

Section 8

Body Details

Procedures covered in this section:

Install main rotor shaft and foot pedal cross tube; fit and install tub, seat bulkhead, floor pan, body panels, windscreen, doghouse, seat back access panels, cyclic inspection panels; install cabin comfort system; construct and install doors.

Cards used in this section:

HARDWARE CARD	E25 CARD 4F	E32 CARD 3F	E49 CARD 1F
E16 CARD 1F	E32 CARD 1F	E32 CARD 4F	E49 CARD 2F
E16 CARD 2F	E32 CARD 2F	E41 CARD 1F	E54 CARD 1F

Prints used in this section:

E16-2000	E41-2000
E32-2000	E49-2001

Templates used in this section:

E25-2	E32-2	E41-2
E32-1	E41-1	

Tools required for this section:

Air grinder	Countersink	Hammer	Scissors
Air or electric drill	Dzus tool	Needlepoint pliers	Screwdriver
Band saw	Files	Nut driver	Tape measure
Cleco	Framing square	Pop rivet gun	Vise
Cleco Pliers	Grease pencil or marker	Protractor level	

Drill bits of the following sizes: 1/16", 1/8", 5/32", 3/16", 1/4", 5/16", 3/8", #53, #40, #19, Uni-bit or step drill

Ratchet with sockets of the following sizes: 1/2", 9/16"

Wrenches of the following sizes: 1/2", 9/16"

Notes:

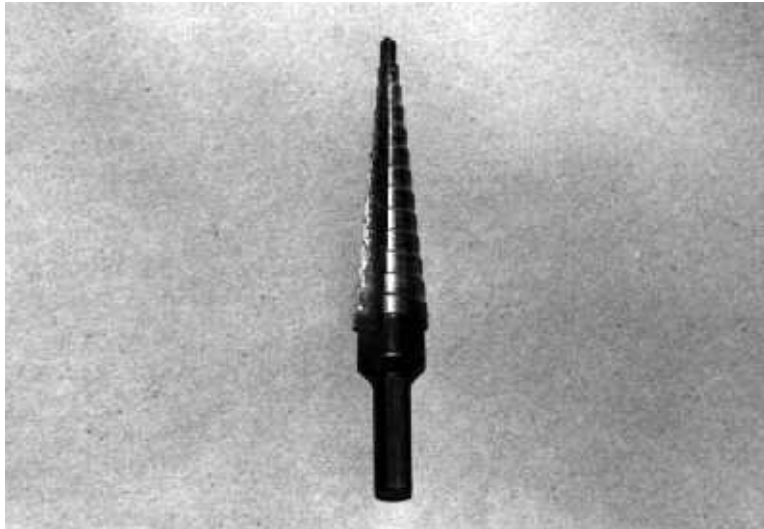
1. MAIN ROTOR SHAFT: The rotor system must be temporarily installed at this point to help position the body and doghouse for assembly. Refer to Section 11 for installation instructions.
2. FOOT PEDAL TUBE: Install the foot pedal cross tube when fitting the floor pan. Adjust the body support pads so that the pan does not rest on the cross tube.

PREFACE

Many of the body panels have pre-drilled master cleco holes. These holes are for initial alignment only, and may not necessarily be in the right position to be used for fasteners after all panels are fitted.

Pre-assemble the entire body with clecos before attaching any nut plates or Dzus fasteners. This gives you the opportunity to shift or relocate components somewhat if there is any unacceptable mismatch. Any unused alignment holes may be filled with fiberglass.

To get accurate hole alignment in the body panels, hold the body together initially with as few cleco fasteners as necessary to maintain alignment. When an acceptable fit has been achieved, lay out and drill the remaining cleco holes. Then enlarge the holes in the fiberglass according to the type of fastener being used. Try using a uni-bit or step drill (see photo below). These types of drills are less likely to wander.



Many of the fiberglass pieces have pre-scribed marks that appear as slightly raised lines on the surface of the gel coat. These are approximate areas to be cut out and are not necessarily in the exact location. When trial fitting, cut out only as much as necessary. Open the cut outs to their finished size after the body is completely fitted.

IT IS EXTREMELY IMPORTANT THAT YOU READ THE ENTIRE SECTION OF BODY CONSTRUCTION PROCEDURES BEFORE BEGINNING THE ACTUAL FITTING AND ASSEMBLY, SO THAT YOU HAVE A PROPER OVERVIEW OF THE ENTIRE PROCESS.

Overview of how the body will look when clecoed in place:

Photo A



Photo B

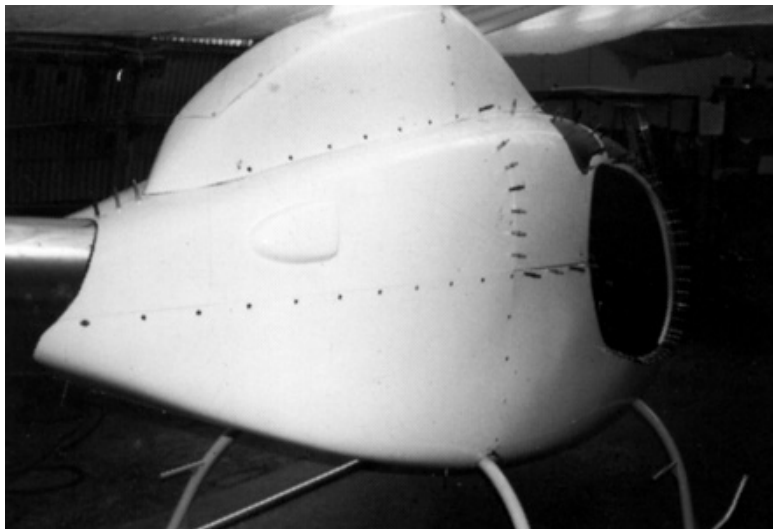
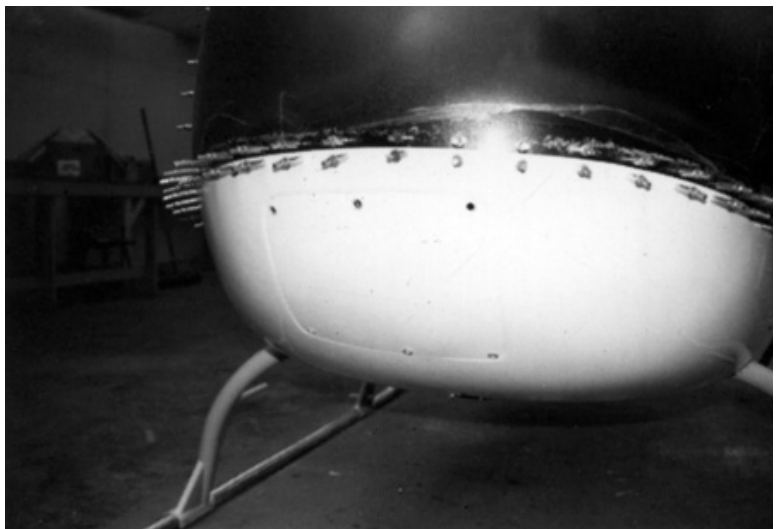


Photo C





BODY

Photo #1

Use print E32-2000 when assembling the body. Parts as received from RotorWay International.

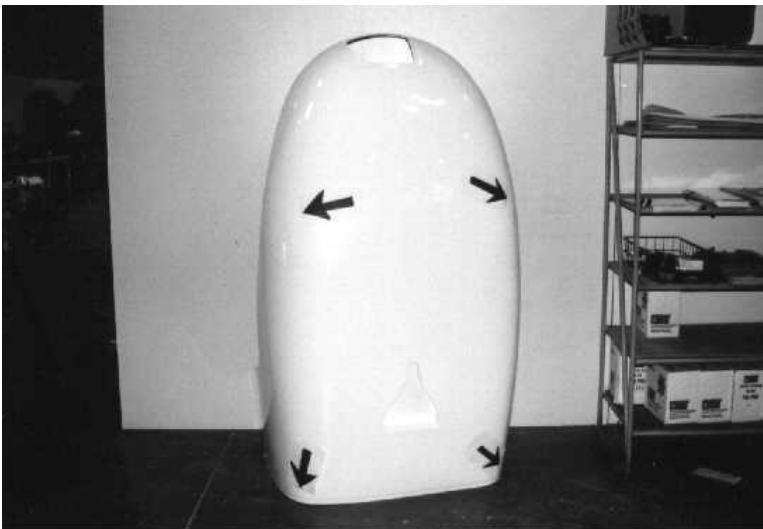


Photo #2

Cut out areas scribed for holes in the tub, as shown by the arrows.

