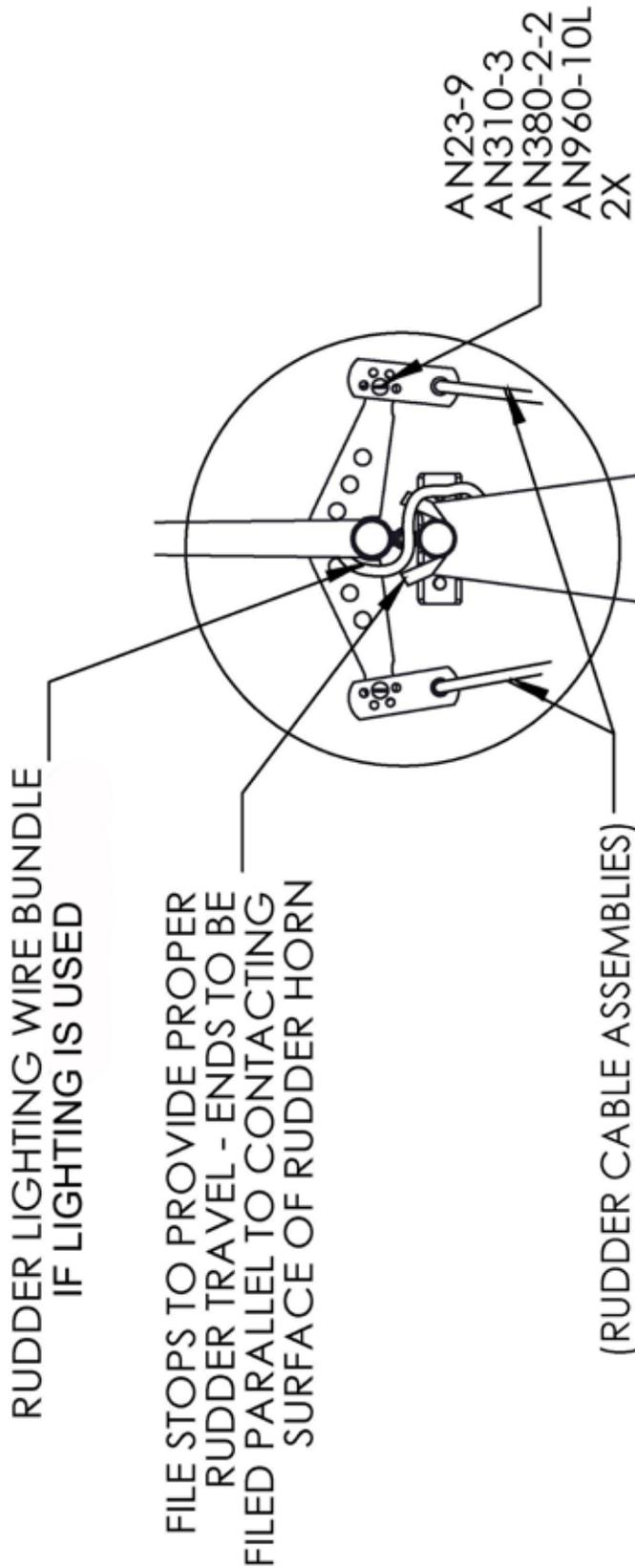


Photo 218



RUDDER CABLE ATTACHMENT

Figure FN26

SECTION 37 ELEVATOR CABLES

The next step addresses the elevator cable adjustment. Begin by measuring the distance from the center of the elevator tube to the top of the opening of the fabric.

The goal is a distance of 3 5/16". Raise or lower the elevator trim to achieve this value by using the trim switch on the control stick.

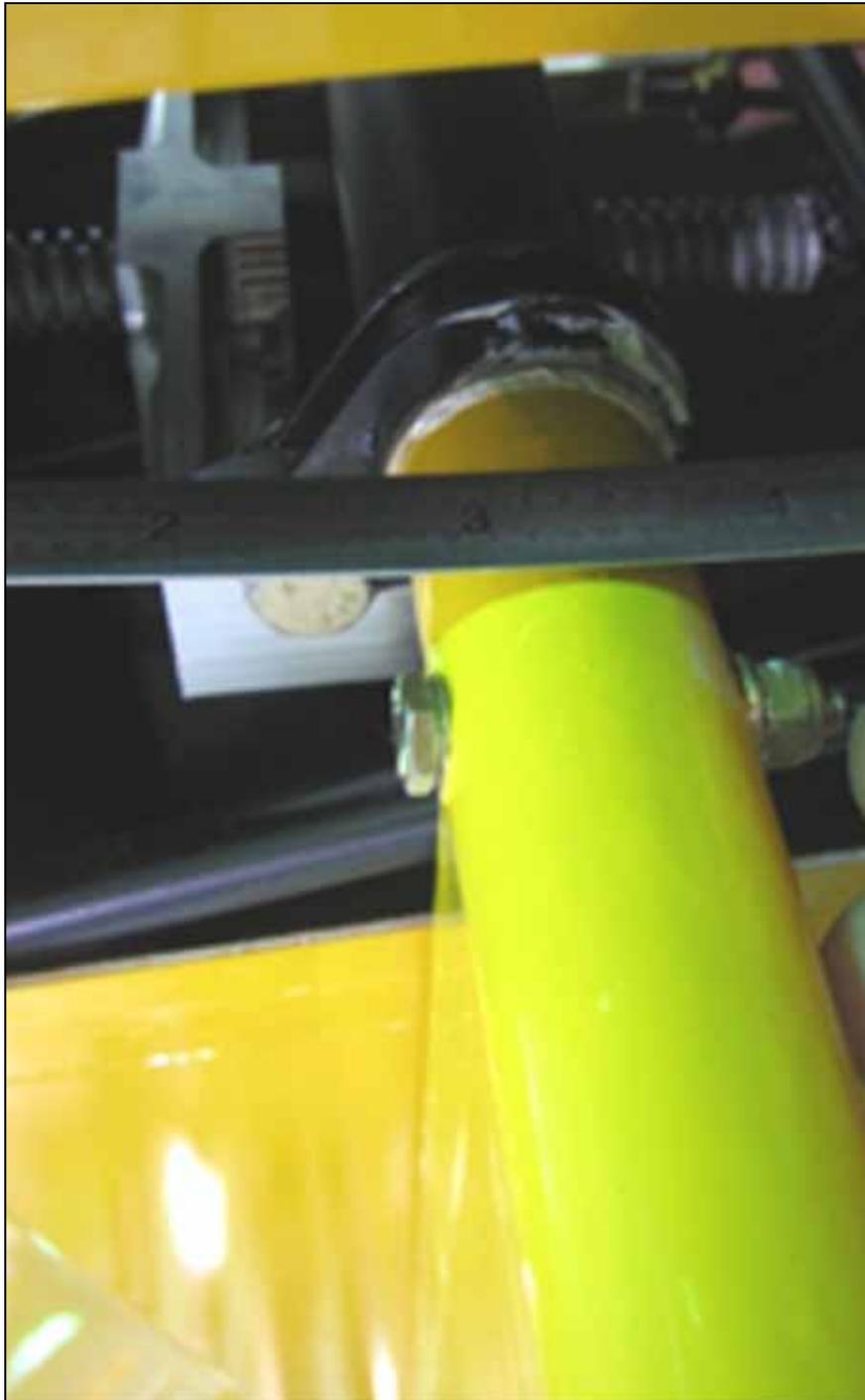


Photo 219

The first part of the elevator position adjustment is to adjust the length of the elevator attachment turnbuckles so that the front stick doesn't contact the instrument panel or the front of the seat.

To adjust the stick forward, tighten the top cable and loosen the bottom cable by adjusting the turnbuckle on the end of each cable.

To adjust the stick back, loosen the top cable and tighten the bottom cable by adjusting the turnbuckle on the end of each cable.

ENSURE THAT WHEN THE CONTROL STICK IS IN THE FULL AFT POSITION THAT THE CONTROL STICK LINK BETWEEN THE CONTROL STICK STUBS DOES NOT CONTACT THE INSIDE OF THE TORQUE TUBE ON THE AFT STICK.

Next we need to set the elevator cable tension. For this you will need to buy or borrow an aircraft cable tension gauge. Our goal is a tension of 60 pounds +/- 2 pounds on the blue scale (the 1/8th inch cable scale).

Adjust the upper and lower turnbuckles in unison to either increase or decrease the tension. For example, if the tension is too high, both turnbuckles will need to be extended (relaxed) and vice versa.



Photo 220



Photo 221



Photo 222

**Photo 223**

Lastly, for the elevator, we need to check the elevator travel. Use a digital level for these measurements. Begin by zeroing the level at the neutral position of the elevator. The neutral position is where the elevator is in line with the stabilizer. You can set this by eye or, better yet, you can hold the elevator against a straight edge that lays on the stabilizer.

**Photo 224**

Next, measure the elevator up travel. It should be $25^{\circ} \pm 2^{\circ}$.

**Photo 225**

Next measure the elevator down travel. It should be $15^{\circ} \pm 2^{\circ}$.

There is no practical adjustment of the elevator travel. This step is an over check. However, because it is relatively easy to make a mistake on the elevator cables connections. You must make absolutely certain that the stick movement and the elevator reaction are properly correlated. That is to say that when the stick is moved forward the elevator should move down and vice versa.

SECTION 38 DATA PLATE

Install the data plate on the mounting bracket underneath the right stabilizer with fasteners as in the Photo 226 below. The mounting bracket will be underneath the fabric covering.

Most of the data plate will be pre-engraved with the correct data. The “manufactured by” lines will need to be completed by you with your name and location of the build.

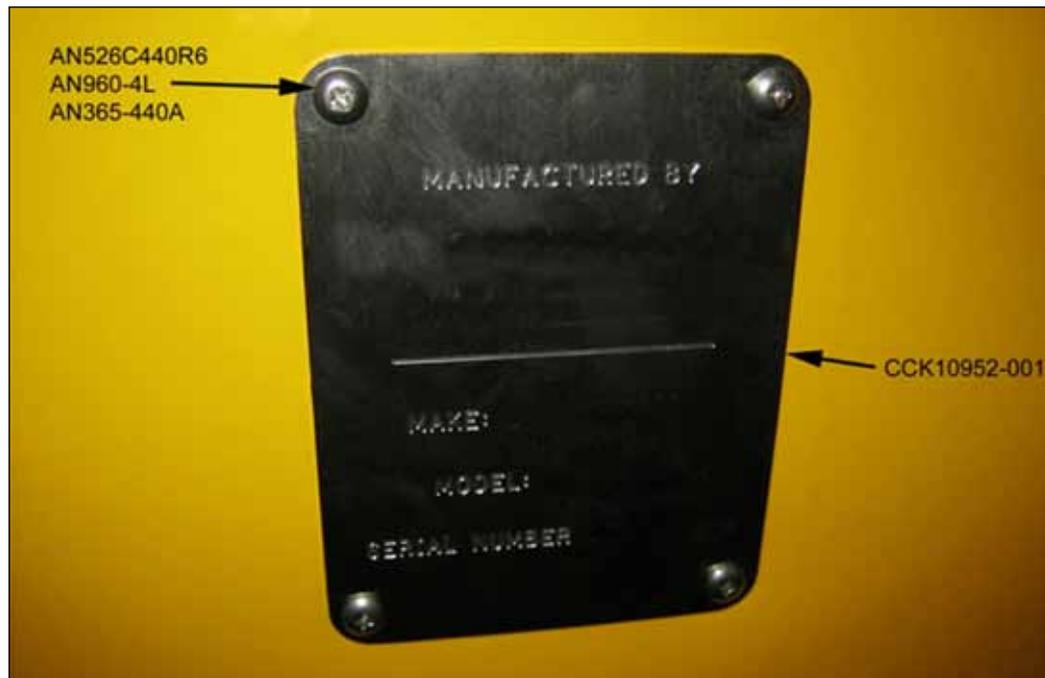


Photo 226

LOG & INSPECTION SHEET FINISH # 5

Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 57 Listed Tasks				
	Task #				
E1	Fabricate Horizontal Stabilizer Spars	X			
E2	Assemble Horizontal Stabilizer Spars to Stabilizer	X			
E3	Fabricate Ribs or Cores	X			
E4	Assemble Horizontal Stabilizer Ribs or Cores to Stabilizer	X			
E5	Fabricate Horizontal Stabilizer Leading and Trailing Edge	X			
E6	Assemble Horizontal Stabilizer Leading and Trailing Edges to Stabilizer	X			
E7	Fabricate Horizontal Stabilizer Brackets & Fittings	X			
E8	Assemble Horizontal Stabilizer Brackets and Fittings to Stabilizer	X			
E9	Assemble Horizontal Stabilizer Structure	X			
E10	Fabricate Horizontal Stabilizer Lead/ Trailing Edges	X			
E11	Assemble Horizontal Stabilizer Lead/ Trailing Edges to Stabilizer	X			
E12	Fabricate Horizontal Stabilizer Cables, Wires and Lines				X
E13	Assemble Horizontal Stabilizer Cables, Wires and Lines to Stabilizer			X	
E14	Fabricate Horizontal Stabilizer Empennage Covering or Skin				X
E15	Assemble Horizontal Stabilizer Empennage Covering or Skin to Stabilizer				X
E16	Assemble Horizontal Stabilizer Structure to Fuselage			X	
E17	Fabricate Elevator Spars	X			
E18	Assemble Elevator Spars to Elevator	X			

LOG AND INSPECTION SHEET FINISH#5cont'd

Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 57 Listed Tasks				
	Task #				
E19	Fabricate Elevator Ribs to Cores	X			
E20	Assemble Elevator Ribs or Cores to Elevator	X			
E21	Assemble Elevator Structure	X			
E22	Fabricate Elevator Leading and Trailing Edge	X			
E23	Assemble Elevator Leading and Trailing Edges to Elevator	X			
E24	Fabricate Elevator Brackets and Fittings	X			
E25	Assemble Elevator Brackets and Fitting to Elevator	X			
E26	Fabricate Elevator Coverings or Skins				X
E27	Assemble Elevator Coverings or Skins to Elevator			X	
E28	Fabricate Elevator Trim Tab	NA	NA	NA	NA
E29	Assemble Elevator Trim Tab to Elevator	NA	NA	NA	NA
E30	Fabricate Special Tools or Fixtures				X
E31	Fabricate Vertical Stabilizer Spars	X			
E32	Assemble Vertical Stabilizer Spar to the Vertical Stabilizer	X			
E33	Fabricate Vertical Stabilizer Ribs or Cores	X			
E34	Assemble Ribs or Cores to Vertical Stabilizer	X			
E35	Fabricate Vertical Stabilizer Leading/ Trailing Edges	X			
E36	Assemble Leading and Trailing Edges to Vertical Stabilizer	X			
E37	Fabricate Vertical Stabilizer Brackets and Fittings	X			
E38	Assemble Brackets and Fittings to Vertical Stabilizer	X			

LOG AND INSPECTION SHEET FINISH#5 cont'd
Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 57 Listed Tasks				
	Task #				
E39	Fabricate Vertical Stabilizer Cables, Wires and Lines	X			
E40	Assemble Cables, Wires, Lines to Vertical Stabilizer			X	
E41	Fabricate Vertical Stabilizer Empennage Covering or Skin				X
E42	Assemble Vertical Stabilizer Empennage Covering or Skin to Vertical Stabilizer			X	
E43	Assemble Vertical Stabilizer Structure to Fuselage			X	
E44	Fabricate Rudder Spar	X			
E45	Assemble Rudder Spar to Rudder	X			
E46	Fabricate Rudder Ribs or Cores	X			
E47	Assemble Rudder Ribs or Cores to Rudder	X			
E48	Assemble Rudder Structure	X			
E49	Fabricate Rudder Leading and Trailing Edge	X			
E50	Assemble Rudder Leading and Trailing Edge to Rudder	X			
E51	Fabricate Rudder Brackets and Fittings	X			
E52	Assemble Rudder Brackets and Fittings to Rudder	X			
E53	Fabricate Rudder Covering or Skin				X
E54	Assemble Rudder Covering or Skin to Rudder			X	
E55	Fabricate Rudder Trim Tab				X
E56	Assemble Rudder Trim Tab to Rudder			X	
E57	Assemble Rudder to Vertical Stabilizer			X	
	Add item :Assemble and Rig Tail Wires			X	

LOG AND INSPECTION SHEET FINISH#5 cont'd

Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 24 Listed Tasks				
	Task #				
F15	Fabricate Fuselage Covering or Skin				X
F16	Assemble Fuselage Covering or Skin			X	
F23	Fabricate Mast and Strut Assembly	NA	NA	NA	NA
F24	Assemble Mast and Strut Assembly	NA	NA	NA	NA

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.37	Ensure the correct fuselage data plate is installed correctly.		
1.38	Ensure the 4 stabilizer attach nuts are torque sealed and there is no play at the front tube to yoke pivot point.		
1.39	Ensure the brace wire top bolt has a bent washer on each side of the fin and there are bushings top and bottom at the outboard clevises.		
1.40	Ensure the tail brace wires are rigged correctly. Brace wire tension 10 lbs ± 1 lbs.		
1.41	Ensure the 5 brace wire attach nuts and the 8 barrel jam nuts are torque sealed.		
1.42	Ensure both elevators clevis pin sets are cotter pinned (2 ea. pin) with a washer on each end.		
1.43	Ensure the top elevator cable attach link bolts are torque sealed.		
1.44	Ensure the bottom elevator cable attach link bolts cotter pinned.		
1.45	Ensure the elevators are rigged correctly and the turnbuckle barrels are safetied. Enter cable tension _____ lbs. (60 lbs. ± 2 lbs)		
1.46	Ensure the elevator trim bungee cable is secured, safetied and operate properly.		
1.47	Ensure both rudder clevis pins are cotter pinned (2 ea. pin) with a washer on each end.		
1.48	Ensure the rudder cable attach ends pivot freely, the nuts are cotter pinned and the rudder moves freely.		
1.49	Ensure the elevator, rudder and trim bungee cables are not crossed or rubbing inside the empennage.		
1.50	Ensure the elevator trim operates easily, in the correct direction.		
1.51	Ensure the jackscrew and stabilizer tubes are greased.		

SECTION 39 ENGINE

The installation of the engine is simple if you have purchased one of the optional CubCrafters engine kits. There are several kits available in O320, CC340 and O360 configurations. Cowlings are available to match the engine choice. Propellers and spinners are available in the same way.

These kits are basically “ready to hang” on the firewall with a minimum of assembly on the part of the builder. An addendum to this manual has been prepared for each of the optional kits that explain the installation of the kit components.

However, if you have chosen the DIY route, you need to deal with a number of issues, as follows:

- Engine series (O320, O360 or other)
- Engine mount
- Carburetion or fuel injection
- Induction system
- Exhaust system
- Cabin heat
- Carburetor heat
- Fuel pump(s)
- Controls (mixture, throttle)
- Magneto or electronic ignition
- Propeller & spinner
- Baffling
- Cowling
- Instrumentation

This manual assumes the engine is on the firewall at the end of this step.



Photo 227



Photo 228

LOG & INSPECTION SHEET FINISH # 6
Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 27 Listed Tasks				
	Task #				
P1	Fabricate Engine Mount(s)	X			
P2	Assemble Engine Mount(s) to Next Level Structure			X	
P3	Fabricate Engine Cooling System/Baffles	X.75			.25
P4	Assemble Engine Cooling System Baffles to Engine			X	
P5	Fabricate Engine Compartment Overheat/Fire Detection System	NA	NA	NA	NA
P6	Assemble Engine Compartment Overheat/Fire Detection System to Engine Compartment	NA	NA	NA	NA
P7	Fabricate Induction System	.75			.25
P8	Assemble Induction System to Engine			X	
P9	Fabricate Exhaust System	X			
P10	Assemble Exhaust System to Engine			X	
P11	Fabricate Engine Control Installation Brackets	.75			.25
P12	Assemble Engine Controls to Next Level Structure			X	
P13	Rig and Adjust Engine Controls			X	
P14	Fabricate Brackets and Fittings	.75			.25
P15	Assemble Brackets and Fittings to Next Level Structure			X	
P16	Fabricate Cables, Wires and Lines				X
P17	Assemble Cables, Wires and Lines to next Level Structure			X	
P18	Assemble Engine (Likely N/A)	NA	NA	NA	NA
P19	Assemble Engine to Engine Mount			X	
P20	Fabricate Engine Propeller (Likely N/A)	NA	NA	NA	NA
P21	Fabricate Propeller Spinner Components				X
P22	Assemble Propeller to Engine			X	

LOG AND INSPECTION SHEET FINISH #6cont'd
Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 27 Listed Tasks				
	Task #				
P23	Rig and Track Propeller			X	
P24	Fabricate Engine Cowling				X
P25	Assemble Engine Cowling to Airframe			X	
P26	Fabricate Engine Fuel System Components				X
P27	Assemble Engine Fuel System Components to Next Level Structure			X	

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.52	Inspect powder coat on fuselage. Ensure complete coverage.		
1.53	Place a straight edge across LH and RH Boot Cowl Spacers. Ensure spacers are straight and flush to the straight edge.		
1.54	Ensure all fuselage tubes and gingerbread are straight and have not been damaged during transport to and from powder coat.		

SECTION 40 STANDARD GEAR CABANE INSTALLATION

At this point the engine is securely attached to the fuselage and the fuselage is no longer easily lifted. It is necessary to lift the fuselage to place the landing gear. We'll be using the lifting lug on top of the engine as a place to fix our chain or strap. The picture here implies that your fuselage is not on your sawhorses but it still should be. This was simply a photograph to show the engine lift.

Your method for lifting will depend on the equipment you have available. You can use a boom-type automotive engine lift (as depicted here) or a forklift or an overhead crane or any secure lifting device that will lift around 1000 pounds. You won't actually lift that much but lifts rated for less are not likely to be secure enough.

Begin by applying protection to the fuselage paint in the landing gear area. Apply several layers of tape around the area of the gear attachment points.



Photo 229



Photo 230



Photo 231

**Photo 232**

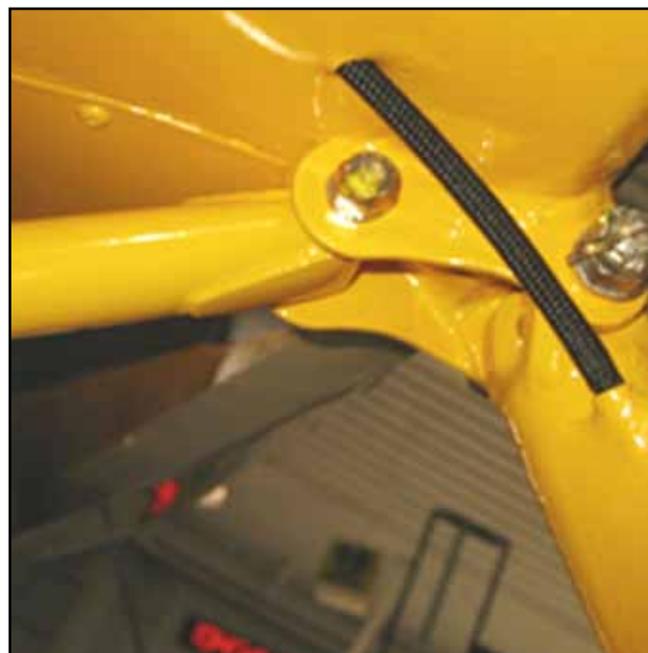
IF YOU PURCHASED THE CARBON CUB 3 X 3 LANDING GEAR OPTION MOVE TO SECTION 41 FOR CABANE VEE INSTALLATION

The next step addresses the installation of the Cabane Vee. This is the "V" shaped piece TC4006-001 in Figure FN27 (and in Photo 237) that joins the upper end of the two shock struts. Begin by gathering the fasteners in accordance with Figure FN27 that will be used to install the Cabane Vee. Apply a light coat of white Lithium grease to the bolts.

Insert the Cabane Vee and check the spacing between the "leg" and the fuselage fitting. You want to have a snug fit. If the fit is a bit loose, add AN960-516 or AN960-516L washers next to the Cabane Vee "leg" to fill the gap. Once you know the washer configuration, install the Cabane Vee with fasteners according to Figure FN27.

**Photo 233**

The Cabane will need to have the upper two holes reamed as shown in Photo 233

**Photo 234**

Once the fasteners are in place, torque them to AN5 specification (100 to 140 inch-pounds) and then Torque Seal the nuts.

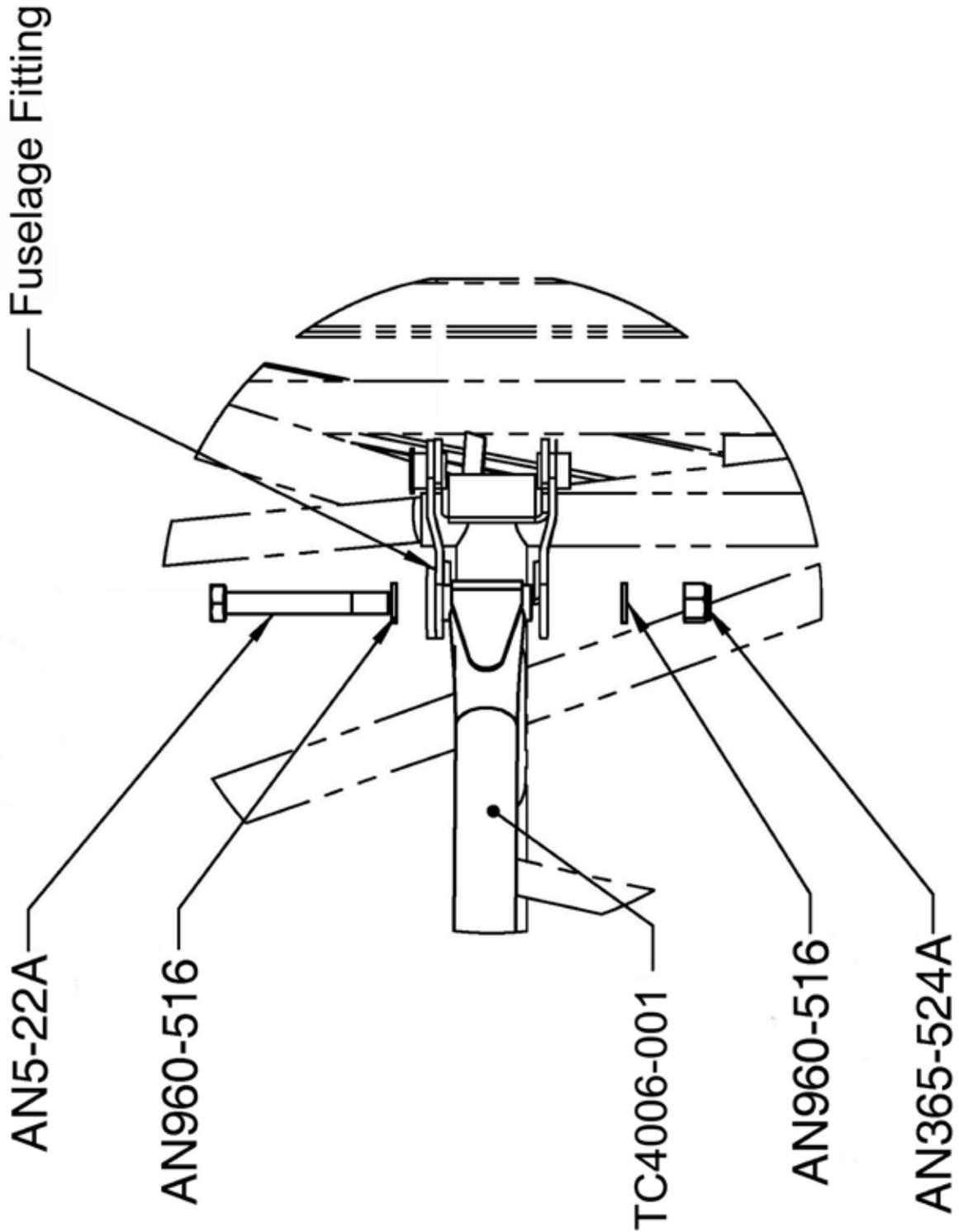


Figure FN27

**SECTION 41 3 X 3 GEAR
CABANE VEE INSTALLATION****Photo 235**

The next step addresses the installation of the 3 X 3 Cabane Vee. This is the “V” shaped piece XC41600-001 in Figure FN28 (and in Photo 237) that joins the upper end of the two shock struts. Begin by gathering the fasteners in accordance with Figure FN28 that will be used to install the Cabane Vee. Apply a light coat of white Lithium grease to the bolts.

Install the cabane vee bushings XC41605-001 as shown in Figure FN28. These bushings should slide into the cabane vee using finger pressure. The bottom of Figure FN28 shows a cutaway view of the bushings installed.

**Photo 236**

Insert the Cabane Vee into the attaching points in the fuselage. **THE CABANE VEE WHEN INSTALLED WILL HAVE A SLIGHT ANGLE TO IT. MAKE SURE THE CABANE VEE IS ANGLED FORWARD.** When installing the lightly lubed bolts, you will need to screw the bolts through the bushings and fittings. **DO NOT TRY TO DRIVE THE BOLT IN USING A HAMMER.** Once the bolt is fully installed, install the washer and nut. Now you will need to tighten the nut until it is snug on the fuselage fittings. The cabane vee bushings will compress bending the fuselage fittings if you over tighten the cabane vee fitting bolts. **DO NOT OVER TIGHTEN THE NUT AND BEND THE FUSELAGE FITTINGS.**

Once the fasteners are in place Torque Seal the nuts.

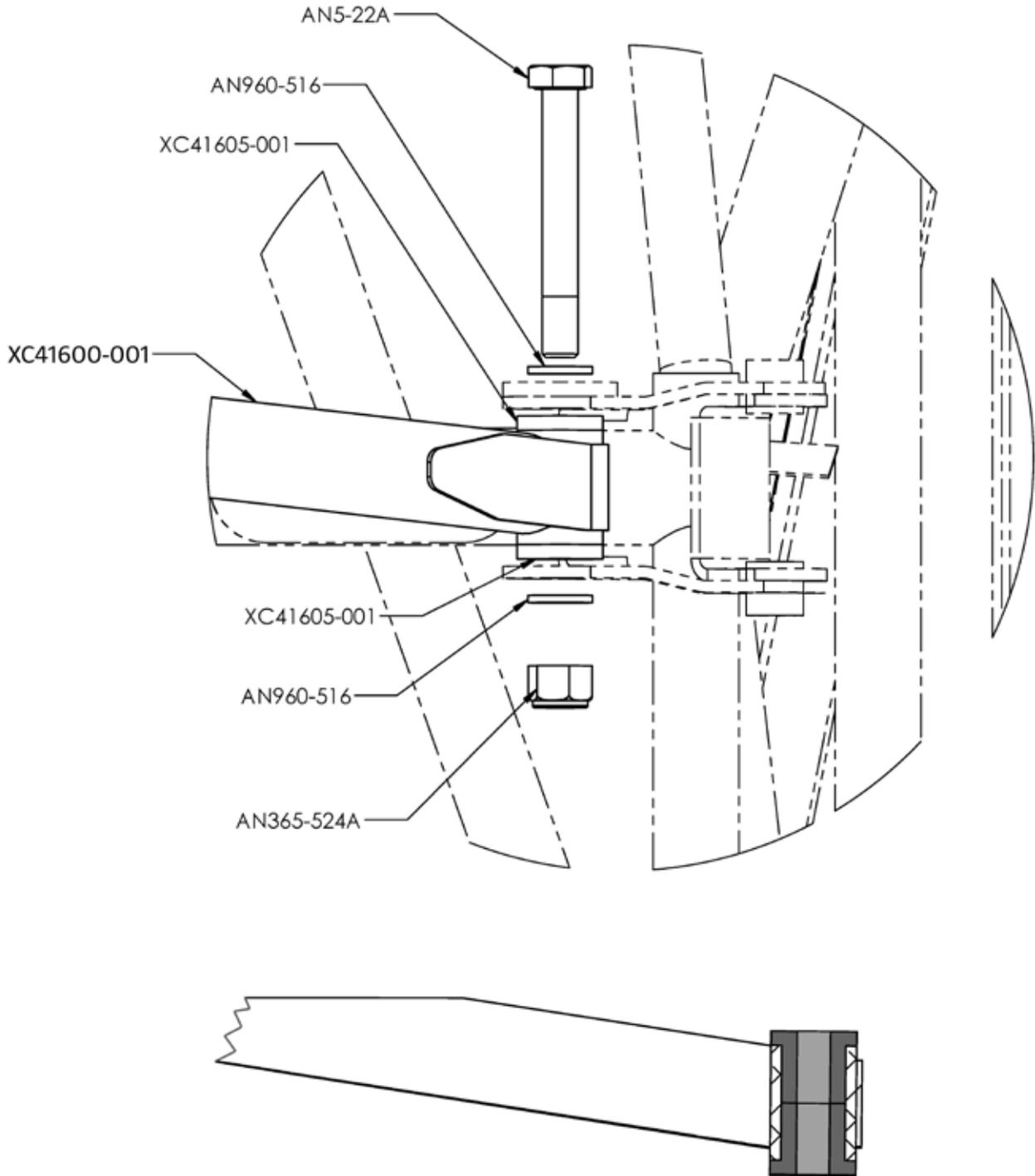


Figure FN28

SECTION 42 LANDING GEAR**Photo 237**

A couple of pages ago, the issue of lifting the fuselage was brought up. It is now time to install the remainder of the landing gear. This means we need to hoist the fuselage.

Raise the front of the fuselage and remove your sawhorse and blocks or any temporary landing gear (like in Photo 238) that you might be employing.

[Recognize that some builders will be very happy with a sawhorse while others can't resist making specialized jigs and fixtures. The fixture in the photograph to the right is employed at CubCrafters. It is shown for the benefit of the jig-builders.

You can see the Cabane Vee in its position in Photo 237.

**Photo 238**

Next it is necessary to ream the landing gear mounts on fuselage to remove any paint or obstruction. Use the 3/8" reamer to ream all 4 of the landing gear mounts.

**Photo 239**

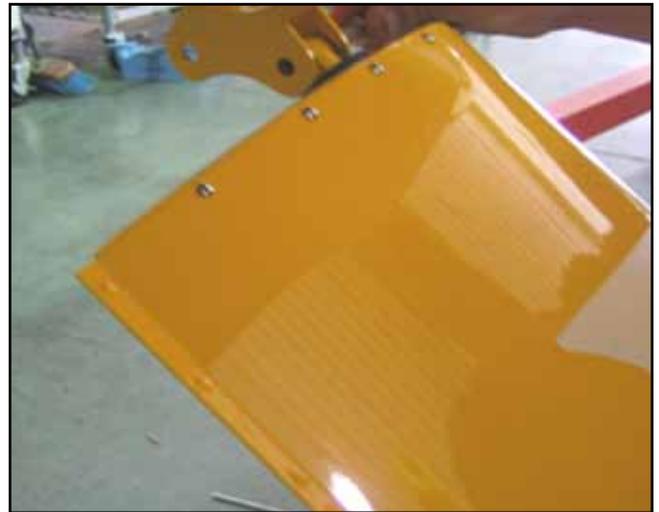
You have tape in place to protect the fuselage but be cautious about the drill motor contacting the fuselage. If you have a big drill, things could become tight.

**Photo 240**

The next step deals with mounting the shock struts. Start by examining the shock struts. You want the closed/small end of the fairing pointed aft

and the finished side of the trailing edge rivets facing up.

Once you have left and right side assemblies sorted out, install the shock strut assemblies to the cabane V with fasteners according to Figure FN29.

**Photo 241****Photo 242**

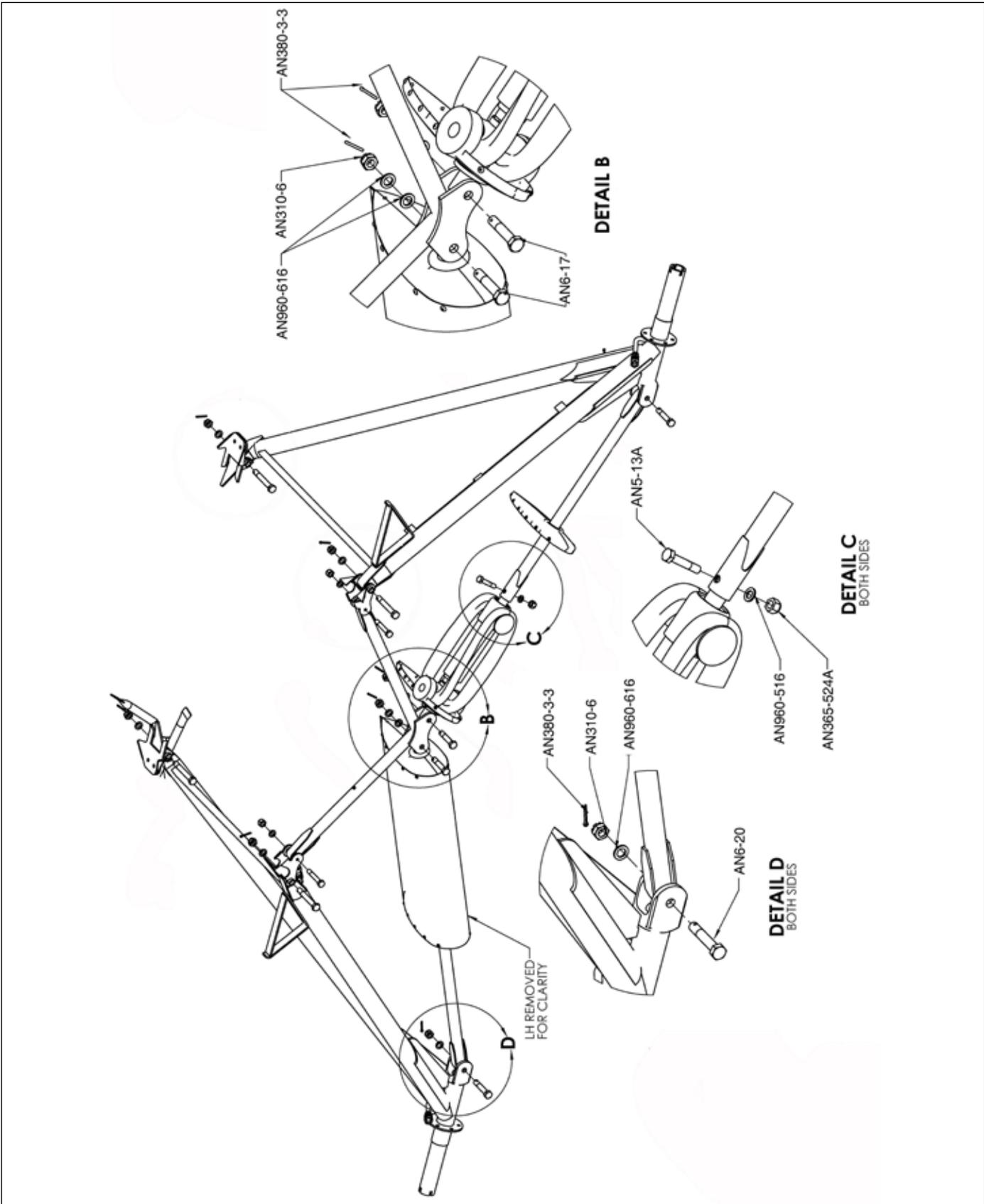


Figure FN29

The next step deals with locating the hole in the bottom of the fuselage for the brake lines to pass through. there will be one on each side of the fuselage, just behind the front landing gear attach fitting as shown in Photo 244. Use the dimensions shown in Photo 243 for location.

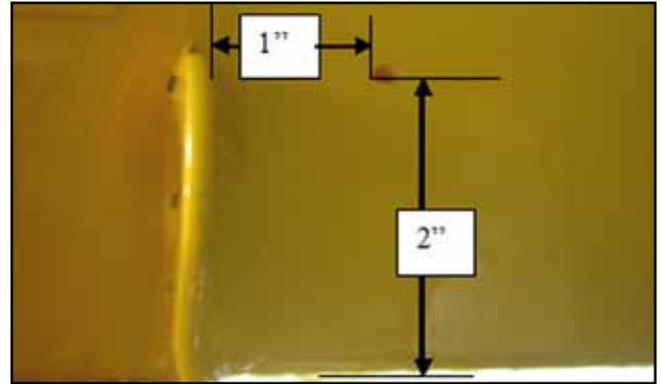


Photo 243

Once you have the correct location, use a hot soldering iron to burn a small hole in the fabric. Use a small piece of brace tubing to test the size of the hole you just burned in the fabric. **DO NOT MAKE THE HOLE ANY LARGER THAN IT NEEDS TO BE.**



Photo 244

The next step addresses the landing gear mounting. Apply a layer or two of masking tape to the upper surfaces of the landing gear legs. Begin by positioning the landing gear under the fuselage next to the mounting lugs. Then, thread the plastic brake line out through the hole in the fabric that was made above. This view is from under the fuselage. You can see the Cabane Vee already installed. Install a section of braided antichafe between the landing gear and fuselage as shown in Photo 245.



Photo 245



Photo 246

**Photo 247**

Way back in the Prep Section you made up 4 3/8" bullets. Go get them and apply a light coat of the white Lithium grease.

Then, move one side of the landing gear into the fuselage fittings and insert a bullet into the forward mount.

As for the Cabane Vee, it may be necessary to add shims to the landing gear.

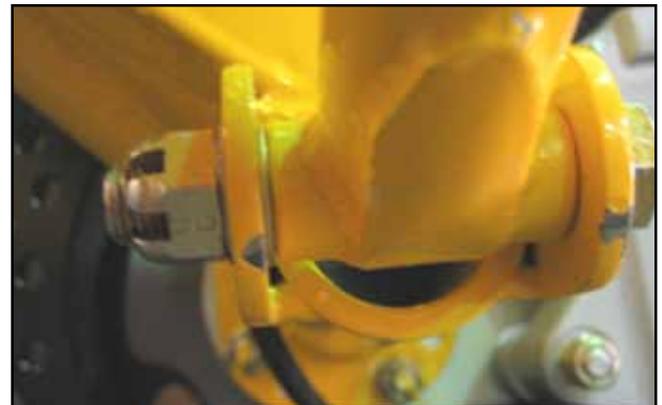
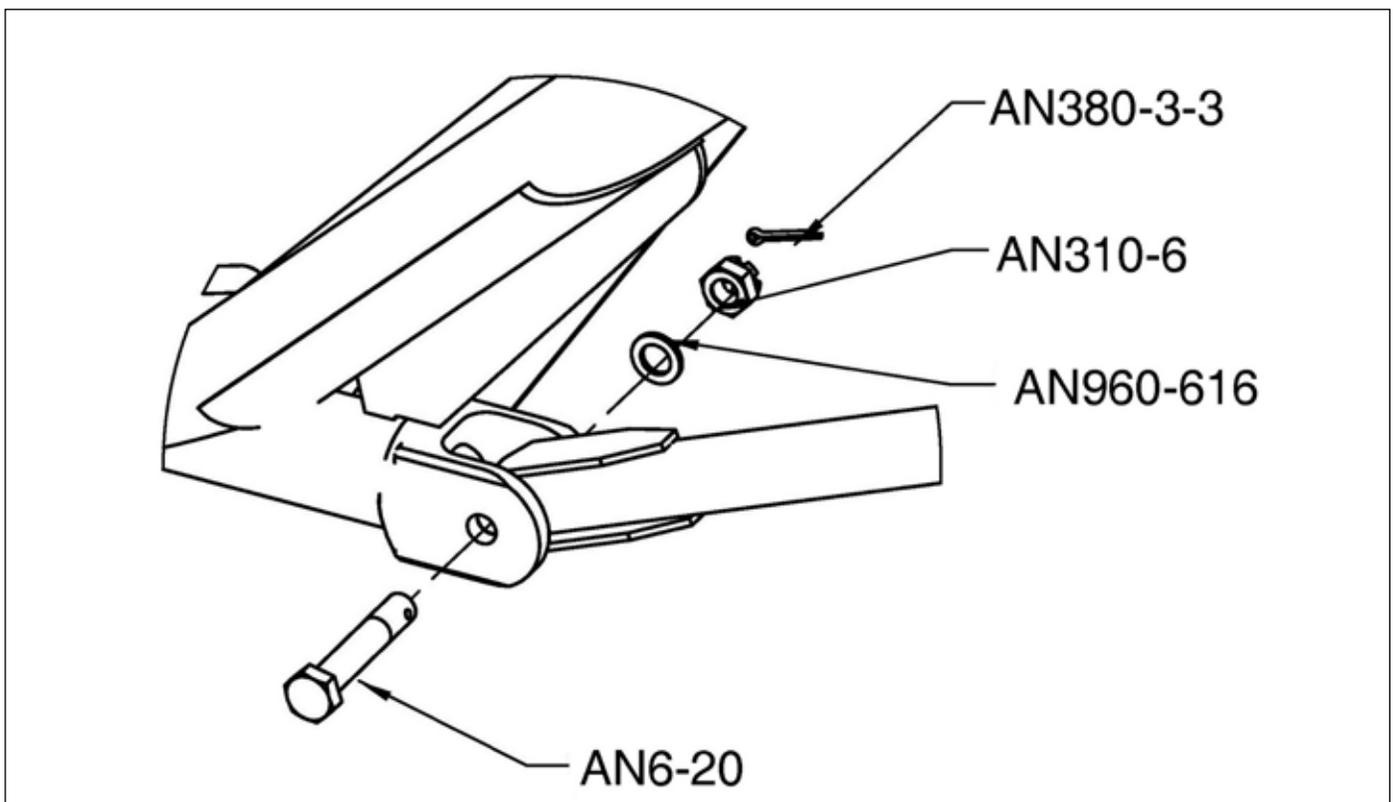
If the fit of the landing gear leg is not snug in the fuselage mount, insert AN960-616 or AN960-616L washers until the snug fit is obtained. Your goal is to remove all end play with a combination of washers.

