

VELOCITY RG CONVERSION

ANALOGY RE CONVERSATION

VELOCITY RG CONVERSION

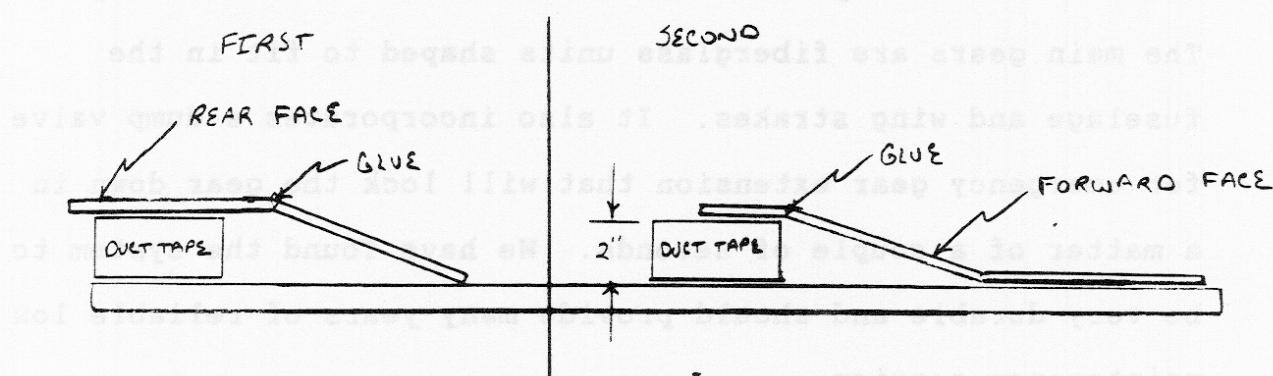
✓ The fully retractable landing gear system was designed and developed by Composite Development Co., formerly Tri Q Development, for the Velocity aircraft. The system is very simple when compared to most retract systems while still using a reliable electro hydraulic pump to operate the three hydraulic cylinders. The nose gear is a modified fixed gear version that incorporates a shock absorber from a motorcycle. The main gears are fiberglass units shaped to fit in the fuselage and wing strakes. It also incorporates a dump valve for emergency gear extension that will lock the gear down in a matter of a couple of seconds. We have found the system to be very durable and should provide many years of reliable low maintenance service.

✓ The plans supplied with this conversion kit are by no means meant to be used exclusively. These are supplemental to the original plans, so follow the guidelines spelled out in them. Remember to do your sanding and cleaning preparation before lay-ups and the micro radius in the corners before lay-ups, in case we forget to mention it.

BULKHEADS

✓ Since you will not use the standard battery bulkhead, or the canard bulkhead (knees), as shown in the plans, don't bother cutting them out. If they are already installed, refer to the nose gear door section for instruction. When cutting out your gear bulkhead and firewall, move the tube cut outs inboard 1/4" or so for gear clearance. With extra 1/4" plywood left over, cut out two pieces, 3" high x 6-1/4", wide for the main gear bulkhead. These will extend the

✓ bulkhead vertically up to the fuselage flange. Using Figure 101 for reference, make the cuts in your gear bulkhead so it can be angled forward 2" at the top before it goes vertical. Use hot glue or five minute epoxy to hold the modified bulkhead together while you glass it. Leave it jigged in its last position while you glass it as plans indicate:



✓ All the other bulkheads are made using the original plans. You may then install the gear bulkhead in the same position as the original, maintaining the minimum distance between the firewall and bulkhead. Make sure the top 3" extension is leveled vertically as the bottom portion should be, before you glass it in.