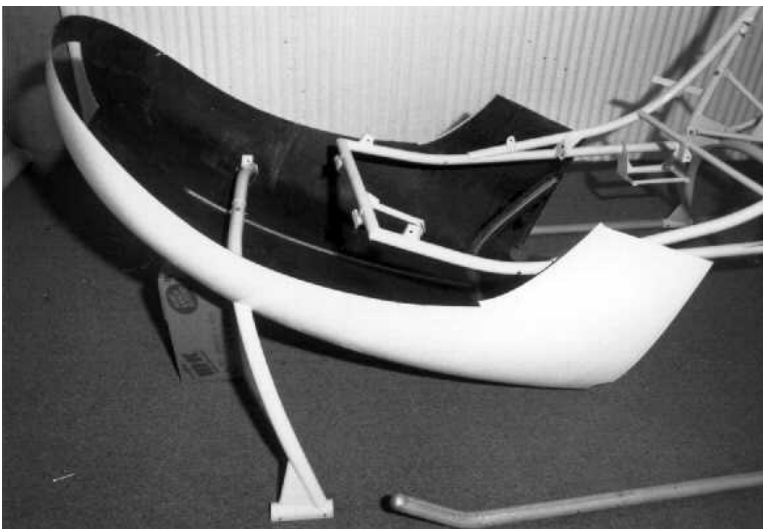


Photo #3

Disassemble the front landing gear and install the halves through the holes in the tub. Then re-assemble. Prop up the tub or have someone help you during this process.

Photo #4

Install the front landing gear on the skids and airframe. Insert the landing gear bolts and install the nuts finger tight.



Photo #5

With the help of an assistant, install the seat bulkhead on the airframe. Push it to the rear and to the pilot's side as far as it will go. Hold this position.



Photo # 6

The seat should sit on the curved airframe tubes. Later it may be necessary to add shims in this area for body alignment.





Photo #7

These arrows indicate where to drill the seat for clecos.

Note: The seat bulkhead is the only part of the fiberglass body that is securely bolted to the airframe. The fit of all other panels is determined by the location of the seat on the airframe. Once the body is completed, it can be shifted slightly on the airframe for a better fit. The initial cleco holes in the seat do not have to be the final bolt holes.



Photo #8

Drill the seat and airframe tubes for clecos.

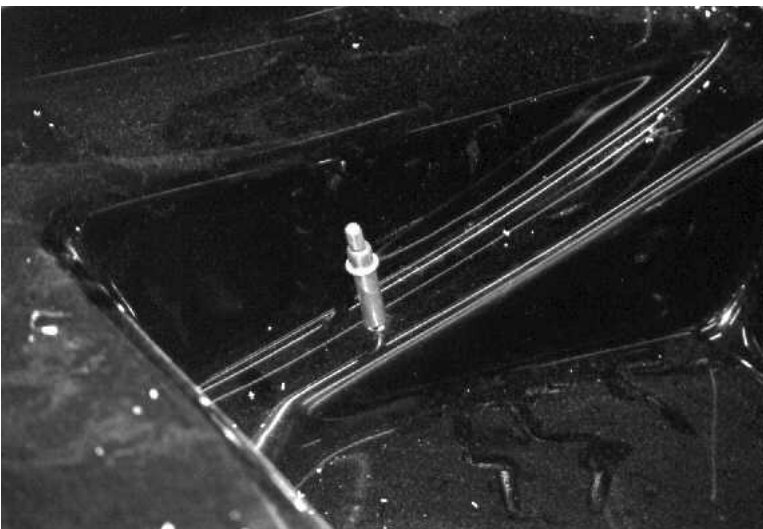


Photo #9

Install clecos to hold the seat in position.

Photo #10

The foot pedal cross tube should be installed before fitting the floor pan. See Section 10 pages 13-14. Install the floor pan and adjust the body support pads so that the pan does not rest on the cross tube. Pull forward and clamp the rear as shown. Secure the front of the floor pan to the tub with clecos in the master holes.

Note: Check alignment by comparing the distance from the front corners of the airframe to the tub on each side. The tub should be centered. Adjust the body support pads as needed to raise the pan up off of the pedal cross tube.

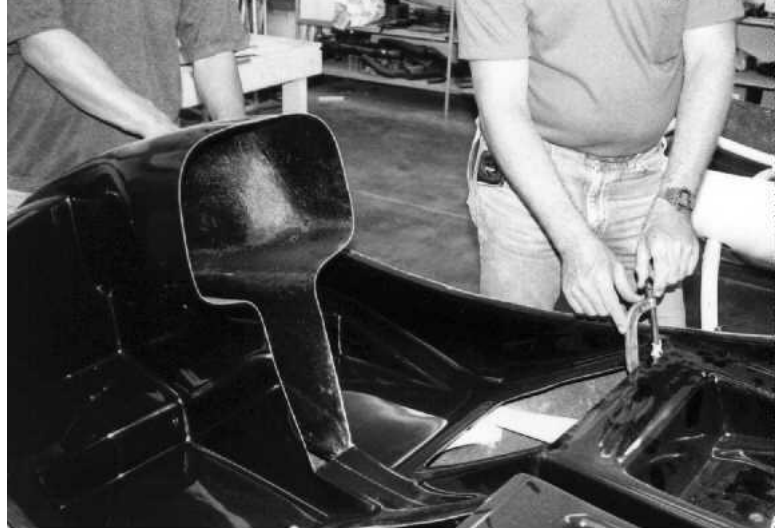


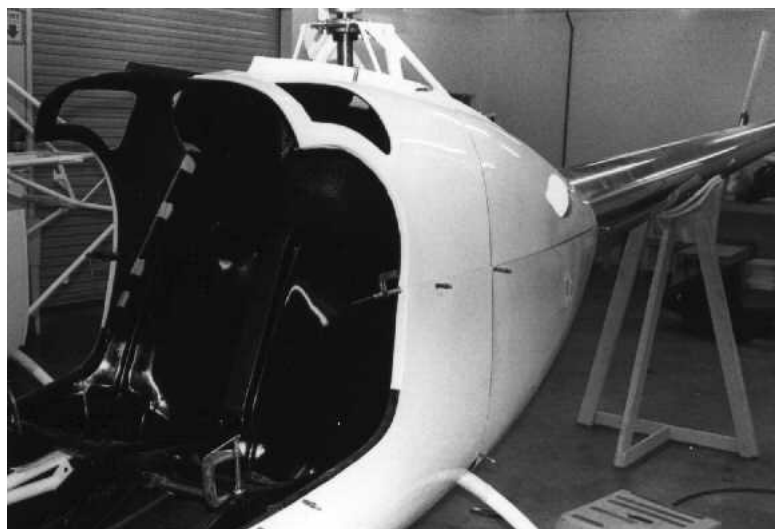
Photo #11

Begin hanging the remaining body panels. Install the upper front and rear panels first. As panels are added, use only as many clecos as necessary to hold them in place and maintain their shape. Since the fit of each panel affects another, gradual trimming and fitting is necessary as the body goes together. Final fitting and hole drilling can be done when all panels are in place.



Photo #12

Install the lower rear body panels. Open the cut-outs for the landing gear only as much as necessary.