Then, once the shims are in, insert a "bullet". If necessary, you can tap the bullet into place with a light mallet.

**Photo 248**

Next we address the mounting of the lower shock struts. Again, it is necessary to have a snug fit. As such, insert either AN960-616 or AN960-616L washers until the fit is snug.

Now, attach the lower shock cord mount to the landing gear with fasteners according to Figure FN30.

*Photo 249**Photo 250**Figure FN30*

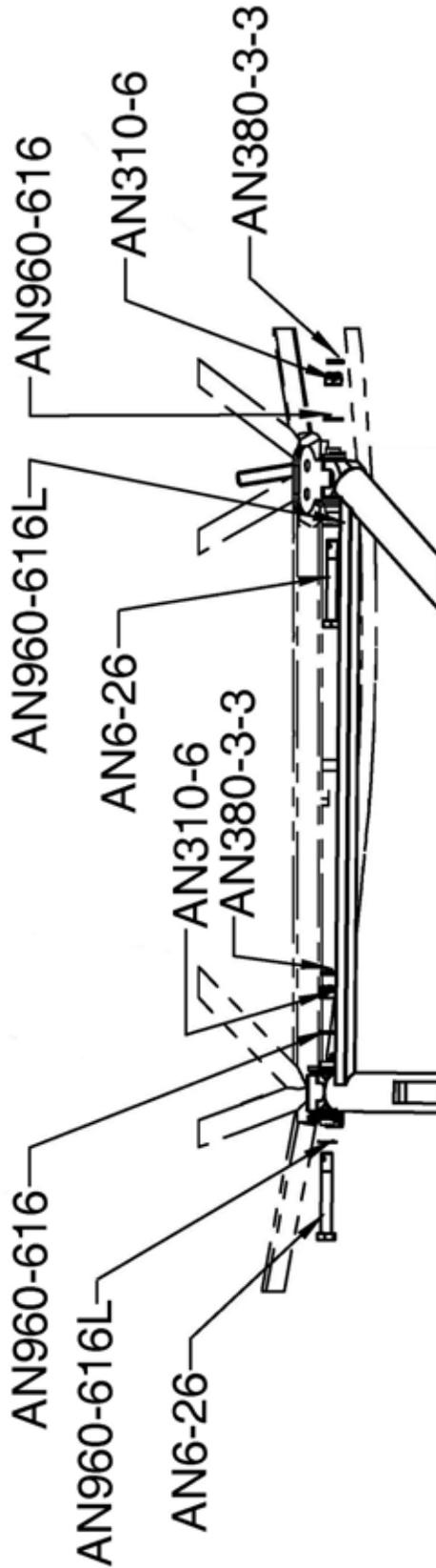
**Photo 251**

This section addresses the installation of the landing gear bolts. Use a punch to drive the “bullet” approx. 1/8” through the landing gear mount (one gear leg at a time). This will keep the gear leg straight in the fuselage fitting and still will allow a bolt to be started.

**Photo 252**

The fasteners are set out in Figure FN31.

**Photo 253**



BOTH SIDES

Figure FN31

**Photo 254**

Insert the correct bolt (lubricated with a light coat of white Lithium grease) into the recess you just created and then use a plastic mallet to drive the bolt into position.

You will be replacing the “bullet”.

**Photo 255**

Now, rotate the bolt so that the hole for the cotter pin is angled toward you.

**Photo 256**

Place the washer and castle nut on the bolt. The cotter pins will be addressed on the next text page. Repeat this process for all four mounting bolts. Lower hoist so that the wheels are on the ground supporting the fuselage. You can place the tail on a block, sawhorse or upside-down 5-gallon pail.

It is time to install and finish the cotter pins on the four gear legs just installed. Begin by tightening the castle nut until “snug”. Then line up the slot in the castle nut with the hole in the bolt. Insert the cotter pins with the long leg facing out. You then grab that leg and bend it over the end of the bolt.

The inside/short leg of the cotter pin needs to be trimmed so that it will not touch the lower shock mount. Trim the short leg and then bend it back against the nut,



Photo 257

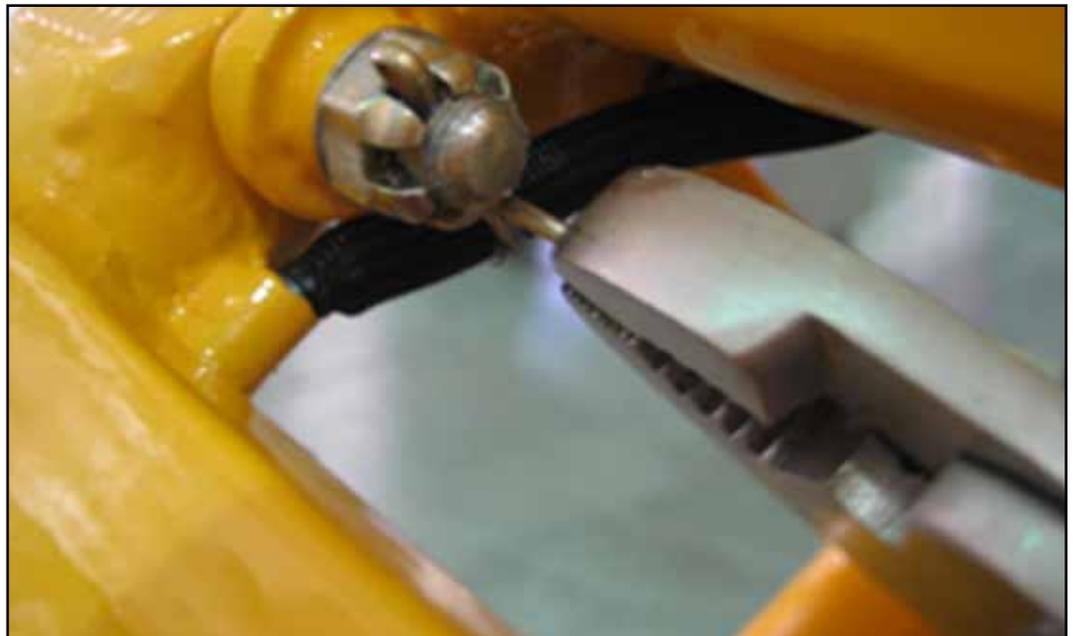


Photo 258

Next we complete the upper shock strut fastening. Tighten the castle nuts at the intersection of the shock strut and the Cabane Vee.

Use the same cotter pin bending method as in the last step.



Photo 259



Photo 260

For the left brake line install spiral wrap on the left side brake line as you just did for the right line. Then apply a fine coat of lubricating compound to the brake line and insert it through the grommet as shown in the photograph to the right.

This is the wire from the front control stick.



Photo 261

It is important to continually protect the project from damage. Start by removing the protective masking tape from the fuselage and the landing gear (before it becomes permanently attached). Then make up a pair of landing gear protectors by using some old carpet or similar padded material. Tape your carpet protectors onto the landing gear.

For the next step you need to examine the angle of the brake line attachment fitting. You want the fitting angled such that the brake line (once attached) will not touch the corner of the seat base. Adjust the angle appropriately.

**Photo 262**

Now, hold the brake line next to the fitting and mark the cut line on the brake line tubing.

**Photo 263**

Next, use a tubing cutter or razor knife to cut the brake line tubing at the mark made in Photo 264.

**Photo 264**

Next we need to apply anti-chafe material to the brake line between the seat base and the fitting. Cut the anti-chafe sleeve (RM7932-001) to length and then slide it onto the brake line. Be sure the anti-chafe material starts under the seat (through the grommet).

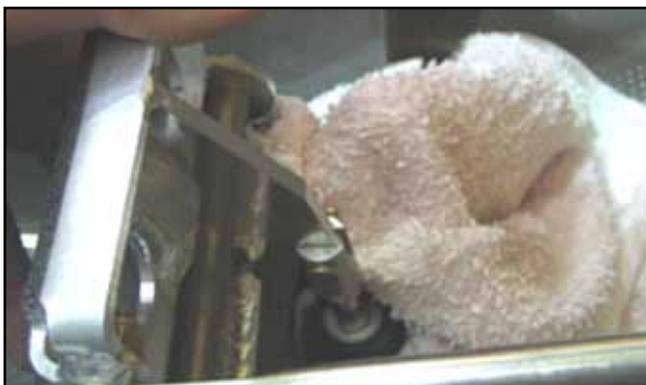
**Photo 265**

**Photo 266**

The next step undertakes the brake line connection. With the nut loose but still engaged, insert the end of the brake line into the fitting on the master cylinder.

**Photo 267**

The plastic line should “bottom” in the fitting. Tighten the nut on the fitting until snug. Pull on the brake line to assure that it is tight and will not pull out.

**Photo 268**

The next step is bleeding of the brakes. Begin by placing an absorbent rag or cloth over the top of the master cylinder. You will need a small pump can (like that use for dispensing light motor oil) and a plastic line that has the inside diameter of the brake bleeder fitting. It is a good idea to put an absorbent cloth under the master cylinder to catch drips.

**Photo 269**

You will force the plastic line from the pump can over the bleeder fitting. You will then open the bleeder fitting with an end wrench.

You will need a supply of Mil. Spec 5606 Hydraulic Oil to fill your pump can. Do not use automotive brake fluid.

With your pump can full of hydraulic fluid, open the bleeder fitting on the caliper and pump the brake fluid supply can. You will have to pump the can a number of times (10-30) depending on the pump efficiency of your can.

Caution: Watch for the red hydraulic fluid on the rag covering the top of the brake cylinder. When the fluid is coming out without bubbles the line is full of fluid.

Repeat this process for both sides.

Now, remove the cap from the master cylinder reservoir and fill the reservoir with hydraulic fluid. Replace the cap; making sure the cap is fully seated into the cylinder.

Remove the pump can line from the bleeder fitting. Then open the bleeder fitting a tiny bit and pump the brake pedal a couple of times. This should expel any air that might be in the brake line. Close the bleeder fitting during the last pump of the brake pedal (while fluid is emerging). Refill the master cylinder reservoirs if they were depleted in any significant amount.



Photo 270



Photo 271

Replace the plastic caps on the bleeder fittings on the calipers.

If you spill hydraulic fluid, wipe it up and clean the surface with soapy water. Any residual hydraulic fluid will dry sticky and will result in a dandy mess if not cleaned up.

SECTION 43 HUBCAPS

The next task is really an easy one. It is the hubcap installation. Begin by gathering the parts in accordance with Figure FN32. Then install the hubcaps on both wheels.

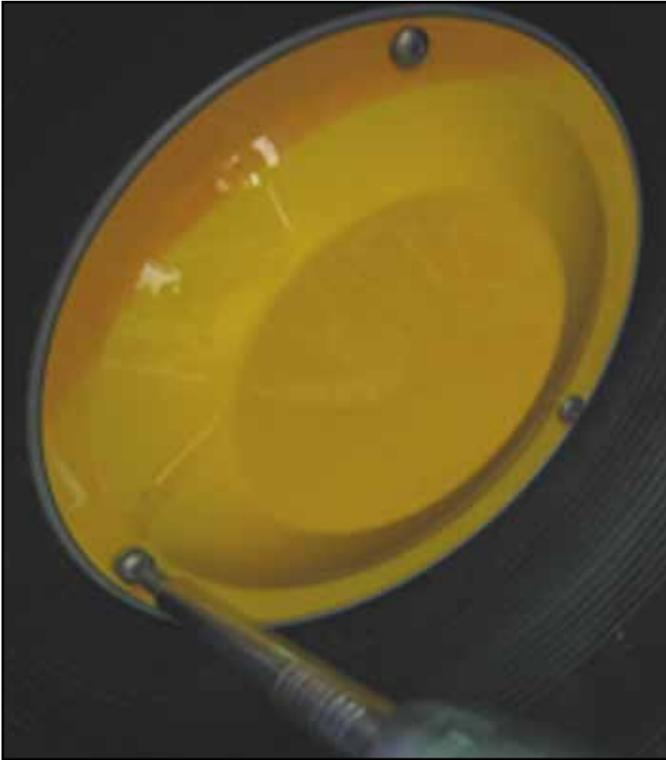


Photo 272

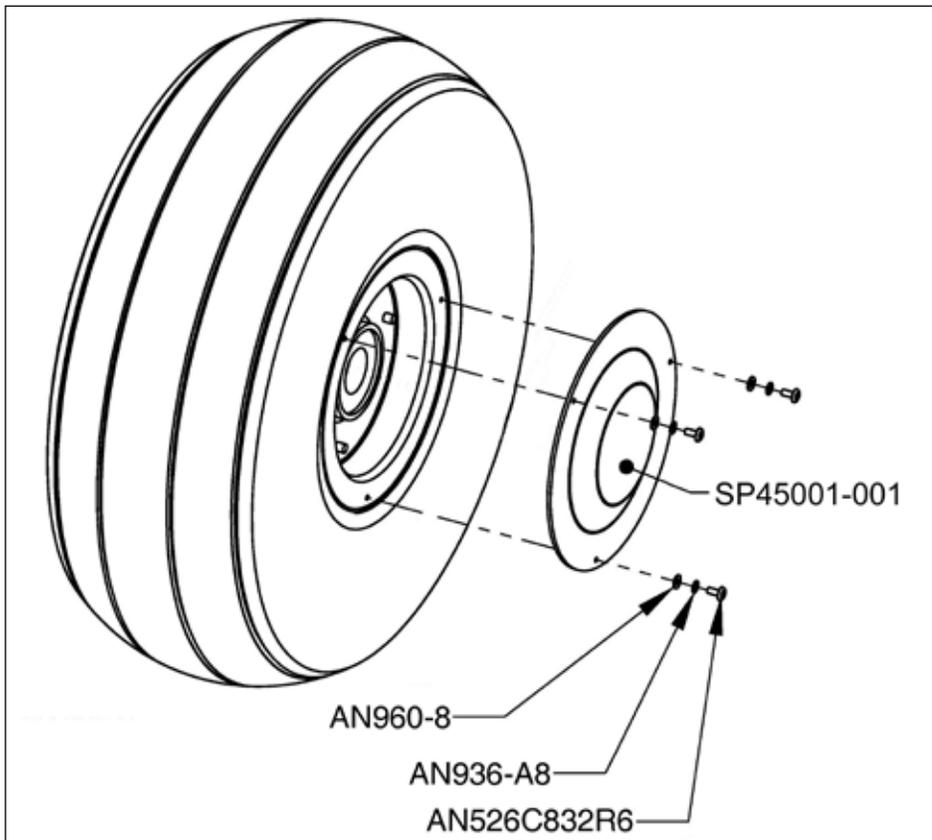


Figure FN32

SECTION 44 TAIL WHEEL

This step addresses the installation of the tail wheel. Begin by gathering the necessary parts as set forth in Figure FN33.

**Photo 273**

The bushing could have some small burrs on the inside. If there are burrs, remove them using a fine cut round file. The bushing should slide smoothly onto the bolt.

**Photo 274**

Insert the bolt and the bushing into the tail wheel spring clamp housing.

**Photo 275**

Place the adapter into position on the tail wheel spring clamp housing.

**Photo 276**

**Photo 277**

This step deals with tail wheel spring stacking. Begin by placing the mounting bolt into position on the fuselage.

**Photo 278**

Then stack the spring assembly so that the oblong hole is on top of the springs with the round hole.

**Photo 279**

This end bolts to the tail wheel. Use the inspection hole to install the mounting bolt and washer.

**Photo 280**

The short spring is installed first.

Then two long springs.

Install the tail spring bracket with parts according to Figure FN33.

Tighten the nuts on the tail spring bracket to 90 inch-pounds and then apply Torque Seal to the nuts.

Use the inspection hole to carefully place a wrench on the tail wheel bolt. Tighten the nut to a torque of 575 inch-pounds and then Torque Seal the nut.



Photo 281



Photo 282



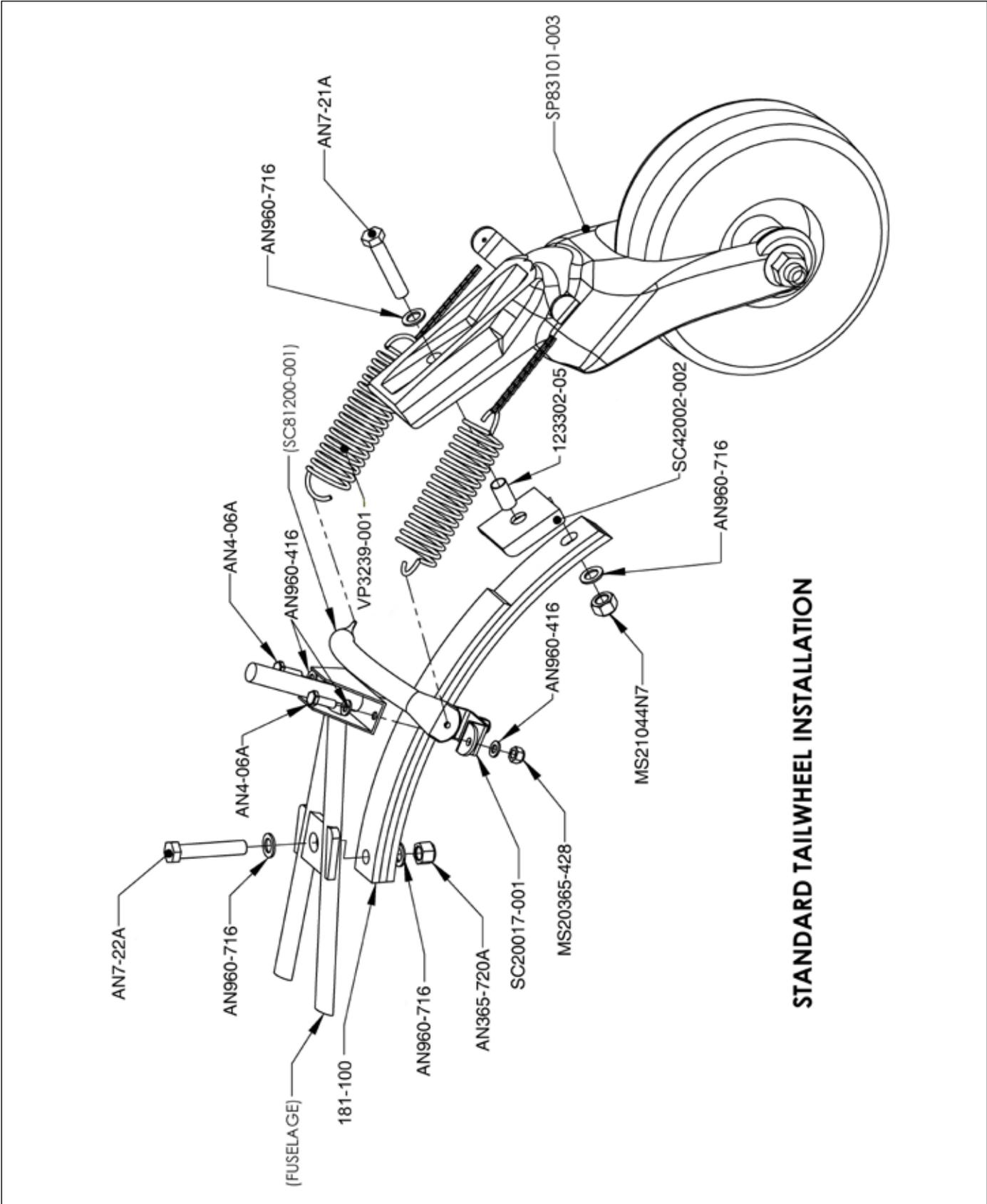
Photo 283



Photo 284



Photo 285



STANDARD TAILWHEEL INSTALLATION

Figure FN33

Then as the last part of the tail wheel installation, torque the tail wheel bolt to 575 inch-pounds and then Torque Seal the bolt head.



Photo 286



Photo 287

LOG & INSPECTION SHEET FINISH # 7

Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 12 Listed Tasks				
	Task #				
LG1	Fabricate Struts	X			
LG2	Fabricate Brake System Components				X
LG3	Fabricate Landing Gear Actuation System Components	NA	NA	NA	NA
LG4	Fabricate Landing Gear System Cables, Wires and Lines	NA	NA	NA	NA
LG5	Assemble Wheels			X	
LG6	Assemble Brakes, Tires			X	
LG7	Assemble Landing Gear			X	
LG8	Assemble Landing Gear System Components Next Level Structure	NA	NA	NA	NA
LG9	Align Landing Gear	NA	NA	NA	NA
LG10	Fabricate Landing Gear Fairings/Gear Doors				X
LG11	Assemble Landing Gear Fairings/Gear Doors to Next Level Structure			X	
LG12	Perform Landing Gear Operational Check (Normal, Emergency Systems)			X	

LOG AND INSPECTION SHEET FINISH #7cont'd**Inspection point**

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.55	Ensure mounting bolt nuts (8) are torqued and have cotter pins.		
1.56	Ensure space between mounting bracket and landing gear has the proper washers inserted.		
1.57	Brake line routing and brake line not touching fabric in belly of fuselage.		
1.58	Ensure brake line clears seat base when rear rudder pedals are in full aft position.		
1.59	No leaks at connections on top and bottom of brake lines.		
1.60	Install wheel covers. (Ensure wheel nut has cotter pin)		
1.61	Ensure proper stacking of tail wheel springs per manual.		
1.62	Ensure proper bushing placement.		
1.63	Ensure tail wheel attach bolts are installed with the heads up and nuts torqued and marked.		
1.64	Ensure steering springs attached.		
1.65	Tail Wheel installed, greased and functional.		
1.66	Tire at proper air pressure, 50 to 60 psi. (Option only: ABW 3200)		
1.67	Check overall fit and finish.		

SECTION 45 FUEL SYSTEM PREPARATION

The next step addresses installation of the fuel tank screens and tank elbows. Begin by applying fuel lube to the fuel screens (2) (part TC7011-001).

Then apply lube to the 45° street elbow fittings (2) (AN915-2D) that will go into the aft fuel tank fitting.

Do not allow fuel lube to get on the first two threads of any of the fittings. Remove the lube from the first threads with a rag if necessary.

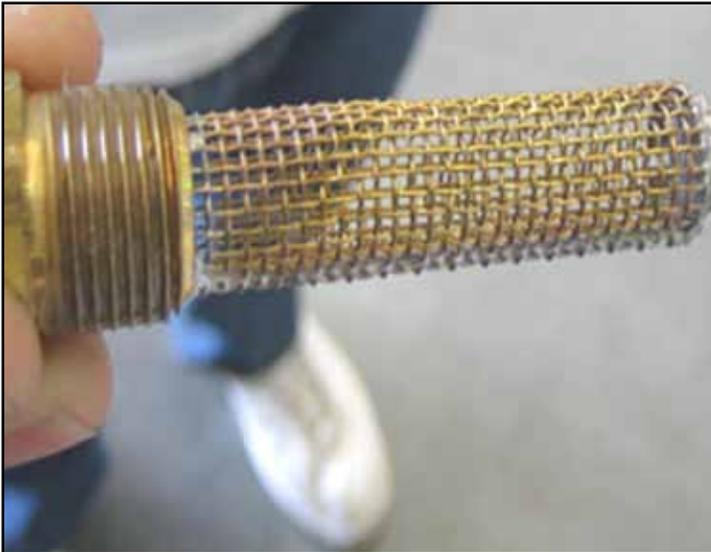


Photo 288



Photo 289

**Photo 290**

Insert the fuel screens into the aft fuel outlet and tighten.

Insert the street elbow into the fuel screen and tighten so that fitting points aft (about the 8:00 clock position).

**Photo 291**

Apply fuel lube to the adapter (SC60100-001) threads that will be inserted into the street el.

Reminder, do not allow fuel lube on the first two threads.

Insert the adapter into the elbow and tighten.

Place masking tape over the open end of the adapter to keep out debris.

**Photo 292**

Repeat this procedure for the other tank aft fitting.

**Photo 293**

This step deals with the forward fuel tank fitting installation. Basically the procedure is a repeat of the procedure for the aft fuel outlet. The only difference is that the forward fittings should point forward and down (about the 4:00 clock position). Install the screen, elbow, adapter, and then tape the open end of the adapter. You need to repeat this for both tanks.

This step deals with the fuel sight gauge fittings. Begin by applying fuel lube to the fuel sight gauge fitting (AN840-4D).

Insert the fitting into the lower opening and tighten. Repeat this process for the upper fitting. Then repeat the process for both fittings on the other tank.

**Photo 294****Photo 295****Photo 296**

**Photo 297****Photo 298****Photo 299**

Next the fuel sight gauge hose installation is addressed. Begin by cutting a piece of rubber hose (RM6000-002) approximately 4.5" long and insert it over one of the lower sight gauge fittings. Install a hose clamp (HDW-100-200) on the fitting and hose. Do not over tighten these hose clamps. Then cut and install a hose approximately 2.5" long on the upper fitting. Apply a hose clamp again. Repeat this step for the other tank. Cover all four open ends of the hoses with masking tape.

Next we deal with the wing root fabric patch installation. Gather the patches (2) and test fit the wing rib patch to the wing. The “shiny” side of the fabric will be glued and the “flat” side of fabric will be facing the cockpit. Trim the pieces as needed to achieve a good fit.

**Photo 300**

Apply 3M Super Weather Strip Adhesive as shown in the Photo 301 and Photo 302 to the right to the rib.

**Photo 301**

Apply adhesive to the edge of the patch on the “shiny” side of the patch.

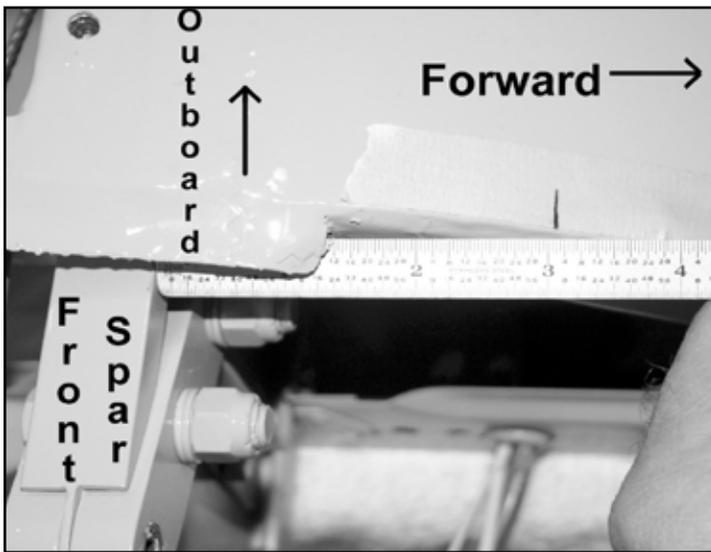
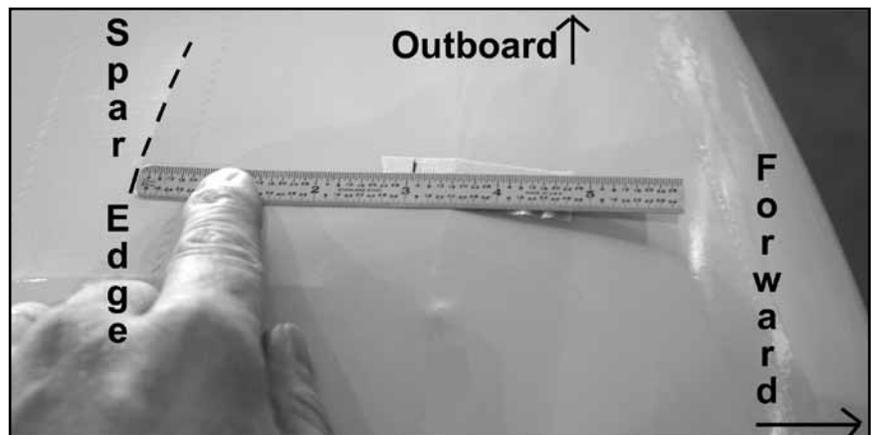
Carefully press the patch into place.

**Photo 302****Photo 303**

SECTION 46 VORTEX GENERATORS

This step is devoted to the vortex generator layout. The following 6 pages contain layout instructions for the vortex generators. Please read and follow these instructions. At the end of the layout and installation instructions will be pictures of the actual installation at CubCrafters.

Measure 3.063" (3 1/16") ± 0.040 " from the forward edge of the front spar toward the forward edge of the wing. Place a mark on the masking tape as shown in Figure FN35. Do the same for the front outboard spar.

*Photo 304**Photo 305*

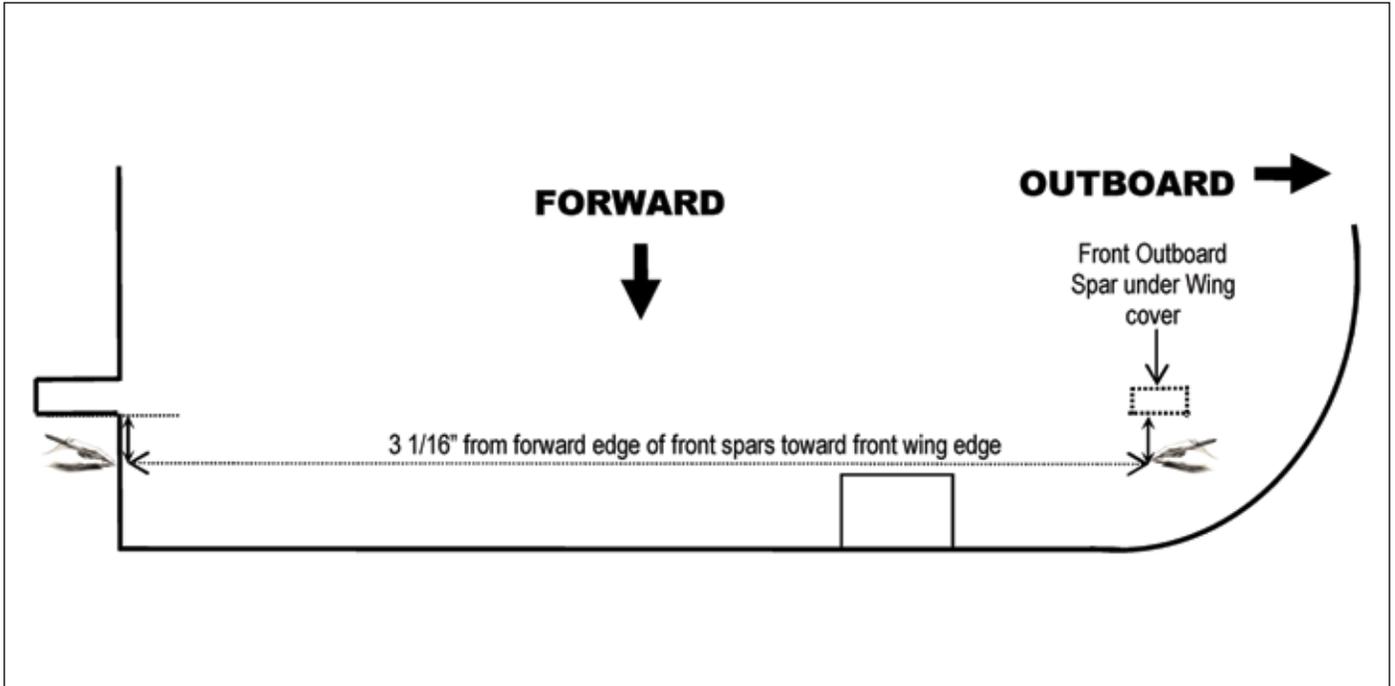


Figure FN35

Stretch a string between the marks made Figure FN35 and shown in Figure FN36. Secure string in place using tape.

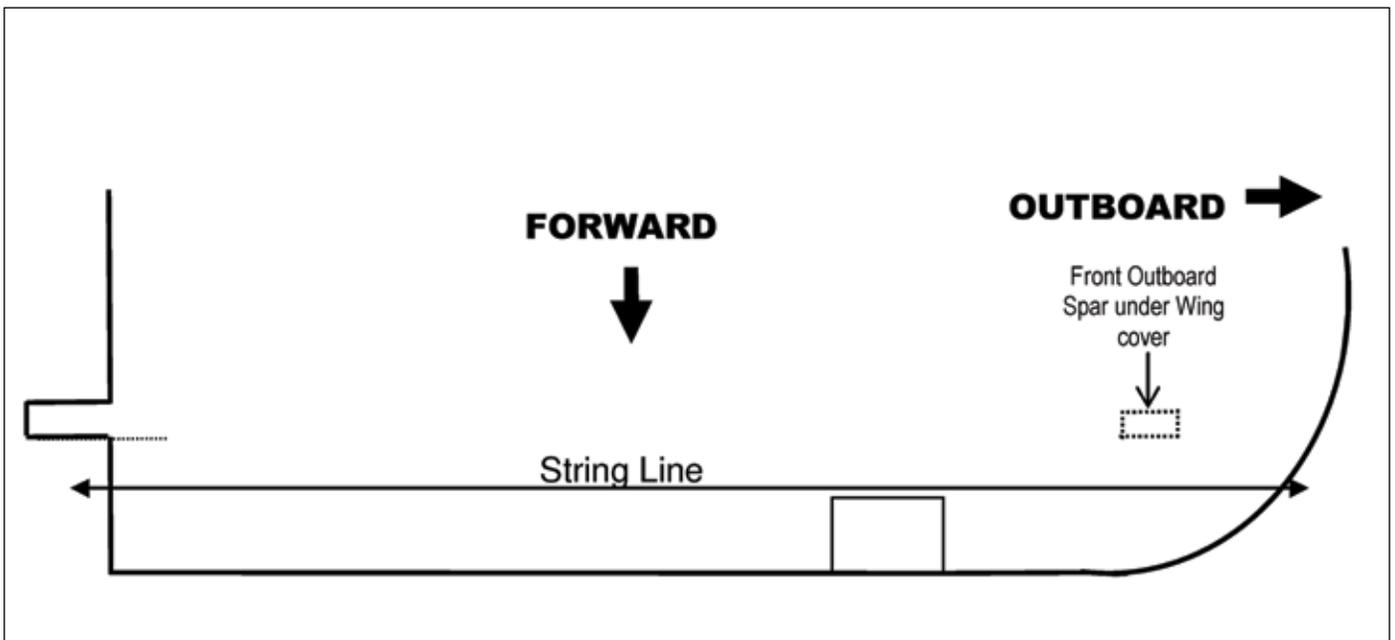


Figure FN36

With the pin in the wing attach hole, as shown in photo 366, measure along the string line and make a mark on a piece of masking tape for the first placement. Place additional marks on the masking tape at the intervals shown in Figure FN37. Tolerance for all dimensions is $\pm 0.25''$.

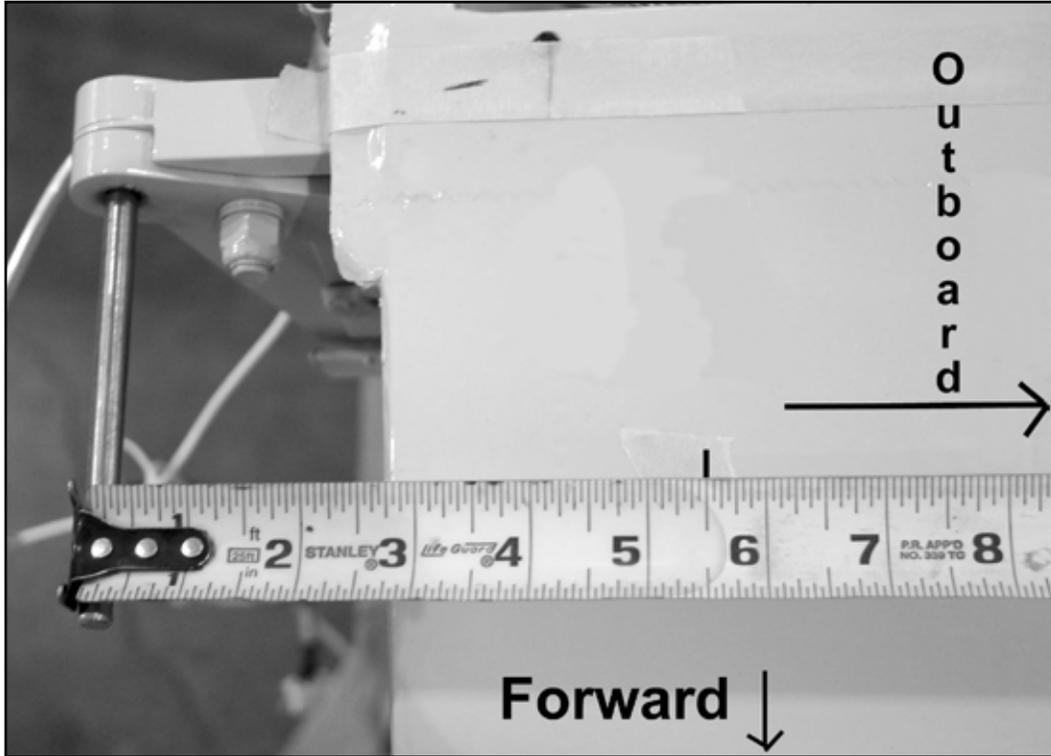


Photo 306

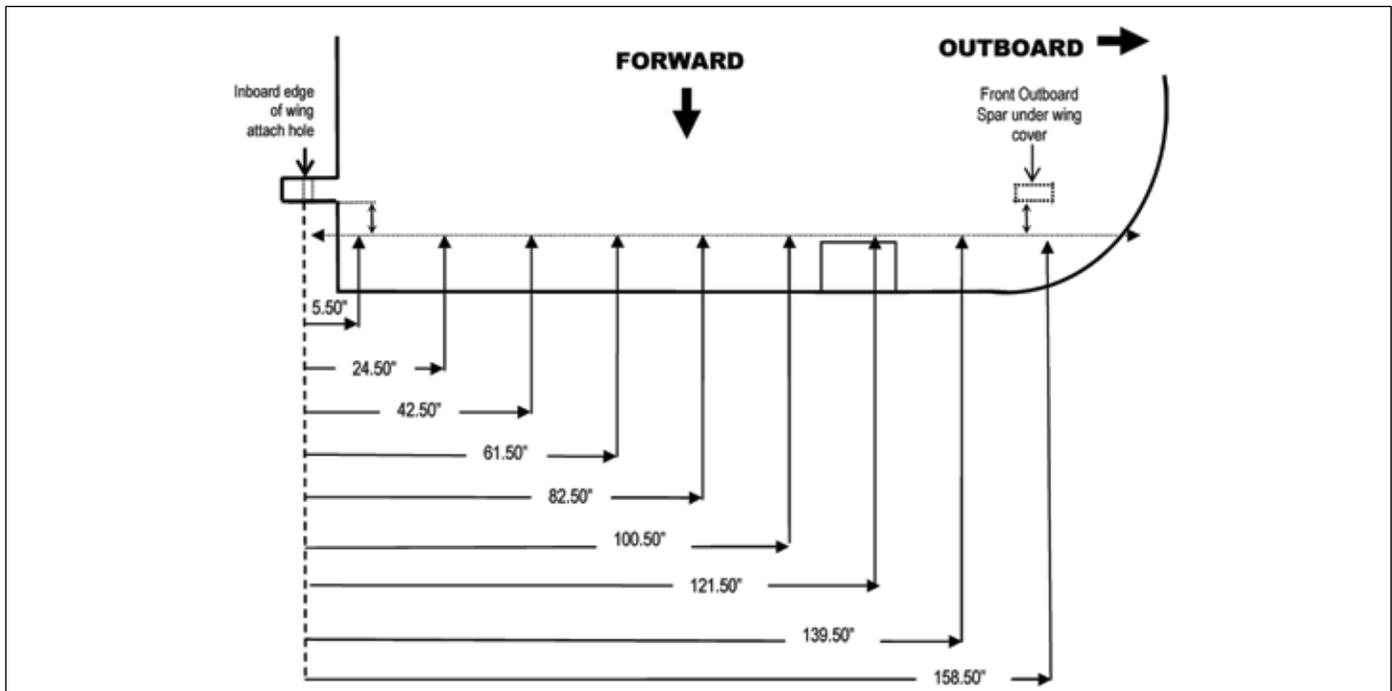


Figure FN37

Carefully peel the templates one at a time from the backing paper. Place them on the wing as shown in Figure FN38 and Figure FN39. Align the notched edge of the templates with the mark on the masking tape along the string line as shown in Photo 308.

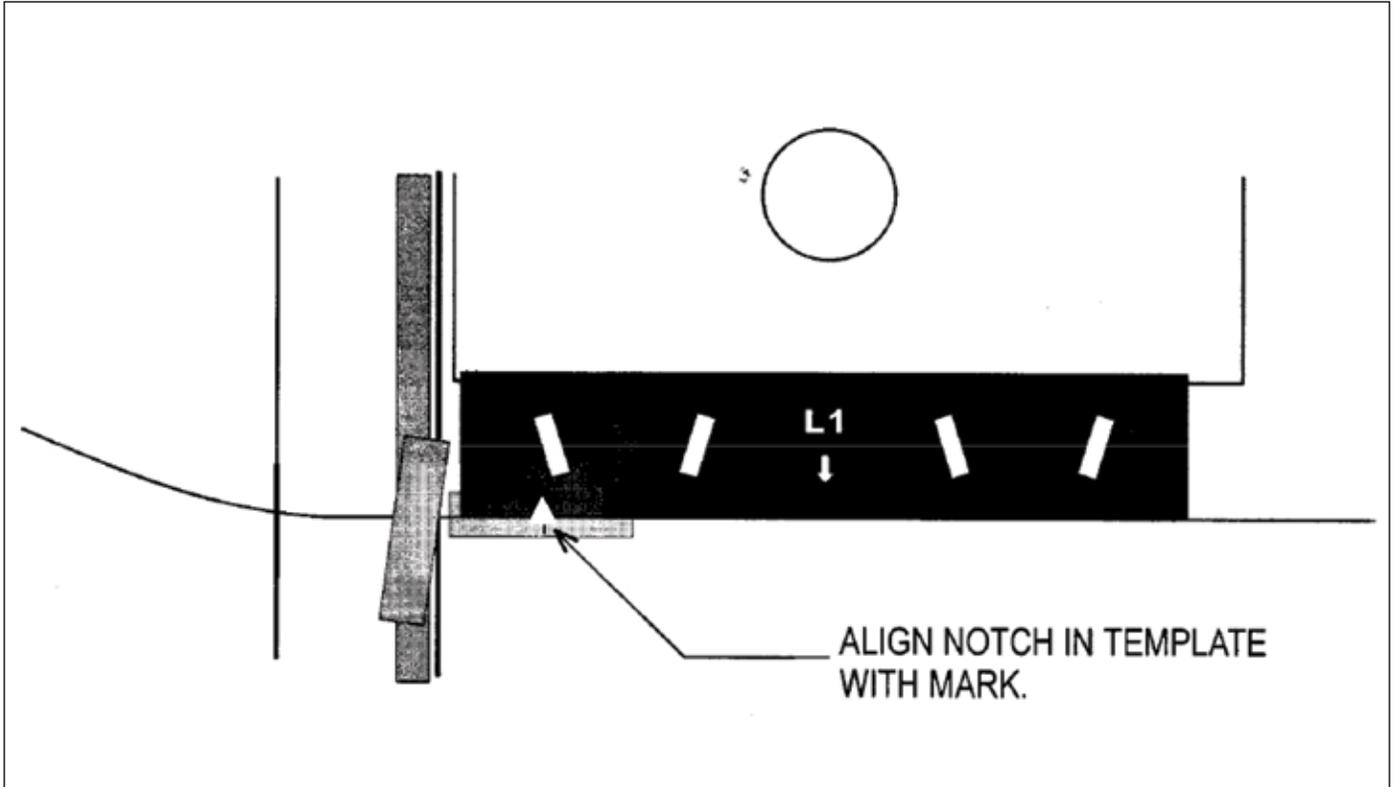


Figure FN38

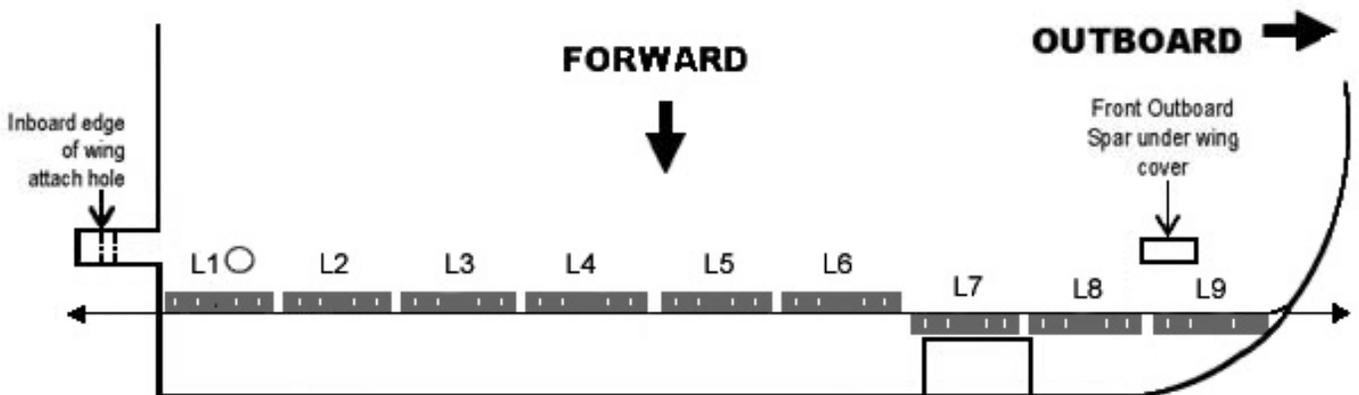


Figure FN39

Using ScotchBrite® pads, lightly sand the area inside the template cutouts just enough to break the paint glaze as shown in Figure FN37.

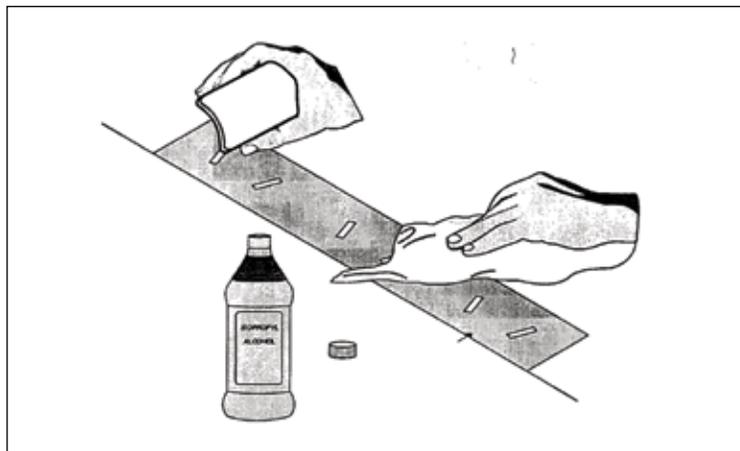


Figure FN40

After sanding is complete, the cutouts must be wiped clean with denatured alcohol (Figure FN40) to remove any residue from sanding.

Prep each vortex generator by scraping the bottoms with a razor blade or LIGHTLY sanding to remove excess paint and clear coat. Wipe clean with denatured alcohol.

To adhere the Vortex Generators to the wing, you will be using Loctite Depend®, which is a two part adhesive consisting of a glue type adhesive and an activator spray. Apply a thin coat of the adhesive to the bottom of the Vortex Generator using either a cable tie or other firm applicator. Be sure to remove any excess adhesive.

Spray the activator onto the vortex generator. See Figure FN41.

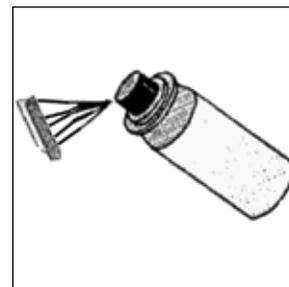


Figure FN41

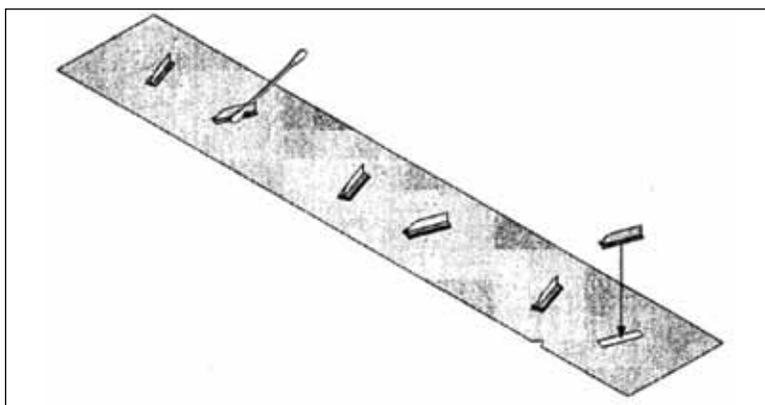


Figure FN42

Press the vortex generator into place in the cutouts, checking for proper alignment with the cutouts. Use a Q-tip® to clean any excess adhesive that may present around the vortex generators. See Figure FN42. Repeat previous steps for each Vortex Generator.

Remove all of the installation templates by carefully peeling them up from front to back as shown in Figure FN43. If any pieces remain afterwards, use your fingernail to aid in removal.

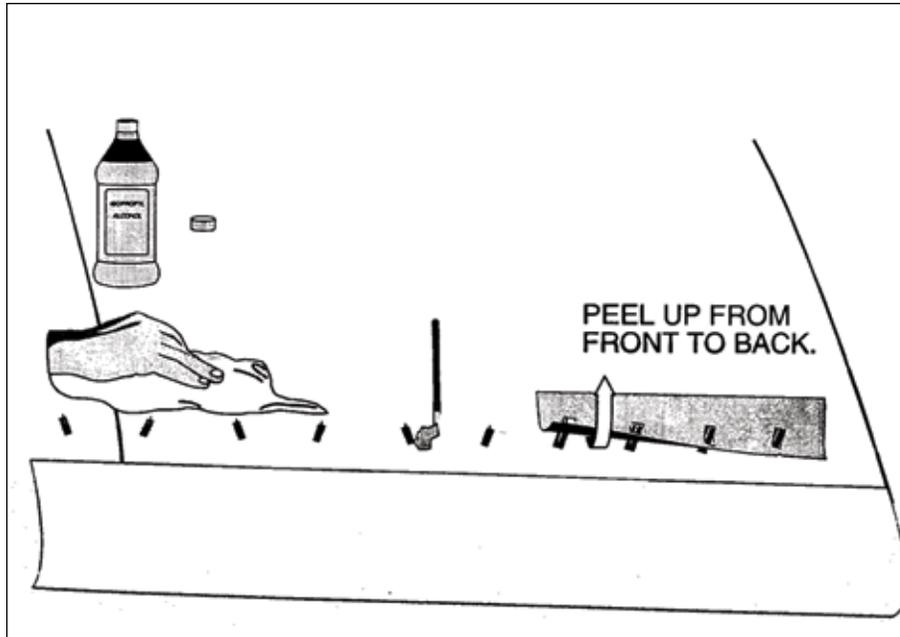


Figure FN43

With the templates all removed, **IMMEDIATELY** give all working areas a liberal wipe-down using denatured alcohol to remove remaining glue. This is **EXTREMELY** important. If the adhesive is not cleaned up, future removal could be very time consuming and/or futile.



Photo 307



Photo 308



Photo 309

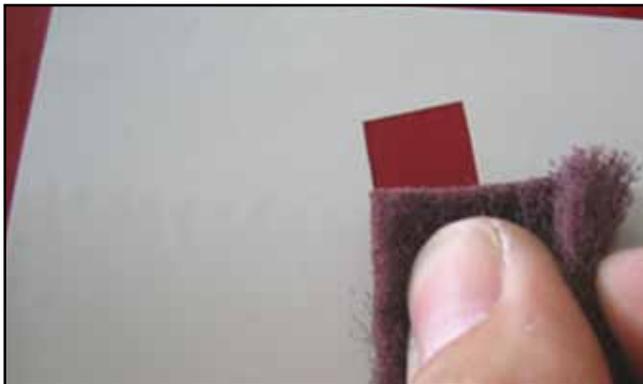


Photo 310



Photo 311



Photo 312



Photo 313

SECTION 47 FUEL TANK CLEANING

The fuel tanks must be clean inside. Remove the fuel cap and use a flashlight to examine the interior of the tank. At this point in time, there should never have been fuel in either tank. If the tanks are still free of fuel and dry and if there is any debris inside either tank use a vacuum to remove it. Inspect and clean both tanks. When done, place the vented cap onto the tanks with the vent pointed forward.

If someone over-zealously put fuel in the tanks before you cleaned them, call CubCrafters to discuss how to deal with this situation.



Photo 314

**Photo 315****SECTION 48 STALL WARNING**

This step deals with the stall warning sensor installation. Begin by using an Exacto knife to cut the fabric away from the 3 stall warning openings in the leading edge of the left hand wing.

Reach through the inspection hole (cut this inspection hole if not cut already) and connect wires to the sensor per photo 370.

**Photo 316**

Connect the stall warning horn wire and ground wire to the stall warning switch at this time per Photo 316.

Work the stall sensor through the inspection hole and into position in the opening in the leading edge of the wing.

**Photo 317****Photo 318**

Next, place the stall warning cover plate into position and check the fit. The cover plate should match the curve of the leading edge of the wing. If it doesn't fit nicely, carefully hand form the cover to obtain a flush fit between cover and leading edge of wing.

**Photo 319**

Start the screws into position but leave them loose. Then, push the stall-warning sensor to its maximum height and tighten the screws.

**Photo 320**

Prepare the stall warning tab and the bottom of the stall-warning sensor by cleaning them with rubbing alcohol.

**Photo 321**

Once clean, apply a thin film of Adhesive Promoter with the brush.

**Photo 322**

Next, apply a small piece of double stick tape to the bottom of the sensor. Trim the tape to fit the end of the sensor.

Trim any excess double stick tape from the bottom of the sensor.

Press the stall-warning tab into place.

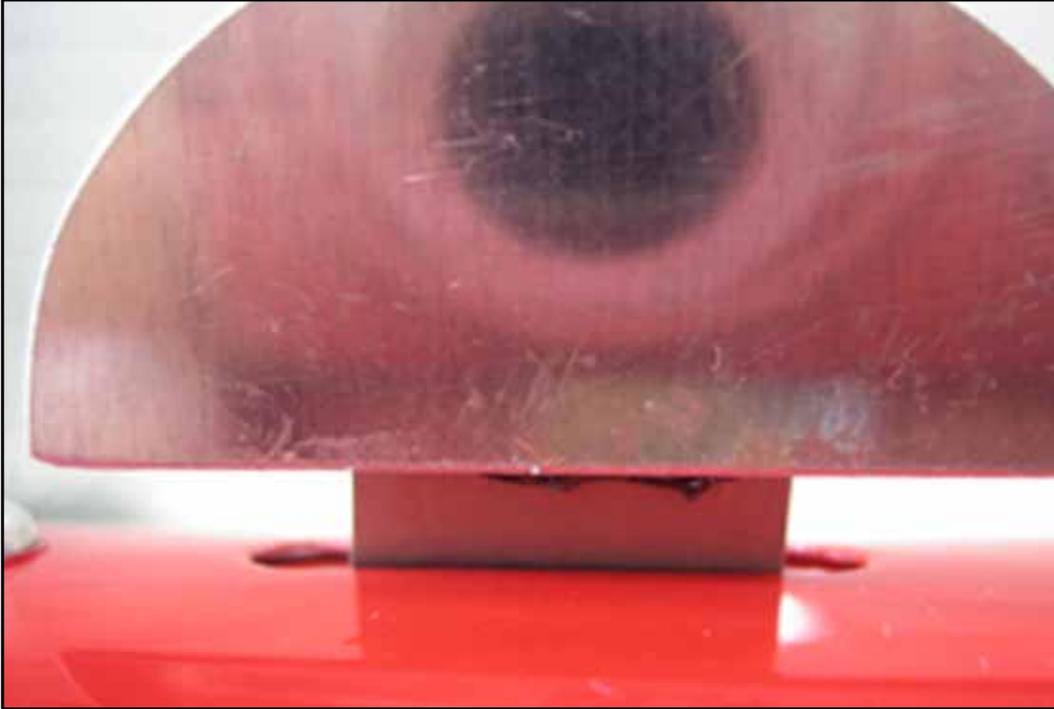


Photo 323



Photo 324

LOG & INSPECTION SHEET FINISH # 8

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
	RH Wing Prep		
1.55	Install Vortex Generators per Installation Instructions.		
1.56	Install fuel tank, finger screens and hose lengths. Ensure hose clamp in place.		
1.57	Install navigation light (green), strobe light if applicable.		
1.58	Ensure fuel cap is installed with vent in forward position.		
1.59	Ensure fuel cap can be removed/replaced with reasonable force.		
1.60	Ensure lift strut mounting holes are free of paint.		
1.61	Ensure black fabric patch is installed in No. 1 nose rib.		
1.62	Check fit and finish.		
	LH Wing Prep		
1.63	Ensure landing light lens has been properly installed.		
1.64	Install Vortex Generators per Installation Instructions.		
1.65	Install fuel tank, finger screens and hose lengths. Ensure hose clamp in place.		
1.66	Install navigation light (red) strobe light if applicable.		
1.67	Install Stall Warning Vane - (Vane pointing down)		
1.68	Install intercom unit per drawing.		
1.69	Ensure fuel cap is installed with vent in forward position.		
1.70	Ensure fuel cap can be removed/replaced with reasonable force.		
1.71	Ensure lift strut mounting holes are free of paint.		
1.72	Ensure black fabric patch is installed in No. 1 nose rib.		
1.73	Check fit and finish.		

SECTION 49 TURTLEDECK

This section deals with placement of the Trix nuts for fastening of the turtledeck. The nuts will be placed on the number one rib capstrip. Start the layout by making a mark on the capstrip directly above the center of the aft spar.



Photo 325

Next, measure 3.25" between each of the 3 additional Trix nut locations towards the trailing edge of the wing.
Mark the locations on both number 1 ribs (left and right wings).

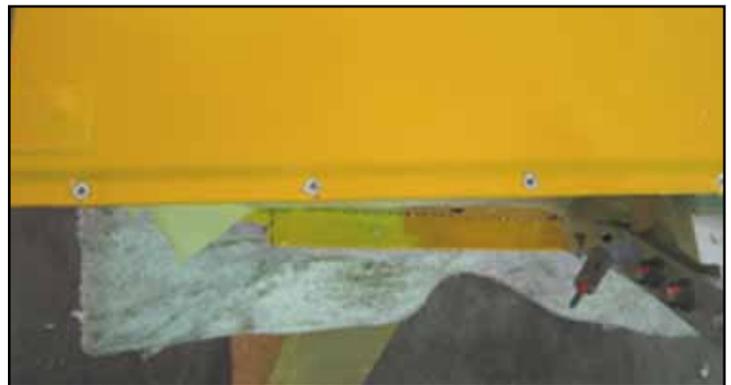


Photo 326

As a precaution, it is wise to apply a layer of masking tape over the rear most opening in the #1 rib to prevent chips from entering the wing during the drilling.

The next step undertakes the drilling for Trix nuts. Drill pilot holes of 3/16" diameter using a #1 Unibit at each of the 8 locations. Determine the edge distance initially mid-way across the flange. Then place the skylight into position and make sure that this edge distance will result in a proper edge distance in the Plexiglas. Balance the two edge distances (flange and Plexiglas) to have reasonable screw positions. Then use a #3 drill bit to open the holes to accept Trix nuts. Be sure to use a drill stop when drilling over the rear spar.

Now, install the 8 Trix nuts (HDW-AT32-632) using the Trix nut tool. Note: Trix nut should be snug and a bit difficult to push through the hole. A tight fit is necessary.

**Photo 327****Photo 328****Photo 329****Photo 330****Photo 331**

SECTION 50 STRUT FORKS

It is time to strut our stuff! Remove the protective cover from the strut fork (SP37101-002).



Photo 332



Photo 333

Turn the nut until it is finger tight on the strut fork and then back it off 8 full turns. There should be 8 threads showing as in the Photo 334.

Install the nut (AN316-C7R) onto the fork. Remove any excess anti-seize compound from the fork as the nut is threaded onto the fork.



Photo 335

Thread the fork into the bottom of the strut. Keep turning until the nut just touches the bottom of strut.



Photo 334

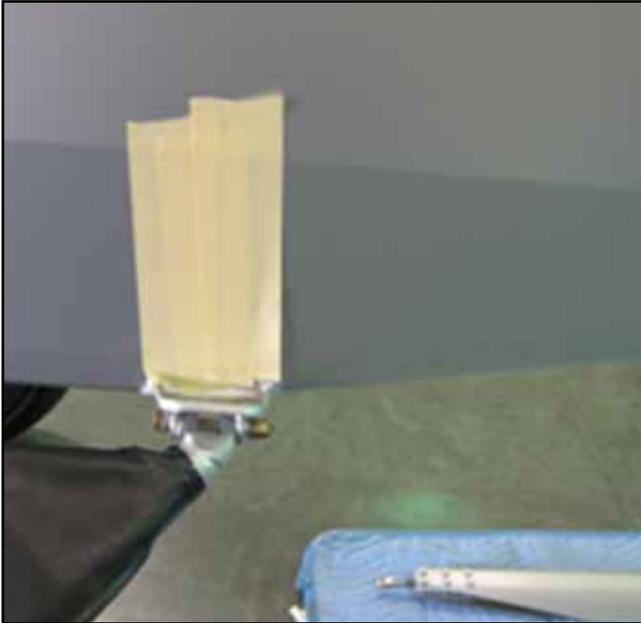
If the fork becomes hard to turn use a punch for leverage. Turn 1½ turns in and then 1 turn out until you pass the spot that is making fork hard to turn. You should be able to turn the fork all the way to the nut by hand. Do not let the nut turn during this process. Repeat this process for the remaining 3 struts.

When all the forks are turned into the strut ends, the fork should be left parallel with the strut chord.

**Photo 336**

Next, remove any paint from the jury strut mounting holes in the top and bottom of each strut. Use a hand deburring tool to accomplish this task.

Photo 337**Photo 339****Photo 338**

**Photo 340****SECTION 51 WINGS**

We start the wing installation by applying several pieces of masking tape to the fuselage just above the strut attach fitting as shown here (on both sides of the fuselage).

Gather up four 5/16" bullets and four 3/8" bullets that were made in the prep section of this manual.

**Photo 341**

The next assembly task is a bit tricky. You need three people to set the wings into place. So, go summon your two helpers. You will want to arrange the people as shown here (two holding and one to place the bullets and bolts).

**Photo 342**

Lightly grease the bullets.
Raise the wing and walk it into position.

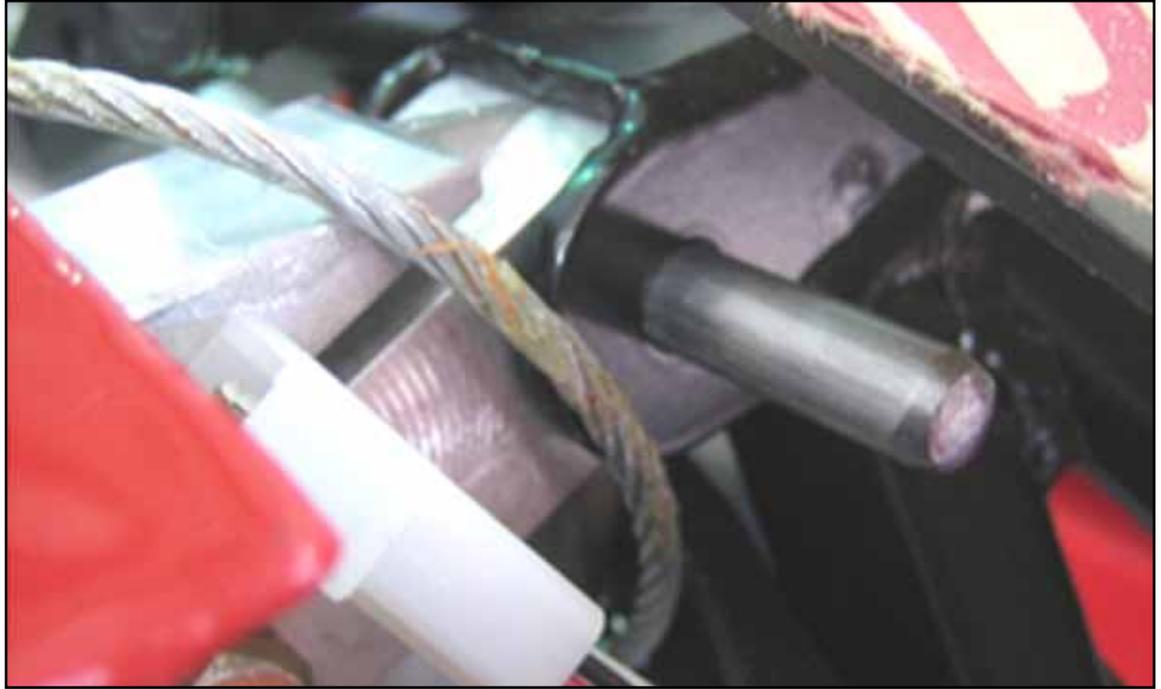


Photo 343

Tap a “bullets” into place on both spars.

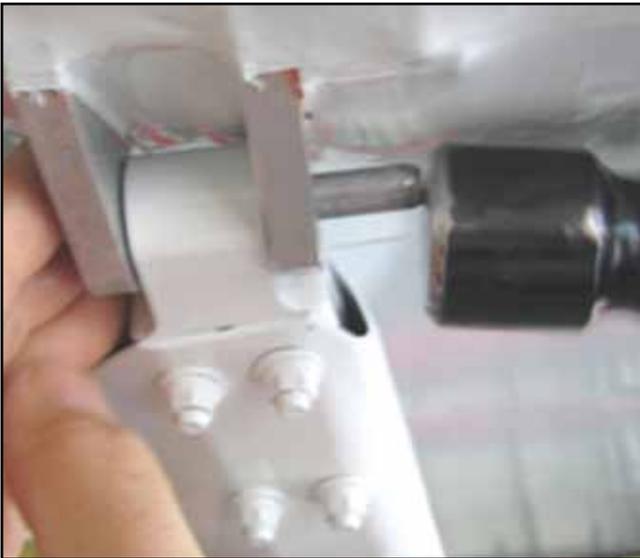


Photo 344

**Photo 345**

Now, before everyone gets too tired, we need to install the rear and front lift struts. Set the forward lift strut into place on the fuselage and insert the bolt (TC1909-001) and washer (AN960-616L) through the fork to hold it in position.

Now, bring the outboard end of the lift strut up to the wing mount. Tap a "bullet" into position to hold the strut to the wing. Notice the masking tape that has been applied to protect the finish from the mallet. Be sure that the bullets go all the way through.

**Photo 346**

Now, set the rear strut into position and insert a bolt (TC1909-001) through the fork and fuselage fitting.

Carefully place the outboard end of the strut into the wing mount and insert a "bullet".

Repeat the entire process for the other wing.

**Photo 348****Photo 347**

SECTION 52 WING RIGGING

We will begin by leveling the fuselage left and right, fore and aft. Next check the wing angles and verifying that the dihedral is correct. The last step is checking the washout.

SECTION 51**Step 1 LEVELING**

To begin, the fuselage will be leveled in the fore and aft direction. Place a level on the bottom doorframe. Level the fuselage by appropriately raising or lowering the tail. You can use a sawhorse and blocking to achieve level or you can use a modified scissors table like the one below (or another scheme of your choice). Make sure the wheel brakes are locked or the tires chocked before raising the tail.

Next we check and adjust the aircraft level from right to left. Place a level on the square crossbar above and forward of the pilot's seat. Read the angle.

If the fuselage is not level, place a jack under the "low" side main gear. Slowly raise jack until aircraft is level. This is easiest with two people – one to read the level and one to adjust the jack.

*Photo 349**Photo 350**Photo 351**Photo 352*

SECTION 51**Step 2 WING ANGLES**

Next we will check the angle of the wings. Go find the level adapter that was made in the Preparation Section of the Build Manual. Place the level with level adapter onto the wing as shown (the 3/8 inch “bump” is outboard) to check the wing for level.

**Photo 353**

If things aren't exactly right, bring the bubble to level by removing the “bullet” from the outboard mount of the forward strut, swing the strut forward, and turn the strut “in” or “out” as needed.

Repeat this process for the opposite wing.

The following is an optional step that may be convenient in the future:

You can establish plumb bob leveling points. One will be an attachment point on the ceiling of the aircraft and one will be a spot on the floor. With the airframe level fore and aft and left to right you should hang the plumb bob from the cockpit ceiling. Where and how you attach the string should be accurately reproducible. Adjust the string until the plumb bob almost touches the floor. This spot on the floor should be marked in some permanent way. You can re-level the aircraft by adjusting the aircraft until the plumb bob hangs as during this first leveling.

**Photo 354**

SECTION 51**Step 3 DIHEDRAL**

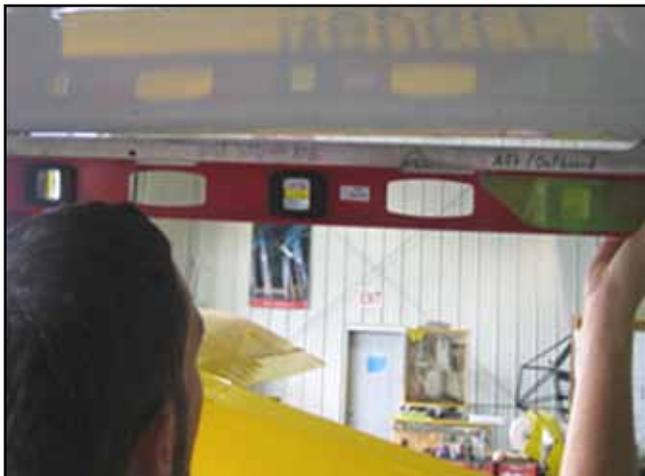
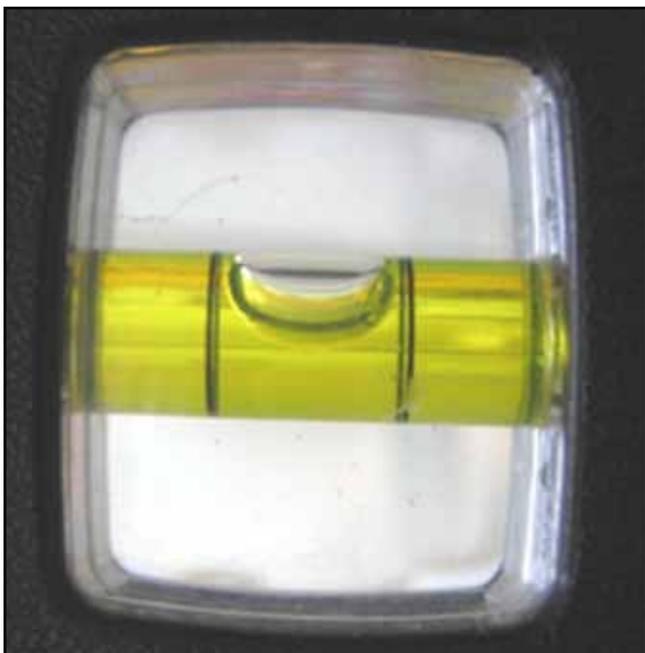
Tape a string to the outboard end of the right hand wing tip.

Use the rivet heads as a guide for the fore and aft position of the string. You want to have the string over the forward spar ends.

Pull the string to the left hand wing tip and tape the string in place. The positioning over the rivets should be the same. Stretch the string taut. It should be a straight line from the last right hand full rib to the last left hand full rib.

Now, place a rule on the top of the forward spar to measure the distance between the spar and the string. This measurement should be $3'' \pm 1/8''$.

**Photo 355****Photo 357****Photo 356****Photo 358**

**Photo 360****Photo 361****Photo 363****SECTION 51****Step 4 WASHOUT**

The next step checks and adjusts the wing washout. The fuselage must be level fore and aft and left to right for this measurement to be correct. The wing angles must also be correct.

Check the washout of the wings by placing a level in the center of the last outboard rib, ensuring that the level is not resting on any rivets.

Wing should be level as shown in photo above.

Adjusting washout = If the washout check shows that the bubble is out of level, remove the "bullet" from the wing attach point of the aft strut, swing the strut aft and turn the strut in or out as needed to bring bubble level.

**Photo 362**

Make sure that the jam nut on the strut fork is loose enough to allow movement of strut.

If a full turn of the strut does not bring the bubble into level, you may need to make a half turn. A half turn is accomplished by removing the bolt at the lower end of the strut and then turning the fork $\frac{1}{2}$ turn. This may be needed for setting the dihedral or washout.



Photo 364

SECTION 51**Step 5 JURY STRUT I-BOLT INSTALLATION**

The next step deals with installing the jury struts. Begin by inserting the jury strut bolt bushing into the forward strut. This bushing has a bolt head on the lower side.

The bushing should fit as shown here (topside view).

**Photo 366****Photo 365**

Next, use a 3/8" wrench to tighten the bushing while holding the eyebolt in the correct position. The eyebolt should line up with the hole in the aft strut. Torque the bushing to 25 inch-pounds using a 3/8" open-end wrench and a torque wrench. Do not allow the eyebolt to turn while tightening the bushing.

Repeat this process for the aft jury strut eyebolt.

Repeat the jury strut installation for the opposite wing struts.

**Photo 368****Photo 367**

SECTION 51**Step 6 FORWARD STRUT**

Next we finalize the strut mounting. Use a punch to partially remove the “bullet” from the forward strut wing mount. Slip a thin washer (AN960-516L) between the mount and the strut.

Then tap the “bullet” back into the mount. Use a punch to tap the “bullet” halfway through the forward strut mount, as shown here.

*Photo 369**Photo 370*

We will now install the forward lift strut bolt and tie down fitting. Begin by lubricating the bolt with a light coat of white Lithium grease. Place the tie down fitting (SC30300-001) in position and then position the bolt (AN5-36A) and washer (AN960-516L), into the recess made in the mount above. Then, lightly tap the bolt with a mallet, driving the “bullet” out of the strut mount and driving the bolt into the mount.

Repeat this step for the opposite wing.



Photo 371

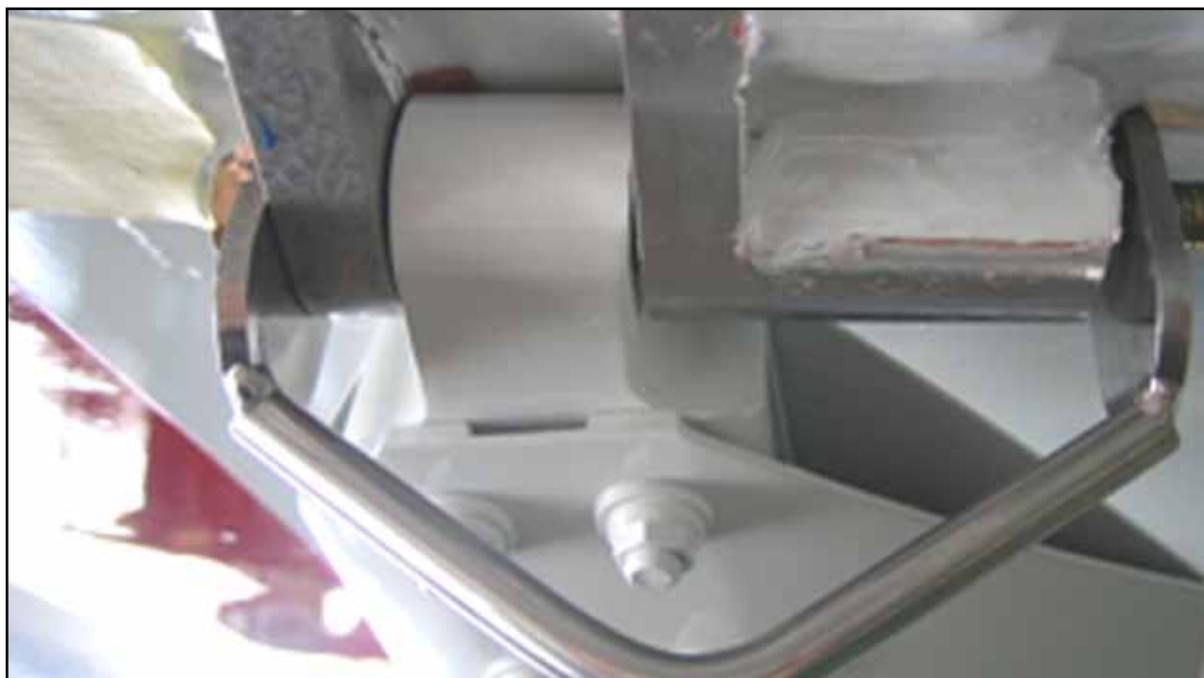


Photo 372

SECTION 51**Step 7 REAR STRUT**

Securing the rear strut is almost the same as the securing of the front strut above. Begin by placing a thick (AN960-516) or (thin AN960-516L) washer as needed into the aft strut wing mount. You want the strut to be quite snug in the mount. Lubricate the bolt (AN5-20A) with white Lithium grease and assemble the washer (AN960-516). As above, tap the bullet slightly out of position and then drive the bullet out as you drive the bolt in.

Repeat this process for the opposite wing.

These bolts will be finished in SECTION 52 Step 11.



Photo 373



Photo 374

SECTION 51**Step 8 FORWARD SPAR**

The next section deals with the forward spar attachment.

Begin by removing the nut holding the flap handle locking plate in position. This will allow flap handle to be swung out of the way to install the bolt in the forward wing mount.

Have an assistant hold the wing at the wingtip while you tap the “bullet” all the way out of the forward spar on one wing. Install the lift ring (SC10210-001) and tap the “bullet” back in approximately halfway through the front spar.

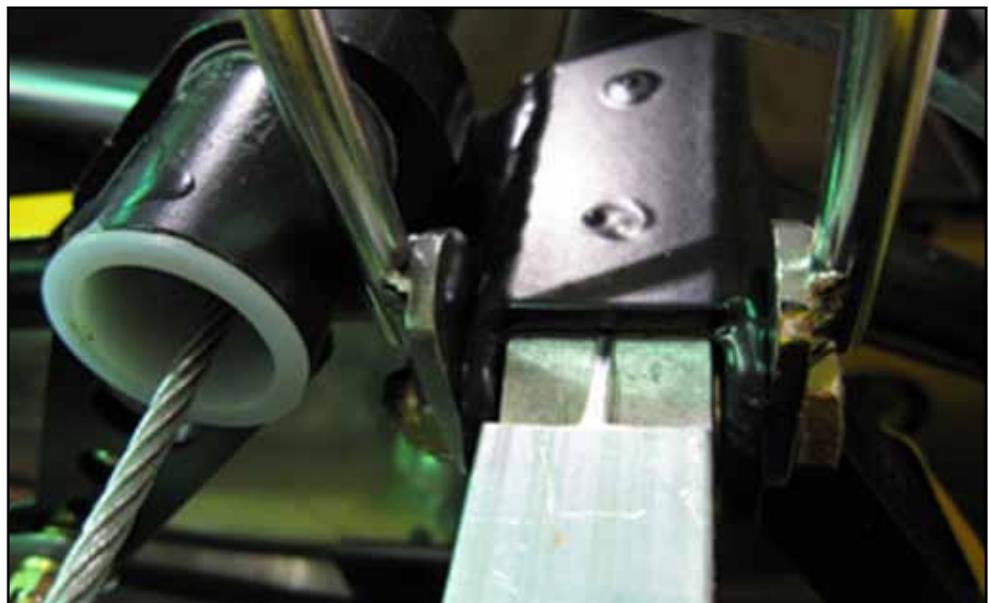
**Photo 375**

Insert a thick washer (AN960-516) or thin (AN960-516L) as needed to snug the spar into the forward mount.

Then insert the spar attachment bolt (AN5-15A). As has just been done several times, tap the bolt through the mount pushing the “bullet” out.

Repeat this process for the opposite wing front spar.

When both wing front spar bolts are in place, replace the flap handle locking plate nut and cotter pin.

**Photo 376**

SECTION 51**Step 9 REAR SPAR**

Next is the rear spar attachment. Begin by lubricating the bolt (AN5-15A) with a light coat of white Lithium grease. Then tap the bullet halfway through the fuselage fitting. Place the bolt and a washer (AN960-516) into position and tap the bolt through the first hinge block on spar.

Insert a washer AN960-516 between the spar hinge blocks.

Tap the bolt through the aft hinge block a little further and remove the "bullet". Insert a thick (AN960-516) and a thin washer (AN960-516L) between aft hinge block and aft wing mount.

Use a punch to assist in positioning the washers and the bolt.

Lightly tap the bolt through the wing mount.

Repeat the rear spar bolt installation for the opposite wing.

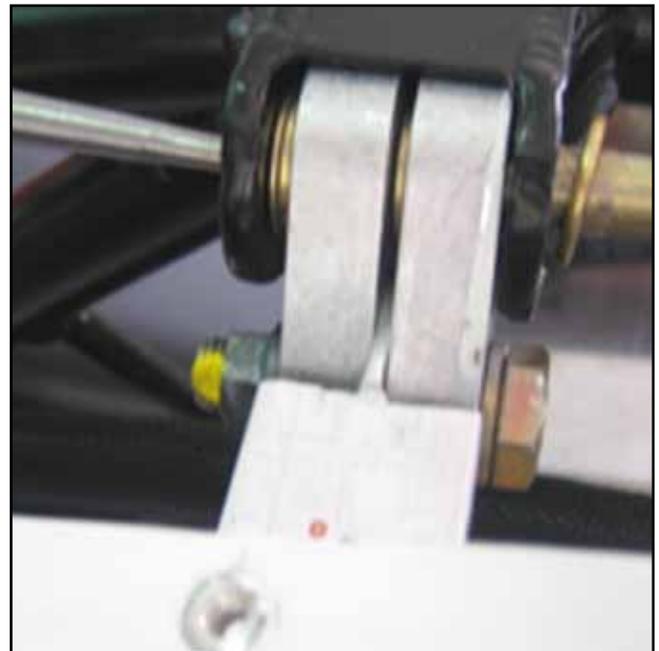
**Photo 377****Photo 378****Photo 379**



Photo 380

SECTION 51

Step 10 PULLEY CAGE

Prepare the aileron cable pulley cage by assembling the hardware in accordance with Figure FN44. Do not bend any cotter pins at this time.

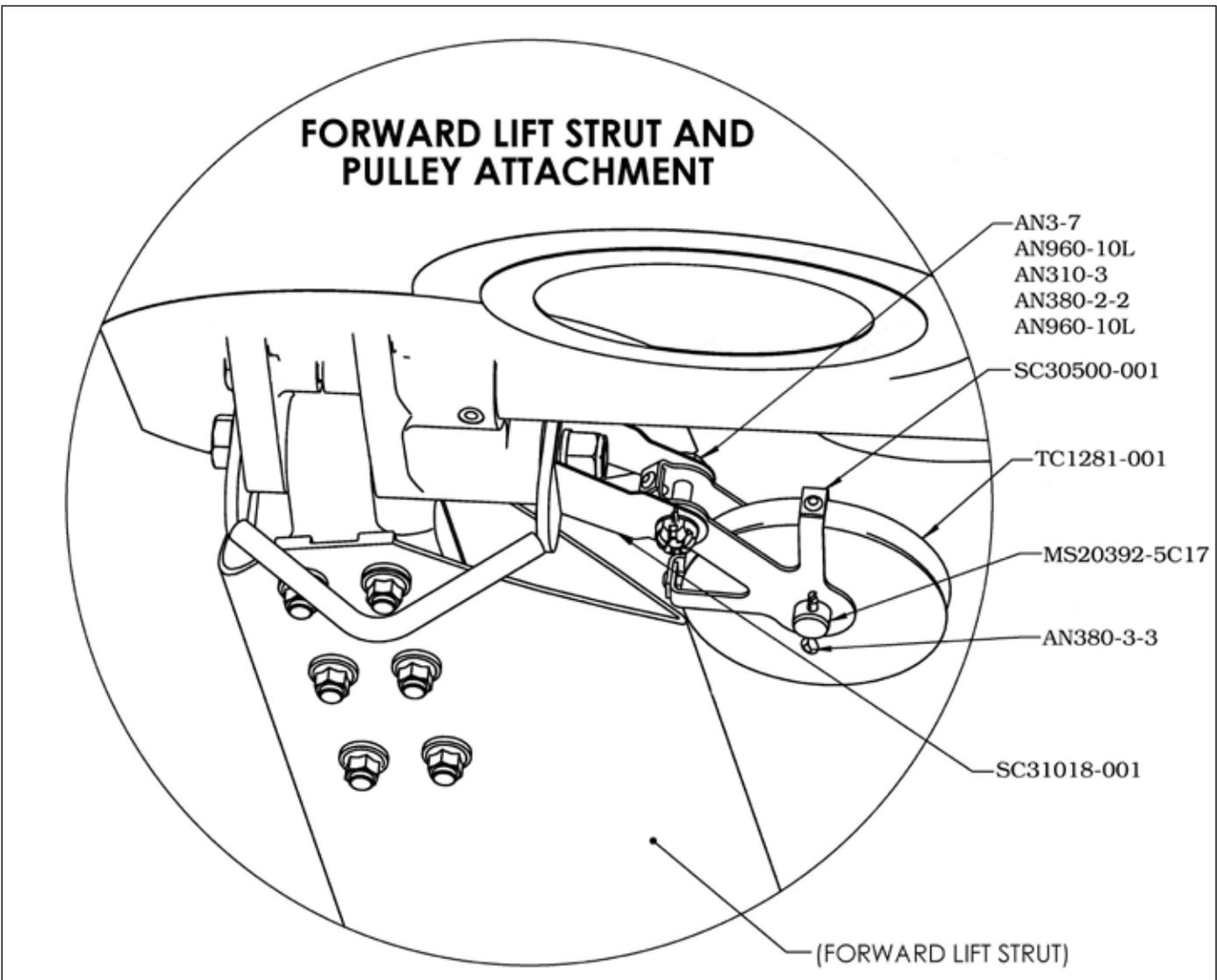


Figure FN44

Next, the pulley cage will be installed. Place the pulley cage and the mounting bracket onto the aft end of the forward strut mounting bolt. Place a nut (AN365-524A) and washer (AN960-516) onto the bolt. Use the same hardware for the rear strut attach bolt.

Do not tighten the pulley mount nut at this time.



Photo 381



Photo 382

SECTION 51**Step 11 TORQUE**

It is time to tighten some bolts. Torque the forward and aft strut to wing mount bolts to 160 inch-pounds. Then mark the nuts with Torque Seal. It is nice to use Torque Seal that matches the aircraft color.

Repeat this step for the other side.



Photo 383



Photo 384

**Photo 385****Photo 386**

Next, the lower strut attach bolts are fastened. Install a washer (AN960-616L) and nut (AN320-6) on the bolt. Then torque the mounting bolts to 95 inch-pounds. Install the cotter pins by turning the nut clockwise (tighter) until the hole is aligned with the next slot in the nut. Install the cotter pins and bend them as shown. Repeat on opposite side.

Next, tighten the jam nuts on the strut forks on both sides of the fuselage. Count the number of exposed threads on each strut forks. There should not be more than 15 threads exposed. The photograph here has 10 threads exposed.

Next, torque the rear spar wing attachment bolt. Begin by installing a washer (AN960-516) and a nut (AN365-524A). Torque the rear spar wing mounting bolts to 160 inch-pounds. Apply Torque Seal to the nut. Repeat this step for the opposite spar.

**Photo 387****Photo 388**

Next, torque the front spar wing attach bolt. If the lifting loop is in place, only install a nut (AN364-524A). If the lifting loop is not going to be used, install a washer (AN960-516) and then the nut. Torque the front spar wing mounting bolt to 145 inch-pounds. Apply Torque Seal to the nut. Repeat this step for the opposite spar.

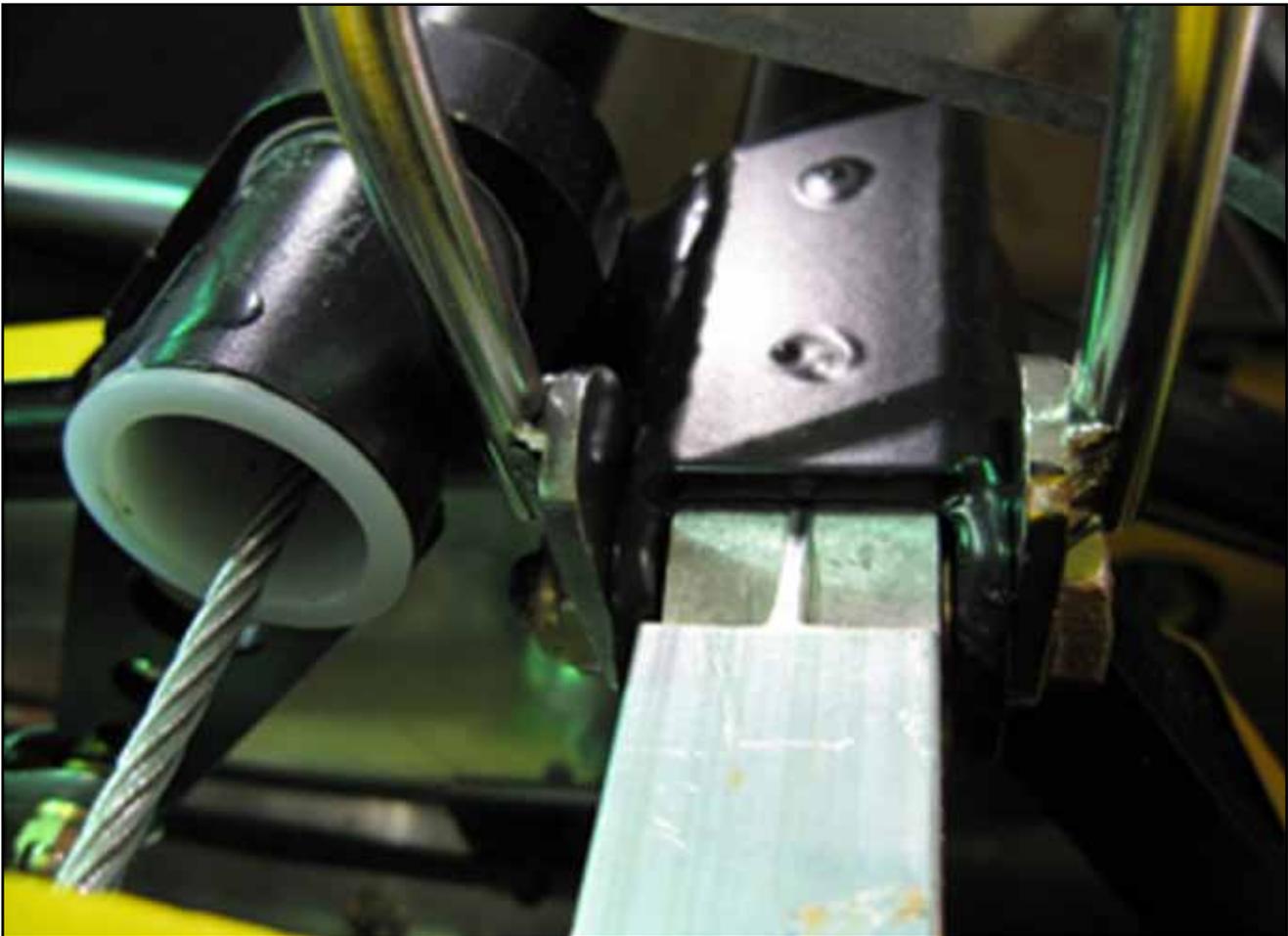


Photo 389

SECTION 51**Step 12 JURY STRUT PREPARATION**

Next the preparation of the jury struts is addressed. Begin by removing the paint from the mounting holes in the jury struts and the cross braces. You can use an Exacto knife to scrape the holes.