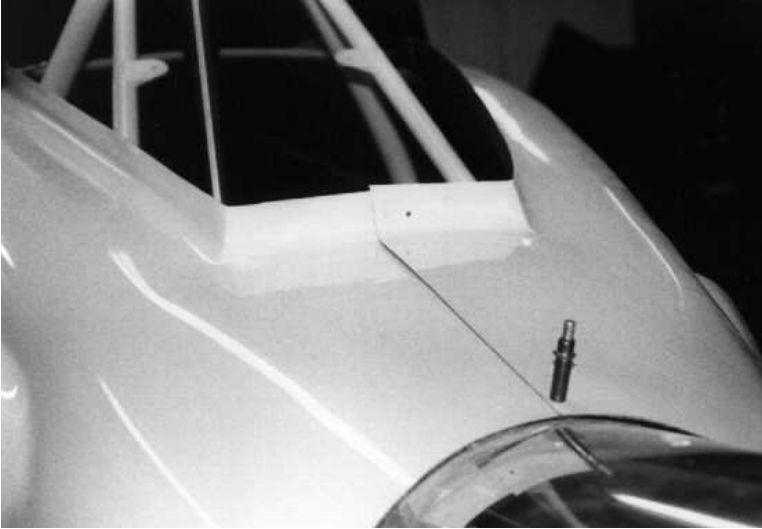


Photo #13

Check the fit of the top rear panels. They may be overlapped to reduce the opening around the tail boom. Shims may be added between the seat and the curved airframe tubes to achieve a better fit and to level the body.



Photo #14

The panels should fit evenly all around the tail boom. When the body has been final fitted, there should be enough clearance around the tail boom for the weather stripping that will be glued in place. Do not fasten the bottom overlap yet. This will be trimmed later when the radiator is installed.



Photo #15

Stretch a tape measure around the upper rear curve of the windscreen. Use the same measurement to install the cabin roof panel. This will ensure that the body is the correct width in that area.

Photo #16

Insert cleco in the two front locations of the roof panel as shown. Do not fasten the back of the panel yet. This will help when fitting the windscreen.

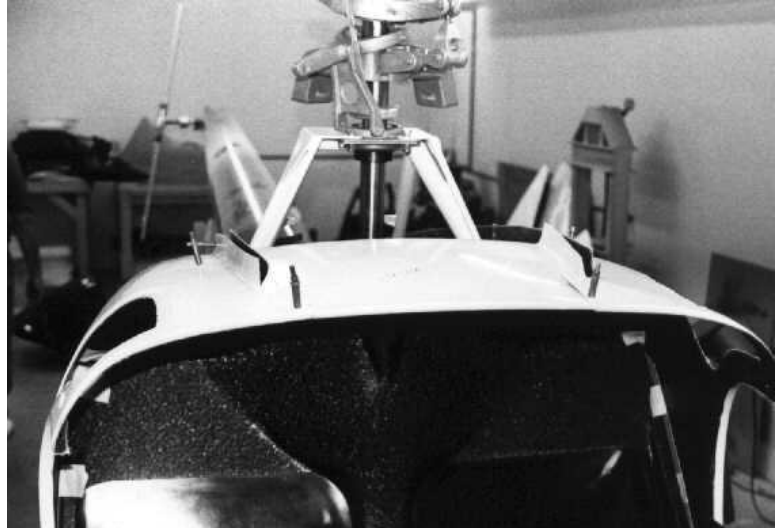


Photo #17

Before installing the windscreen, review “Working With Plexiglass” in Section 1. Place the windscreen on the body and position it for best fit. It should be allowed to fit naturally without being forced into position. Check the alignment and curvature of the top of the windscreen with the body. Find an area where the windscreen fits well and hold it in place at that point with clecos.



Photo #18

Trim the front part of the door posts (also called windscreen bracing panels). Attach them to the tub with cleco. The upper rear part of the posts will be fitted later.





Photo #19

Check all around for fit. The windscreen in this photo is slightly short on the upper rear passenger side. Body panels can be shifted and adjusted slightly to reduce some of this mismatch.

Note: This is shown as an example only. Trimming and fitting of your windscreen may vary.

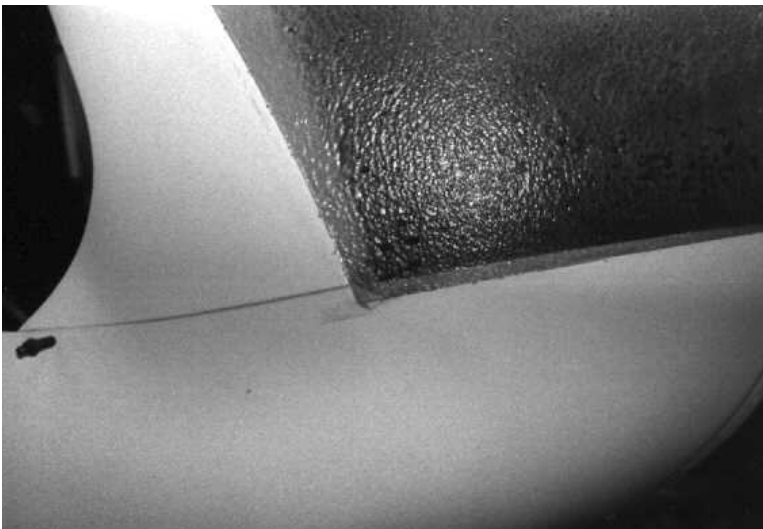


Photo #20

The windscreen in this photo is also slightly long on the lower passenger side. This will be trimmed off for a better fit. The windscreen when fitted properly should fit naturally without binding or stress.

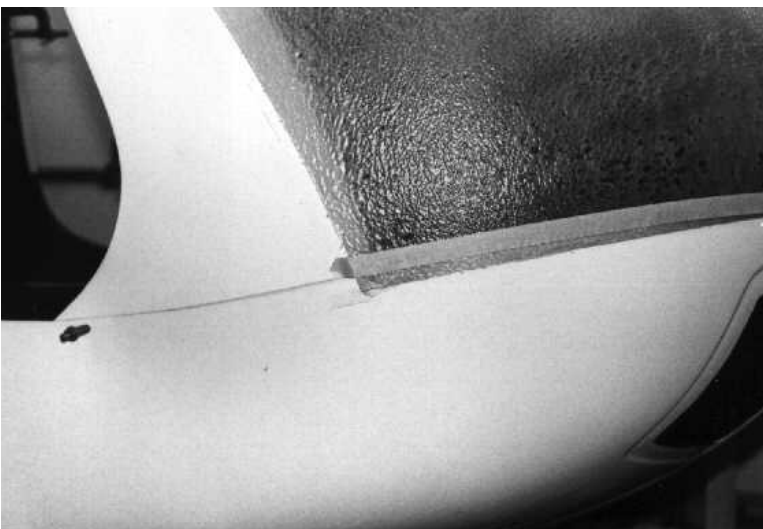


Photo #21

Mark the area to be trimmed with masking tape.

Photo #22

Remove the windscreen and trim. An air grinder with a 2 to 3 inch abrasive wheel works well for this.



Photo #23

When the windscreen fits properly, secure it with a cleco in that area.

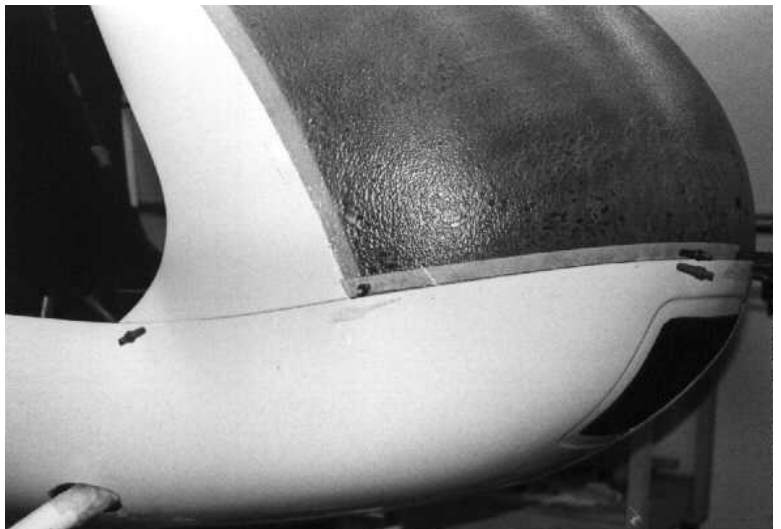


Photo #24

The door posts are supplied longer than needed. Trim off a little at a time and fit them carefully to avoid cutting them too short.

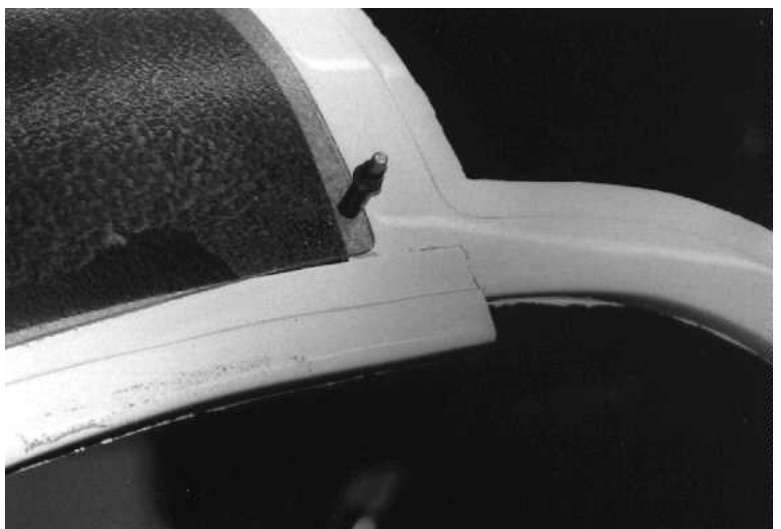




Photo #25

Cut out the area in the upper body panel where the door post will fit.

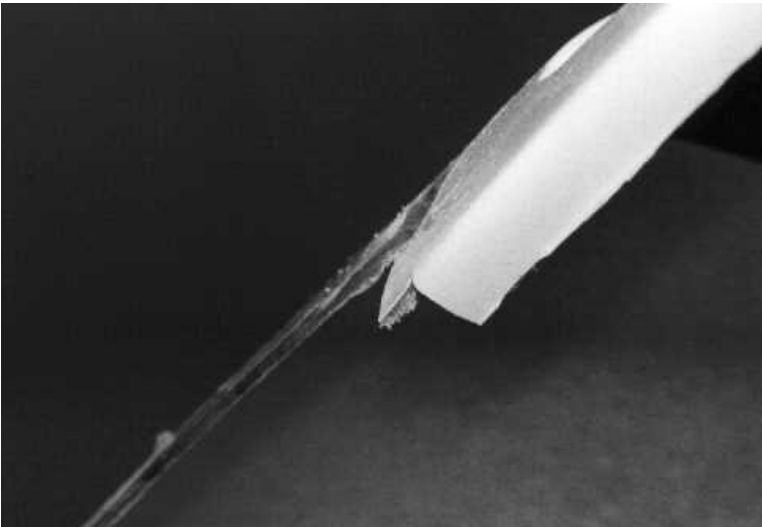


Photo #26

Gradually enlarge the cut out as necessary for best fit.



Photo #27

Secure the door post with a cleco when the desired fit is achieved.

Photo #28

The edge of the windscreen should fit into the recess in the door post. Trim the edge as necessary.



Photo #29

A simple tool can be made to transfer the location of the seat back to the outside body panels.



Photo #30

Trace the outline of the seat back onto the body with a grease pencil.



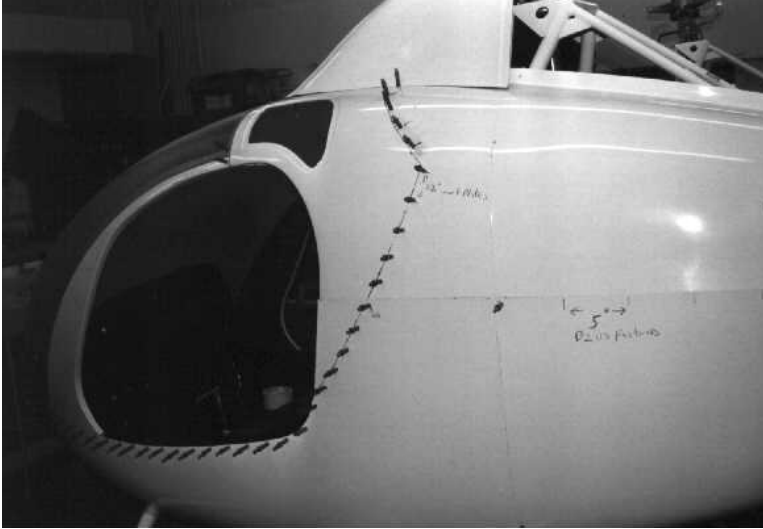


Photo #31

Layout and drill the holes for the cleco to hold the seat bulkhead to the body panels. Correct hole spacing is 2-1/2 inches apart for screws with nut plates, 5 inches apart for Dzus buttons. Note: Place the doghouse front panel on top of the body so that the screws can be spaced around it in that area.

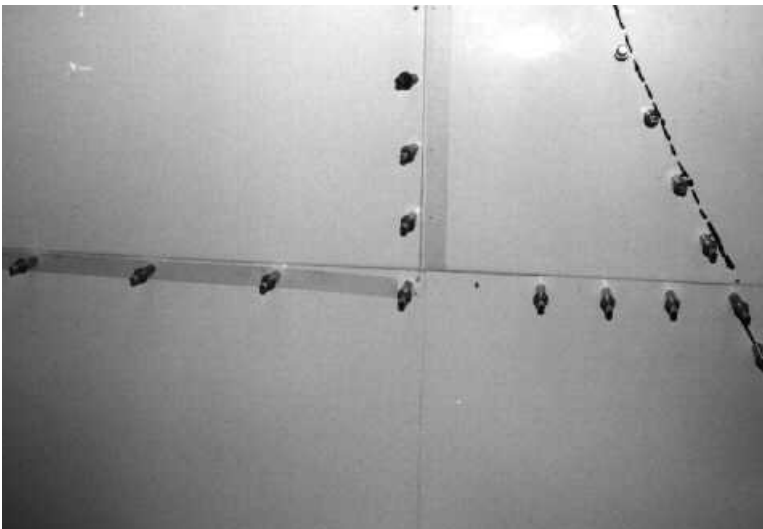


Photo #32

Continue drilling and fitting panels. As panels are being fitted, clecos can be moved and edges trimmed as necessary. In this photo, the four seams do not come together at the same point.



Photo #33

A file or a wood block wrapped with sandpaper works well for precise fitting, and leaves a smoothly finished edge. Clecos can be relocated and panels shifted as necessary.

Photo #34

Cut the panels at an angle where they come together. Use nut plates to attach a piece of .050 aluminum behind the forward top panel to support the Dzus spring.

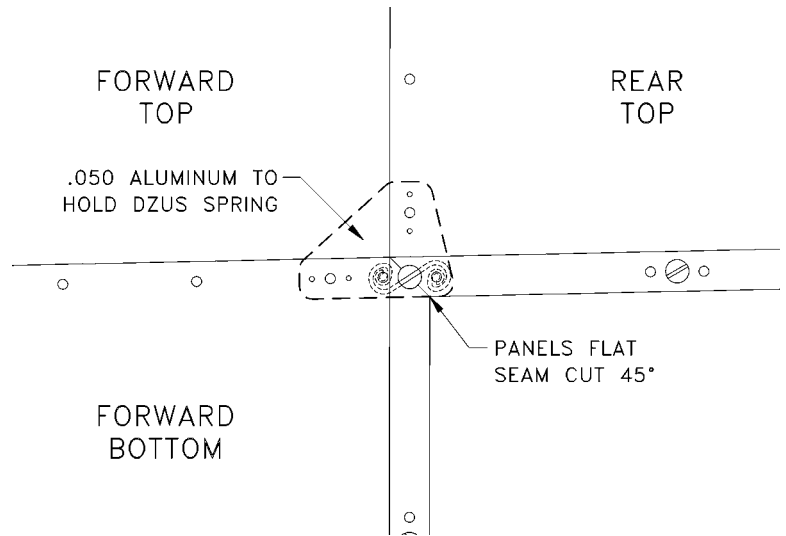


Photo #35

Overall view of the fitted body panels.
Note: The main structure will be fastened together with nut plates and screws. Panels used for inspection access will be fastened with Dzus buttons. The longer Dzus buttons will be used in areas where more than two panels overlap. Holes for fasteners should be centered on the recess where panels overlap.