The jury strut with the tube in it will go on the left wing.



Photo 390

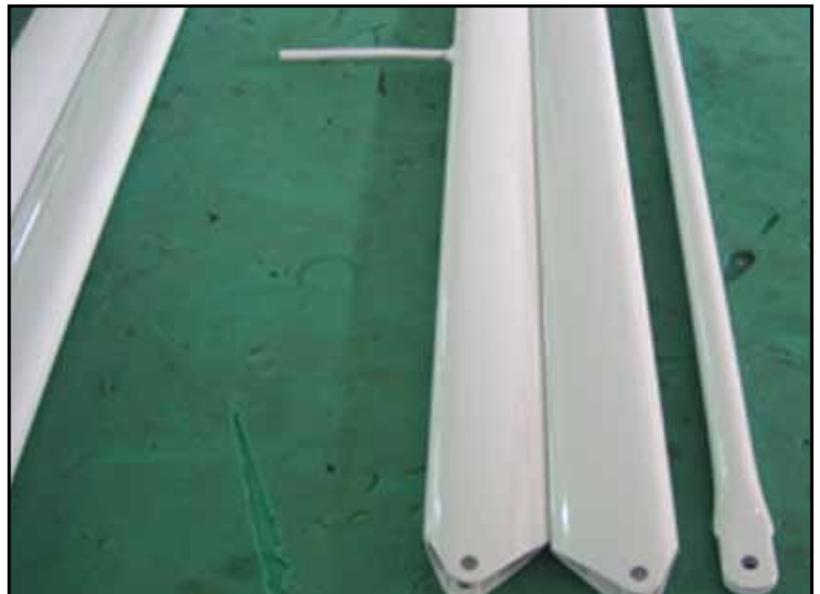


Photo 391

SECTION 53 INSPECTION HOLES

Before we install the jury struts, it is prudent to cut the inspection holes in the bottom of the wings. There are 3 holes on the right hand wing and 4 holes in the left hand wing. Try to cut the holes so that you remove a circular piece of material. Put the material that is removed into a zip lock bag and store it in a safe place. See the photographs.



Photo 392



Photo 393

The next step deals with burning drain holes. Using a hot soldering iron burn drain holes in the wing to match the photographs here.

Holes are made in each wing at the:

1) Aft tip of the tip bow;

2) The aileron side of the machined aileron/flap hanger; and

3) The inside the inboard rib at the edge of the false spar. The dashed line shows the edge of the false spar.

The left hand wing also has a hole aft of the front jury strut mount (for the pitot tube mount) as shown in to the right.



Photo 394



Photo 395



Photo 396



Photo 397

SECTION 54 JURY STRUT INSTALLATION

Now it is time for the jury strut installation. Begin by installing the forward and aft jury struts to the wing mount in accordance with Figure FN45.

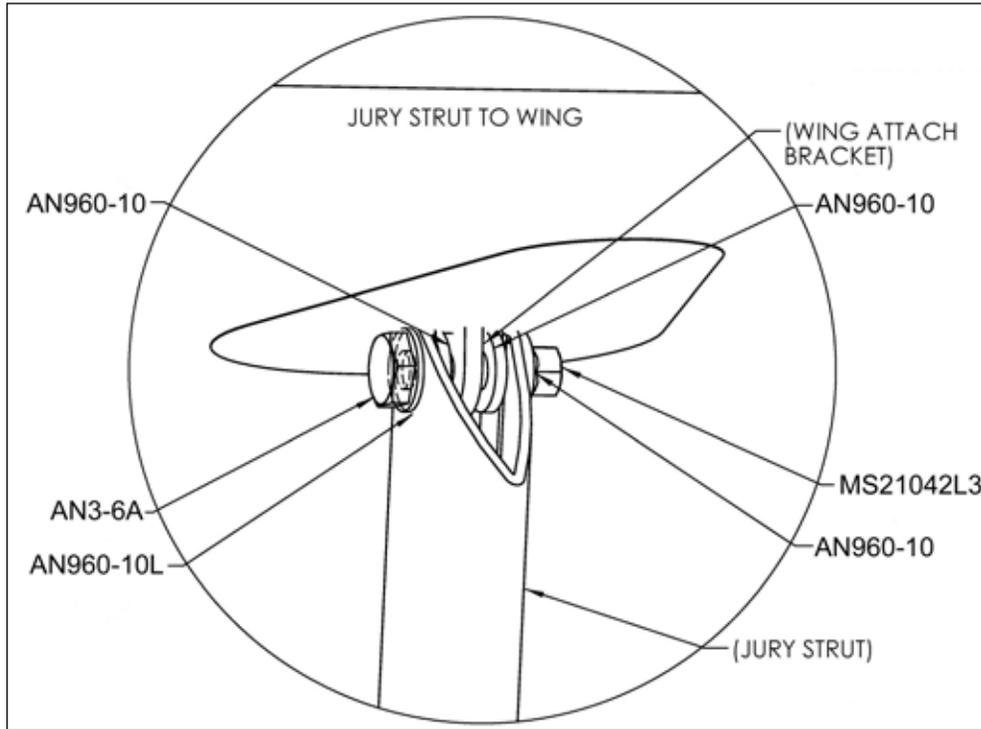


Figure FN45



Photo 399



Photo 398

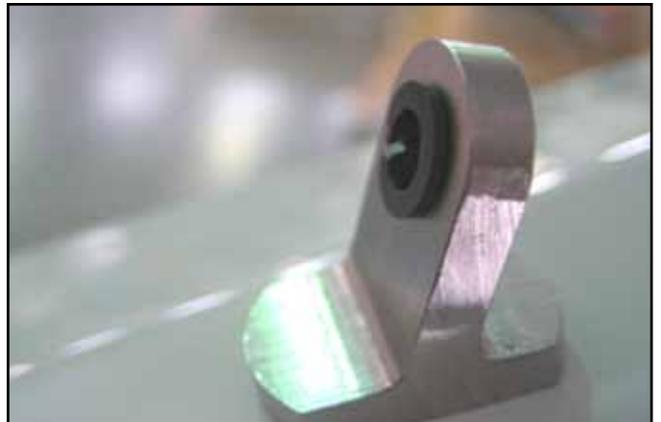
Next, the left hand forward jury strut installation is addressed. The photograph to the right shows the left hand forward jury strut with the Pitot tube. Insert the bolt through the strut and add a washer as shown.

**Photo 400**

Insert the Pitot tube through the hole behind the strut mount. Add remaining fasteners as set forth in Figure FN45.

**Photo 401**

The next step seals with the lower jury strut installation. Begin by inserting bushings into the eyebolts for the lower jury strut mounts. The shoulder of the bushing should be to the inboard side of eyebolt.

**Photo 402**

Position the ends of the cross brace such that they fit over the eyebolt and the bushing.

**Photo 403**

Insert the fasteners in accordance with Figure FN46.



Photo 404

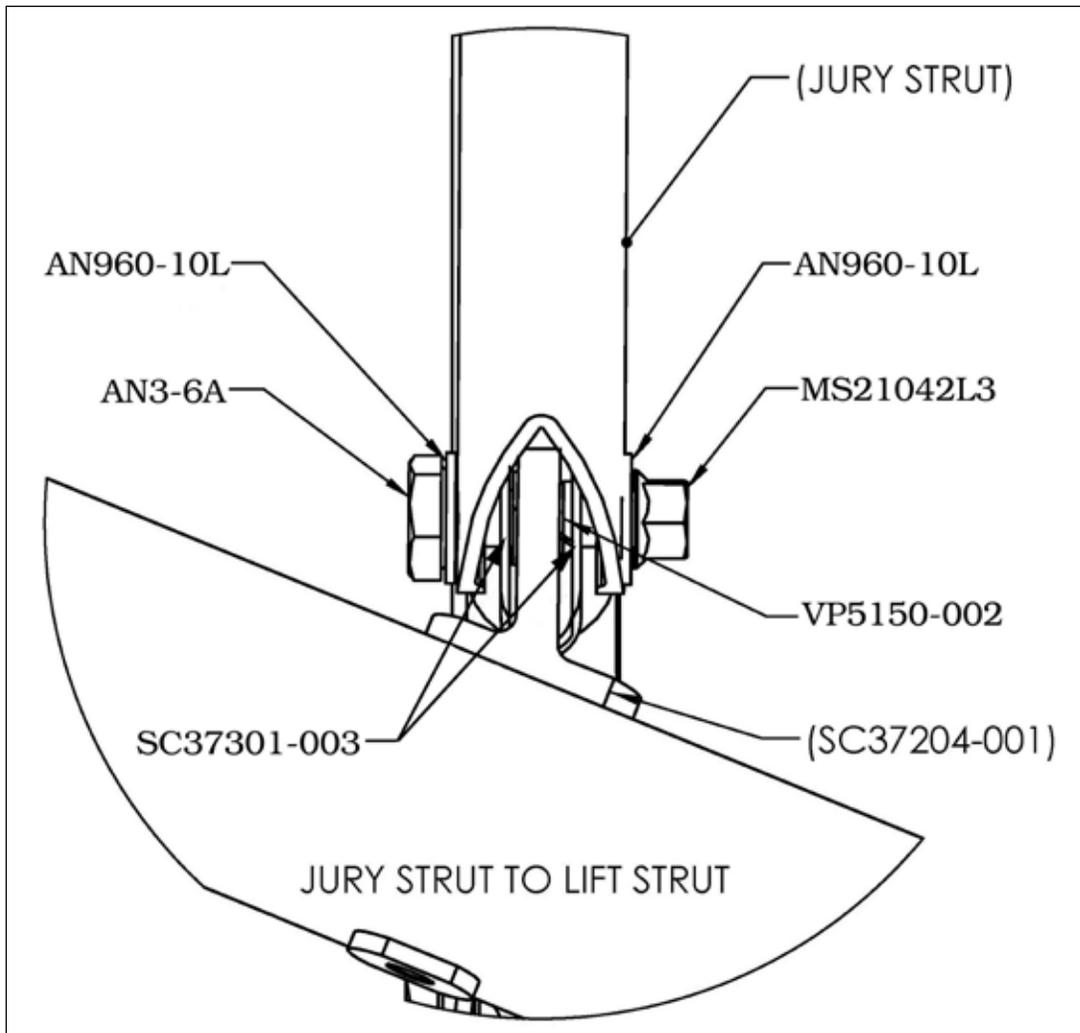


Figure FN46

The last part of this step is torquing the jury strut fasteners. Torque the bottom jury strut mount to 28 inch-pounds.

Torque the top jury strut mount to 40 inch-pounds.

Apply Torque Seal to the nuts. Again, it is nice if the Torque Seal matches the color of the aircraft.



Photo 405



Photo 406



Photo 407

SECTION 55 PITOT TUBE

The final portion of the Pitot tube installation is addressed in this step. Begin by locating the plastic tube that runs through the wing. Hold the plastic tube next to the metal extension of the Pitot tube that was placed in the wing in the previous step. Look along the length of the plastic tube and make sure that the tube will not contact any metal in the interior of the wing.

Cut the plastic tube for a nice radius and fit. Then, slip the end over the metal Pitot tube extension. Overlap the tube $\frac{1}{2}$ inch or more.



Photo 408

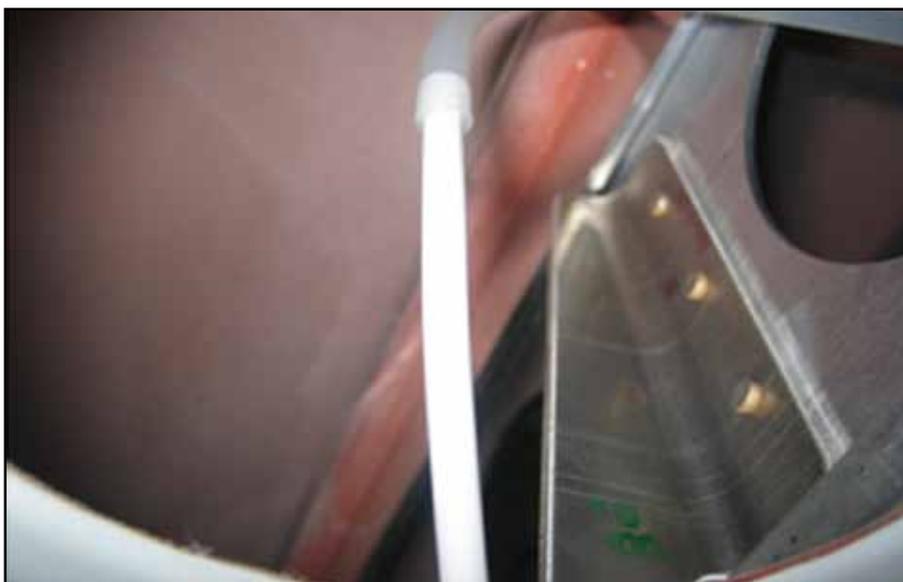


Photo 409

SECTION 56 SIDE WINDOW

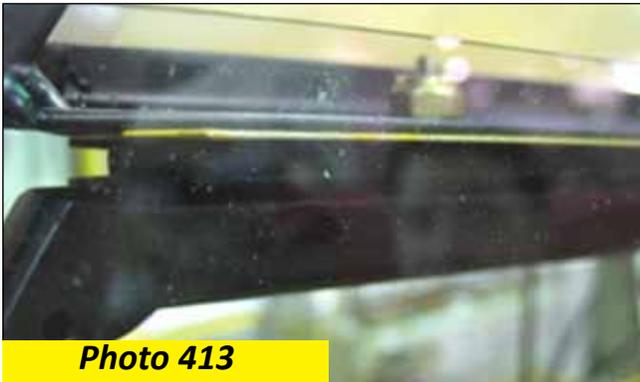
THIS SECTION WILL HELP WHEN INSTALLING THE WINDSHIELD IN THE WINDSHIELD INSTALLATION SECTION (NOTICE Photo 410).

This step addresses the side window glass installation. Begin by peeling the protective paper from the edges of the window and tape the window into place with masking tape.

The aft bottom edge should be consistent with the bottom line of the "D" window. The forward bottom edge should follow the line of the windshield liner.

The forward edge of window should follow the windshield trim piece. Use sanding block as needed to adjust the line of the trim.

Now that you know how it is supposed to fit, we will move to the window glass trimming. Start at the top edge. Ensure that the window will clear the hinge. Apply a piece of masking tape over the area where cut needs to be made. Then use a straight edge to mark your line.

**Photo 410****Photo 411****Photo 413****Photo 412****Photo 415****Photo 414**

**Photo 416**

Then cut the line with a die grinder and cutoff wheel. As before, use a sanding block and a utility blade to smooth the cut edge.

We continue the side window trimming. After making the top cut, tape the window back into position.

**Photo 417**

Now, examine the overlap between the “D” side window (already in place) and the side window we’re working on. The goal is to have the aft edge of the forward window overlap the “D” side window by approximately $\frac{3}{4}$ inch. As such, mark for the aft cut on the side window at the aft side of the “D” window forward frame. Repeat this sentence to yourself before marking the spot. Make the cut and smooth as you just did for the top cut.

**Photo 418**

Next we undertake the side window match drilling. Bring the window back from the aft side cut and tape window into position. Match drill from the inside of the side window frame with a #40 bit. Place Clecos from the outside as you drill. Once these pilot holes are complete, enlarge the holes to $\frac{5}{32}$ ” using a #1 Unibit. When drilling the Plexiglas, start the drill from one side and finish the hole drilling from the opposing side.

**Photo 419****Photo 420**

Next we apply the window adhesive tape. As before, wipe the window frame with rubbing alcohol and then apply the red 3M Foam Tape (RM4905-002) to all of the areas that window will contact the frame. For the length under each hinge, cut the tape in half lengthwise.

Use a utility knife blade to trim the excess width from the tape on the top of window frame.

Screws will be going through the tape. As such, we need to pre-drill the tape. From the inside of the frame drill the tape at all holes with a #40 bit.

Use an Exacto knife to help peel the red cover tape at each break in the tape. Peel approximately 2" of cover tape from each end of each piece of tape and hold the ends in place with a short piece of masking tape.

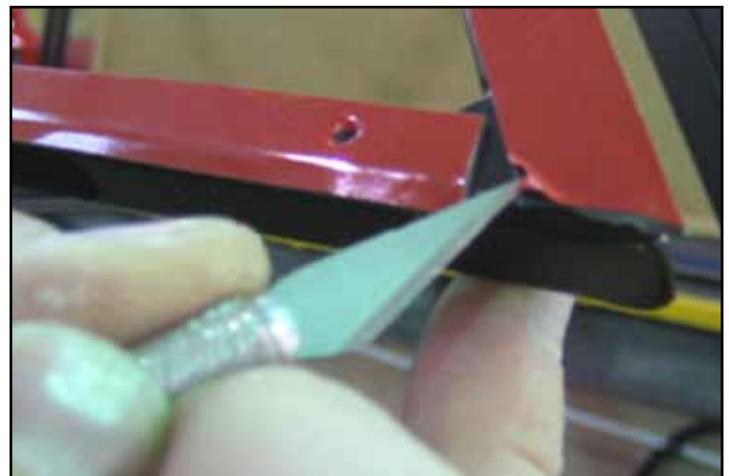
**Photo 421****Photo 422****Photo 424****Photo 423**



Photo 425

The front of the side windows should be trimmed to reflect the side window in Photo 425.



Photo 426

As in our previous applications of Plexiglas, it is now time to clean. Wipe the window with rubbing alcohol where the window will contact the double stick tape.



Photo 427

Cleco the window into place and remove the red cover tape from the double stick tape. It may be convenient to re-arrange the Clecos as the tape is removed to mitigate any interaction between cover tape and the Clecos.

Now, attach the window to the frame by inserting screws with plastic washers into the window per Figure FN47.



Photo 428

DO NOT OVER TIGHTEN THESE SCREWS.

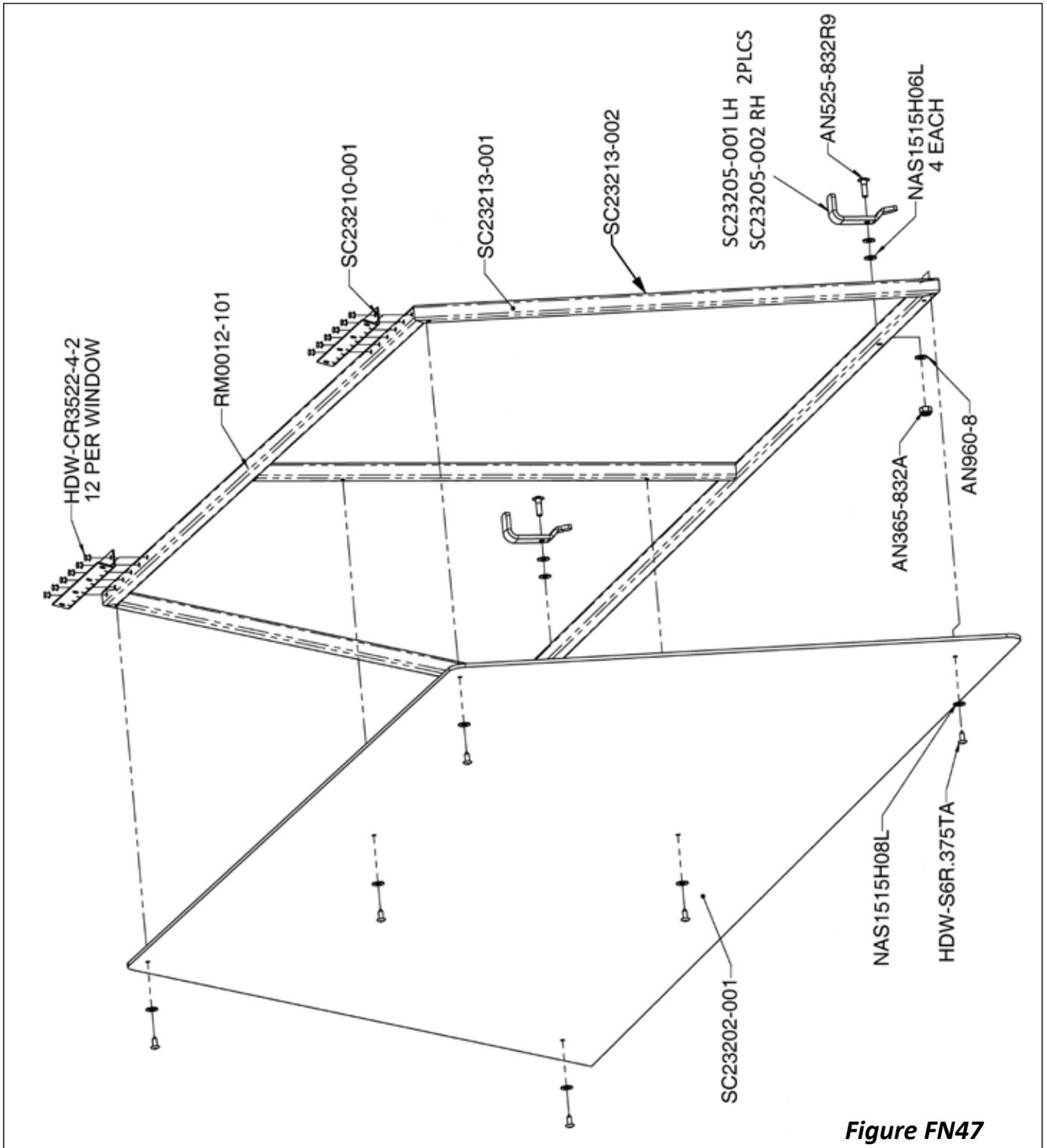


Figure FN47

IF YOU ARE PLANNING TO INSTALL THE WINDOW OPENING LATCHES AT THIS TIME, REFER TO SECTION 75.

SECTION 57 WINDSCREEN

You could fly the Carbon Cub without a windscreen and return from flights with bugs in your teeth and hair all slicked-back but it might be better if we employ a little Plexiglas. To start this installation, we need to protect the boot cowl, as we'll be working over it. Go back to SECTION 6 and read about paint curing. If the curing criteria are met, apply Gerbermask to the front of the boot cowl.

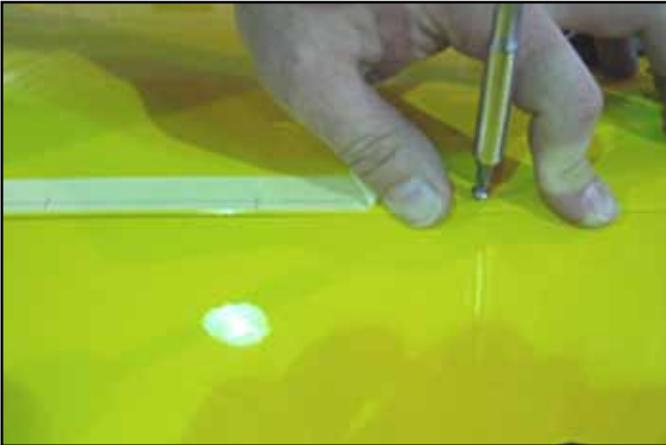


Photo 429



Photo 430

The windshield is either marked at CubCrafters for pre-fit trimming or has already been pre-fit trimmed. If the windshield has only been marked carefully cut on the marked line using a die grinder and a cut off wheel. It is a good idea to match the angle of the boot cowl where the windshield will touch. Pursue this cut with light pressure to avoid excessive heat generation.



Photo 431

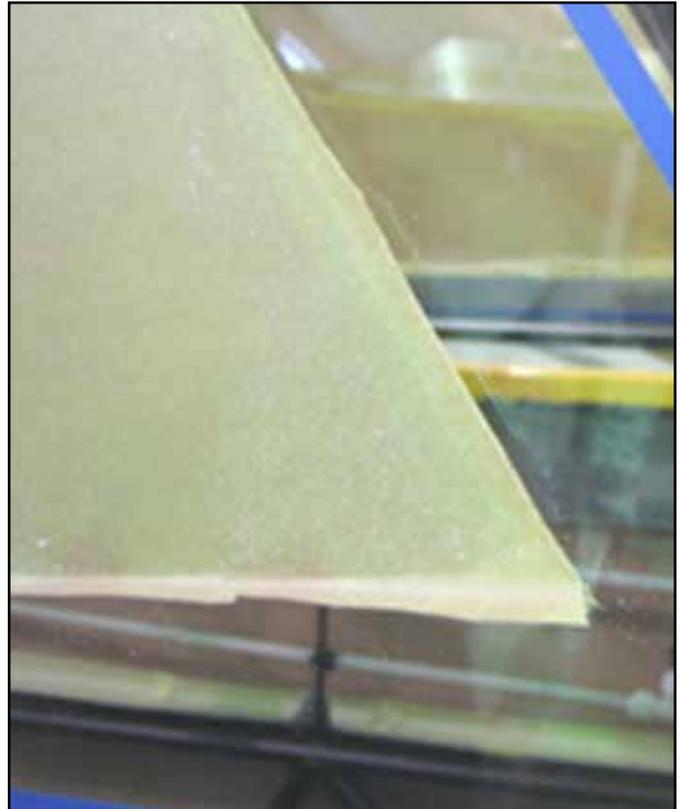


Photo 432

The left and right side windows can be painted similar to the “D” side windows. To layout the masking, apply blue masking tape to extend the painted line on the “D” window.

Next apply blue masking tape along the “A” post approximately 1/8” to 3/16” from the inside edge of the frame.

Remove the left and right side windows and paint them consistent with what you did for the “D” side window.

**Photo 433****Photo 434**

Once cut, chamfer the bottom edge of the windshield with a right-angle die grinder and a ScotchBrite wheel. Any small residual burrs can be removed by scraping a utility blade over the cut edge.



Photo 435

We now need to make a few measurements for fitting the windshield and the windshield liner. Mark the Gerbermask as follows: Start at the front lip of the boot cowl. Move inboard from the top lip of the boot cowl 1.5" (see Photo 436) and make a mark, and then mark an additional 2.75" (see Photo 437). Figure FN48 also shows these measurements. The 2.75" mark will be the front edge of the windshield. The 1.5" mark will be the front edge of the window liner.

Temporarily install the windshield onto the boot cowl. Now, tape the bottom front edge of the windshield to the boot cowl.

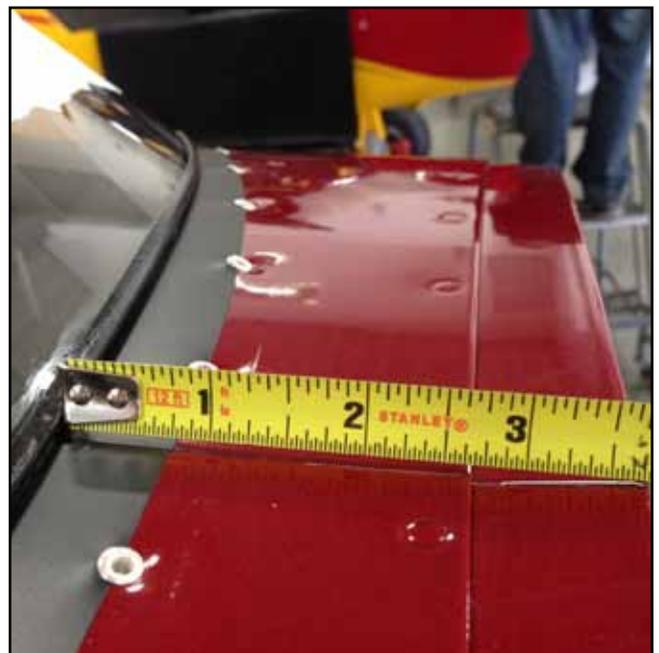
The windshield is positioned on the bottom edge according to the measurements made in the preceding pictures and text. Next we need to position the top of the windshield.

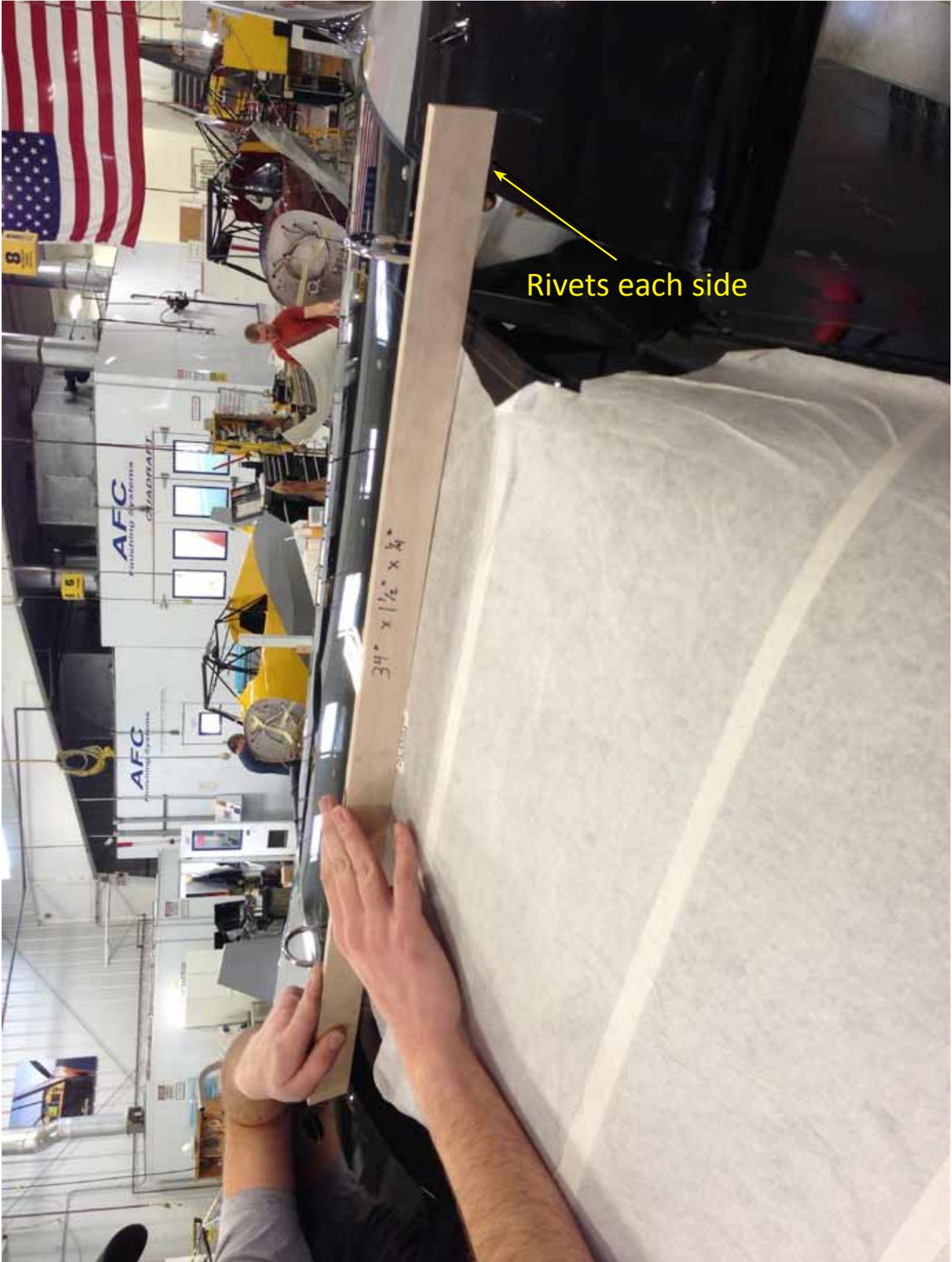
Cut a 1/4" X 1 1/2" X 34" piece of plywood as shown in Photo 438. This will be used to set the position on the top of the windshield. Set the plywood on the top of the top of the wings as shown in Photo 438, the next page has a larger photo. The plywood should rest just above the top leading edge rivet on each wing.

Move the top of the windshield fore or aft as necessary to achieve this fit. Once you have it, clamp the side as shown and repeat on the opposite side.

When both sides are clamped, clamp the top of the windshield to the upper windshield channel.

Recheck the front measurements and make adjustments, if necessary.

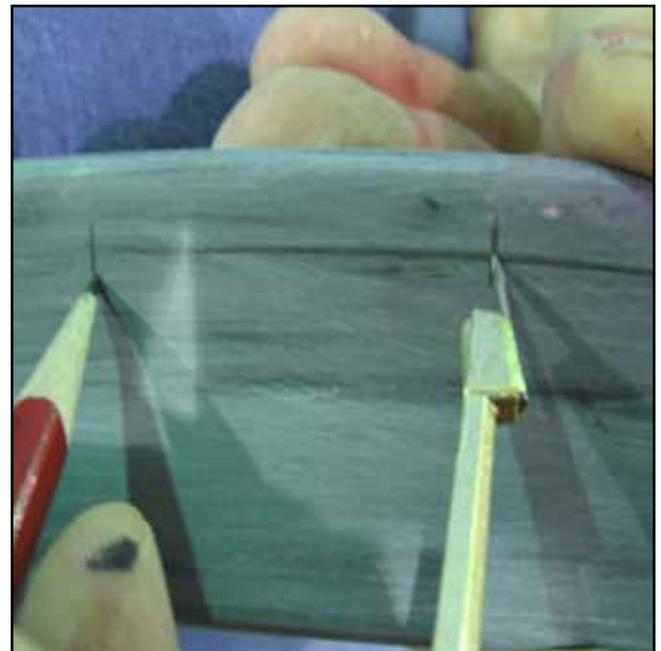
**Photo 436****Photo 437****Photo 438**



With the windshield positioned according to the preceding step, mark the centerline of the boot cowl on the windshield protective wrap. Now, center the windshield liner on the windshield and mark the same centerline on the window liner.

**Photo 439**

Use a compass to mark the centerline and the lateral spacing for the screw holes in the window liner per Photo 440. The edge distance should be 0.5 inch.

**Photo 440**

Tape the windshield liner into place using the centerline marked above.

**Photo 441**

**Photo 442**

Begin at the center and drill each of the marked holes with a #40 bit. Cleco each hole as it is drilled. Work your way outward from the middle, alternating left and right.

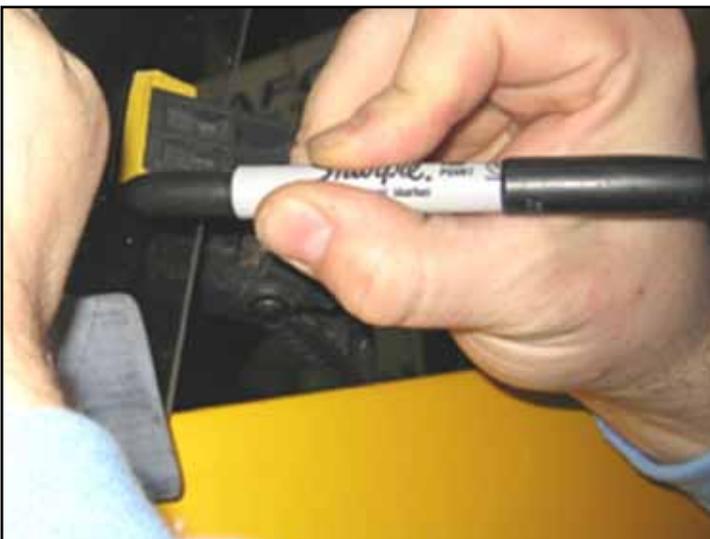
Do not drill the last two holes on each side at this time.

**Photo 443**

Next, we need to mark a trim line on both sides of the windshield liner before removing it from the windshield.

Follow the line of the "A" pillar channel to make the line on the windshield liner.

Now, mark a trim line at the top aft edge of the windshield. Leave the protective paper in place.

**Photo 444****Photo 445**

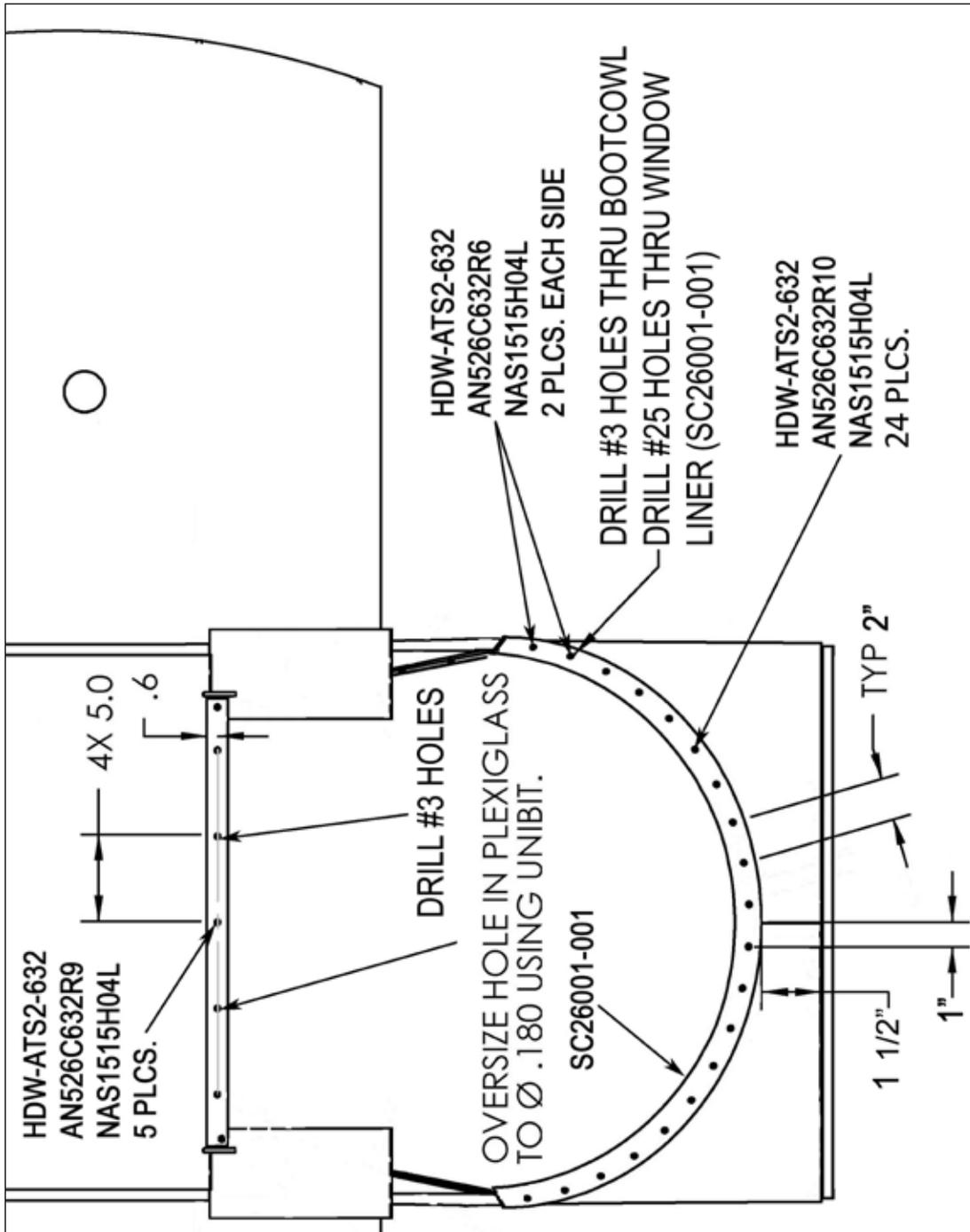


Figure FN48

**Photo 446**

We now need to prepare for the windshield side trim. Begin by marking the center of the holes for the windshield, side trim pieces. You will be able to discern the holes in the "A" pillar through the Plexiglas.

Mark the sides of the windshield for trimming by making marks on the junction line between the channel and the "A" pillar.

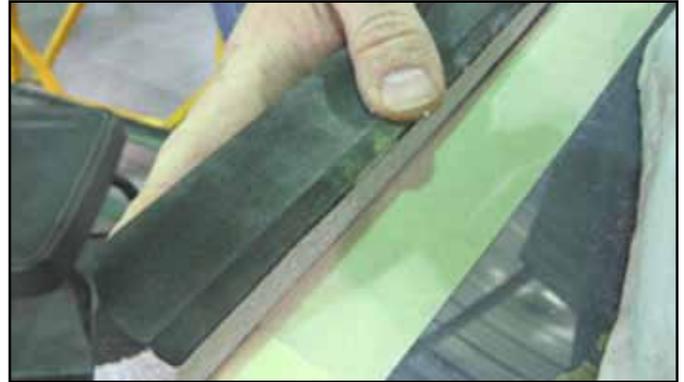
**Photo 447**

Apply masking tape to the windshield (mostly) on the windshield side of the marks (as opposed to the side that will be cut off). Then use a straight edge to mark the cut line (straightening out the line). Use a die grinder to make the cut. As above, be careful and proceed with light pressure. Steady the hand holding the die grinder by running your other hand along the edge.

Be sure to trim both sides and the top line.

**Photo 448**

Scrape the cut edge with a utility blade to smooth it. The use of a sanding block can also be effective to generate a straight and smooth edge.

**Photo 449**

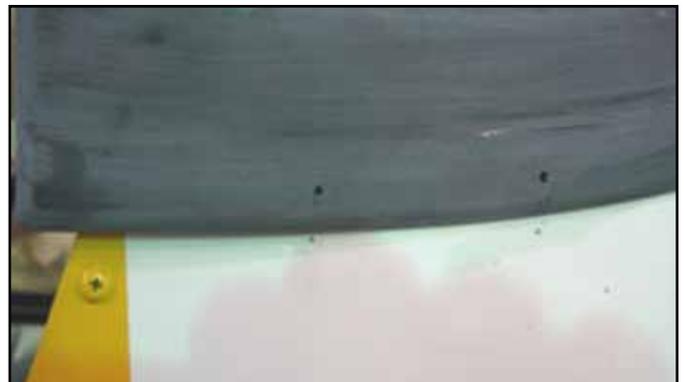
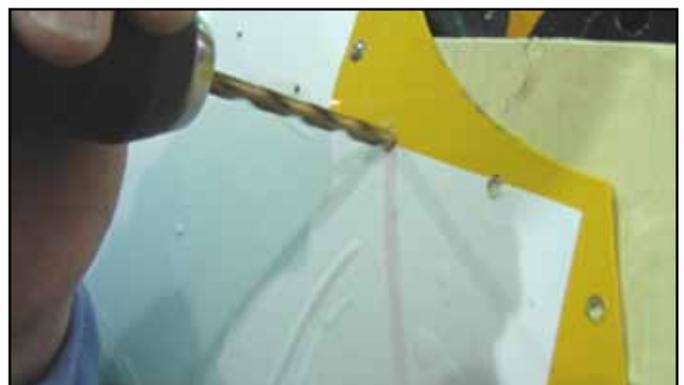
Now, use a #1 Unibit to drill holes for the well nuts that will hold the sides of the windshield and trim pieces in place.

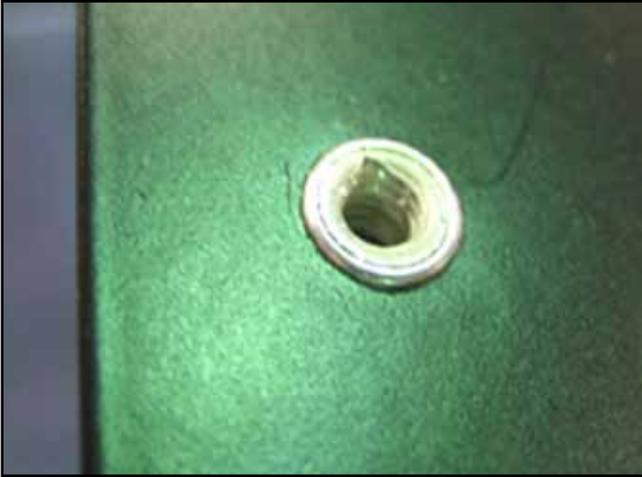
**Photo 450**

We will now finish the windshield liner drilling. The last two holes on each side of the window liner are to be drilled through the liner only. Believe it or not, you want the drill bit to make a tiny mark on the Gerbermask. Drill the holes with a #43 bit. If this drill-bit-marking makes you nervous, mark the hole locations with a Sharpie pen

The windshield liner has been removed and you should be able to see the marks made in the preceding step. Place a "metal protector" (a piece of sheet metal or thin plywood that you won't drill through) between the boot cowl and the interior of the cockpit before drilling.

This is done to protect the wire harness that is behind the boot cowl. Begin by drilling the marks made above with a #43 bit. After drilling with the #43 bit, finish the holes by drilling them with a #3 bit. The size issue (#3 vs. #43) will become clear in the next step.

**Photo 451****Photo 452**

SECTION 58 TRIX NUTS**Photo 453**

Once upon a time, a breakfast cereal advertisement claimed, “Trix are for kids”. These Trix are not so tasty. A Trix nut is a cylindrical fitting that has threads on its interior. This kind of nuts allows bolting to thin panels. The Trix body is placed into a drilled hole and is then upset to grip the panel and prevent Trix extraction or rotation. The picture to the right shows a properly placed Trix nut.

Go back to Figure FN48 and look at all the places that you will be placing Trix nuts (HDW-ATS2-632).

**Photo 454**

It is recommended that you use a #1 Unibit and drill down 3 steps (to the 3/16” diameter) for each pilot hole in the boot cowl. Then finish drill each hole with a #3 bit. Please note that it is critical for proper Trix nut function to have the correct size hole.

Before you drill the holes in the top crossbar, place a drop cloth (moving company padded blanket shown here) into the cockpit to collect the falling chips.