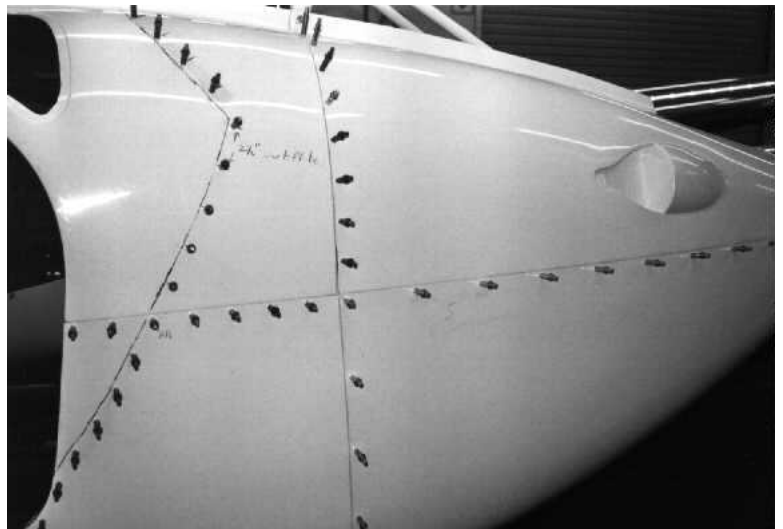
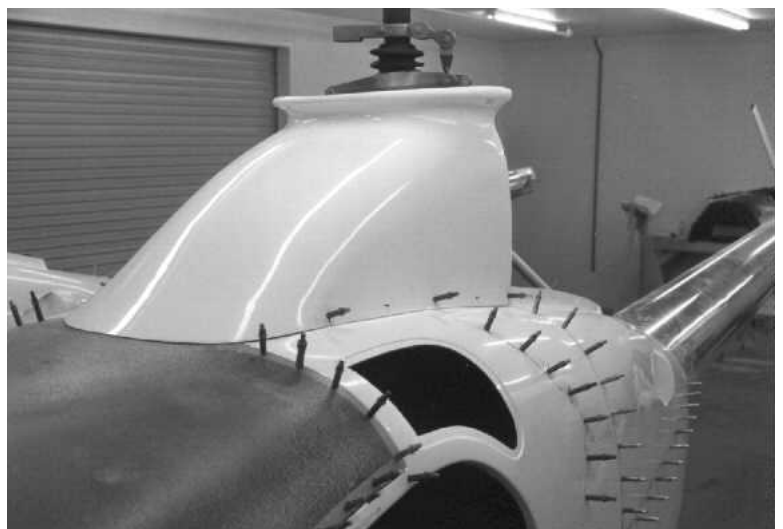


Photo #36

After all body panels are trimmed and fitted, install the doghouse front panel. There should be no pressure on the windscreen.



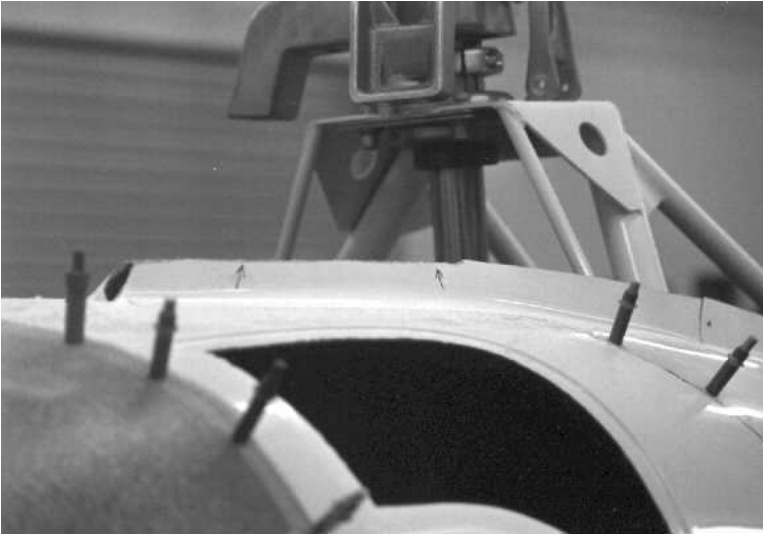


Photo #37

Trim off part of the lip on the upper front panels to clear the doghouse if necessary.

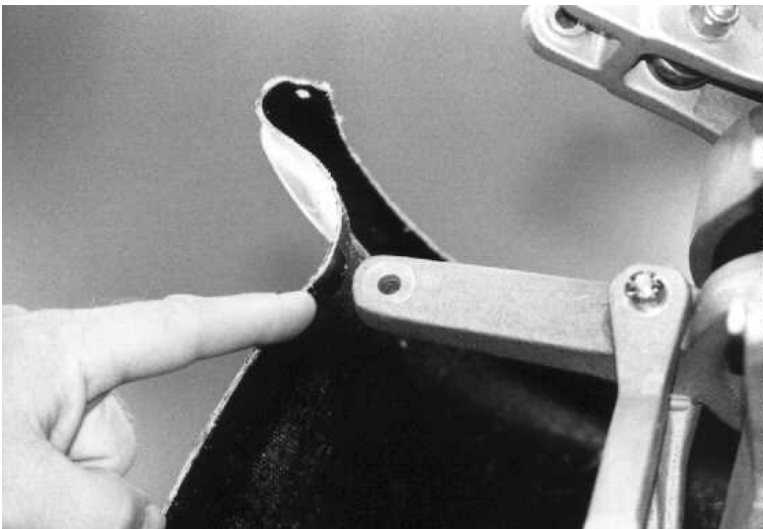


Photo #38

If the collective actuator fork contacts the fiberglass, adjust the doghouse on the body for more clearance. If this does not help, the actuator fork can be cut off as necessary up to the spot face. (The spot face is the circular machined flat around the hole in the fork.)

Note: Do not remove the actuator fork from the main rotor shaft assembly. Cut it in place with a hacksaw or air grinder. Do not locate a Dzus button where it will come in contact with the actuator fork.

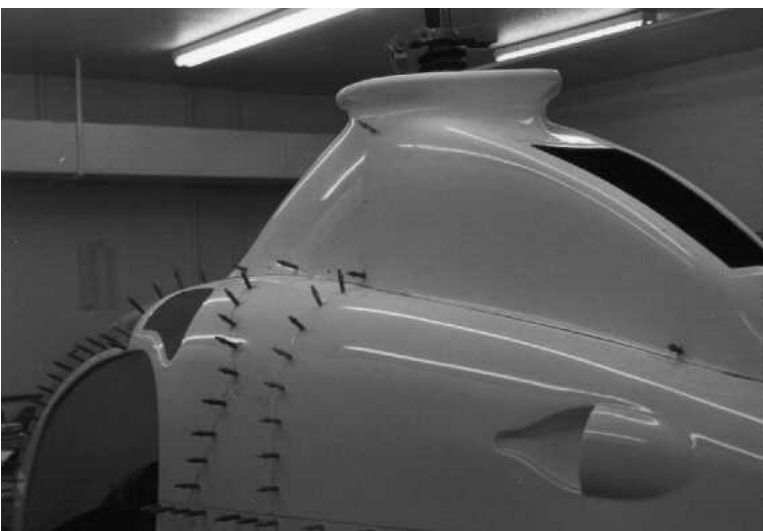


Photo #39

Install the rear doghouse.

Photo #40

Check the swash plate clearance around the doghouse opening. Trim and fit the doghouse as necessary, then install remaining clecos.



Photo #41

Install the hinge on the doghouse inspection panel as follows: Cut a slight notch in the inspection panel. (This will prevent the hinge pin from coming out.) Drill and countersink the rivet holes in the panel, and match drill the holes in the hinge. Rivet the hinge to the panel, cover the rivets with bondo, and sand smooth.