**Photo 456**

After you’ve dealt with the boot cowl holes, repeat the drilling process for the 5 holes in the crossbar.

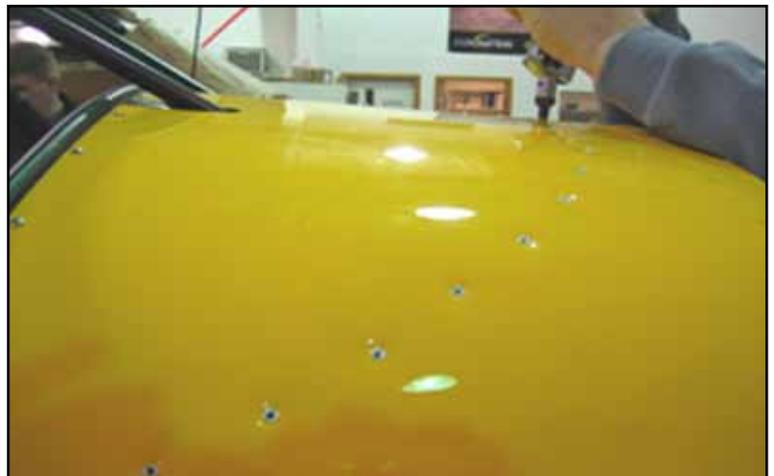
**Photo 455**

Begin the Trix nut installation by installing the Trix nuts into the top crossbar. There are a variety of tools for installing threaded inserts. A simple pliers-type is shown to the left that will be sufficient for the Carbon Cub build.

Be sure that the Trix nuts are fully seated and upset to the extent required. The Trix nut should be tight in the hole and should not rotate. If yours rotate, try upsetting the nut a bit more. If that fails, carefully drill out the offending Trix and replace it. Remember, you don't want to oversize the hole. A #3 drilled hole is the only hole a 6-32 Trix will fit.

Remove the Gerbermask from the boot cowl and install the Trix nuts in the boot cowl.

Remove the drop cloth. Take a few minutes to vacuum the floorboard to remove any debris.

**Photo 457****Photo 458****Photo 459**

**Photo 460**

SECTION 59 WINDOW LINER INSTALLATION

The next step in the process is opening up the holes in the window liner. It is recommended that you use a #1 Unibit and drill down 2 steps (5/32"). Drill each pilot hole in the window liner.

To deburr the holes you can turn the liner over and just touch the Unibit from the backside. The next larger ring will remove the burr.

**Photo 461**

Trim both sides of the window liner to reflect Photo 462. Ensure that you have sufficient gap between the window liner and the side window as shown in Photo 462. Once trimmed, sand the edges smooth.

It is now time to paint the window liner.

**Photo 462**

Now we will install the windshield for the final time. Loosely fit the windshield liner to the boot cowl. Install the screws but only enough to engage the threads. Do not tighten the screws yet.

Do not insert the last 2 screws on each side of windshield liner.

Next we will prepare the windshield for installation. Begin by wiping the edge of the windshield with rubbing or denatured alcohol. Next apply 3M foam tape (RM4095-002) folded over the bottom edge of windshield. ~~(RM4095-002)~~ RM4011-001

Do not apply 3M Foam Tape to the last 2.5" of each side of the windshield.

**Photo 463****Photo 464****Photo 465****Photo 466****Photo 467**



Photo 468



Photo 469

Place the trim strips into their positions on the windshield using well nuts to fasten the strips. The well nuts are shown here. **5 wellnuts per side.**

Pull approximately 2" of red cover tape from the 3M Foam Tape on each side of windshield. Work windshield into position on fuselage. Well nut should insert through the channel on the "A" pillars. Tighten well nuts on both sides of windshield.

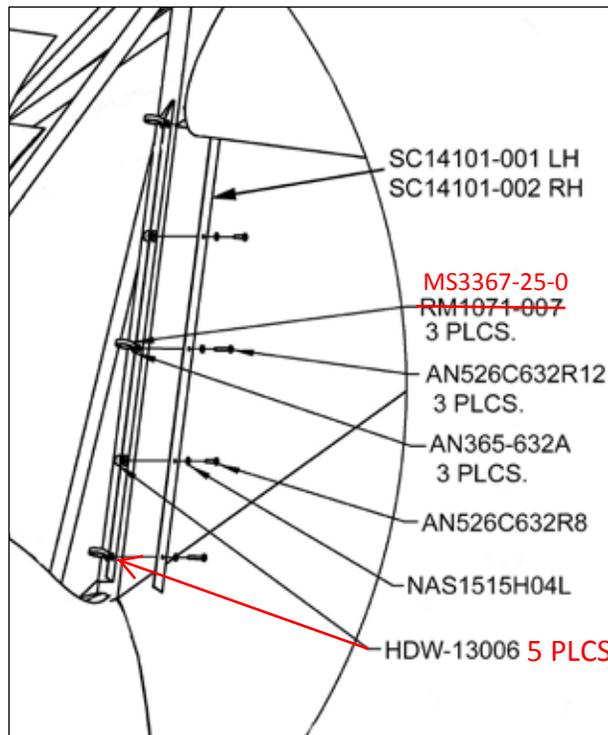
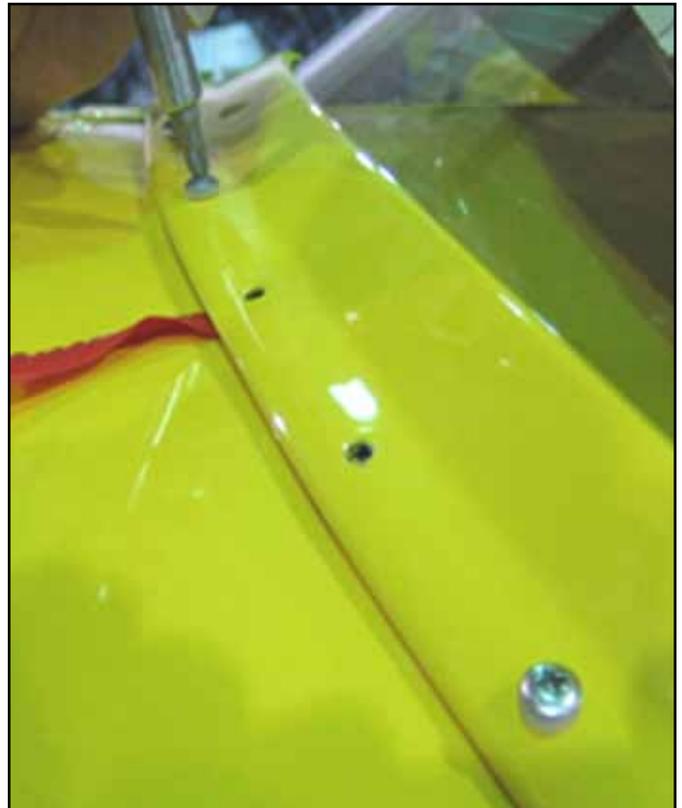


Figure FN49

With the windshield in position, remove 2 screws and pull the red cover tape until stopped by the next screw. It will be necessary to pull the tape slowly to avoid breaking it. It is not fragile but it can be broken if excessive force is used. In Photo 470 3 screws were removed and the tape is being pulled to the right.

Next, re-start the two (or three) screws that were removed. As before, just engage the threads – do not tighten. Now, remove two more screws and pull the tape over to the next blocking screw. Repeat this process across the windshield. After the cover tape has been completely removed and all the screws have been replaced, begin tightening the screws working from the center outward to each side. It is recommended to progressively tighten the screws (meaning tighten each screw a few turns each and then turn a few more turns repeating until the screws are tight).

**Photo 470****Photo 471**

SECTION 60 WINDOW A PILLAR WIRING INSTALLATION

The next step in the process is installing the tie down straps for the A pillar wiring harnesses. Drill a #24 hole in the straps as shown in Photo 472. Install the straps onto the three long screws in the A pillar as shown in Photo 473 and Figure FN49. Wrap the wire tie around the wire and fuel bundle as shown in Photo 474 and pull it tight. Using a set of side cutters remove the tail of the wire tie per Photo 475.



Photo 472



Photo 473



Photo 474



Photo 475

LOG & INSPECTION SHEET FINISH # 9
Log sheet

	FABRICATION AND ASSEMBLY TASKS	A	B	C	D
		Mfr Kit/Part/ Component	Commercial Assistance	Am-Builder Assembly	Am-Builder Fabrication
	Finish - 11 & 24 Listed Tasks				
	Task #				
F17	Fabricate Windshield			X	
F18	Assemble Windshield to Fuselage		X		
C1	Fabricate Instrument Panel	.5			.5
C2	Fabricate Instrument Panel Bracket and Fittings				X
C3	Assemble Instrument Panel with Fittings and Brackets			X	
C4	Assemble Avionics to Instrument Panel			X	
C10	Fabricate Electrical Wiring, Controls and Switches				X
C11	Assemble Electrical Systems Controls and Switches to Next Level Structure			X	

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.8	Install windshield per manual		
1.9	Install all painted parts with windshield		
1.10	Install window strike plates and adjust window latches per manual.		
1.11	Ensure all windows are sealed per manual.		
1.12	Ensure "A" pillar secure ties are installed (3 ea. side).		

SECTION 61 AILERON CABLES

This step deals with installing the aileron cable guides. The front lift strut is predrilled for Lower Aileron cable guides. Line up the cable guide and install a 1/2" long screw (HDW-S6R-.5TA) in the aft hole. Install a 3/8" long screw (HDW-S6R.375TA) in the forward hole.

Repeat this procedure for all the cable guides on each forward lift strut.



Photo 476


Photo 478

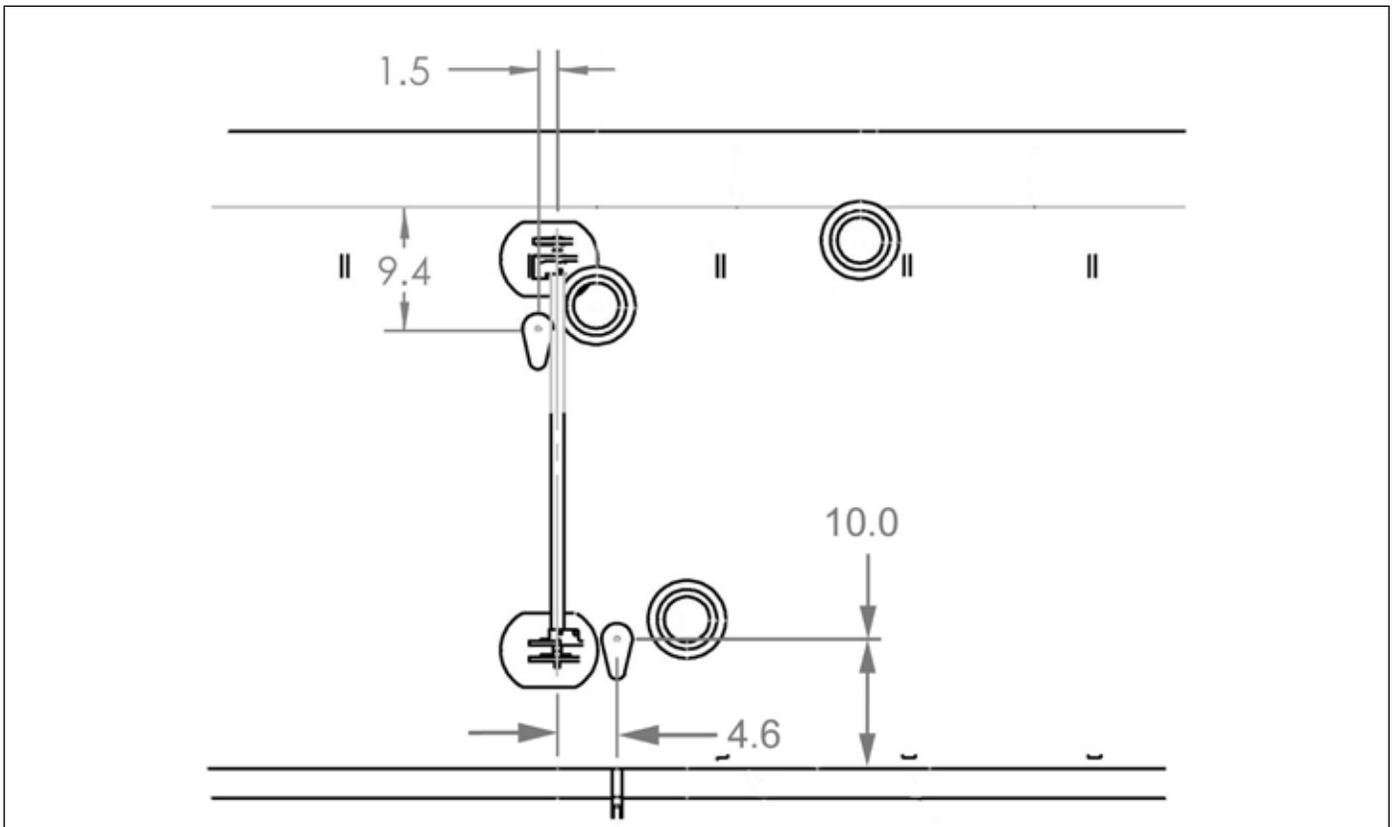
Photo 477

In this step you will be burning aileron cable holes in the wing. Begin by marking the locations for the aileron cable holes in accordance with Figure FN50. Use a small soldering iron to burn the holes in the fabric.

The next step addresses stringing the aileron cables. Begin by using a straight wire to locate the hole for the lower aileron cable to pass through fabric. From the open belly pan, locate the bottom of the pulley that the cable will pass through. The photograph to the right shows the bottom of the aileron cable pulley.

Align the wire with the bottom of the torque tube and the pulley and push the wire through the fabric. The wire will exit the fuselage above the lift strut mount.

Repeat this step for the other side.


Figure FN50

Now that the holes are located, you need to burn the aileron cable holes in the fuselage. Use a small soldering iron to burn the holes for the aileron cable to pass through the fabric.

Carefully route the cables through the holes in the fabric.



Photo 479

The next step addresses the lower aileron cable connection. Connect the lower aileron cables to the bottom of the rear torque tube mast in accordance with Figure FN51.



Photo 480

Make sure that the cotter pins are in place and there is freedom of movement of the cables and the linkage to the mast.

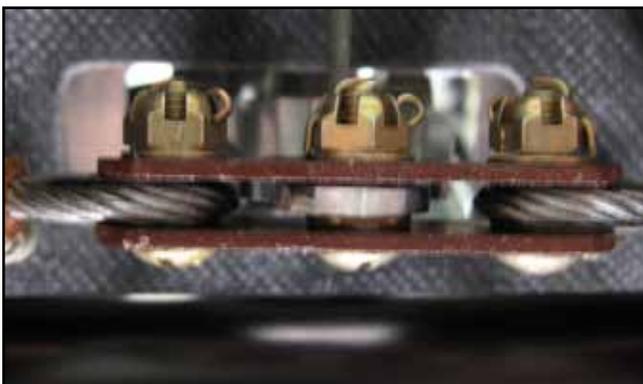


Photo 481



Photo 482

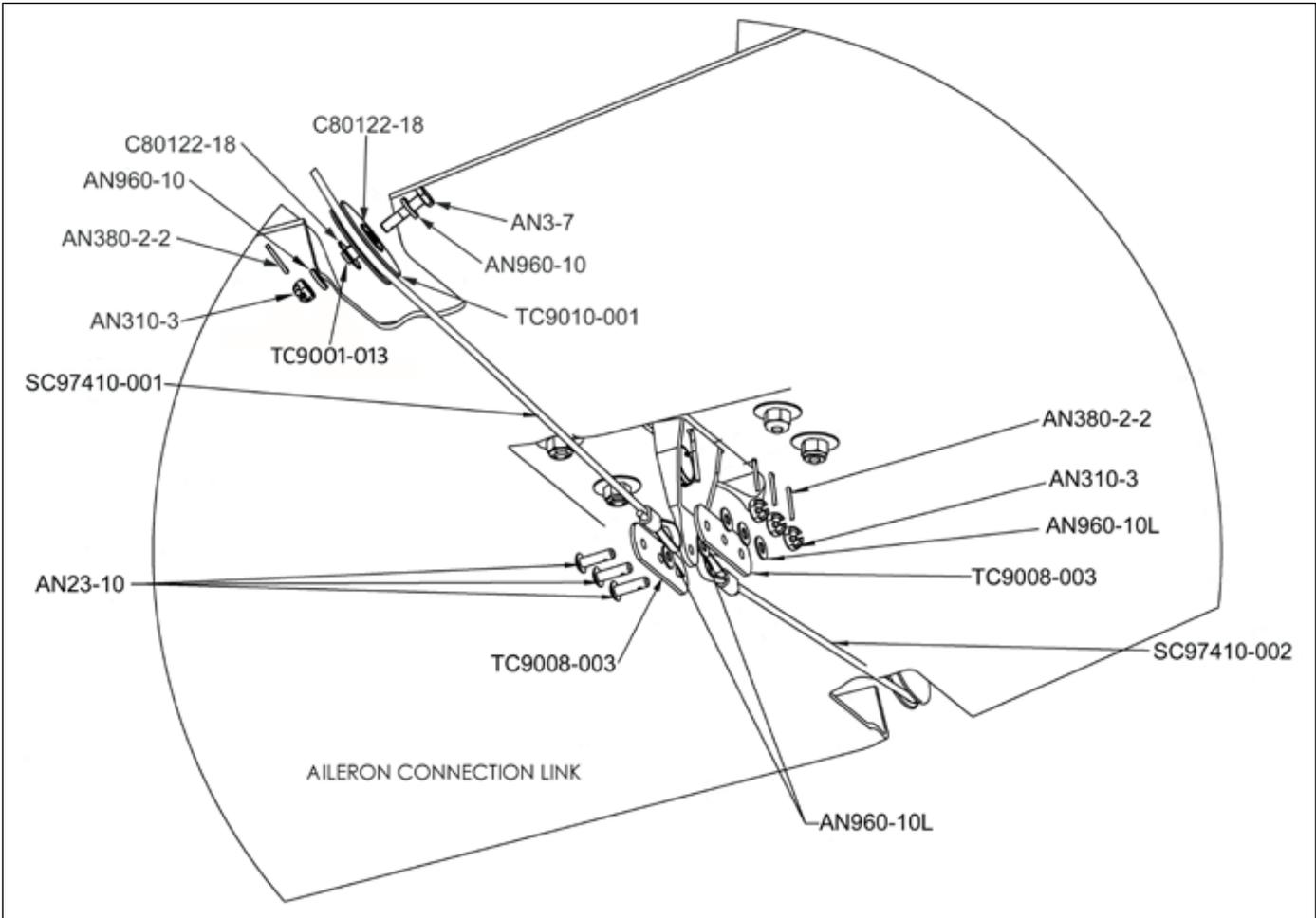


Figure FN51

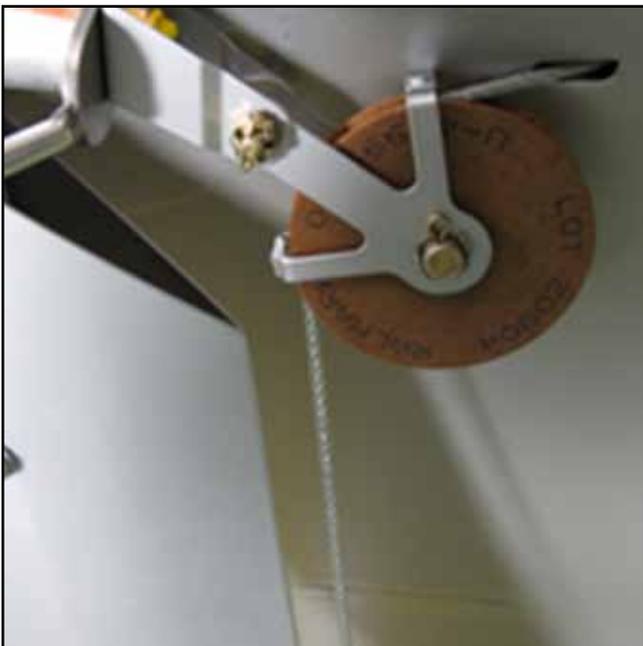


Photo 483

This step deals with installing the lower aileron cables in the wing. Both of the lower aileron cables should be connected to the rear of the torque tube mast. If you have not already done so, run the cables up the struts through the cable guides.

Now, remove the pulley axle pin and route the cable through the pulley and into the hole in the wing. With the cable seated in the pulley push the pulley back into the pulley cage. Reinstall the axle pin and install the cotter pin (AN380-3-3). Bend the cotter pin to fix its location.

Route the cable through the inside of the wing and through the upper pulley slot as shown here.

Now that the cable is in place, assemble the upper pulley in accordance with Figure FN52.



Photo 484

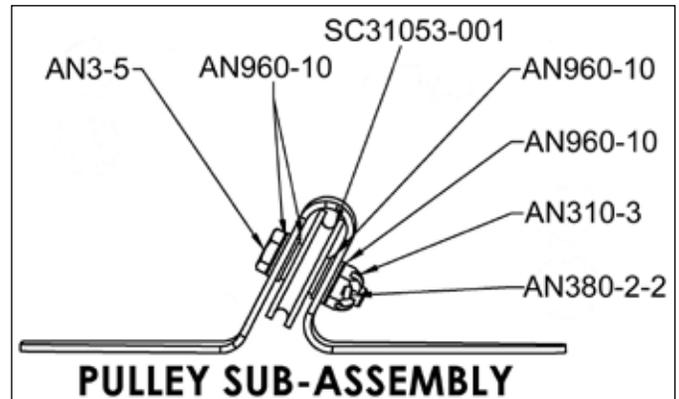


Figure FN52

The last part of this step is connection of the upper aileron balance cable. If you have standard fuel pull the upper aileron balance cables out through the inspection hole in the second bay of the left wing. If you have extended range fuel connect the upper aileron balance cables through the extended fuel tank opening in the left wing. Connect the two cables together using a shackle (AN115-21), clevis bolt (AN23-10), nut (AN320-3), and a cotter pin (AN380-2-2) as below. Then pull each cable tight so the connection is directly above the inspection hole.

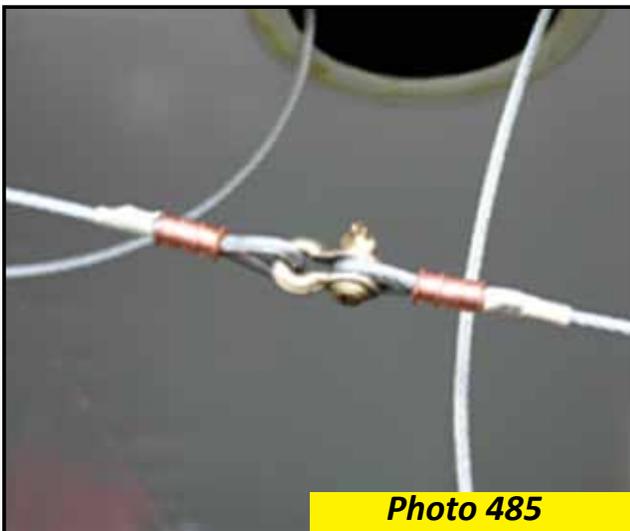


Photo 485



Photo 486

LOG & INSPECTION SHEET FINISH # 10

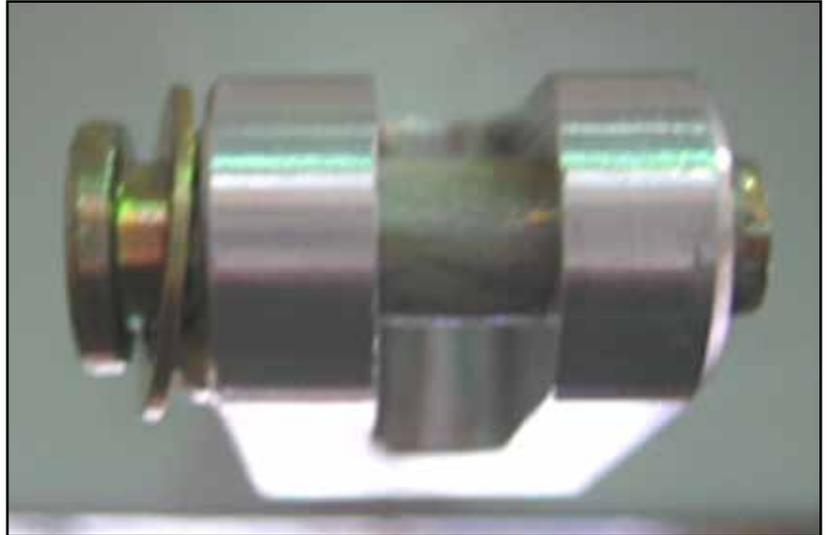
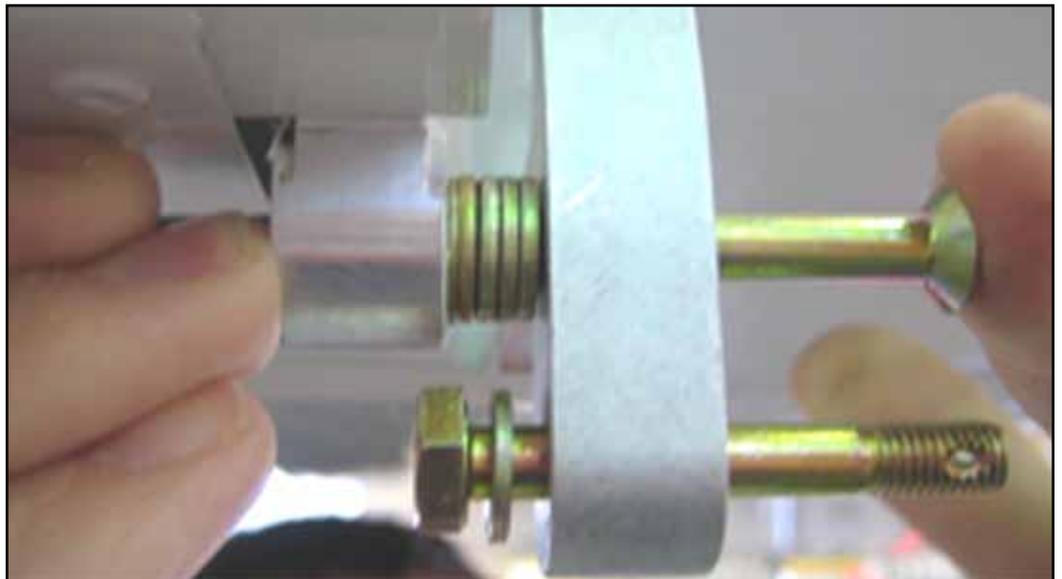
Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
1.74	Ensure wing prep inspection is complete and signed off.		
1.75	Chase strut fork holes if needed and install forks.		
1.76	Install a fork in each strut with 8 threads below the nut.		
1.77	Install wing on plane. (use bullets temporarily)		
1.78	Install forward struts (use bullets temporarily)		
1.79	Install aft struts (use bullets temporarily).		
1.80	Adjust wing dihedral to 3" ± 1/8". Ensure both wings have the same angle.		
1.81	Adjust washout, measured with level, last full rib.		
1.82	Install wing root to fuselage bolts then torque and mark nuts.		
1.83	Ensure float lift rings are installed on forward wing root mounts.		
1.84	Ensure washer installed between hinge blocks on aft spar mount to fuselage.		
1.85	Install tie down rings.		
1.86	Install wing to strut bolts. Torque and mark nuts.		
1.87	Install strut to fuselage bolts, torque and mark castle nuts, insert cotter pins.		
1.88	Tighten jam nuts on strut forks		
1.89	Install jury struts, torque and mark nuts.		
1.90	Ensure aileron cable guides were installed to forward struts per Dwg SC97100		
1.91	Hook up fuel hoses, check routing for low spots, possible chaffing. Secure and mark hose clamps and nuts on fuel line fittings.		
1.92	Ensure all fuel line connections were assembled per manual Fitting Torque/Assembly Procedure with ferrules and inserts.		
1.93	Connect landing and nav light wiring, stall warning if applicable		
1.94	Connect pitot line at wing root.		
1.95	Install pitot tubing to pitot tube.		
1.96	Zip tie wires in wing root.		

SECTION 62 AILERONS

This step deals with aileron installation. The fasteners are set out in Figure FN53. Begin by placing the bolts and pins in the hinge points.

Installing the ailerons is best accomplished with two people. One can hold the aileron while the other installs the fasteners.

**Photo 487****Photo 488****Photo 489**

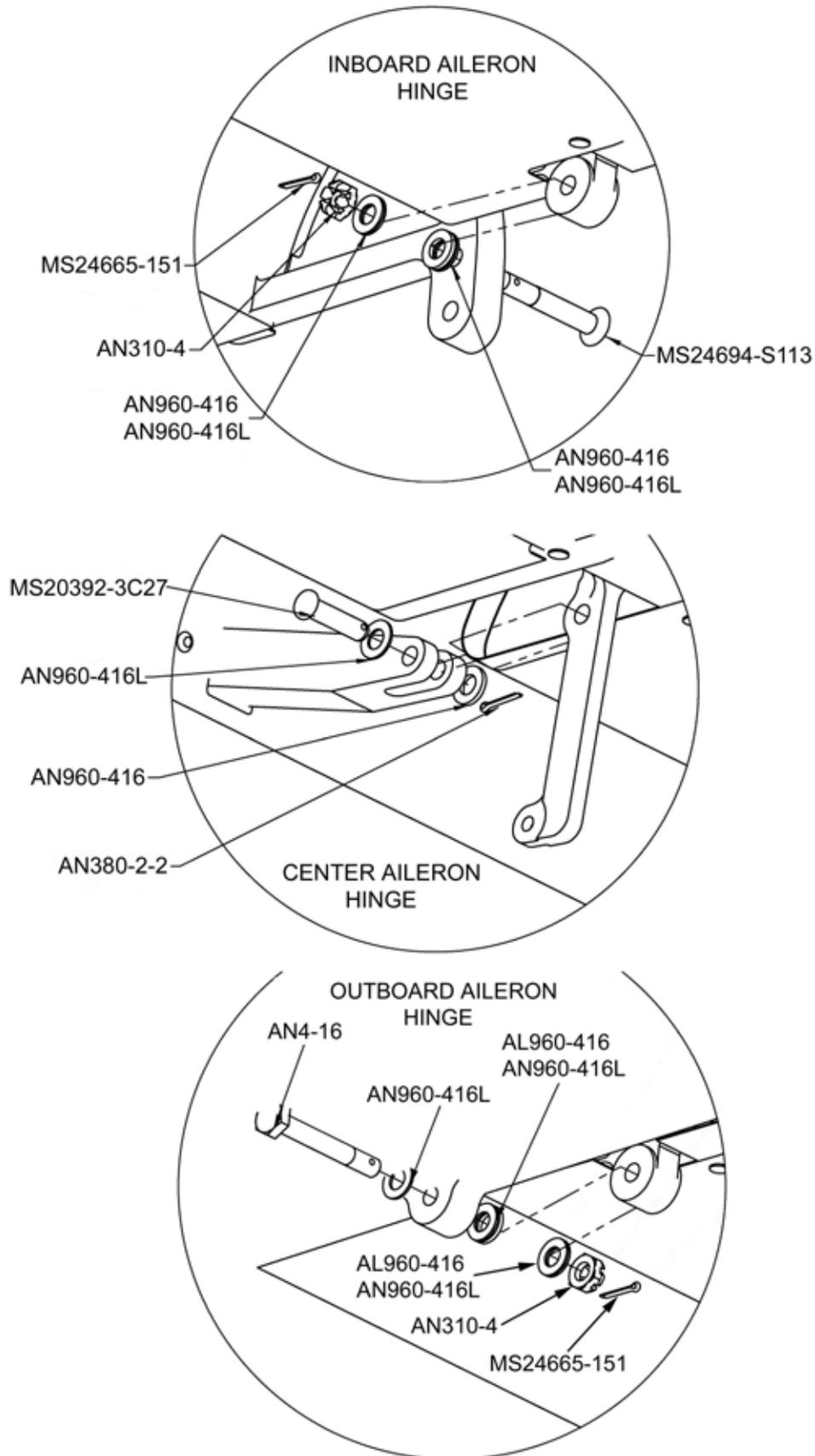
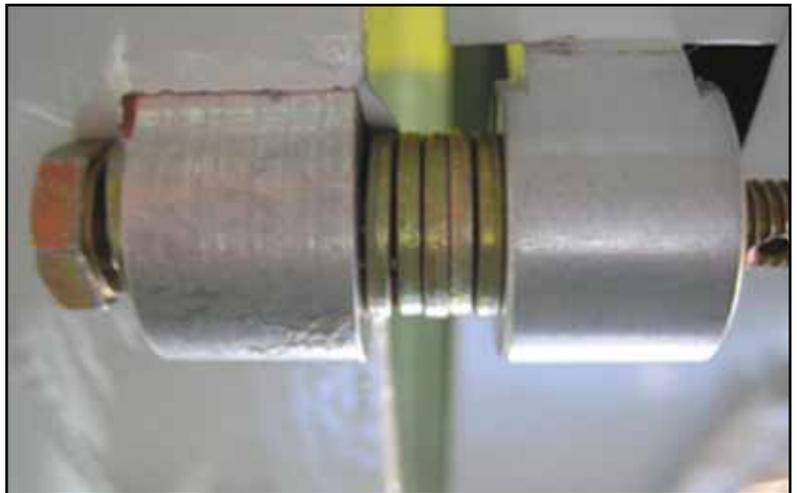


Figure FN53

Position the aileron now. Insert the bolts to hold the aileron in place. Do not secure the bolts with nuts and cotter pins at this time.

**Photo 490**

It is appropriate to insert as many washers as necessary to fill the gap. The gap should be full but the movement of the aileron must be free without binding. Don't force one more washer into place if it makes the aileron movement stiff.

**Photo 491**

The aileron should line up with the tip bow. The tip bow and aileron edges should be parallel. Once you have this position, apply masking tape to hold the aileron in place.

**Photo 492**

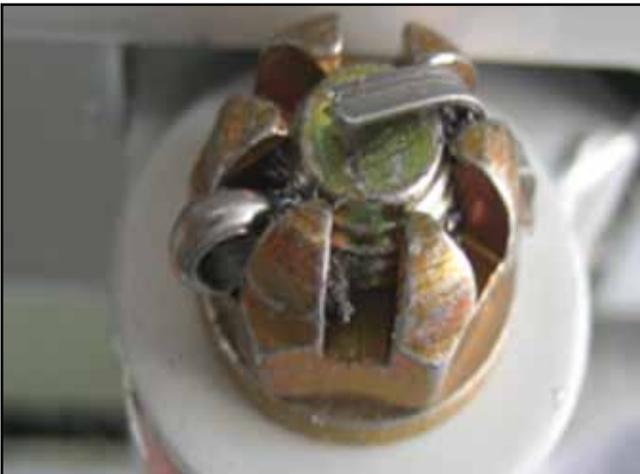
**Photo 493**

Install the washer (AN960-416 or AN960-416L) and castle nut (AN310-4) on the inboard aileron mount as in the Photo 493. Check to be sure that the aileron will move freely when the nut is set. The next step involves drilling a hole for a cotter pin. Tape a piece of sheet metal to the bottom of the aileron to protect the aileron.

Now, drill a hole using a #46 drill bit, through the castle nut slot, through the bolt as shown in Photo 493.

**Photo 494**

Install cotter pin (MS24665-151) to secure nut. As previously, the long end of the cotter pin should be out.

**Photo 495**

Bend the long end of the cotter pin over the bolt end. Trim the short end and fold it the other way.

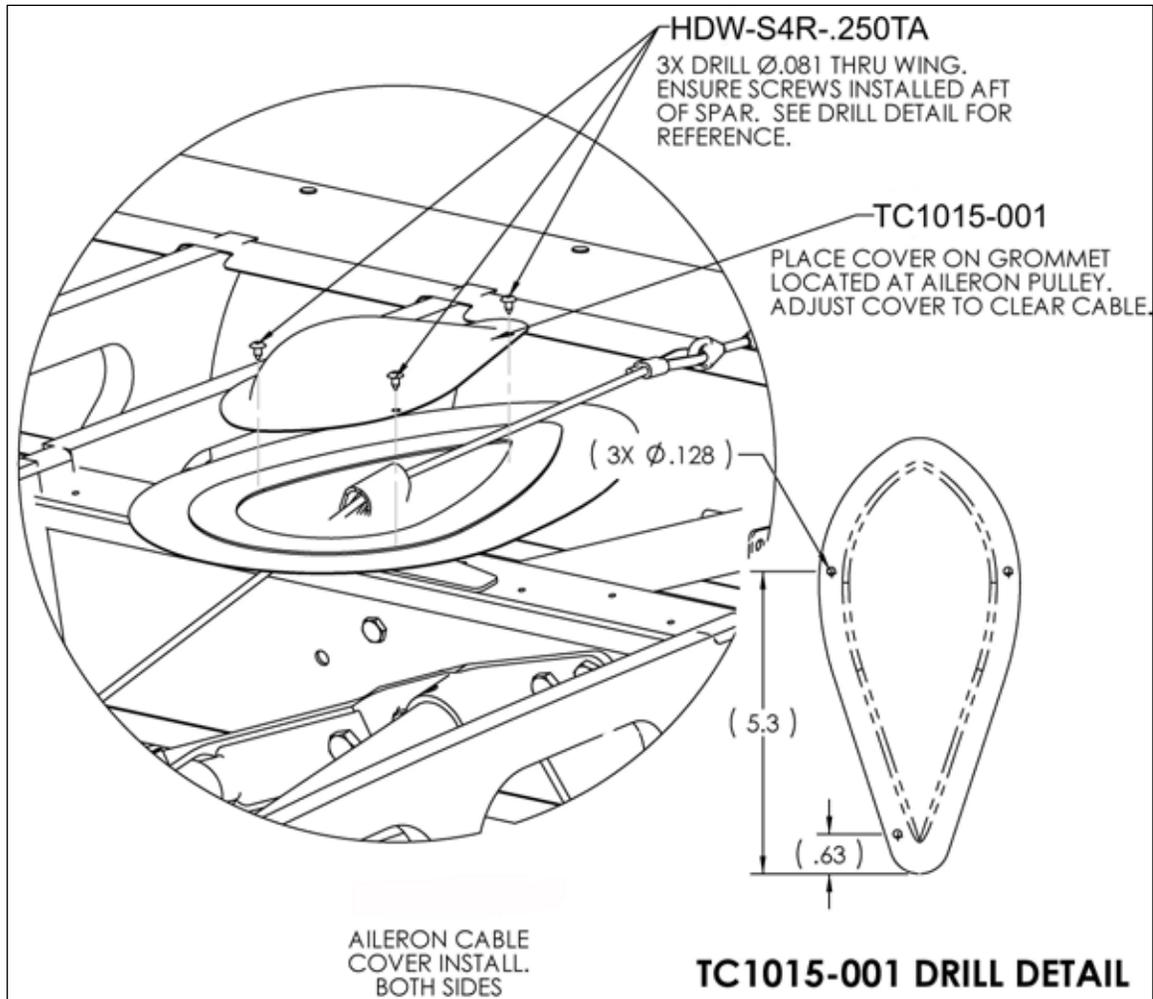
Next, the aileron pulley covers are installed. Refer to the “drill detail” in Figure FN54 for the location of the 3 holes. Each hole should be centered on the flange. Mark and drill the 3 holes with a #30 drill bit. Use a hand deburr tool on both sides to remove any burrs.



Photo 496



Photo 497



TC1015-001 DRILL DETAIL

Figure FN54

After drilling, route the aileron cable through the slot in the pulley cover. Make sure that the cable will be centered in the cover slot when the cable is drawn taut. Once the cover is correctly positioned, drill holes in the grommet with #50 bit. Insert 3 screws per Figure FN54 to secure the plate. Repeat this step on the other wing.



Photo 498



Photo 499

SECTION 63 FLAPS

The next steps deal with flap installation. Begin by installing the flap rod bearing to the flap in accordance to Figure FN55.

Torque the bolt to 60 inch-pounds.

Safety wire the flap rod bolt as shown in Photo 501 with 0.032 safety wire. Repeat this for both flaps.



NOTES:

1. > ADJUST QUANTITY USING THICK, THIN, OR COMBINATION OF BOTH AS NECESSARY TO PREVENT BINDING AND INTERFERENCE.
2. > ADJUST LENGTH, MATCH FLAP TRAILING EDGE TO ALLERON TRAILING EDGE IN RETRACTED POSITION, BOTH SIDES.
3. > SECURE SAFETY WIRE (MS20995C32) BETWEEN FLAP AND BOLT (AN4H10A).
4. > APPLY RED LOCTITE (RM0568-004) TO THREADS.
5. > DEBURR FLAP HANDLE LOCK (SC32204-001) FOR PROPER FIT AND FUNCTION, AS NECESSARY.
6. > ADJUST LENGTH SO TURNBUCKLE HAS 5 THREADS MAX PROTRUDING PAST JAM NUT.
7. > ADJUST LENGTH SO BEARING HAS 20 THREADS MAX PROTRUDING PAST JAM NUT.
8. > TORQUE TO 40-60 IN LBS.
9. > FLARED END (LEFT HANDED THREAD) FORWARD.

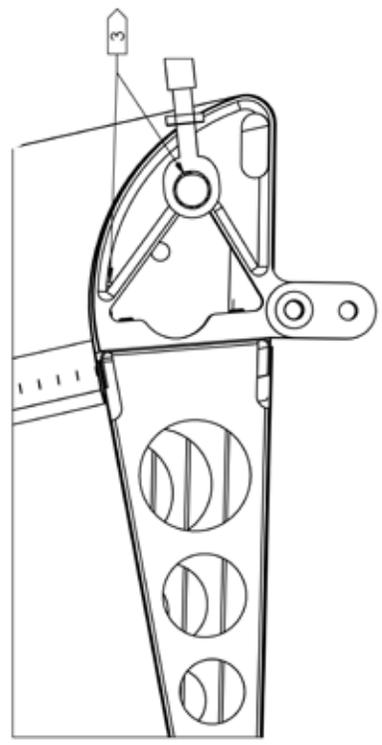
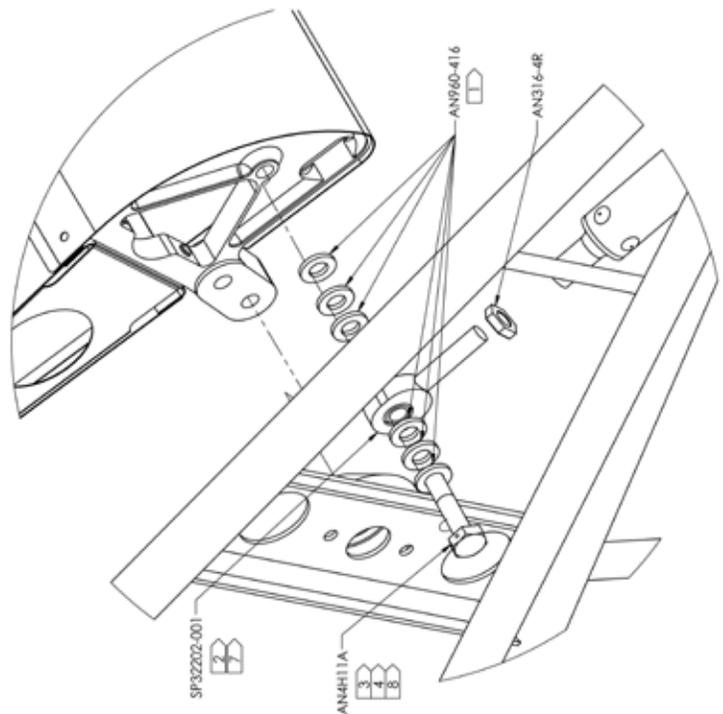
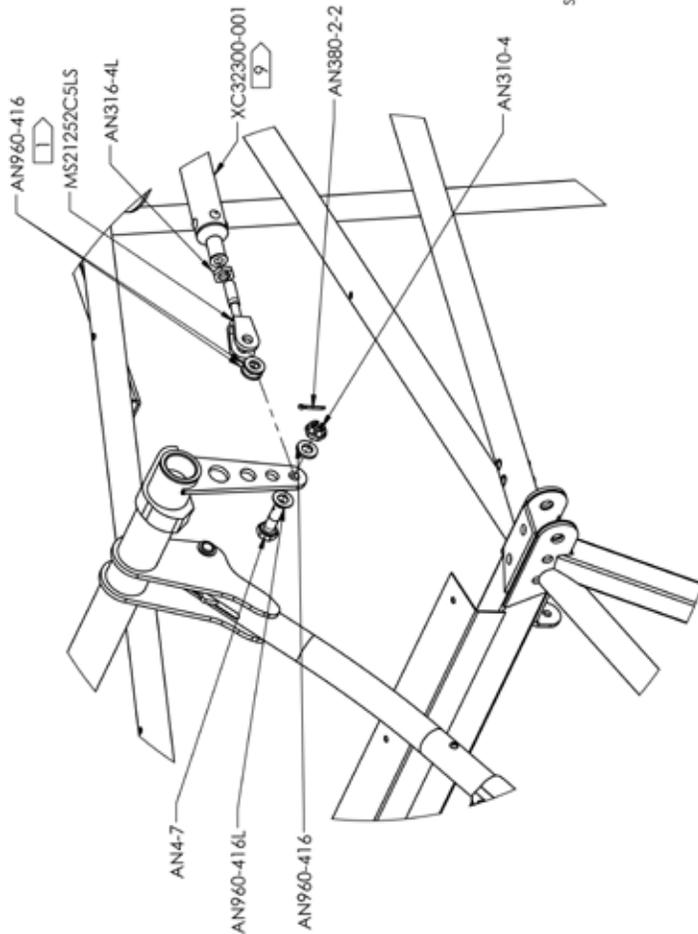
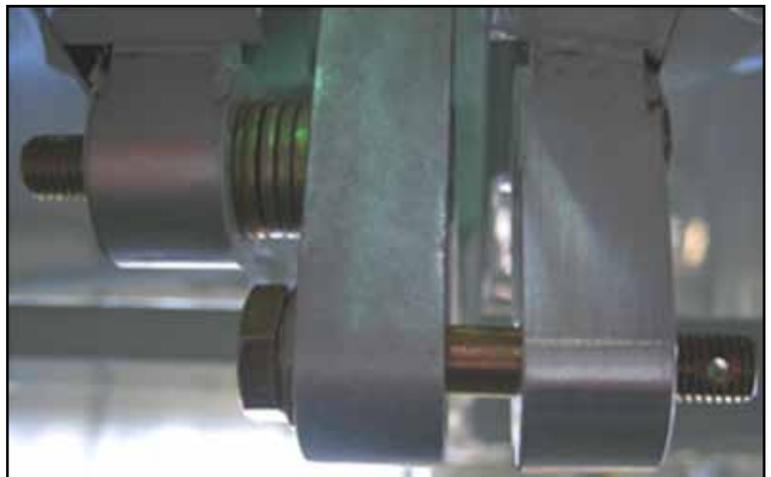


Figure FN55

Position the flap onto the flap cone bolt per Figure FN55 and then bring the outboard end into a position that will allow insertion of the bolt.

**Photo 502**

Install the outboard flap bolt in accordance with Figure FN56. Check the gap at the aileron/flap hanger and fill the space with washers as needed.

**Photo 503**

Install the castle nuts finger tight and then turn the nut to the next slot alignment in the castle nut for insertion of the cotter pin. Make sure the flap is free to move. Insert the cotter pin and secure it.

Now, go back to the inboard end of the flap. Install the washer and castle nut. Hand-tighten the castle nut and then use a wrench to turn the nut to the next tighter slot so that the cotter pin can be inserted. Install the cotter pin (MS4665-151) and secure it. Repeat this step for the other flap.

**Photo 504****Photo 505**

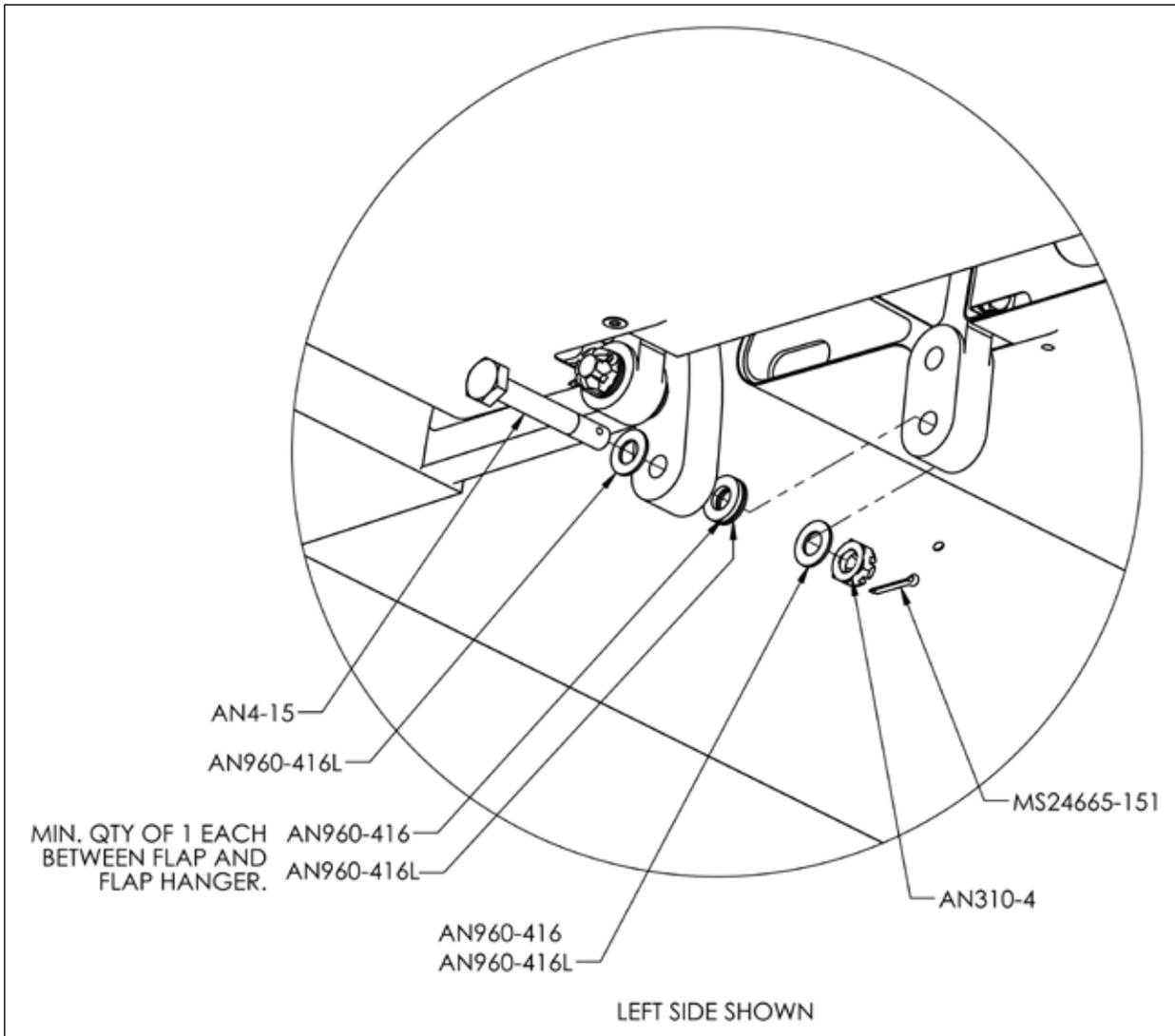


Figure FN56

It is now time to set the alignment of the flap and the aileron. Position the flap to align with the aileron (which is already taped to the tip bow).

The flap and aileron should line up as shown in Photo 506.

Tape the flap to the aileron as shown in Photo 507.



Photo 506



Photo 507

SECTION 64 FLAP HANDLE

Reattach the flap handle lock plate and replace the cotter pin to secure nut in accordance with Figure FN57.

Place the flap handle in the full up position (closest to the windshield).



Photo 508



Photo 509

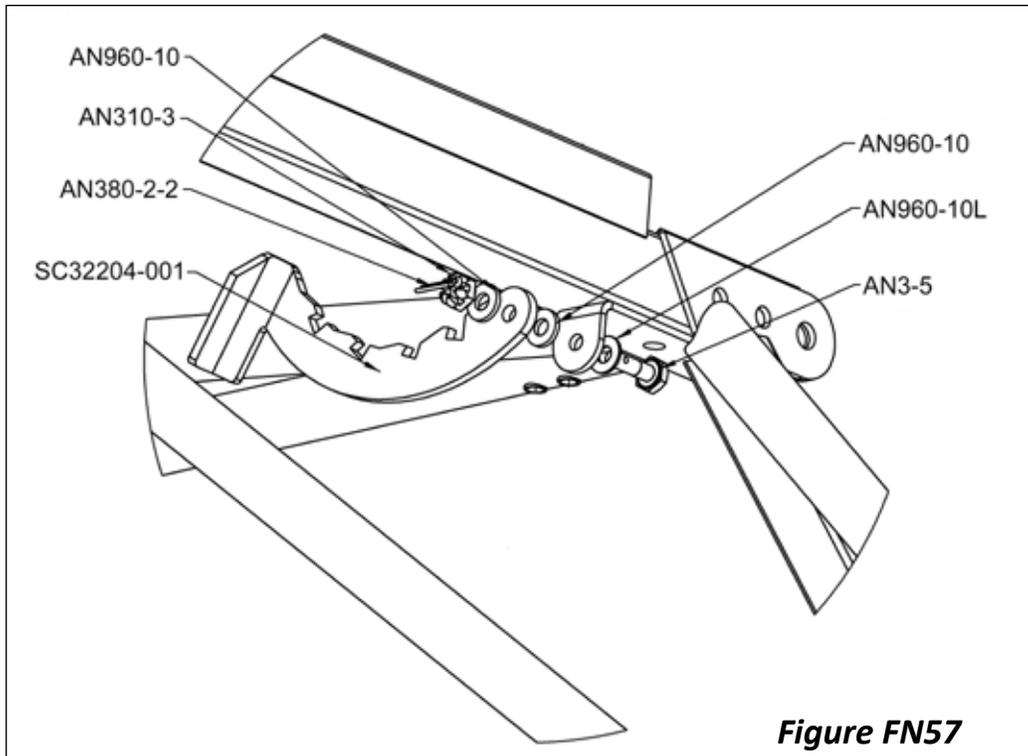


Figure FN57

This step deals with the flap control rod installation. Begin by screwing the forward flap rod attach fork and jam nut into place on the flap rod, about 3 threads is enough. Figure FN58 shows the hardware for this step.



Photo 510

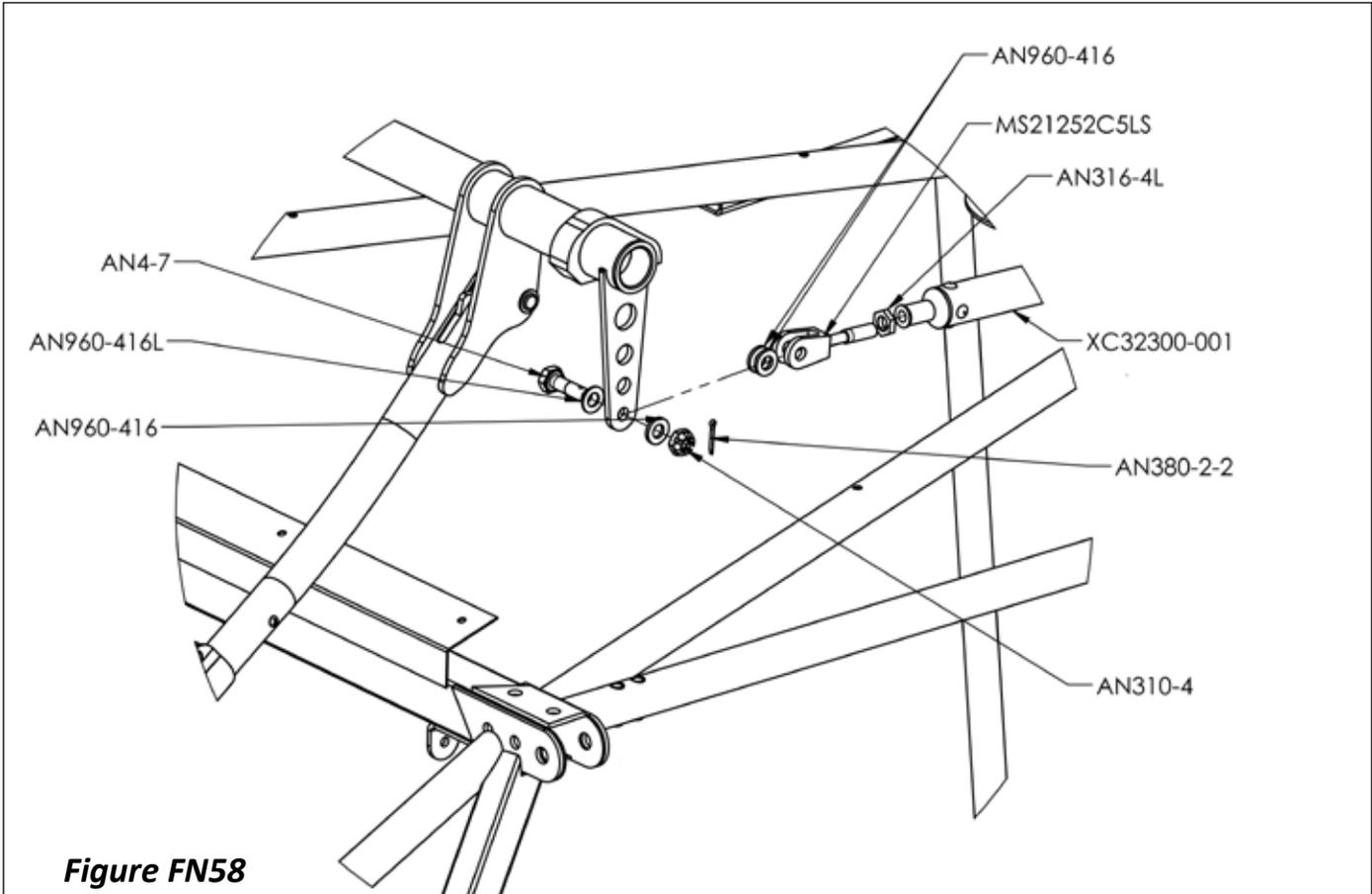


Figure FN58

Now, screw the flap rod onto the rod end bearing at the flap, about 3 threads is enough. Next holding the fork end of the flap rod rotate the flap rod until you are able to attach the forward end (open fork end) of the flap rod to the flap handle.



Photo 512



Photo 511

Remove the masking tape holding the flap in place.

Check the alignment of the aileron to the wing tip and aileron to the flap. Adjust the flap rod (lengthen or shorten by adjusting the rod end threading) as needed to correct alignment of the aileron and the flap.

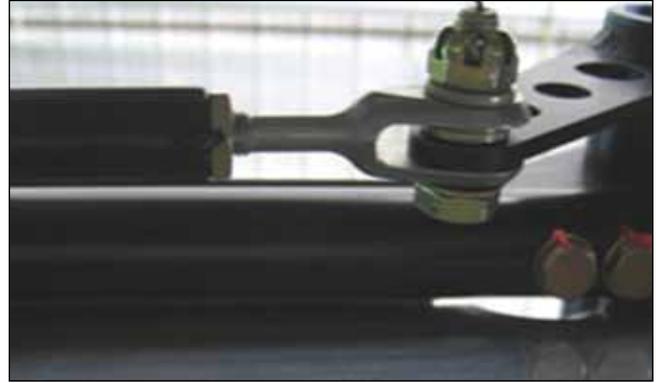


Photo 513

Once you are happy with the alignment tighten the jam nuts on both ends of the flap rod. Apply Torque Seal to the jam nuts.



Photo 514

Check to make sure that the flap rod does not touch any wiring or the door header.

Move the flap handle through the full range of motion to ensure smooth operation. The flap rod must not contact any part of the aircraft. Safety the flap cone bolts as shown below with 0.032 safety wire. Repeat on the opposite side.



Photo 515



Photo 516



Photo 517

The last part of the flap installation is checking the flap maximum travel. Place a digital level on the top side of the flap and reset the level zero point. The level should not be reading zero. Move the flap handle to put the flaps into full down position. Read the level and record the value.



Photo 518



Photo 519

LOG & INSPECTION SHEET FINISH # 11

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
	Flap Installation		
1.97	Install flap push-pull rod. Ensure forward end is secured with cotter pin, aft end secured with red Loctite on bolt attached to flap.		
1.98	Adjust flap push-pull rod so bottom of flap is inline with the aileron. Ensure jam nuts are secure at both ends of rod.		
1.99	Check for smooth, quiet operation.		
2.1	Ensure ball joint bearing "floats" in the flap cone per manual.		
2.2	Safety wire flap cone mounting bolts.		
2.3	Ensure nut is safetied with cotter pin on both inboard and outboard flap mounts.		
2.4	Torque and safety the castle nut on the flap handle lock plate.		
	Aileron Installation		
2.5	Install ailerons; insert clevis pin, bolt and safety with cotter pins.		
2.6	Aileron inboard spacing must have a minimum of one AN960-416 washer between pivot points.		
2.7	Aileron outboard spacing must have a minimum of one AN960-416 washer between pivot points.		
2.8	Connect control cables to aileron with clevis bolts and safety nuts.		
2.9	Check cable for free travel (can hang up in tank bays, on struts and holes in fabric).		
2.10	Rig aileron position.		
2.11	Hook up cables-tension should be 40 lbs ± 5 lbs. check for interference with rib stitching inside wing.		
2.12	Safety all turnbuckles (4).		
2.13	Adjust the aileron travel stop at the torque tube. Aileron travel should be 18° ± 2° each way from neutral.		
2.14	Check pulleys for freedom of movement and safeties. Ensure upper aileron pulleys are inspected before covers are installed.		
2.15	Ensure Teflon tape applied to the aft side of the forward struts under the aileron cable.		

*Photo 520*

SECTION 65 SKYLIGHT

The next step deals with the skylight installation. The first step involves drilling for Trix nuts. Begin by marking the location for the forward Trix nut for the skylight. This Trix nut is placed on the extension (outboard) of the line of Trix nuts at the top of the windshield.

Use a Unibit and drill a 3/16" hole.

Then use a #3 drill bit. Repeat for the other side.

*Photo 521*

Use the Trix nut installation tool to install a Trix nut (HDW-AT32-632) in the hole you just drilled.



Photo 522



Photo 523

The next part of the skylight installation involves application of the 3M Foam Tape (as used previously). Before applying the tape, clean the wing inboard edge with rubbing alcohol. Apply a line of double stick tape (RM4905-002) between the forward Trix nut and first of the 4 Trix nuts at the trailing edge of wing root.



Photo 524



Photo 525

**Photo 526**

Using an acid brush, apply adhesive promoter to the fuselage tubes where the double stick tape will be applied.

**Photo 527**

Apply two pieces of 3M Foam Tape (RM4095-002) 8" long (each) on the angled tubes above the rear baggage area.

**Photo 528**

Apply an 11" piece of 3M Foam Tape (RM4095-002) to both sides of fuselage as shown here.

Apply a strip of 3M Foam Tape (RM4011-001) to the forward edge of the fuselage above the rear shoulder harness.

Drill a hole with a #30 bit in each of the rear cargo hooks as shown here.

Peel a short section of the red cover tape at each end of the 3M Foam Tape. As in previous steps, these ends will be used to help remove the cover tape as the skylight is set and secured.



Photo 529

The skylight should now be placed into position. Insert screws per Figure FN59 into the trim strip where the windshield overlaps the skylight.

Do not tighten these screws at this time.

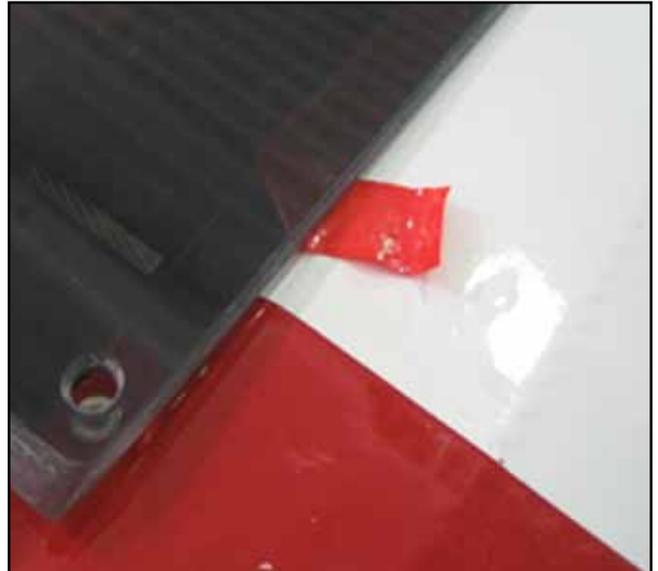


Photo 530



Photo 531

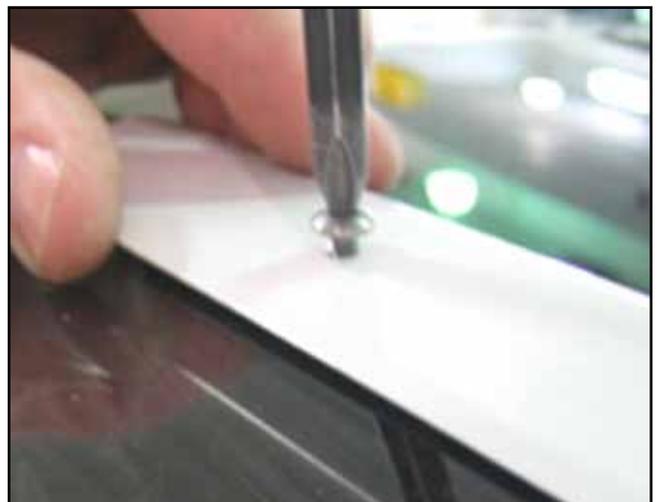


Photo 532

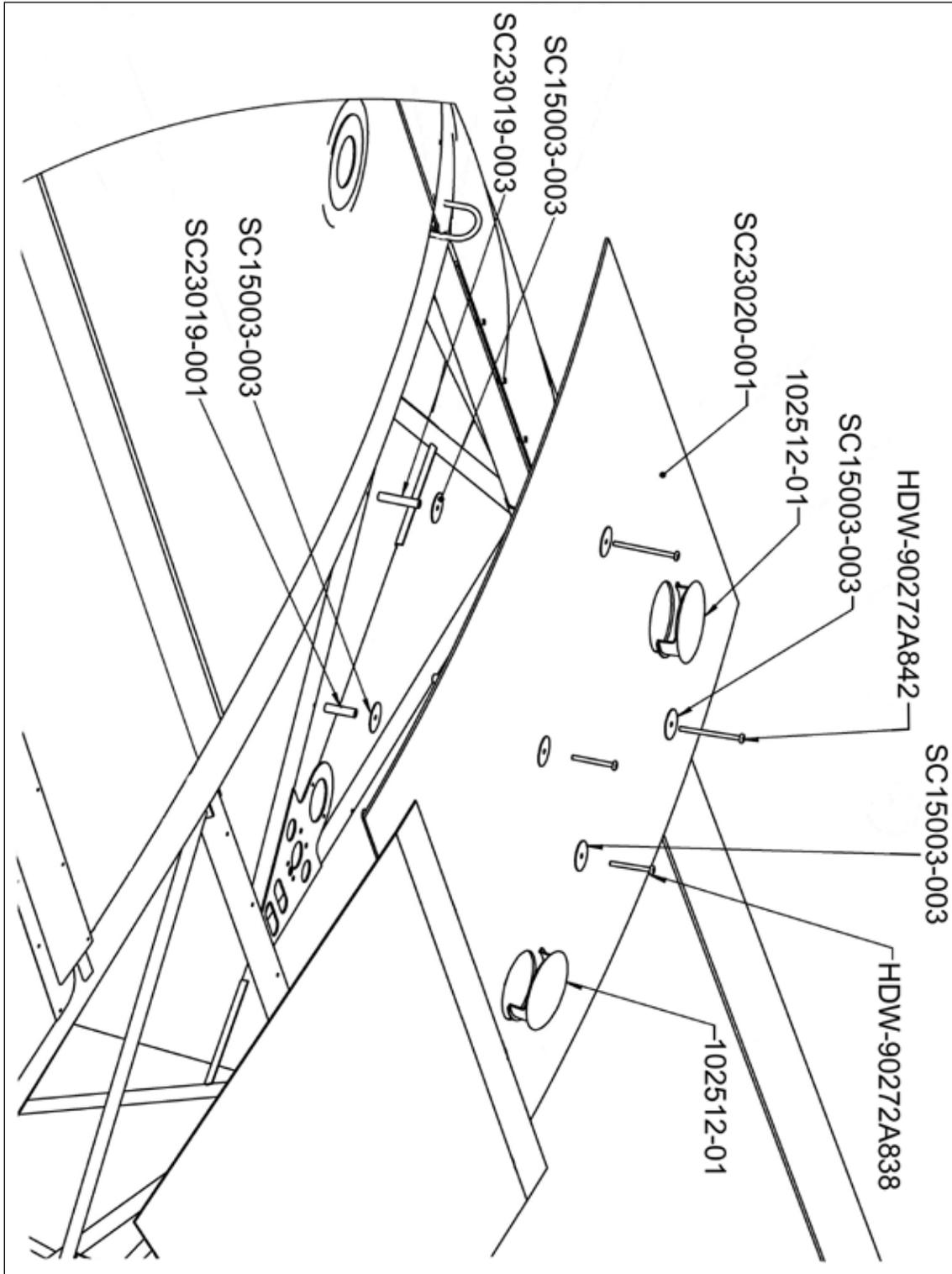


Figure FN59

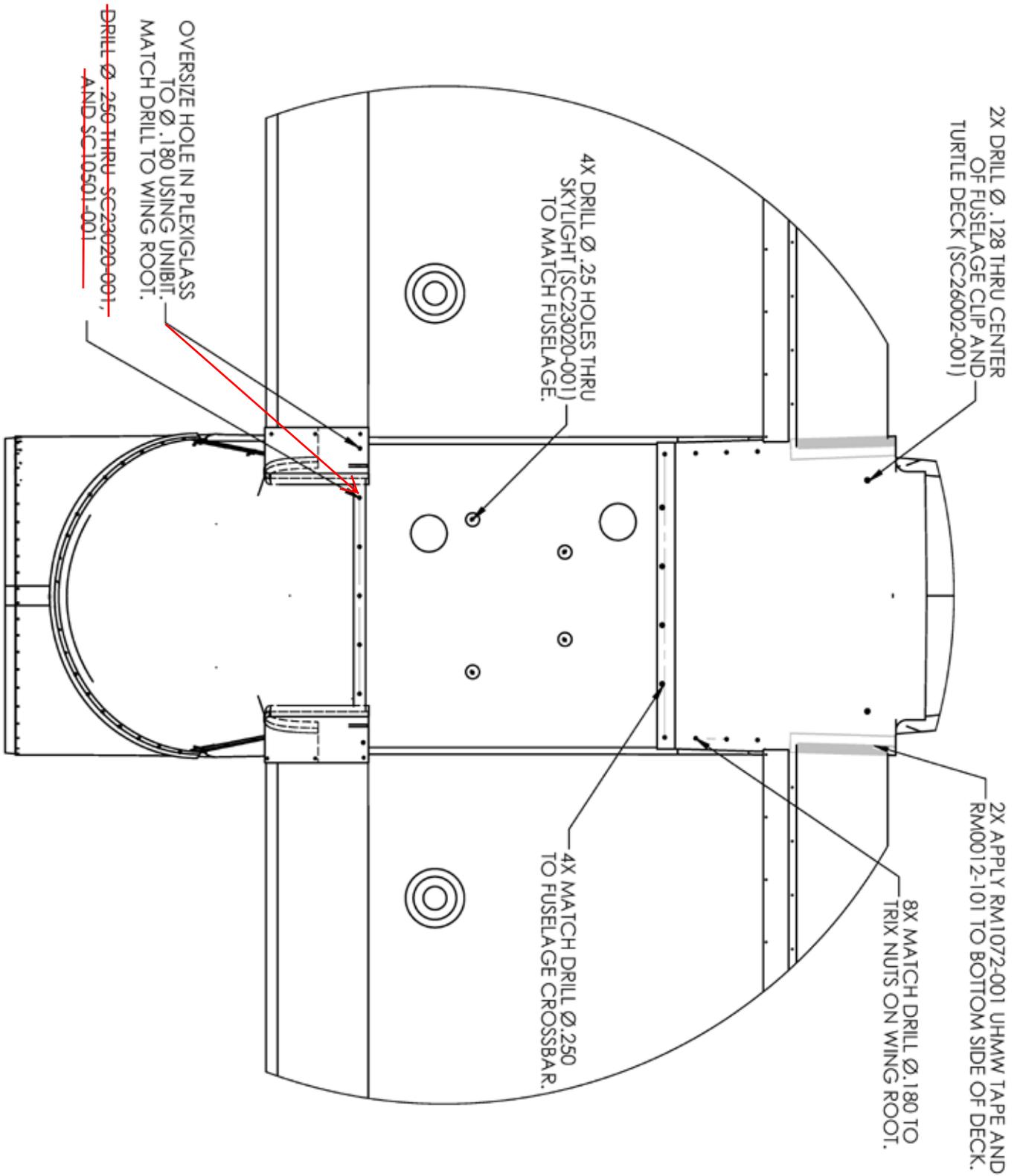


Figure FN60

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SECTION 66 TURTLEDECK

Begin the turtle deck installation by cleaning the edges of the turtle deck with rubbing alcohol. Press the turtle deck into position.

Insert screws P# AN526C1032R9 and NAS1515H3L into through the lip of turtle deck and the skylight. **Do not tighten these screws at this time.**

Next, apply a strip of $\frac{3}{4}$ " masking tape to the fuselage just aft of the aft edge of the turtle deck.

Lift the turtle deck just a bit and apply a strip of 3M Foam Tape (forward of the masking tape) under the turtle deck.

**Photo 533****Photo 534****Photo 535****Photo 536**



Photo 537

Press the aft end of the turtle deck into the double stick tape.



Photo 538

Tighten the side screws and then the forward screws on the turtle deck.

Do not install the two outside screws in the turtle deck lip at this time.

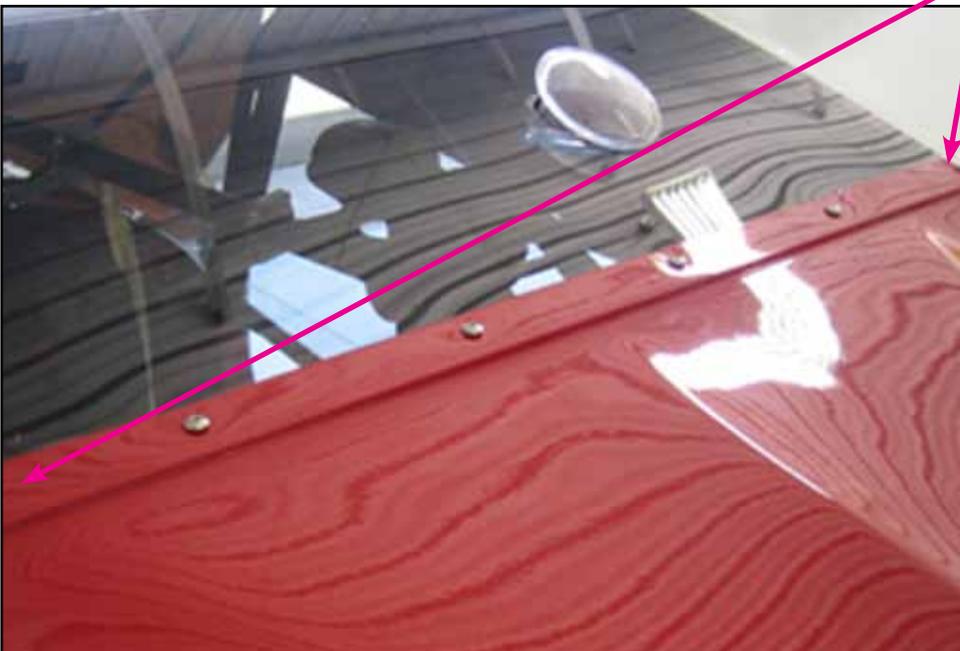
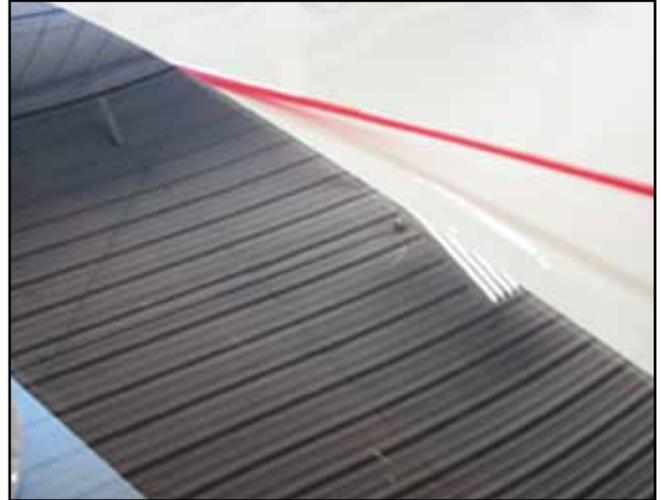


Photo 539

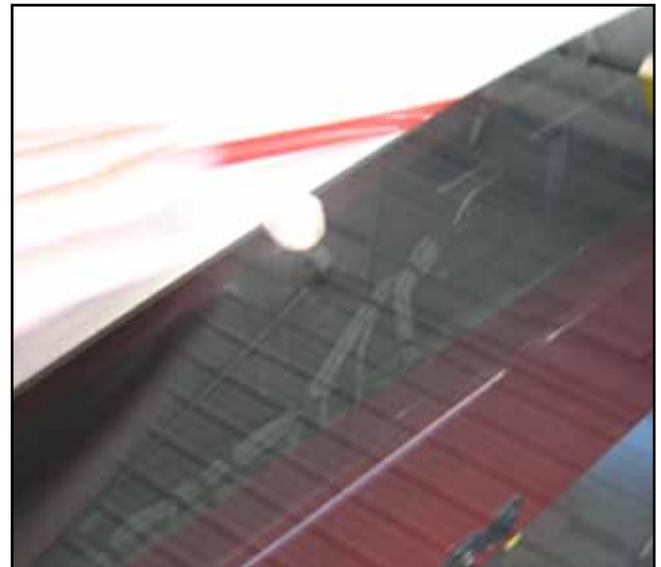
Next pull the red cover tape from the 3M Foam Tape under the skylight sides.
Now, install the two outside screws in the outside turtle deck lip that were not installed on the preceding page.

Tighten the trim strip screws at windshield/skylight overlap.

**Photo 540**

Grab the ends of the cover tape on the fuselage tubes and remove the cover tape.

Next, match drill a hole with a #30 drill bit through the cargo hook and the turtle deck.

**Photo 541****Photo 542****Photo 543**

**Photo 544**

To complete the turtle deck installation use a #30 micro countersink to countersink the hole in the turtle deck drilled in the preceding step.

Insert fasteners HDW-A3236-012-935 and MS24693C25.

The skylight has spacers that position it above the fuselage tubes. Carefully insert screws into the 4 skylight spacer holes in the fuselage tubes. The screws should lightly touch the bottom side of the skylight.

**Photo 545**

Using a #50 drill bit, drill pilot holes in the center of the screws.

**Photo 546****Photo 547**

The skylight screws need to be trimmed to length. One method is to use a pair of wire crimpers that have a screw cutter built in. Alternatively, you can cut the screws with a die grinder or hack saw and then deburr the end of the threads. Using the crimper method, thread the screw (HDW-90272A842) into the cutter and cut 5/16" from the screw.

**Photo 548**

Two screws need to be cut.
As mentioned, deburr the threads.

Next, the skylight hardware needs a bit of preparation.
Begin by applying red Loctite to the spacer screws.

**Photo 549**

Then, apply a thin layer of silicone to one side of the 8 fender washers that will be used on the spacers.

**Photo 550****Photo 551**

The installation of the skylight spacers is a two-person job. As such, you need to summon your assistant. One person is needed outside the skylight placing the screw and the flat washer into place. The second person, inside the cockpit, places the fender washer and bushing onto the screw.

The inside person directs the screw into the threaded hole while the outside person turns the screw with a screwdriver.

The inside person slowly turns the bushing while the screw is being tightened. Once the bushing stops turning stop tightening the screw. Repeat this process for the remaining 3 spacers.



Photo 552



Photo 553

SECTION 67 AILERON CABLE RIGGING

It is finally time to rig the aileron cables. Begin by centering the front control stick. Use a level to assure that the stick is in the 90° position (left-right).

Use masking tape to secure the stick in the correct position.

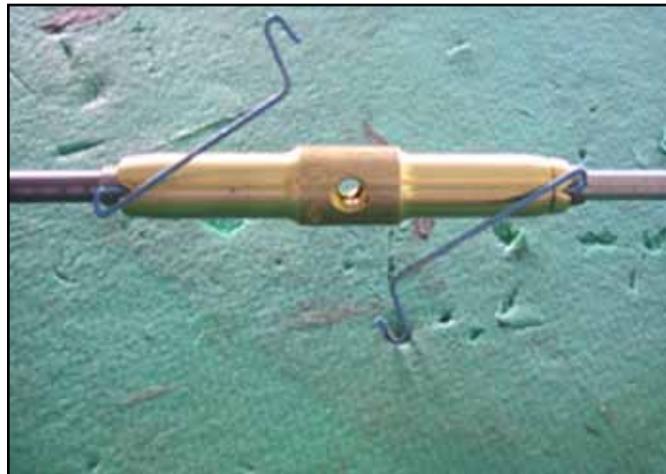
The flaps and ailerons should still be taped in position so that trailing edges all align with the tip bows.



Photo 554



Photo 555

**Photo 557****Photo 556**

It is now time for assembly of the turnbuckles. In accordance with Figure FN61, assemble the aileron cable turnbuckles and attach them to the aileron hinge.

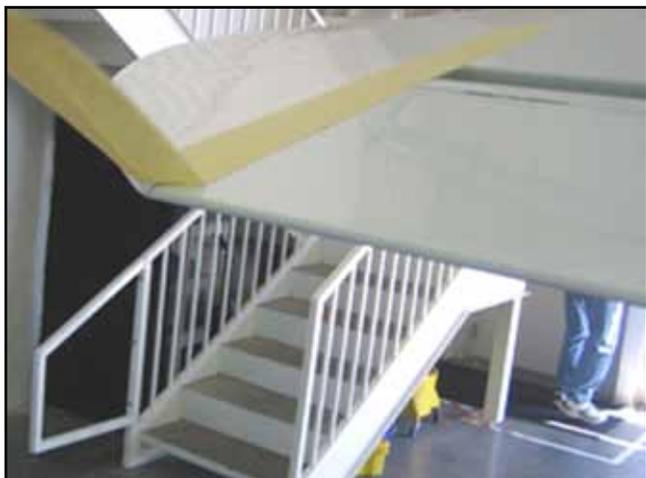
Attach the lower aileron cable to the top of the aileron hinge horn. Remove the cable slack by tightening the upper and lower turnbuckles by hand.

The locking slot should face away from the wing.

Insert the locks as shown here to keep the turnbuckle in place. Do not fully lock the turnbuckle.

Both slots of the thimble lock must be on the same side.

Next we check the aileron positions. Begin by removing the masking tape from the ailerons and flaps. Check that control stick is still in a 90° position. Notice that the photograph below shows an aileron that needs to be adjusted to align with the tip bow.

**Photo 559****Photo 558**

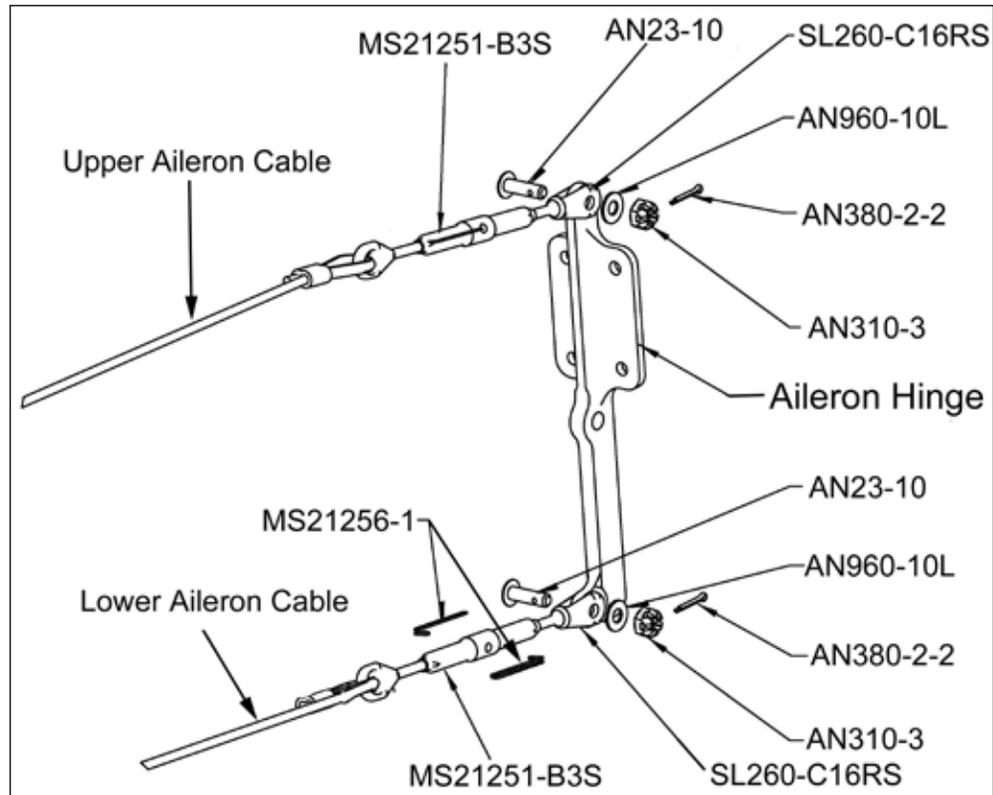


Figure FN61

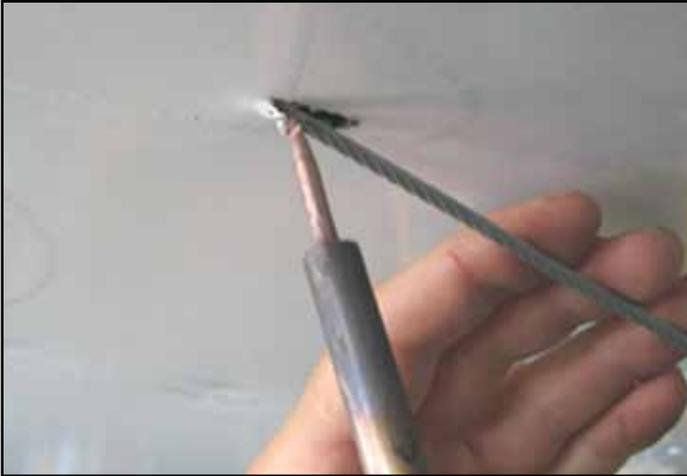
Next, the aileron position is adjusted. Use a small metal rod, with a rounded end, to turn the turnbuckle. **Do not let the rod scratch the paint.** Adjust until the aileron is in line with the tip bow. Then, remove the tape from the control stick and move stick full left and right. Re-check and re-adjust as necessary to have the ailerons line up with the tip bow.



Photo 560



Photo 561

**Photo 562****Photo 563**

So far we have small holes for the cable exit holes. It is necessary to enlarge the holes where the cables pass through the fabric to keep the cables from touching the fabric. Once again a soldering iron will be used to burn the fabric.

This must be done carefully and slowly to prevent over sizing the holes.

The cables should not touch the fabric when the hole re-sizing is complete.

Next, it is necessary to adjust the aileron cable tension. Borrow a Tensiometer from the local FBO or one of your well-equipped friends.

Set the dial for 1/8" cable.

**Photo 564****Photo 565**

Clamp the Tensiometer onto the aileron cable between two of the cable guides on the wing lift strut.



Photo 566

Set the tension to 40 pounds \pm 5 in lbs.

Insert cotter pins on all turnbuckle forks and the center aileron hinge pin.

Insert cotter pin into the castle nut with the long side on top. Bend cotter pin a cut ends as needed. Bend the cotter pin for the center aileron hinge pin as shown.



Photo 567



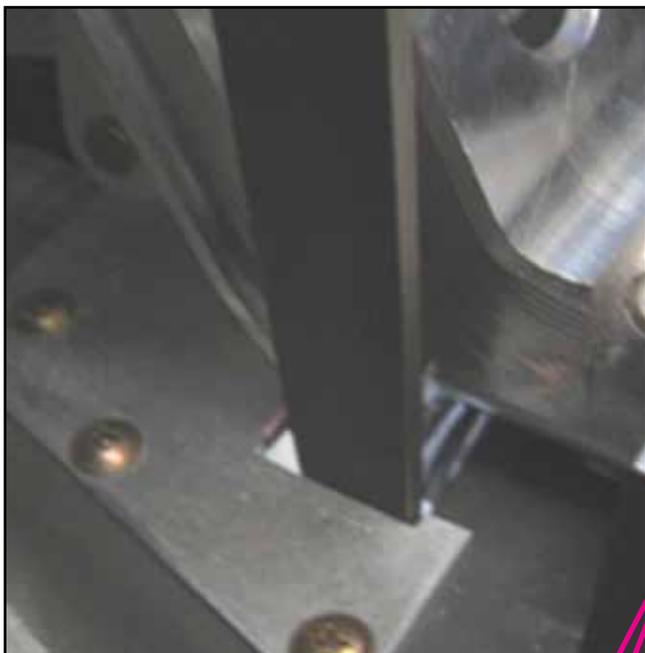
Photo 568



Photo 569

**Photo 570**

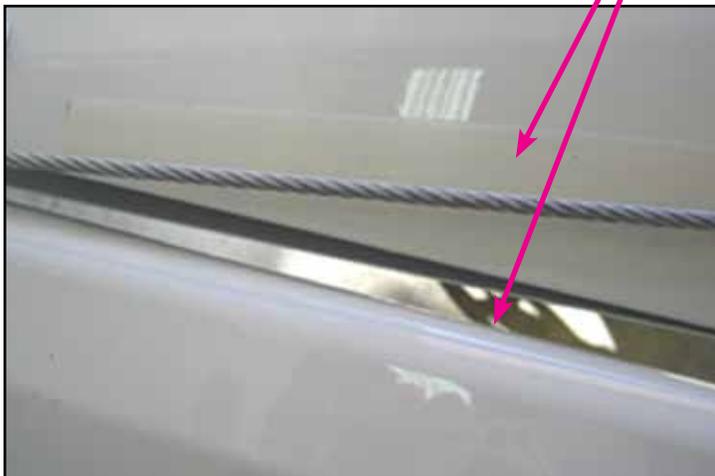
Next it is necessary to check the aileron travel with a level. The aileron travel should be $18^\circ \pm 2^\circ$.

**Photo 571**

Use a file to remove material from the aileron stop plate at the base of the rear torque tube mast as needed to achieve the travel specification as shown on Photo 571.