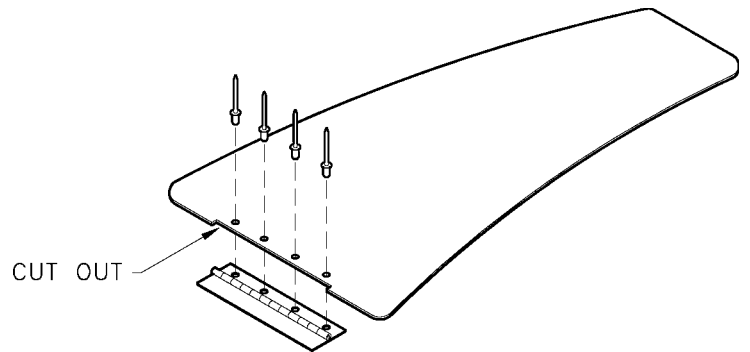
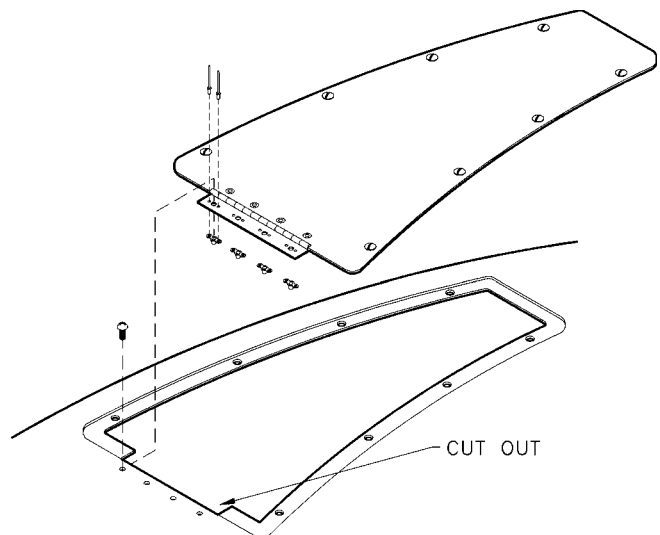


Photo #42

Drill the other side of the hinge and rivet four 8-32 nut plates to the hinge. Cut out an opening in the doghouse for the hinge to fit into. File the fiberglass underneath so that the hinge will fit flat against the underside of the doghouse. Mount the panel on the doghouse with four screws, then locate and install the Dzus buttons.



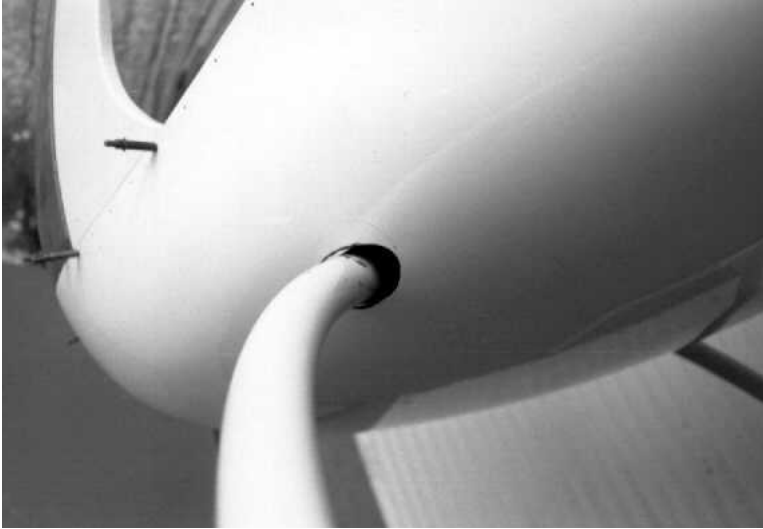


Photo #43

The openings around the landing gear should be close to, but not touching, the gear. This will be trimmed again later because the weight of the completed ship will cause the gear to flex.

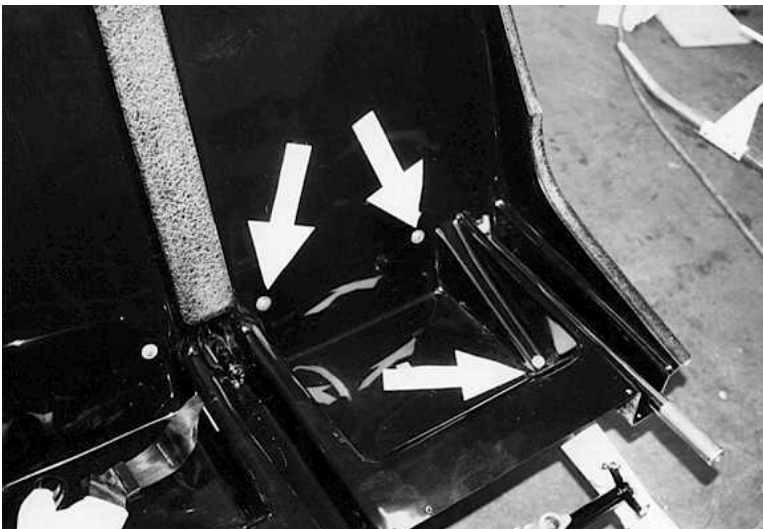
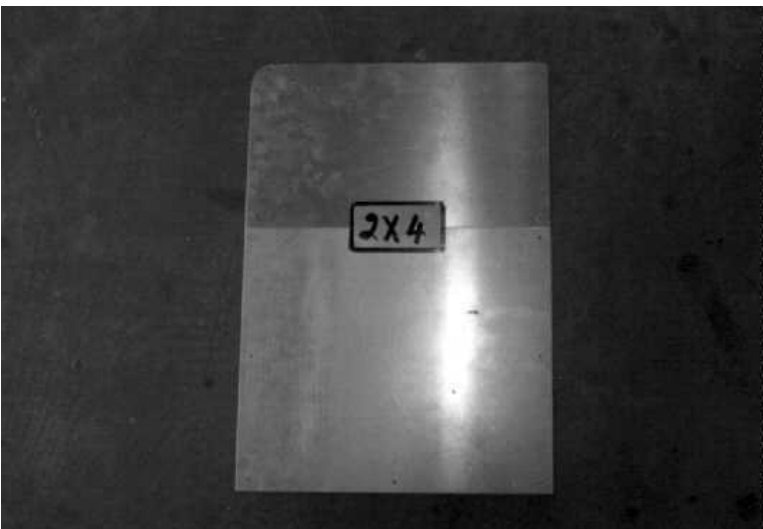


Photo #44

When body fit is satisfactory, open the cleco holes in the seat bottom to 3/16" and install the bolts. Secure the seat with 2 more bolts on each side, through the seat bulkhead and the 1" diameter cross tube of the airframe. Arrows indicate the locations of all three bolts.

Note: Use 3/16 x 1-5/8 (E00-2308) and 3/16 x 2-1/8 (E00-2312) bolts, found on E32 CARD 3F.



SEAT BACK INSPECTION PANELS

Photo #45

Using templates E32-1 and E32-2, cut out the seat back and battery access panels. The 2"x4" doublers are to reinforce the seams.

Note: These templates will also be used later to locate the electrical components on the seat back panels.

Photo #46

Locate the panels on the shiny area of the seat bulkhead as follows:

The top of the panels should be 1-3/8" below the top edge of the shiny surface.

The side of the panels should be 2-7/8" from the edge of the shiny surface.

Locate the battery access panel on the seat bottom, passenger side.

Note: For best fit, fabricate and install the ECU tray at the same time as the battery access panel. See Section 21 photos #15-20.

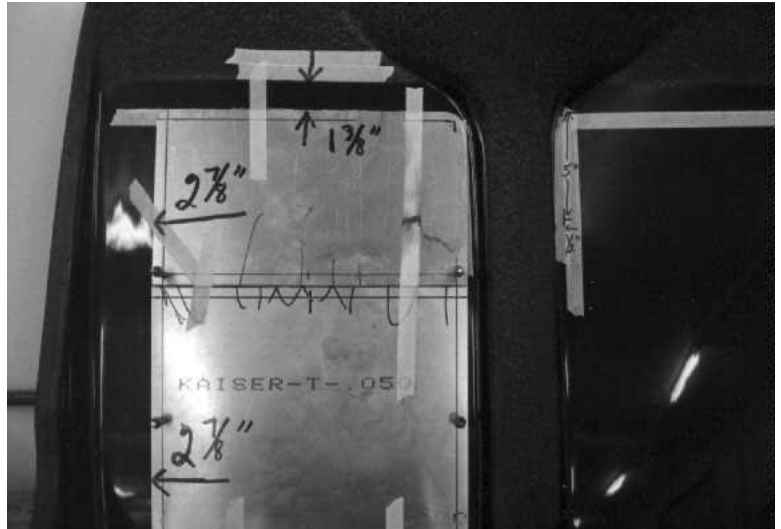


Photo #47

Cut out the openings 3/4" smaller than the panels on all sides.



Photo #48

Wire 5 pieces of seat filler foam under the pilot seat and 5 pieces under the battery inspection panel on the passenger seat. Use safety wire in a cross pattern. This precaution will provide a good deal of cushioning in the event of a hard landing.

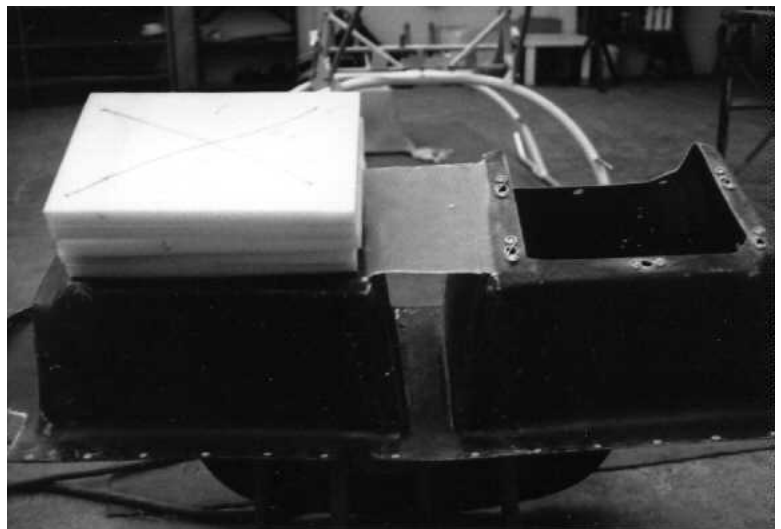




Photo #49

Foam wired to bottom of battery inspection panel.



Photo #50

In addition, cut 5 pieces of foam, approximately the same size, to fit in the pocket under each seat cushion.

Note: Foam can be added or removed under the cushion to adjust seat height, but the foam between the fiberglass bottom of the seat and the tub should not be removed. There should always be a MINIMUM of 5 layers for both pilot and passenger.

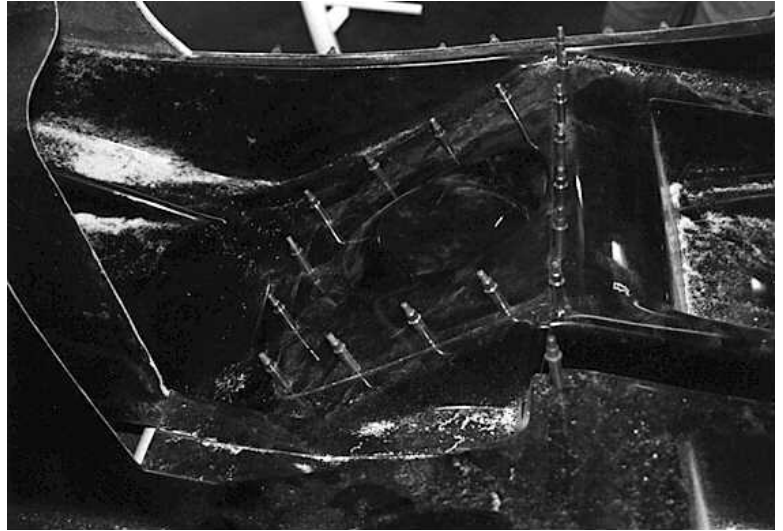


Photo #51

Using template E32-2, cut out the aluminum heel plates and install them in the floor pan using 8 pop rivets each. These are wear plates and also provide smooth surfaces for your heels to slide on during directional control movements.

Photo #52

Fitting and attachment of the cyclic inspection panels should be accomplished after the cyclic control is installed to best position the panel around the cyclic handle. The rear edge of the panel should tuck under the front of the seat bulkhead. The panels will be secured with screws and nut plates on final assembly. Hole size for the cyclic boot is 4-1/4".



CABIN COMFORT

Photo #53

Cabin comfort parts as received from RotorWay International. Cabin comfort small parts and hardware are found on E54 CARD 1F.

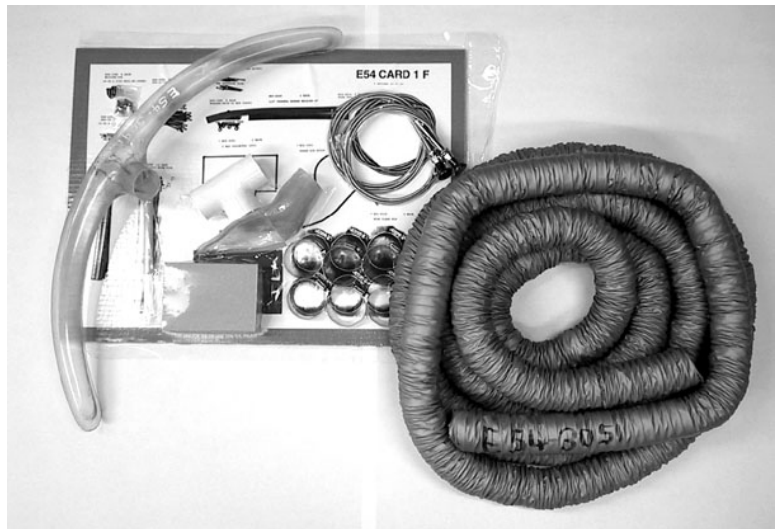
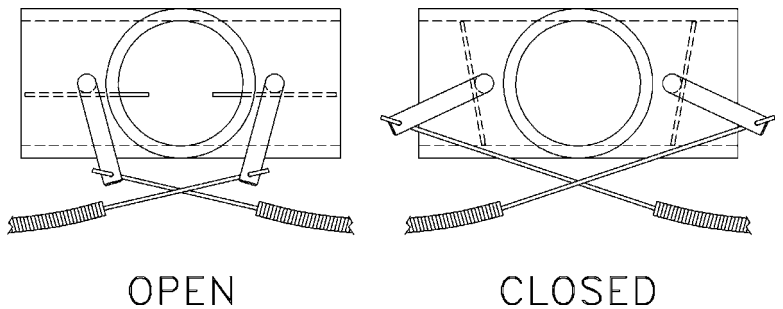


Photo #54

Overview of the assembled three way collector. The inlets are directly across from each other. The outlet is the hole that is 90 degrees from the two inlets. Each butterfly will open when the cable is pulled out and close when the cable is pushed in. See Section 22 Photo 19 for cable routing.



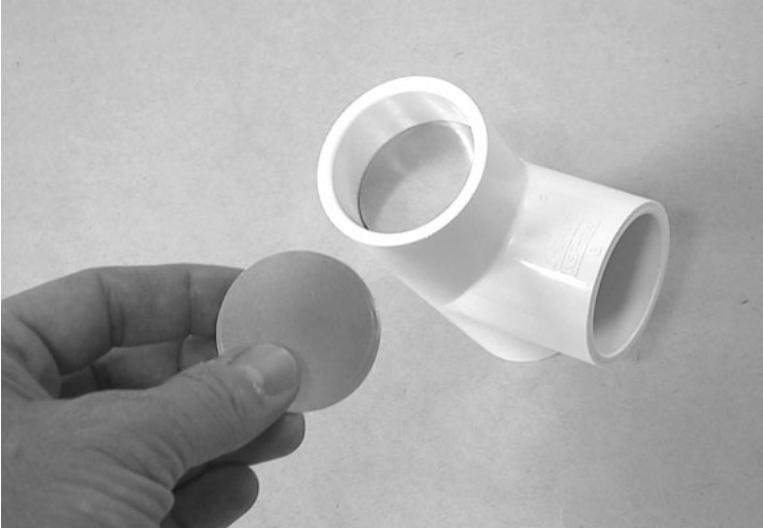


Photo #55

Cut out the butterflies from .050 aluminum and fit them into the openings.