Next, apply self-sticking anti-chafe tape (RM1072-001) to the forward lift struts to protect the struts from the lower aileron cable. The tape should be applied so that the cable is on the centerline of the tape. The anti-chafe tape should start from the inboard edge of the first cable guide and end at the outboard bolt of the strut fork block (approx. 18.5").

Trim the tape along the trailing edge of the lift strut as needed.

**Photo 572****Photo 573**

While you are installing the turnbuckle and tightening the cables, pay attention to how many threads are exposed and how many threads are inside the barrel. The amount threads showing or inside the barrel should be the same on both ends of the barrel.

THE MAXIMUM NUMBER OF THREADS SHOWING OUTSIDE OF THE BARREL IS THREE THREADS.



THE MAXIMUM NUMBER OF TURNS THAT THE CLEVISES SHOULD BE SCREWED INTO THE BARREL IS FOUR THREADS.

The final part of this step is to place the thimble locks into the turnbuckles. Ensure that the thimble locks are on the bottom of the turnbuckle, facing away from the wing.



Photo 574

LOG & INSPECTION SHEET FINISH # 12

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
	Skylight Installation		
2.16	Install Plexiglas skylight.		
2.17	Install skylight standoffs.		
2.18	Ensure vents are installed and operate properly.		
2.19	Install painted trim between skylight and windshield.		
	Turtle deck Installation		
2.20	Ensure turtle deck has proper overlap on front edge of Plexiglas skylight.		
2.21	Ensure double stick adhesive tape is stuck to both sides.		
2.22	Ensure all screws are installed in turtle deck.		
2.23	Ensure Teflon tape has been installed at flap contact areas.		
2.24	Flap gap seals installed. Ensure proper clearance from flaps.		
	Cabin Prep		
2.25	Test Wing Nav Lights, Landing Lights and Rudder nav/strobe light		
2.26	Ensure aileron pulleys are 1.75" before installing cabin aileron pulley covers.		
2.27	Upper door latch installed, adjusted and functional.		
2.28	Ensure sponge rubber seal is installed between the window hinges on both windows.		
2.29	Placards: Volume and Min grade near filler neck on both wings. "No Step" on each strut.		
2.30	Burn drain holes in wings. (3 locations each wing per drawing)		
2.31	Install inspection covers on bottom of wings.		
2.32	Silicone seal nav. lights, landing light lens.		
2.33	Install aileron pulley covers on topside of wings. (Ensure pulley is 1.5")		
2.34	Ensure windows, windshield and rudder nav light are silicone sealed properly.		
2.35	Ensure all belly inspection plates are properly secured. (not belly panel)		
2.36	Ensure stabilizer/elevator cover and stabilizer yoke plate are installed per manual.		
2.37	Ensure seat belt/shoulder harness buckles connect and release properly.		
2.38	Check fit and finish.		

SECTION 68 BELLY TEARDROP

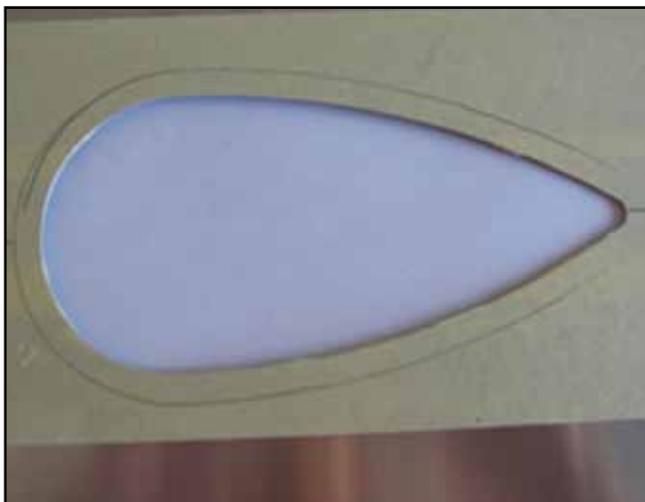
The next step addresses marking the teardrop opening on the belly of the fuselage around the pulley. Begin by covering the opening on the bottom of the boot cowl with 2" masking tape as shown to the right. Next, use an Exacto knife to cut the center out of the teardrop hole tape.

**Photo 575****Photo 576****Photo 577**

**Photo 579****Photo 578**

Set a pencil type compass to $5/16$ " between the pencil and the point of the compass as shown in Photo 579. Mark a $5/16$ " line around the teardrop hole in the boot cowl as shown in Photo 578. Then, mark a line in the center of the teardrop opening. This centerline will help you line up the cover in the next step.

Use the cover (SC53104-003) to locate the holes. Line up the center of the two front holes on the centerline. Be sure that properly center the cover fore and aft over the cutout. Then, using a pencil, mark the three screw holes and draw a line around the outside of the cover.

**Photo 581****Photo 580**

Next, remove the cover and look at the outside line, if it is centered and you see all the marks for the holes, you can proceed to drill the three holes. If not, re-draw the figure.

The cover does not need to be perfectly centered on the opening, but there should be at least 1/8" edge distance to the hole

Drill three holes with a #20 drill bit.



Photo 582



Photo 583

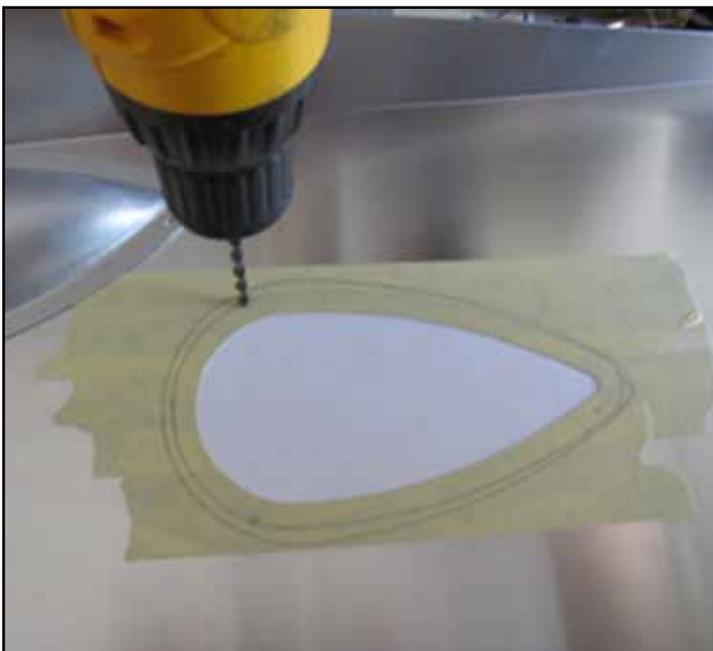


Photo 584

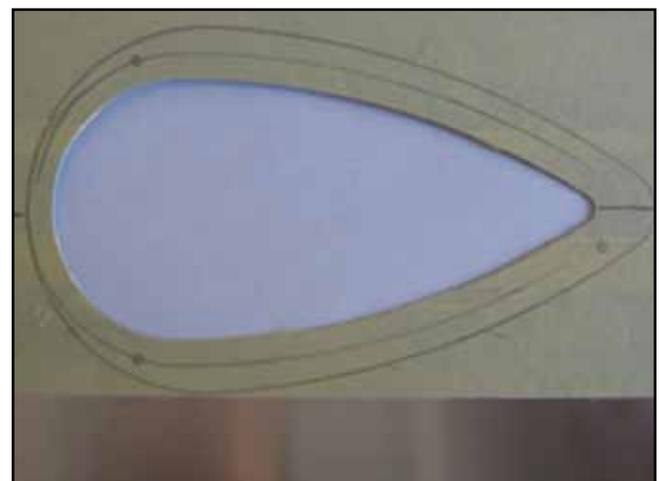


Photo 585

Next it is necessary to place the Tinnerman nuts. If necessary, use a nibbler to allow correct fit of the Tinnerman nuts.



Photo 587

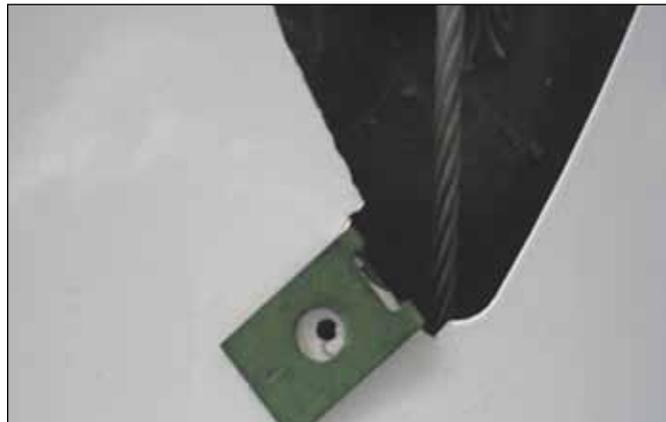


Photo 586

Make sure the 3 Tinnerman nuts (HDW-A1784-6Z-1) are correctly placed. Install the cover with screws (HDW-S6R.375TA).



Photo 589



Photo 588



Photo 590

If the optional transponder antenna is used, a hole will need to be drilled in the cover and an antenna installed. Connect antenna wire to antenna before installing the cover. The transponder installation is detailed in the appendix to this manual supplied as part of the transponder kit.

SECTION 69 WING FAIRING SEAL

The first fairings to be installed will be the forward wing root fairings. Begin by applying masking tape to the painted side of the forward wing root panel leaving a $\frac{1}{4}$ " gap. Work on the left and right fairings at the same time for this step.

**Photo 591**

Cut the edge seal to the length needed plus $\frac{1}{2}$ ".

**Photo 592**

Trim an acid brush so that the bristles are approximately $\frac{5}{16}$ " long. Pinch the other end of the handle closed with a pair of needle nose pliers. This brush will be used when applying weather-strip adhesive.

**Photo 593**

Next, sparingly apply weather-strip adhesive to the painted side of panel outboard of the tape. ●

**Photo 594**

**Photo 595**

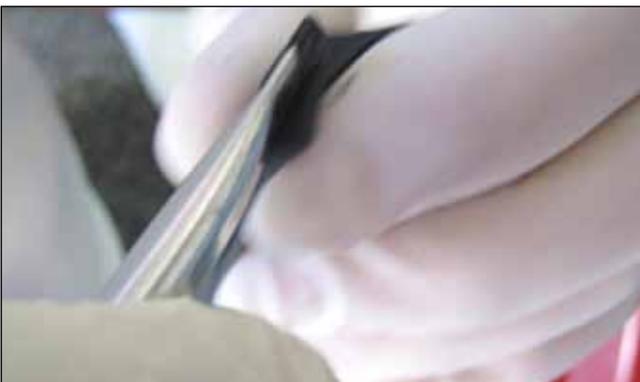
Spread the adhesive with the trimmed acid brush to produce a thin even layer of adhesive.

**Photo 596**

Turn the panel over and apply adhesive to the backside and spread it in the same manner.

**Photo 597**

Now, open the seal and apply adhesive to the surfaces that will contact the adhesive applied to the fairing.

**Photo 598**

Use the spatula end of the acid brush handle to spread the adhesive.

While the adhesive is still sticky, press the edge seal into position on the panel.



Photo 599

Use spring clamps to hold the edge seal in position while the adhesive cures.



Photo 600

After the adhesive has cured a bit, carefully remove the masking tape. Check the adhesion on the edge seal.



Photo 601

Clamp as needed to keep the edge seal in contact with the fairing. Set the fairing aside to cure for approximately 24 hours.



Photo 602

SECTION 70 FLAP GAP SEAL

This step deals with positioning of the flap gap seal. Begin by setting the flaps to the first notch down. The inboard end of seal should be flush with the turtle deck. The outboard edge should be 1/16 to 1/8 inboard of the flap outboard edge.

The seal should be parallel to the trailing edge of wing.

Tape the bottom side of the gap seal in place. You will need approximately 1/16" between the gap seal and the flap.

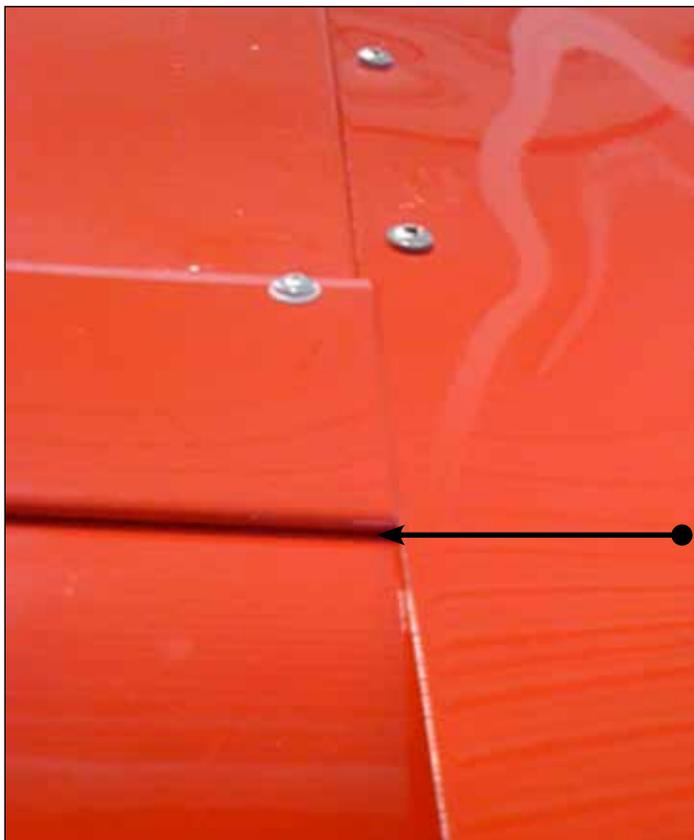


Photo 603

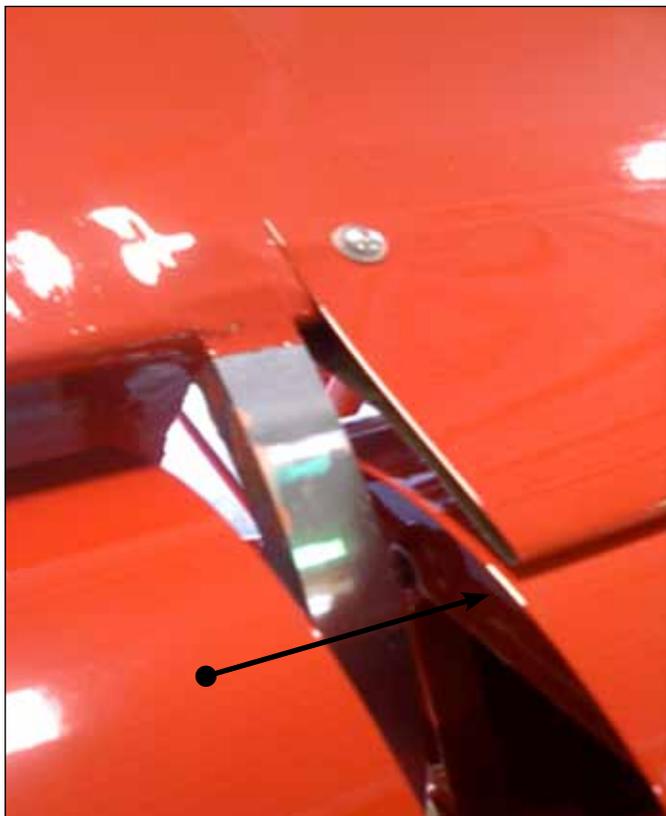


Photo 605

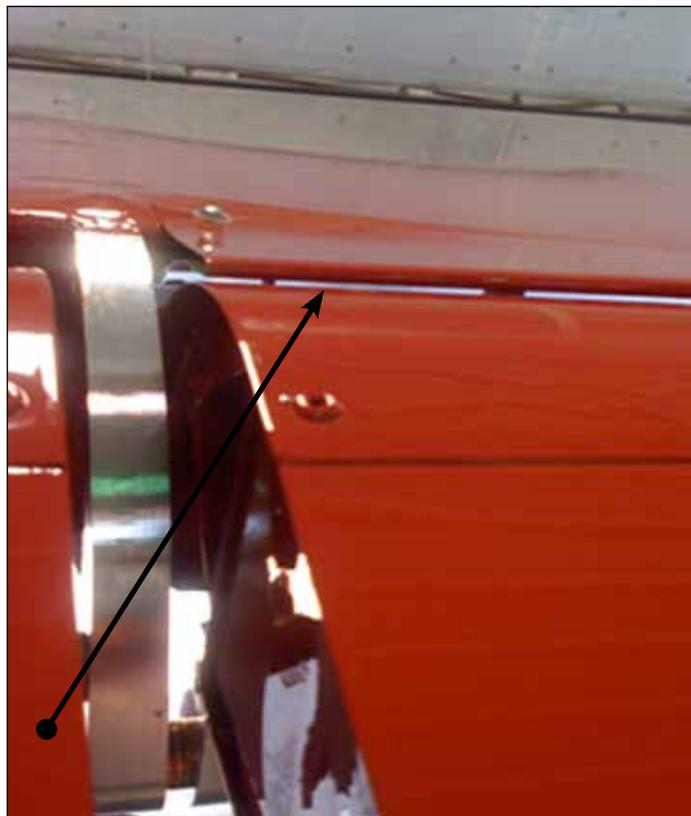
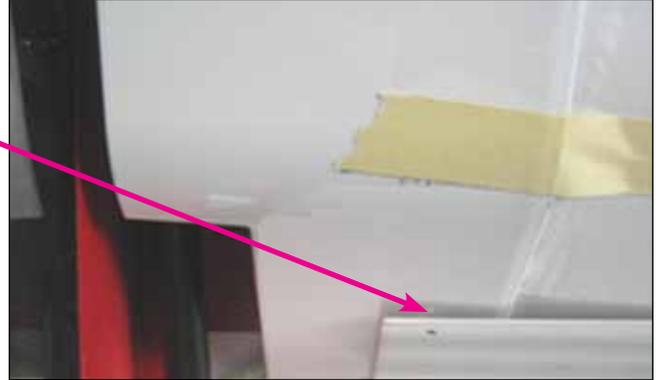


Photo 604

Tape the rear wing root fairing into position under the gap seal as shown here.

**Photo 606**

Next, the flap gap seal will be secured. Use a battery drill-driver with the clutch set at one of its lowest settings. Insert the first screw (HDW-S4R.25TA) in the top inboard hole. The second screw goes in the bottom inboard hole. Next insert the top middle screw and then the bottom middle screw. Ensure an even reveal between the gap seal and the false spar. By adjusting the angle of the screw you can pull or push the flap gap seal as needed to maintain an even reveal between the gap seal and the false spar. If necessary, the hole in the gap seal can be elongated to allow movement of the seal. Repeat this process on the opposite wing.

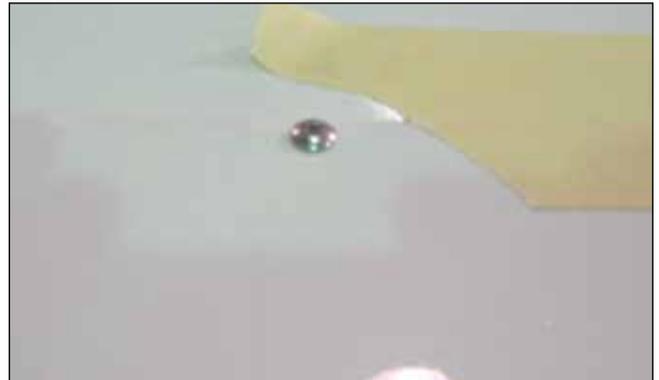
**Photo 607****Photo 608****Photo 609****Photo 610**



Photo 611

SECTION 71 WING ROOT FUEL LINES

Start this procedure by trimming the fuel line to allow approximately 1/2" of plastic tubing to be inserted into the fitting. Place the compression nut and the compression insert (ferrule) onto the plastic tubing. Place the nylon insert into the open end of the tubing and then insert the tubing into the fitting. Turn the compression nut until it is hand tight. After the compression nut is hand tight place a mark on the nut and the fitting. Then turn the compression nut 1.5 to 2 full turns past the mark.



Photo 612

Repeat this process for the three remaining fuel lines.

Place Torque Seal on the fitting when completed.



Photo 613

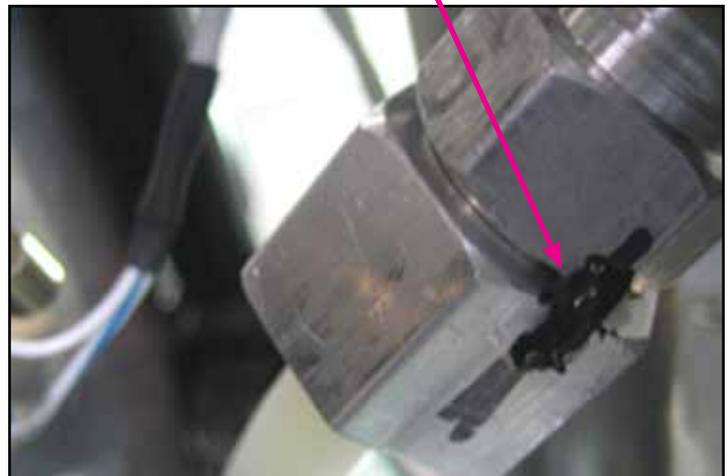


Photo 614

SECTION 72 WING ROOT WIRING

Secure the wiring in the left side door header to the compression strut with zip ties. Ensure that no wires will chafe against any metal.

Apply chafe wrap as needed to protect wires that are close to the front wing spar.

Repeat this process for the right wing.

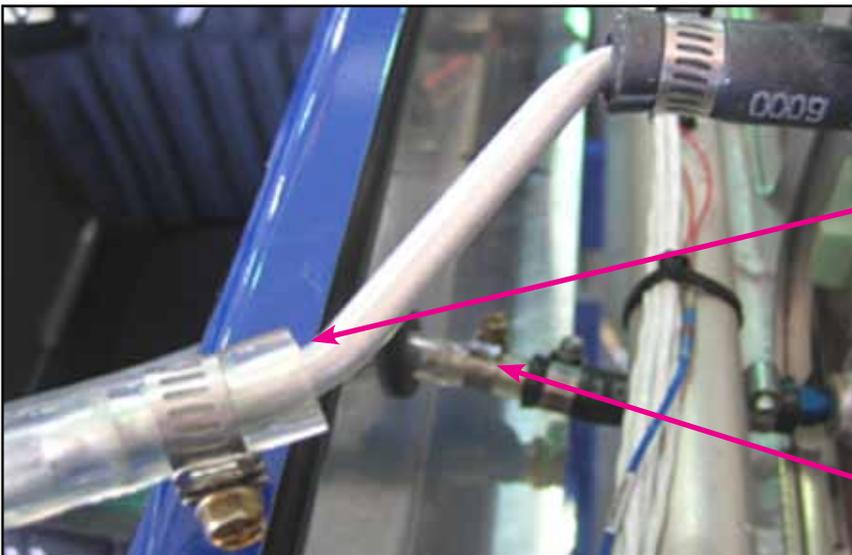
*Photo 615**Photo 616**Photo 617*

SECTION 73
WING ROOT PITOT TUBE

Connect the Pitot tube between the fuselage and the wing with a short piece of rubber tubing. If necessary, you may heat the rubber slightly to assist with the fitting over the plastic tube.



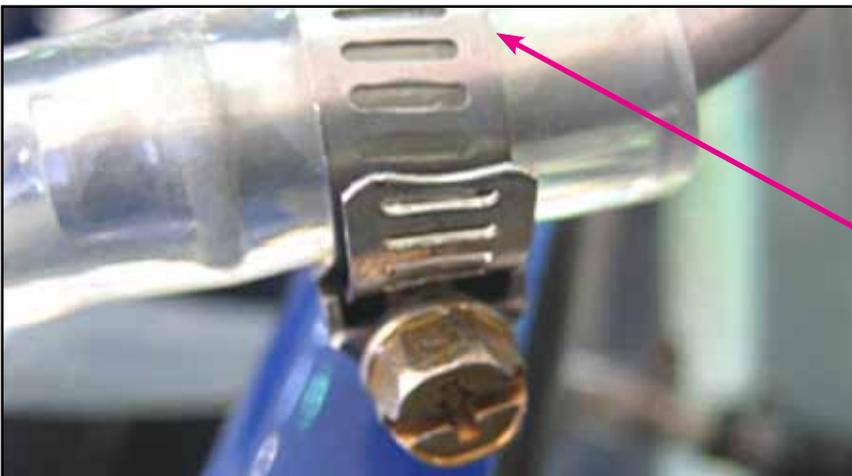
Photo 618



Trim the fuel sight gauge lines to length. Insert a Hydrodynamic Surge Dampener into the top tube from the fuel tank and then slip the hose clamp into place.

Place hose clamp on the dampener and then slide the top of the sight gauge into position and tighten the hose clamp.

Photo 619



Keep the smooth side of the clamp above the door header.

Photo 620

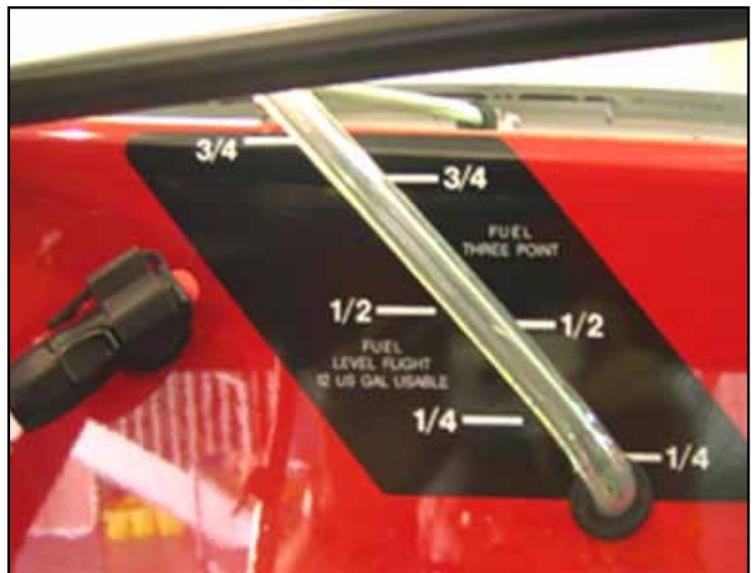
Insert the bottom Hydrodynamic Surge Dampener into the bottom rubber tube from the fuel tank. Secure with a hose clamp (as for the top).

**Photo 621**

Place a hose clamp over the tube and insert the sight gauge onto the tube. Then secure the sight tube with the clamp.

**Photo 622**

This is a correctly installed sight tube. Ensure that the tube follows the angle of the markings on the placard.

**Photo 623**

SECTION 74 WING ROOT PANELS

This section is installing the lower middle wing root fairings. Begin by centering the lower wing root panel between the window hinges.



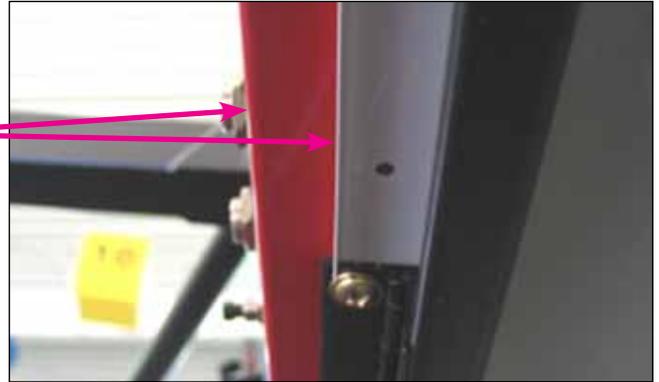
Photo 624

Align the fairing along the edge of the fabric tape and then tape the fairing in place.



Photo 625

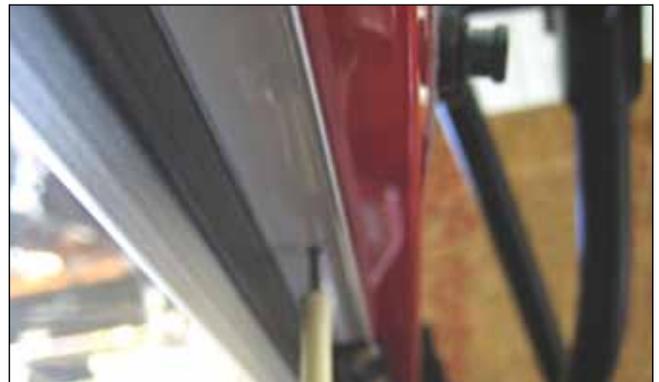
When the lower middle wing root fairing is in the correct position there should be an even reveal between the edge of the fairing and the door header.

**Photo 626**

Next, the lower middle wing root fairing needs to be match drilled to the wing root. Match drill holes in the fairing to the wing root with a #42 drill bit.

**Photo 627**

Match drill #46 holes in the door header.

**Photo 628**

When all the holes have been drilled, remove the lower middle wing root fairing and the lower rear wing root fairing. Blow out all the chips from the drilling.

**Photo 629**

**Photo 630**

Install the screws (HDW-S4R.25TA) in the lower middle wing root fairing.

Insert a screw in the aft end of the lower middle wing root fairing and the forward end of the lower rear wing root fairing.

Do not drill the final hole in the wing root panel at this time.

**Photo 631**

Insert screws into the door header.

**Photo 632**

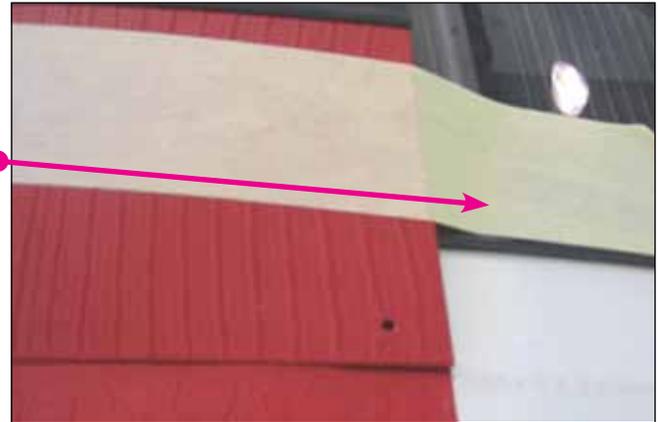
After all the door header screws are installed check the edge of the wing root panel to ensure that it is laying flat against the bottom of the wing. You may have to remove one or two screws to enlarge the hole in the wing root fairing to allow it to lay flat.

**Photo 633**

Now, apply sponge rubber seal (SP23001-001) between the window hinges.

Repeat this entire fairing installation for the opposite wing.

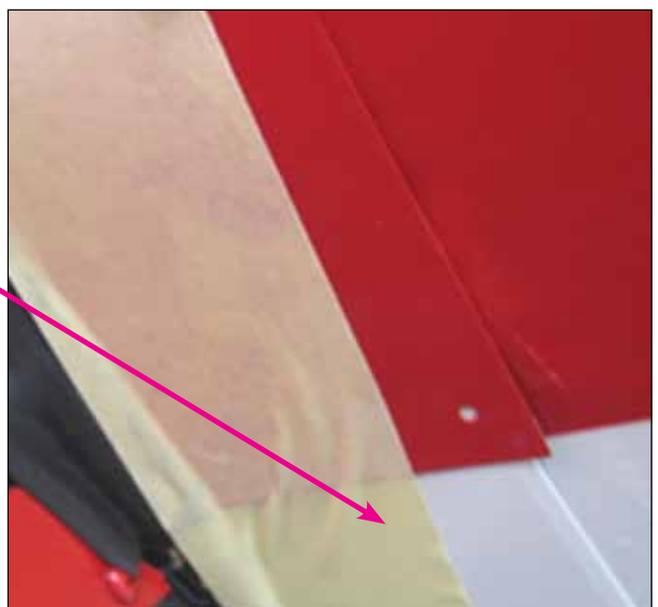
The next step deals with fitting the forward wing root fairing. Begin by taping the forward wing root panel into place starting at the top of the wing. Align the aft edge of the fairing with the paint line and the edge of the fabric tape.

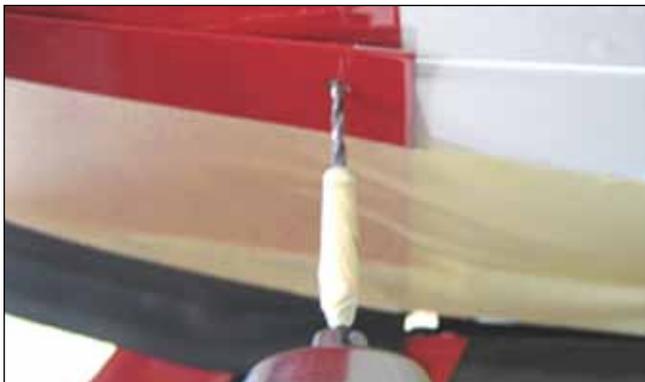
**Photo 634**

Next, the rubber seal between the fairing and the windshield is installed. Carefully press the rubber seal against the windshield as you wrap the forward fairing around the leading edge of the wing. Keep the seal taut and smooth as you install.

**Photo 635**

Tape the fairing to the bottom of the wing. Align the aft edge of the forward fairing with the edge of the bottom wing root fairing such that you have roughly $\frac{1}{2}$ to $\frac{3}{4}$ inch of overlap of the forward fairing over the middle fairing.

**Photo 636**

**Photo 637**

The next step deals with drilling the forward wing root fairing. Match drill the end hole in the fairing into the wing root with a #43 drill bit as shown here.

**Photo 638**

Next, use a Hole Finder to locate the hole in the skylight under the panel. Drill this hole with #10 drill bit.

Insert the screw at the aft end of the fairing.

**Photo 639**

Next, match drill the aft outboard screw hole with a #43 drill bit. Insert the screw (HDW-S4R.25TA).

**Photo 641****Photo 640**

Lastly, drill a #46 hole for the aft inboard screw on the forward wing root fairing. Insert the screw (HDW-S4R.25TA).



Photo 642



Photo 643

The following photographs will allow you to see the final screw positions.



Photo 644

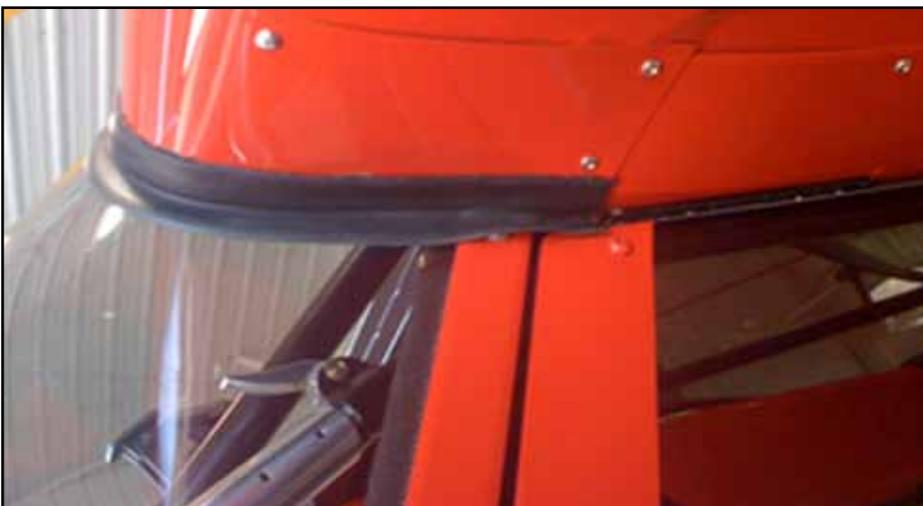


Photo 645



Photo 646



Photo 648



Photo 647

SECTION 75 WINDOW LATCHES (OPEN)

The windows are a different size for the right and left, this means that you will need to have both windows installed before installing the window open latches. Trim both window reinforcement brackets (SC23211-001) as shown in Photo 649. Install the window reinforcement brackets according to Figure FN62. Now that the reinforcement brackets are installed, install the upper window latches per Figure FN63 and Photo 650. **MAKE SURE BEFORE DRILLING THE HOLES FOR THE WINDOW LATCHES THAT YOU HAVE CHECKED TO MAKE SURE THE LATCH WILL CATCH THE WINDOW IN THE OPEN CONDITION AND THE LATCH WILL OPEN FAR ENOUGH TO ALLOW THE WINDOW TO BECOME UNLATCHED.**

Drill holes for the window latch screws with a #40 drill bit and install the latches.



Photo 649

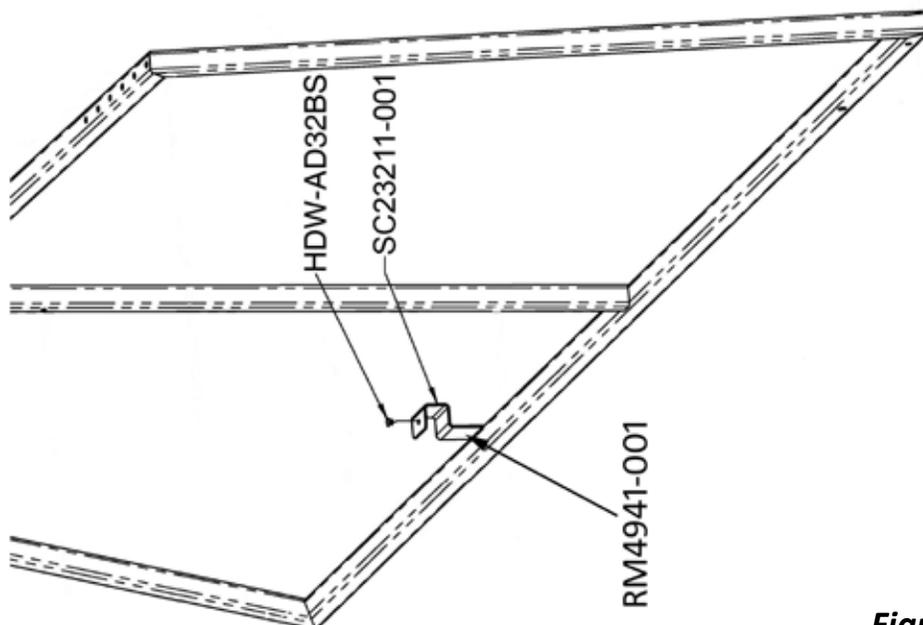


Figure FN62



Photo 650

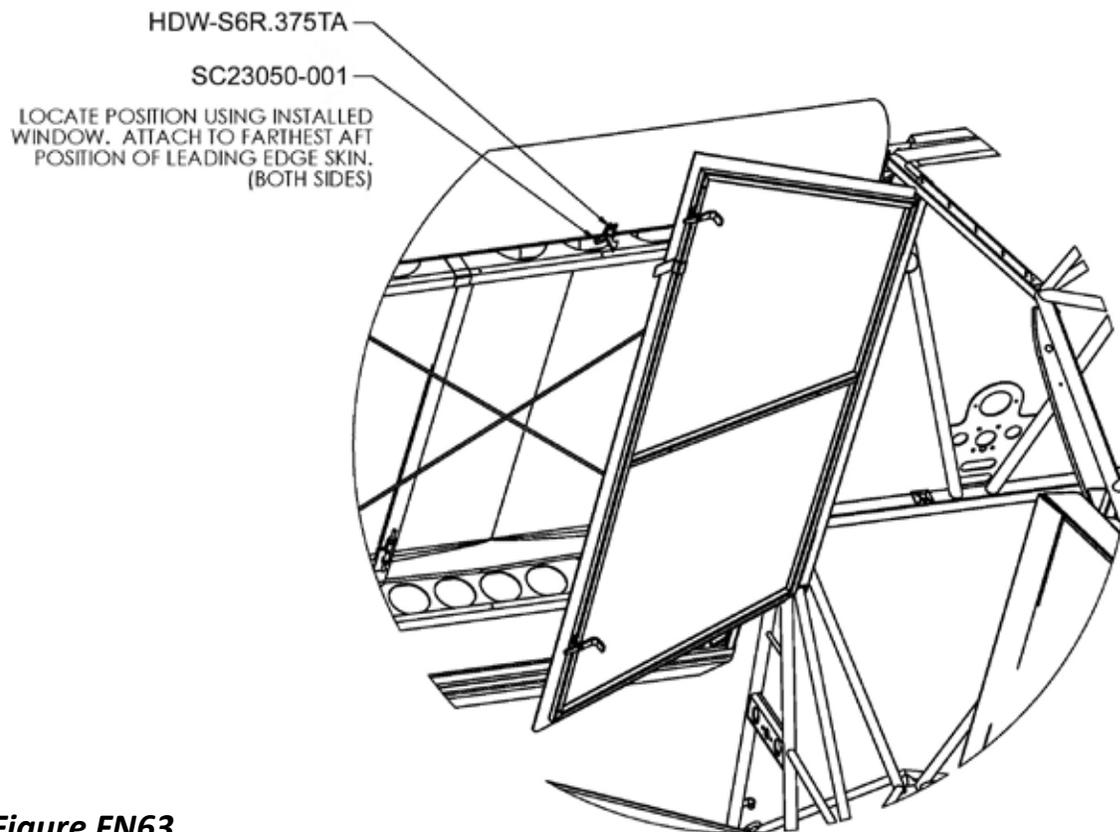


Figure FN63

SECTION 76 INSTALLING THE BELLY PANEL

Some preparation is required before installing the belly panel, at the factory we install a wire whip antenna in this panel. We also use a 4" aluminum reinforcement on the inside of the panel connected by the antenna. The antenna and reinforcement are included in the panel kits. We also use a BNC connector to connect the antenna wire for removal of the belly panel. The first step will be to use a soldering iron to open up the screw holes on the attaching tubes. Once this has been completed, a test fit and some match drilling will be needed. First you need to add some masking tape the corners of the belly panel as shown in Photo 651. Next slide the belly panel between the boot cowl and the fuselage, then install for screws as shown in Photo 651. Then using a fine tip magic marker or pencil, transfer the holes to the belly panel as shown in Photo 652. Remove the belly panel and drill the marked holes with a #30 drill bit Photo 653, then enlarge the holes to 3/16". Make sure that you deburr the holes as in Photo 654. Install HDW-A1784-6Z-1 tinnerman as shown in Photo 655 for each hole in the belly panel. These tinnerman nuts will need to be installed on to the fuselage flange. Install the belly panel for the final time using the hardware callout in Figure FN64. The screws for the belly panel/boot cowl seam are HDW-S6R0.5TA.



Photo 651



Photo 652



Photo 653

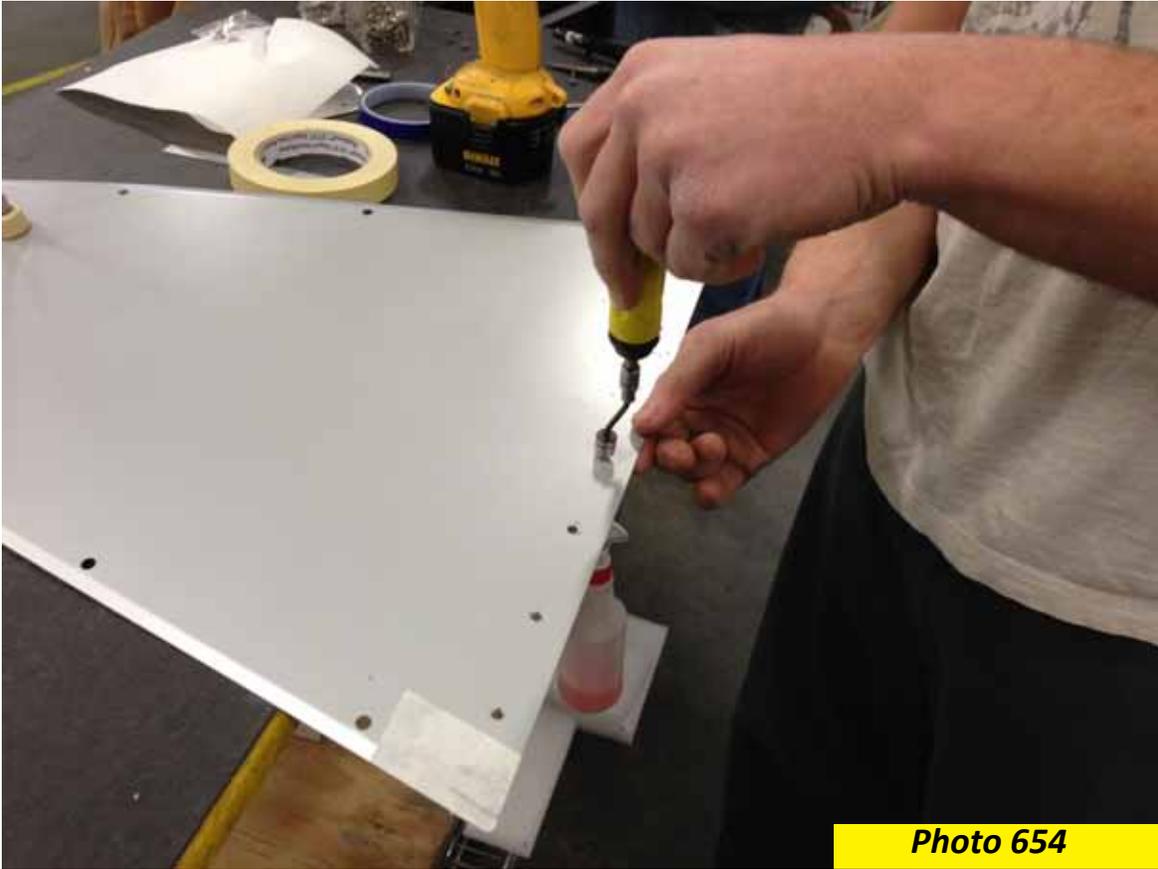


Photo 654



Photo 655

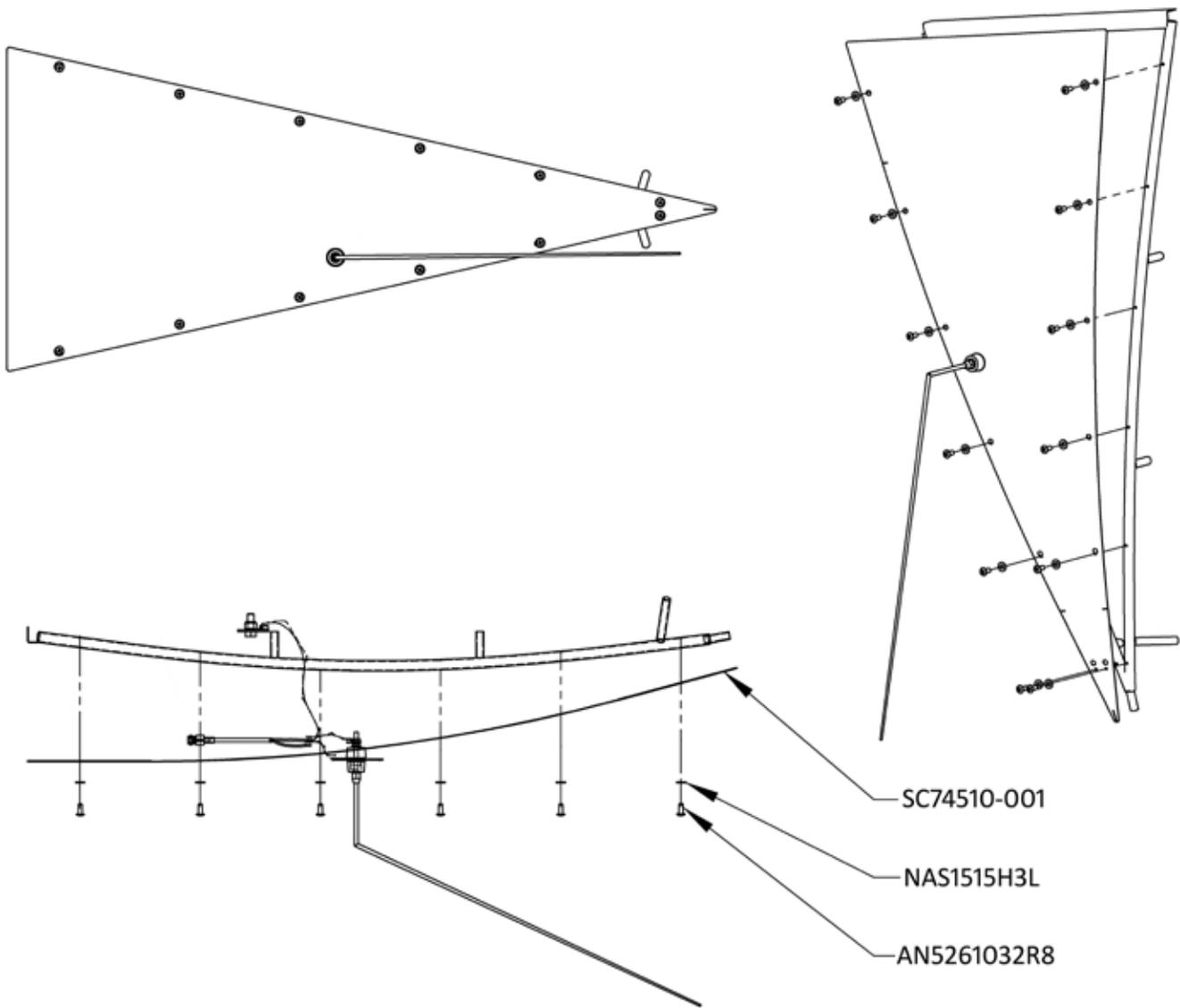


Figure FN64

SECTION 77 INSPECTION COVERS

The inspection cover that attach to the fabric via the grommets that were glued to the fabric during the covering process should be installed now. Center the cover paying special attention to anything that may be moving inside that inspection cover. The three pictures Photo 656, Photo 657, and Photo 658 will show the more difficult covers. Tape the covers into position and match drill using a #48 drill bit. **MAKE SURE YOU DO NOT DRILL INTO ANY STRUCTURE THAT IS BEHIND THE INSPECTION COVER.** Install the cover with HDW-S4R.25TA Screws. **DO NOT OVER TIGHTEN THESE SCREWS, REMEMBER YOU ARE INSTALLING THESE SCREWS INTO PLASTIC.**



Photo 656



Photo 657



Photo 658

SECTION 78 SEALING

Some preparation is necessary before sealing the windshield. The goal is application of silicon to the trim strip to windshield and trim strip to skylight gap in a way that is neat.

Begin by applying masking tape to the trim strip on the windshield/skylight junction and on each side of the trim strip. Allow a gap of approximately 1/8" for the silicone to be applied on each side of the trim strip.

Place a thin bead of silicone down the length of the tape in each of the two tape gaps

**Photo 659****Photo 660**

**Photo 661**

Now, run your finger down the two beads of silicone to smooth the silicone into the gaps between the masking tapes (and into the gap between the trim strip and the Plexiglas).

**Photo 662**

Remove the masking tape. You should have two nice beads of silicone remaining.

**Photo 663**

The process is the same for the skylight to wing sealing. As such, repeat the masking tape, silicone application, smoothing and removal of the tape. Perform this step for both sides of the skylight.

**Photo 664**

You have probably figured it out already but the process is the same for the turtle deck sealing. Repeat the sealing procedure on the turtle deck/skylight overlap. The skylight should now be sealed on all four sides. Any silicone on painted surfaces can be removed with rubbing alcohol. Silicone on the skylight or windshield should be allowed to dry and then it can be rubbed off. The sealing of the navigation lights is almost the same as the sealing just undertaken. The exception is use of plastic tape instead of masking tape. Begin by applying plastic tape to the navigation light as shown below. Then apply a bead of silicone around the navigation light. Make sure that the gap between the navigation light and the tip bow is filled with silicone.

**Photo 665****Photo 666****Photo 667**

Smooth the silicone around the navigation light with your finger and then remove the tape.

**Photo 668****Photo 669**

The landing light sealing is the same as that for the navigation lights. Begin by applying plastic tape around the inside and the outside edge of the landing light lens.



Photo 671



Photo 670

Now, apply silicone to the gap between the lens and the wing. Do not inject silicone into the gap as it will creep under the lens and look sloppy. Lightly run your finger along the bead of silicone to smooth the surface. Again for emphasis - **do not press the silicone into the gap**.



Photo 673



Photo 672

Remove the tape from the lens by pulling at a slight angle away from the silicone. There should be no silicone under the lens.



Photo 674



Photo 675

After the tape is removed, carefully smooth the silicone toward the screws. You are just trying to seal the screws. Do not overwork this process, as you will only spread the silicone onto the lens.

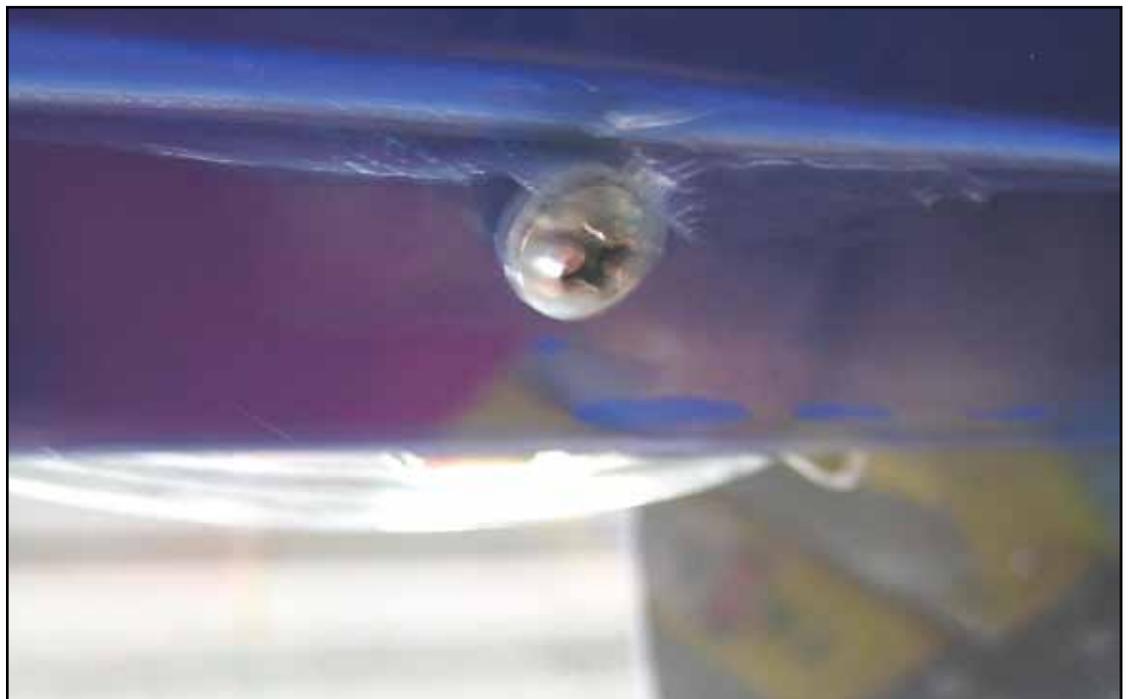


Photo 676

SECTION 79 PLACARD INSTALLATION



Photo 677



Photo 678



Photo 679



Photo 680



Photo 681

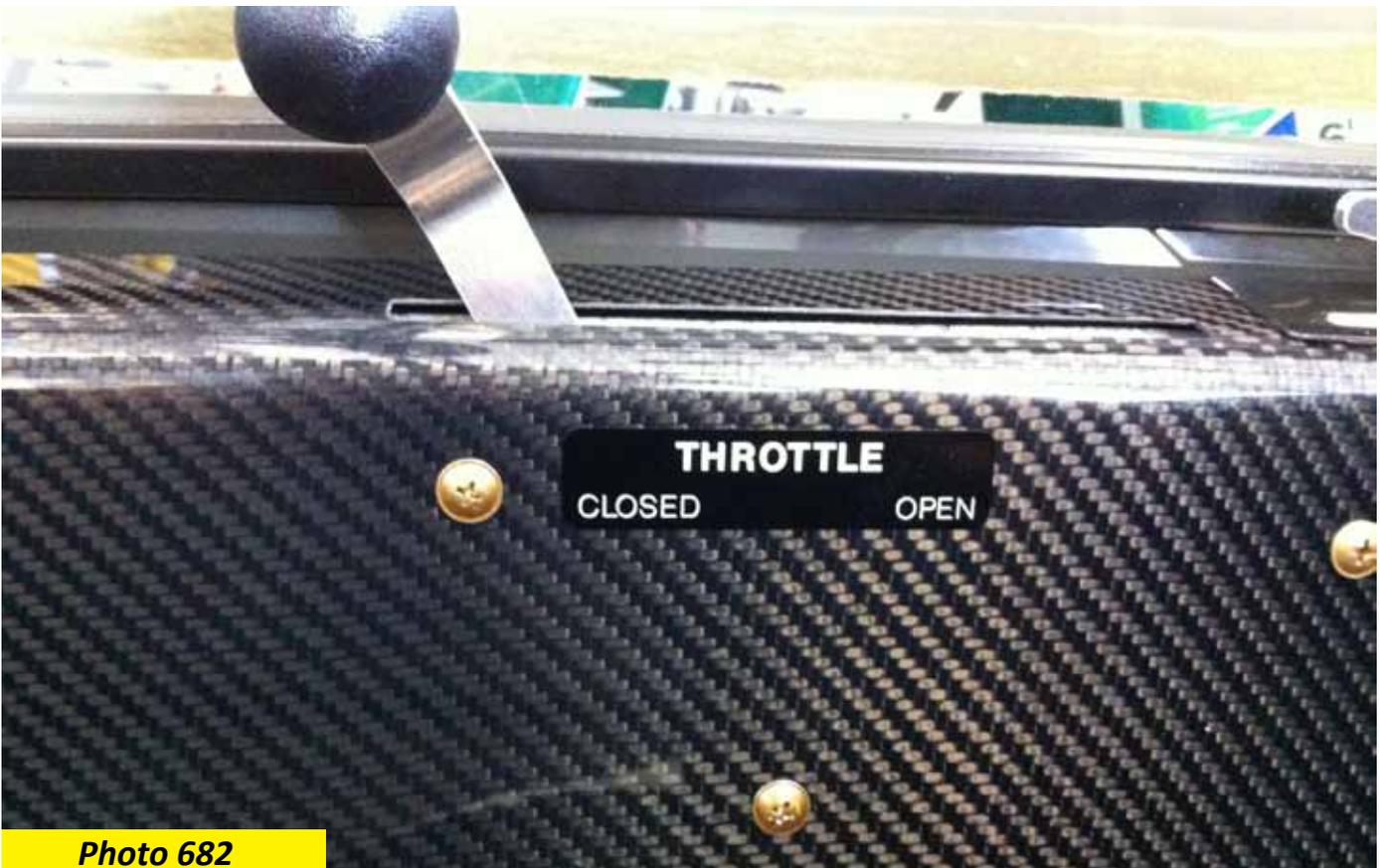


Photo 682



Photo 683



Photo 684

STANDARD BAGGAGE



Photo 685

EXTENDED BAGGAGE



Photo 686



Photo 687

LOG & INSPECTION SHEET FINISH # 13**Inspection point**

	INSPECTION ITEMS	BUILDER	ALTERNATE
	Belly Panel Inspection		
2.39	Install links and connect aileron cable to torque tube.		
2.40	Verify aileron cables are not rubbing floorboard		
2.41	Ensure all wiring is tied up properly in lower seat base.		
2.42	Ensure complete movement of rear stick does not allow elevator cable to contact sides of hole in floorboard.		
2.43	Ensure belly panel is attached securely.		
	Wing Root Fairings		
2.44	Operate the flaps to verify that the flap rod does not contact any electrical wiring.		
2.45	Ensure wing root fairings are installed per drawing.		

NOW WOULD BE A REALLY GOOD TIME TO WATCH THE COWL PREP. AND COWLING INSTALL VIDEOS INCLUDED IN YOUR MANUALS

SECTION 80

ENGINE COWLING PREPARATION

This step deals with preparation of the engine cowl and then fitting the cowling to the fuselage.

SECTION 73

Step 1 FITTING LOWER COWL AND UPPER AIR FILTER RETAINER

Begin by gathering the Upper Cowl (PC53002-001), the Oil Door (PC53003-001), the Lower Cowl (PC53001-001), the Upper Air Filter Retainer/Carburetor Door (PC53021-001) and Lower Air Filter Retainer (PC53017-003). The Lower Air Filter Retainer is fastened to the lower cowl at CubCrafters but you should still see the part number tag.



Photo 688



Photo 689



Photo 690



Photo 691

Begin by fitting the Upper Air Filter Retainer to the Lower Cowl. Take notice of the fit along the long lines and in the corners.



Photo 692

The likely place for finding trimming need is in the corners.

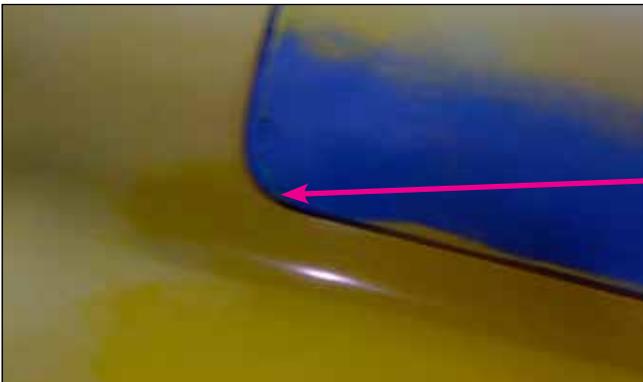


Photo 693

The filter retainer needs to lay nicely onto the flange in the lower cowl.



Photo 694

You can see a trim line marked here along the side of the retainer.

**Photo 695**

Mark the trim lines with a Sharpie or a pencil and then either cut or sand to remove the excess material.

In Photo 696 you can see the use of a die grinder and a sanding disc to shape the side. Repeat the cut-and-try process to achieve a good fit. Be sure to radius the edge too match the radius of of the flange in the lower cowl.

Once the cowl fits, tape it in place with 2 inch tape. Start by applying the tape at the aft end of the filter retainer. Use a fair amount of tension in the tape to hold the filter retainer snugly against the lower cowl.

**Photo 696****Photo 697**

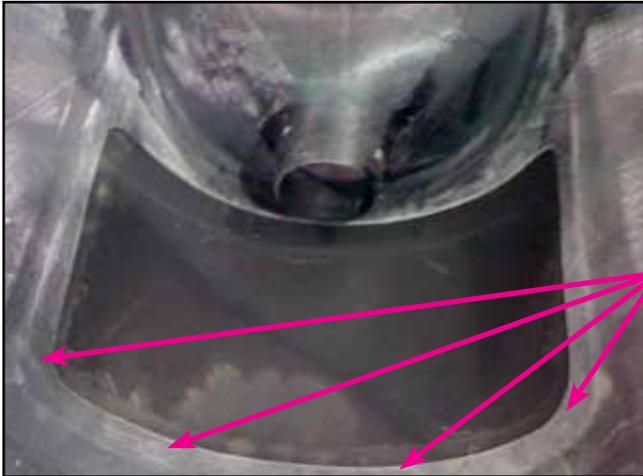


Photo 698

SECTION 73

Step 2 FASTENING UPPER AIR FILTER RETAINER

From the inside of the bottom cowl use a #30 bit and drill pilot holes. 10 holes need to be drilled. Center the holes in the flanges such that the edge distance is roughly the same inside (in the cowl) and outside (in the retainer).

Place #30 Clecos as the holes are drilled.

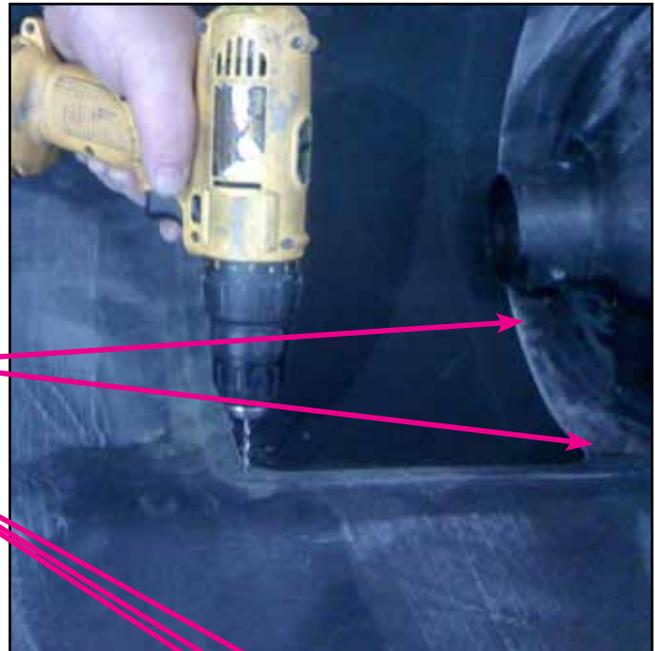


Photo 699

4 holes across the aft edge

4 holes under the air nozzle

2 holes in the forward edge

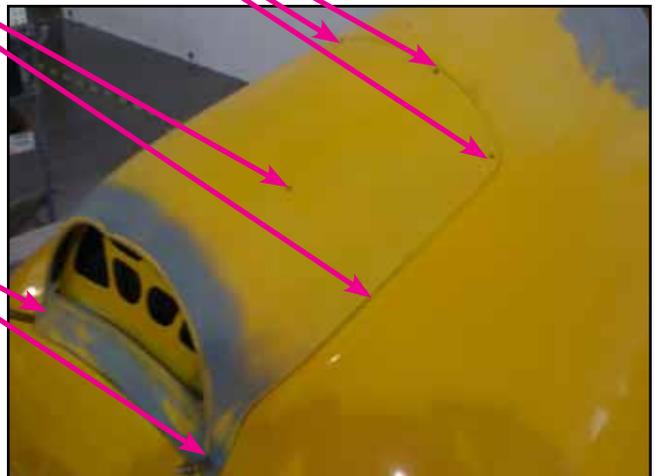


Photo 700

Photo 701 shows 4 of the Clecos.



Photo 701

The next step drills for nut plates. Photo 702 and Photo 703 show a great jig for drilling nut plates. The first step is to drill all of the holes with a #19 drill. Then the jig below is placed in the hole and the first side hole is drilled with a #40 bit. The jig is flipped (see photograph to right), inserted into the two holes and the second side hole is drilled. Drill all of corner holes diagonally and the other positions parallel to the sides.



Photo 702



Photo 703

Photo 705 and Photo 704 show 8 of the completed nut plates.



Photo 705



Photo 704

Next, countersink the holes in the filter retainer to fit the countersunk washers (HDW-A3236-012-935). As shown in the left photograph below, it is a good idea to use a backing block when countersinking. A Micro Stop tool can be used for most of the holes but the front holes will probably need to be countersunk free-hand. Install the washers and screws (AN507C632R6). Use AN507C632R8 for the forward holes.



Photo 707



Photo 706

The next two photographs show example drilled holes.



Photo 708

Now that the nut plate holes are drilled, use a #40 countersink bit to countersink the outer holes. Flush rivets and your rivet squeezer will be used to fasten the nut plates to the lower cowl. The front two holes will need their rivets to be bucked. Use MS20426A3-4 rivets for all but the front two holes. Use 3-5 rivets for the front holes, as the material is a bit thicker there. The nut plates are MS21059L06.



Photo 709

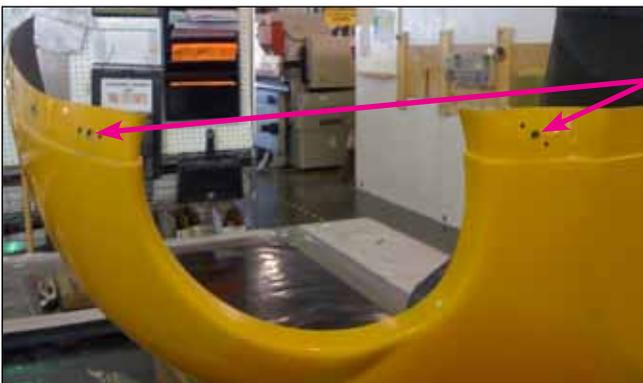
Use a #40 Cleco on one side while riveting the other side. The nut plates will move around a little (by their design) but you should be able to place the rivets without much trouble.



Photo 710



Photo 711

**Photo 712****Photo 713****Photo 714****Photo 715****SECTION 73****Step 3 UPPER COWLING**

Begin the work on the upper cowl by setting the lower cowl on a table. Use wooden 4x4's and a weight bag to stabilize the cowl. Place the upper cowl in place and use spring clamps to hold the upper cowl in place.

Now, use a #30 bit to match drill the upper cowl holes into the lower cowl. Place Clecos as you proceed. You should drill the front two holes first and then, working your way aft, drill 7 holes along each side. Leave the 8th (most aft) hole to be drilled during the fitting of the cowling to the fuselage.

Pull the upper cowl to keep the lap line straight as you work your way aft.

Remove the Clecos and separate the upper and lower cowl. Use the same technique as described above (drill #19, then #40, countersink, rivet) to place 16 nut plates. Keep the nut plates parallel to the parting line on the side but angle the front nut plates at approximately 45-degrees.

Drill the holes in the top cow with a #19 and then countersink for the same countersunk washers, as above.

SECTION 73**Step 4 OIL DOOR**

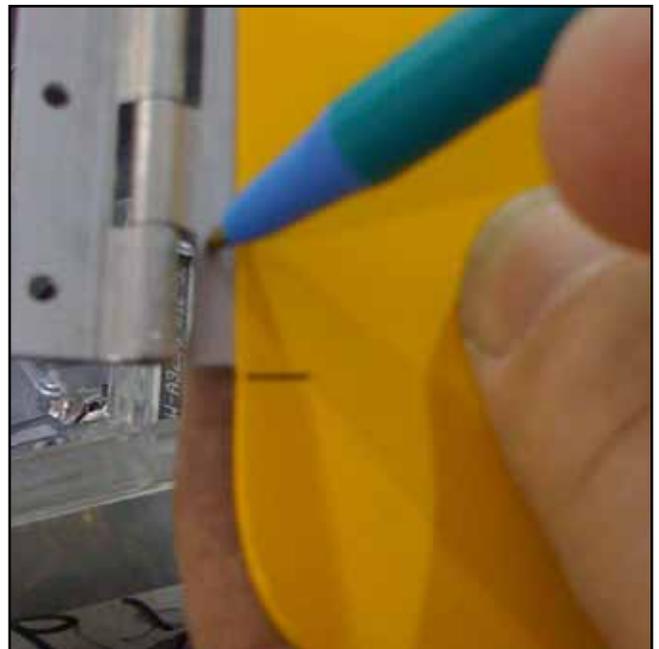
Check the fit of the oil door (PS53201-001) in the opening in the upper cowling. Trim and smooth the oil door as necessary to achieve a good fit.

Check to be sure that the hinge pin is fixed in the hinge. If necessary, shorten the pin so that it is 1/8th to 3/16th inch short of each end. Use side cutters to pinch the hinge tube slightly (trapping the pin).

Next determine the centerline of the door and mark that line with a pen or pencil. Set the centerline of the hinge on the centerline of the door.

Mark the extents of the hinge.

Using a file, rotary file or sandpaper to remove the lip on the backside of the oil door between the extents lines.

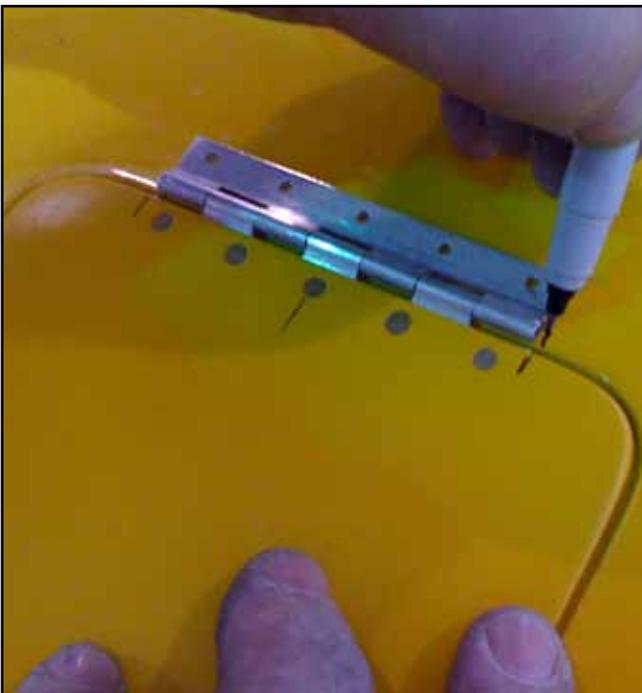
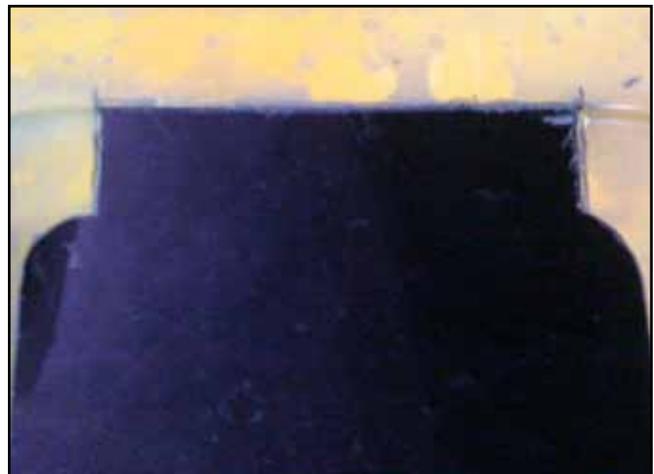
**Photo 716****Photo 717****Photo 718**

**Photo 719**

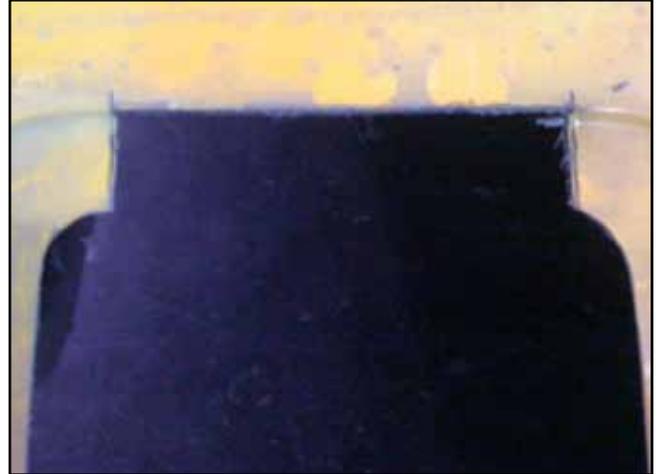
Align the hinge with the extent marks and hold in place with spring clamps.

Drill the middle 3 holes with a #40 drill bit. Place Clecos in the outer two of these holes. Remove the spring clamps. Countersink the door to accept MS20426A3-4 rivets in the 3 center holes. Use a rivet squeezer to place the 3 rivets. Drill the outer two holes and rivet them in the same manner.

Now, mark the extent of the hinge on the top cowl as in the photograph to the right and the bottom left. Then remove the inner marked section as shown in the photograph to the bottom right. A Dremel or die grinder with a cutoff wheel will be useful for removing the piece. A file or sandpaper on a backing board will be useful for trimming and smoothing.

**Photo 720****Photo 722****Photo 721**

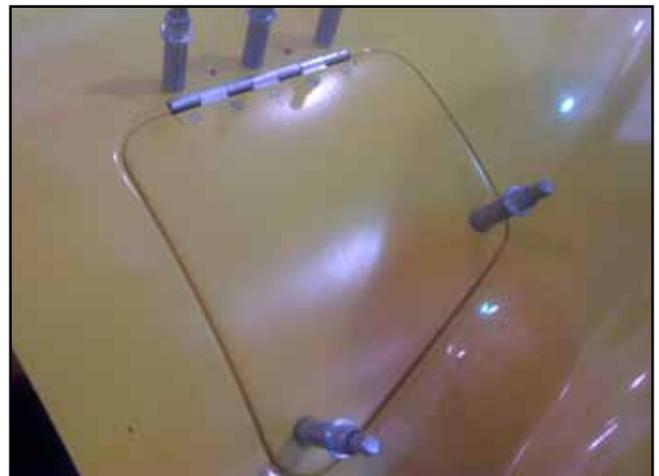
Continue sanding and fitting the hinge until a fit like that depicted to the right is achieved. Be sure that the radius of the hinge is replicated on the door to get a good fit. Once the fit is satisfactory, tape the door into place.

**Photo 723**

Drill the holes for the upper side of the hinge from the inside of the upper cowling. Place Clecos as you drill. Once the door is positioned and Cleco'd, drill for the door closures with a #40 bit and Cleco those two holes.

**Photo 724**

Now, if the tape is not already removed, remove it now. Drill the two latching holes with a #19 bit. In the same manner as for nut plates, drill for the placement of the half-turn fasteners that will be used for the oil door closure. Angle the holes as shown in Photo 725.

**Photo 725**

Drill the 2 closure pilot holes in the oil door to 0.245 inch. This is a "D" drill. Sand the backside of the drilled holes to remove burrs.

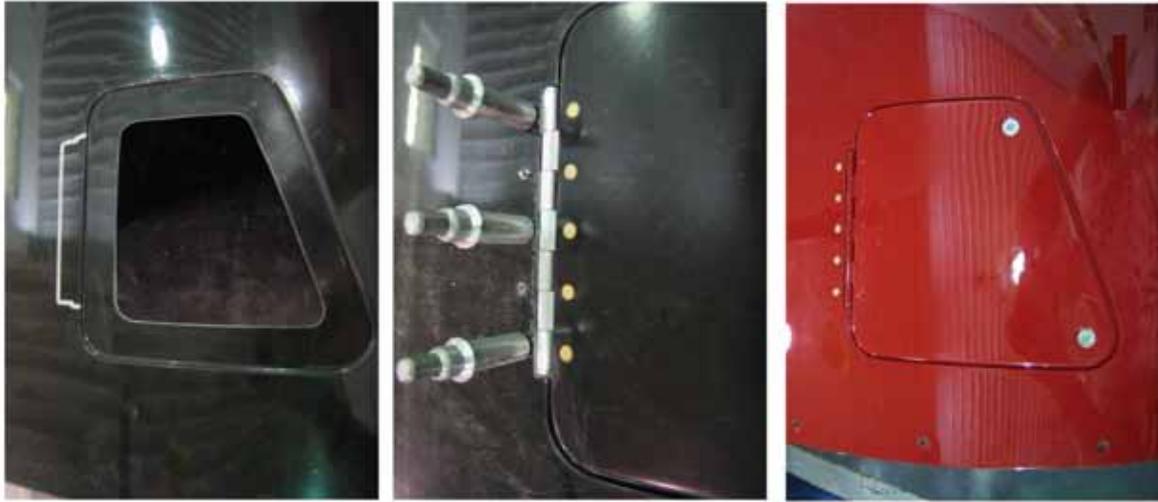
Next, countersink the outer holes in the upper cowl with a #40 countersink. Use four MS20426A3-5 rivets and your rivet squeezer to fasten two HDW-82-35-295-20 half-turn fasteners to the upper cowl. The photograph to the right shows the resulting placement. Countersink the oil door closure holes to fit the half turn fastener countersunk washers.



Photo 726



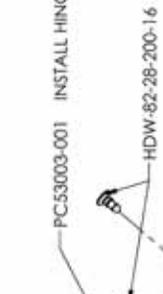
Photo 727



STEP 1

INSTALL HINGE CENTERED ON OIL DOOR AND MARK CUTOUT ON TOP COWL

INSTALL HINGE ON OIL DOOR FIRST



PEEN BOTH SIDES OF HINGE AFTER TOP COWL IS CUTOUT. BEFORE FINAL INSTALL

PC53201-001

STEP 2

CUTOUT TOP COWL FOR HINGE MATCH DRILL AND COUNTERSINK HOLES BUT DO NOT INSTALL HINGE ONTO TOP COWL UNTIL AFTER PAINT

DRILL ϕ .245 THROUGH OIL DOOR AND COWL TO MATCH SCREW

4X MS20426A3-4

HDW-82-35-295-20

STEP 3

Figure FN65

SECTION 81 FITTING ENGINE COWL TO FUSELAGE

This should be the starting condition for the engine cowl fitting. The engine should be in its final position and configuration. The CC340 is depicted here.



Photo 728



Photo 729

**Photo 730****SECTION 74****Step 1 NOSE HOLE PREPARATION**

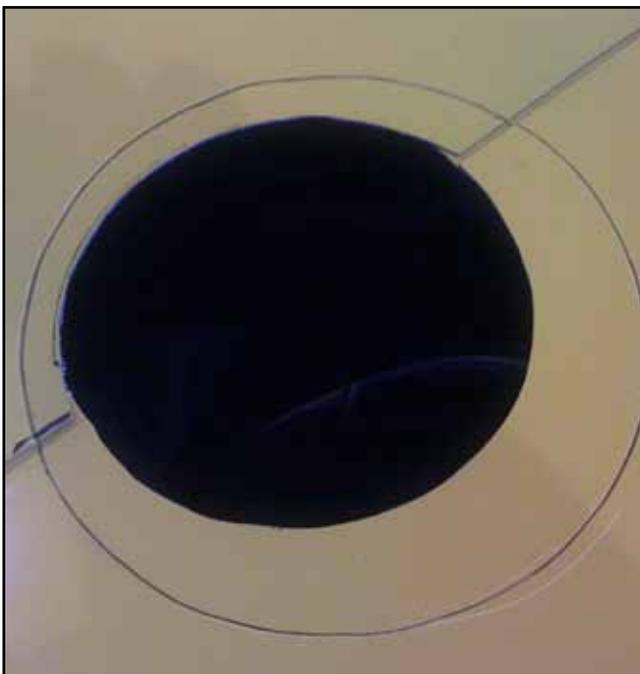
Place every other screw in the cowl to fasten the upper and lower cowl together.

Then, place a spinner backplate on the nose of the assembled cowl. Center the backplate on the “flat” at the front of the cowl.

Mark the backplate center hole on the cowl (6.5 inch) and remove the backplate.

Cut the hole with a saw and roughly smooth the edges. It is not necessary to final-finish the hole as it will be cut again in a later step.

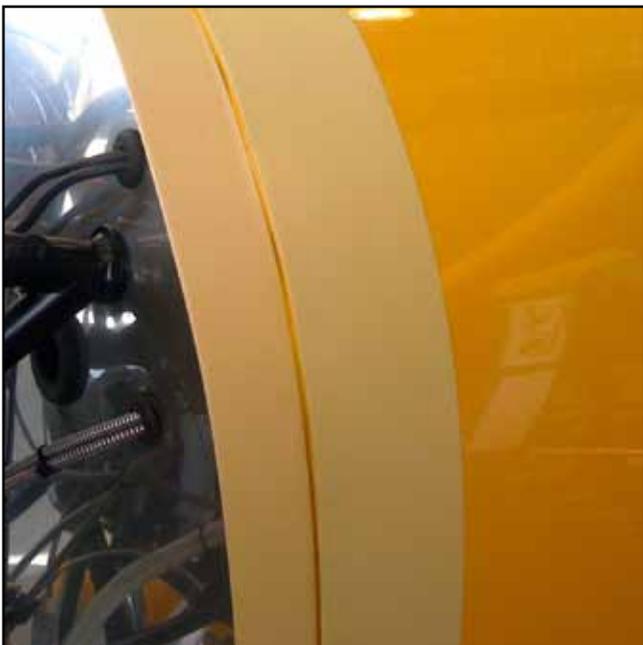
The resulting nose-hole should look like this photograph.

**Photo 731****Photo 732**

SECTION 74**Step 2 COWL FITTING**

Position the flywheel on the crankshaft and fasten with two bolts. Be sure the flywheel is properly indexed (in terms of rotation) to fit the crankshaft properly. As the propeller is not involved in this step it will be necessary to use washers to space the bolts away from the hub. In the photograph here you can see washers taped together as spacers and large fender washers at the head of the bolts.

Now, carefully apply 3 layers of 2 inch masking tape around the boot cowl. The edge of the tape needs to precisely follow the edge of the boot cowl. Then, apply 1 inch tape to the boot cowl flange to protect the paint. Apply several bands of tape at the top of the boot cowl to protect the paint. Mark the centerline of the boot cowl on the tape.

*Photo 733**Photo 734**Photo 735**Photo 736*

The upper and lower cowl should still be fastened together. Use a sanding block to smooth the inside seam. It will thin the wall a bit and remove burrs.



Photo 738



Photo 737

Check the fit of the cowl to the fuselage by carefully sliding the cowl into place and discerning the gaps and overlaps. Don't worry about overlap like that depicted here. It will be removed in a later step. Grab the forward edge of the cowl and slide left and right by small amounts to correct the fit where the engine cowl meets the boot cowl.



Photo 739

The crankshaft will, most likely, not be centered in the hole but this is normal and OK. Use masking tape to hold the engine cowl in place against the boot cowl. Then use masking tape to position a flexible measuring tape. You want to determine the distance across the upper cowl from parting line to parting line. Once the distance is determined, mark the centerline of the engine cowl on the cowling.

*Photo 740**Photo 741**Photo 742**Photo 743*



Photo 744



Photo 745



Photo 746

Release the tape holding the engine cowl against the boot cowl. Roll the engine cowl to align the boot cowl and engine cowl centerlines. Re-apply the tape to hold the engine cowl against the boot cowl.

Place 4 pieces of tape across the nose of the engine cowl.

Mark the tape approximately ¼-inch in from the perimeter of the “flat” at the front of the cowl. The measurement does not need to be precisely ¼-inch but the distance at all four sides needs to be the same.

Install a spinner backing plate on the crankshaft.

Loosen the tape holding the engine cowl to the boot cowl. Center the cowl on the spinner backing plate by reference to the 4 marks just made. Retape the engine cowl to the boot cowl.

Use a rule to mark a line $\frac{1}{4}$ -inch forward of the boot cowl leading edge on the engine cowl (one spot will do).



Photo 747

Now determine the distance from the back of the 2-inch tape to the mark just made. In principle it will be 2.25 inches but find the real distance. Remember when it was said that the tape needed to be precisely placed, this is where that precise placement pays off.



Photo 748

Using the 2.xx distance you just determined, transfer the measurement all around the boot cowl. Remove the cowl and cut this line. Roughly smooth the cut by removing any big burrs. This line will be cut again if things are "usual". Replace the engine cowl on the boot cowl and check the fit. The fit depicted here is not bad but it can be improved.



Photo 749



Photo 750

Try a little adjustment of the fit by using a longboard sander block to trim the edge. Re-apply the engine cowl to the boot cowl.

Check the clearance between the engine cowl and the spinner back plate. The clearance should be $\frac{1}{4}$ inch to $\frac{3}{8}$ inch.

If necessary, you can open up the nose-hole a bit to allow the cowl to be moved rearward. Use a compass to mark $\frac{1}{8}$ inch of additional clearance around the flywheel. Don't open the hole any more than necessary. In a later step, when the cowl is in its final position a $\frac{5}{8}$ inch perimeter gap will be cut.



Photo 751

Now, if the fit at engine to boot cowl is not really fine and you still have not exceeded the $\frac{3}{8}$ inch spinner backplate to cowl clearance, you can remark the engine cowl at a constant distance from your tape line and try again to get a really nice fit. This is fairly normal procedure but you only get to do it once (otherwise the backplate to engine cowl gap will be too large).

Continue working the fit until it is as good as you can achieve. The photographs on the next page show a good fit. Once you're happy with the fit tape the engine cowl in place so that it cannot move. Place a length of $\frac{3}{4}$ inch tape all around the engine cowl at the boot cowl-to-engine cowl gap.

Now, measure 3.25 inch from the engine cowl top centerline in each direction (left and right).

Then measure 3.75 inch for the second through 10th holes. The last hole is 2.5 inch from the 10th 3.75 inch mark. Thus, you have 1@3.25, 10@3.75 and 1@2.50. Now mark the edge distance at 1/2-inch. Drill the holes just marked with a #40 bit and place Clecos as each hole is drilled. You can remove the tape as you go to help get rid of chips. Drill the holes in the engine cowl with a #30 drill and countersink for the same countersunk washers previously used for the engine cowl.

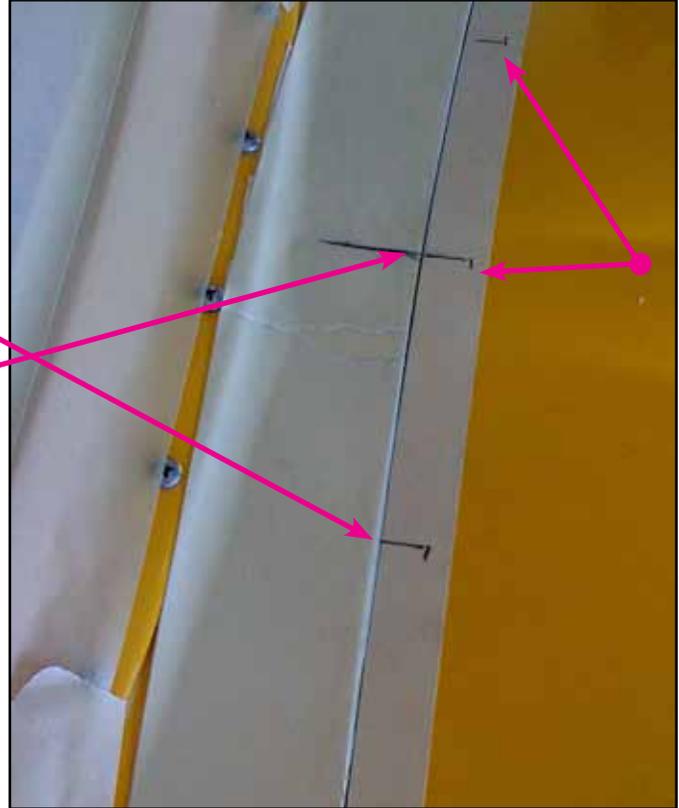


Photo 752



Photo 753



Photo 754

Now, you've placed nut plates several times already. This time you should use the same process and the same fasteners. Place nut plates in the boot cowl at each of the 24 positions. Now, measure 5/8 inch from the flywheel horizontally and mark the engine cowl for trimming. You will not be measuring from the silver part shown here. Measure the 5/8 inch from the coned region of the flywheel to achieve a horizontal 5/8th inch clearance. The photograph to the right shows a nice fit between the boot cowl and the engine cowl.



Photo 755



Photo 756

We're just about done with the engine cowl. Photo 759 and Photo 760 show a good fit all around. The last step is trimming so that the Gascolator quick drain can be accessed with a sample cup. Trim the lower cowl so that the sample cup can move vertically to contact the quick drain. Photo 759 and Photo 760 show a reasonable clearance.

*Photo 757**Photo 758**Photo 759**Photo 760*

LOG & INSPECTION SHEET FINISH # 14

Inspection point

	INSPECTION ITEMS	BUILDER	ALTERNATE
	Engine Cowl fitted to Boot Cow		
2.46	Ensure a min. 5/8" clearance around the propeller adapter		
2.47	Ensure a min 3/8" clearance around the two exhausts (S1 exhaust only)		
	Note: S2 exhaust exits from the engine cowl through the scoop. (Option)		
2.48	Ensure proper clearance for the gascolator		
2.49	Ensure aft edge of engine cowl fits flush to the edge of the boot cowl		
2.50	Place spinner template into position on the propeller adapter: A: Ensure a gap (.375 ± .125) between backing plate and the front of the engine cowl B: Ensure template and engine cowl front are as close to parallel as possible.		
2.51	Ensure all trimmed edges are smooth and free of burrs		
2.52	Ensure all areas needing fiberglass repair are clearly marked		