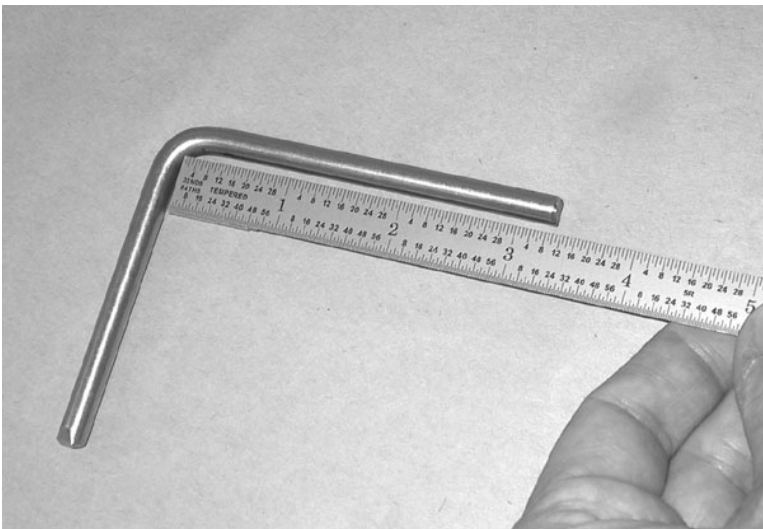


Photo #56

Bend the butterfly shafts 90 degrees, 3-1/4" from one end. The shafts may be heated to make bending easier.

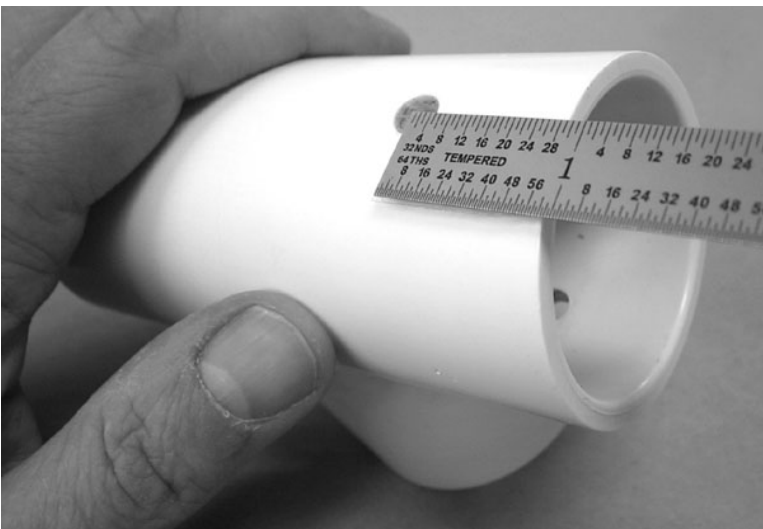


Photo #57

Measure 7/8" from each end of the collector and drill a 1/4" hole in each location for the butterfly shafts. The holes must be parallel to the 90 degree outlet hole.

Photo #58

Place a piece of tape on the shaft to verify that the butterflies will be mounted correctly. Observe open and closed positions.



Photo #59

Hold the shaft in the closed position and draw a line on the shaft inside the collector, across the entire inside diameter. This will be the center line of the butterfly mounting holes.

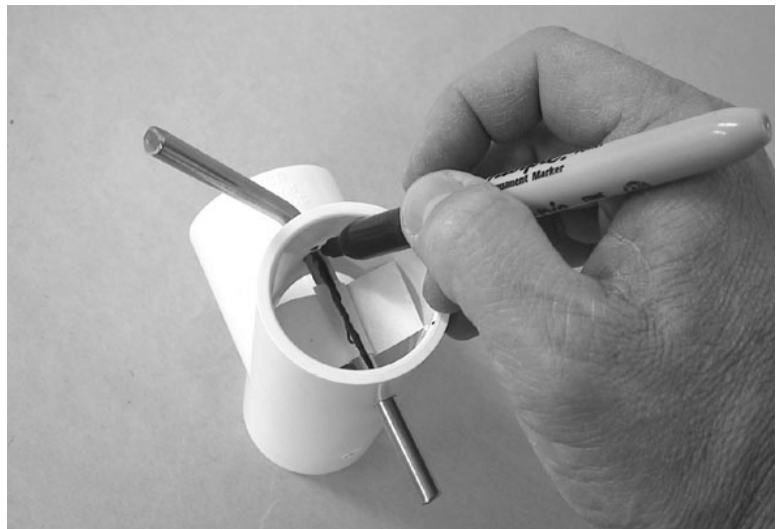


Photo #60

Remove the tape and the shaft. Locate the mounting holes by measuring 1/2" from each end of the line. Drill a 1/8" hole at each location.



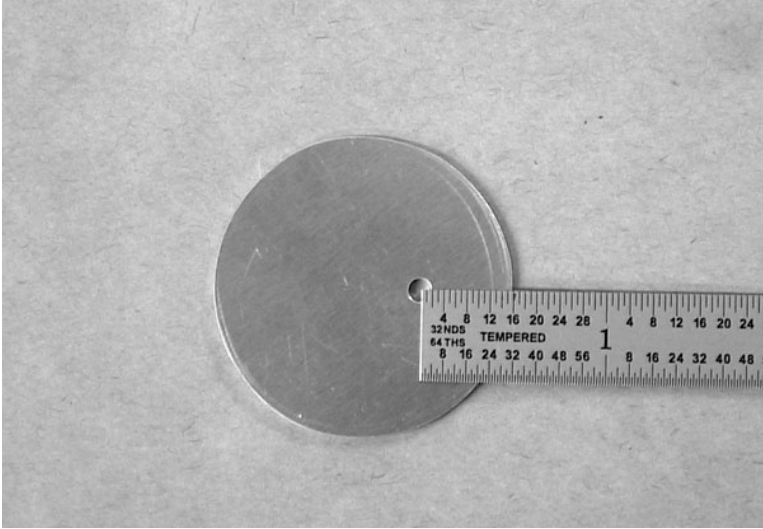


Photo #61

Measure 1/2" from the edge of the butterfly and drill one 1/8" hole.

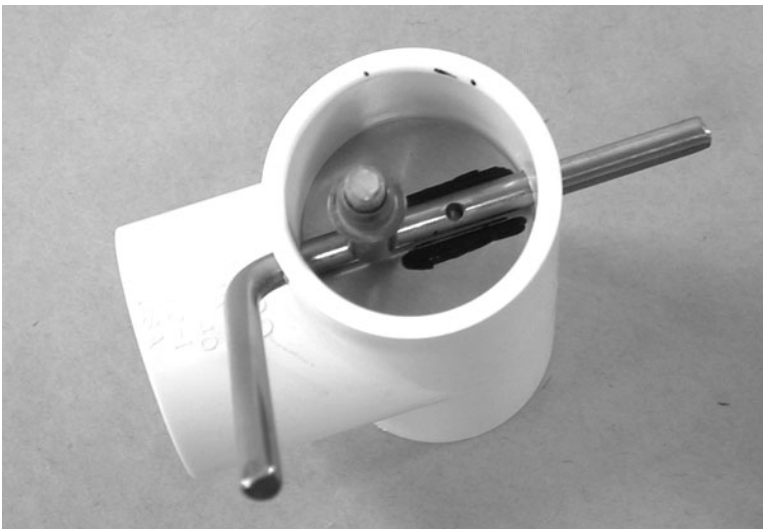


Photo #62

Install the shaft and hold the butterfly in the three way collector with one cleco. Mark each side of the shaft.



Photo #63

Remove the shaft and butterfly. Cleco them together, align the shaft with the marks and drill the second hole.