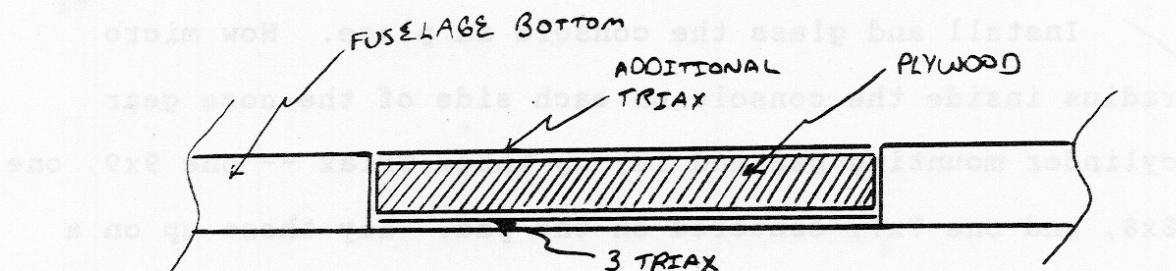
✓ The other bulkheads, canard, seatback, and firewall can also be installed as per original plans with two bid. Don't bother glassing the canard bulkhead to the fuselage in the area of glass to glass, or recessed area, since that area will be cut out for gear doors later. Also, don't do those other stiffening lay-ups from the canard bulkhead onto the floor since that area gets cut out.

✓ Before you permanently install the center console, you should make the mounting pad for the nose gear hydraulic

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✓ cylinder. The center of the pad is located back 28-7/8" from the canard bulkhead along the centerline of the fuselage. See Figure 102. Cut a hole centered at this location, 3-1/2" long and 3" wide, through the inside layer of glass and remove skin and foam down to the outside layer of skin. Don't go through the fuselage. Lay-up three Triax in the hole first, followed by a 3" x 3.5" x 1/4" piece of plywood, and additional Triax until you are flush with the inside skin:



✓ After this pad has cured, sand it and surrounding areas in preparation for the lay-ups inside the console. Also sand the inside of the console where lay-ups will be added later.

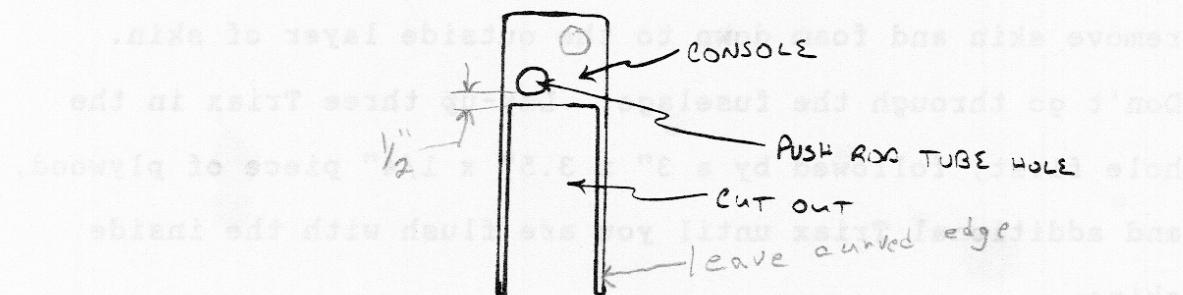
Figure 104.

✓ Assemble your two aluminum angles onto your nose hydraulic cylinder, as shown, and tighten just enough to take the slop out. Lightly bondo those angles down onto the pad so the bolt is at the 28-7/8" location and the cylinder is lined up along the centerline. Remove the cylinder and drill through the aluminum angles down through the fuselage floor. Knock the aluminum angles off and re-assemble them onto the cylinder. After fitting the console as per plans, set it in place and mark around it with a pencil. Go ahead and put the

No
drill
Front
is
connected.

holes in the front of the console for the control mechanism.

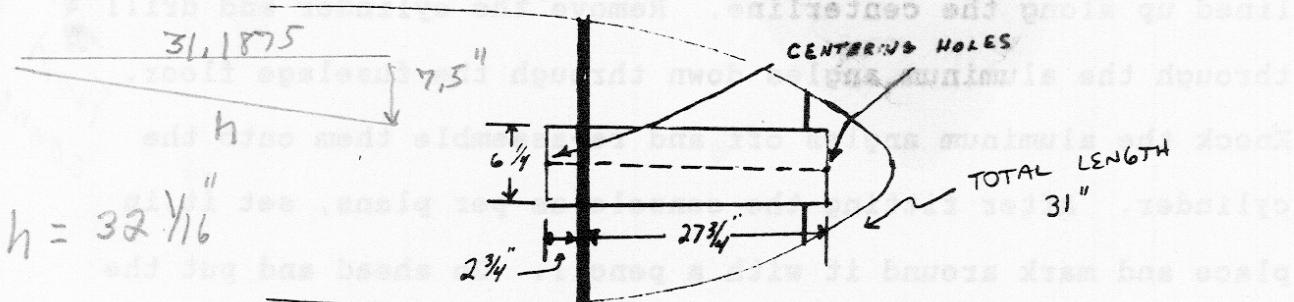
Now cut the rest of your console out starting about 1/2" below the elevator torque tube hole:



Install and glass the console in place. Now micro radius inside the console on each side of the nose gear cylinder mounting pad and lay-up three Triax -- one 9x9, one 8x8, and one 7x7, centered on the pad. Lay these up on a piece of plastic first, starting with the 7x7 pad, then lay them in place. Remove plastic and squeegee to get the air out. See Figure 104. At this time you'll install the nose gear doors and afterwards we'll come back to the side panels in front of the console.

NOSE GEAR DOOR INSTALLATION

✓ Plumb and mark the center line from the nose to the back of the canard bulkhead. Drill two 1/16" holes on the center line to mark the rear and forward edges of the gear door.

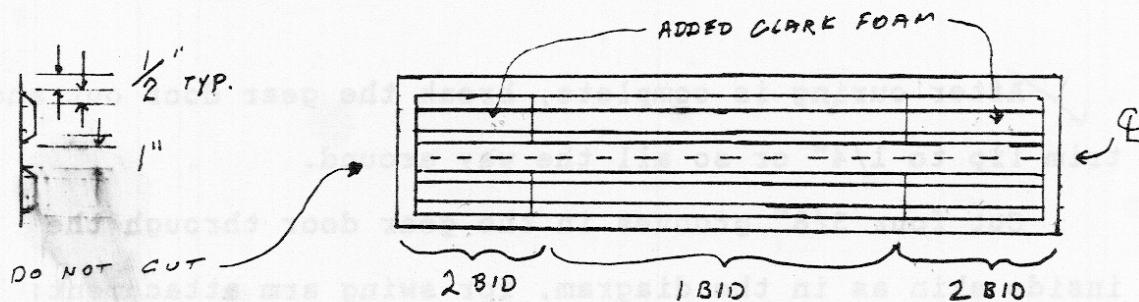


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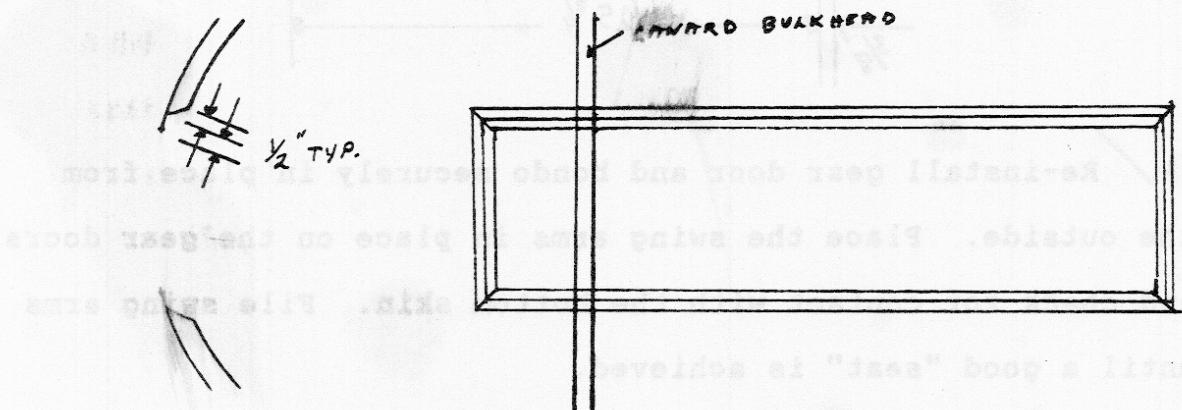
✓ Turn the fuselage over, measure and cut out the gear door as in the diagram. Cut vertically through the battery bulkhead if it is already installed. Turn fuselage back right side up to finish the work on the hole.

N/R Wet micro 3/8" thick Clark foam filler blocks to the front and rear of the door. After curing is complete, trim as indicated:



✓ Cover trimmed area front to rear with (1) Bid. Add one additional Bid over the new foam area.

✓ Trim fuselage cut out as indicated:

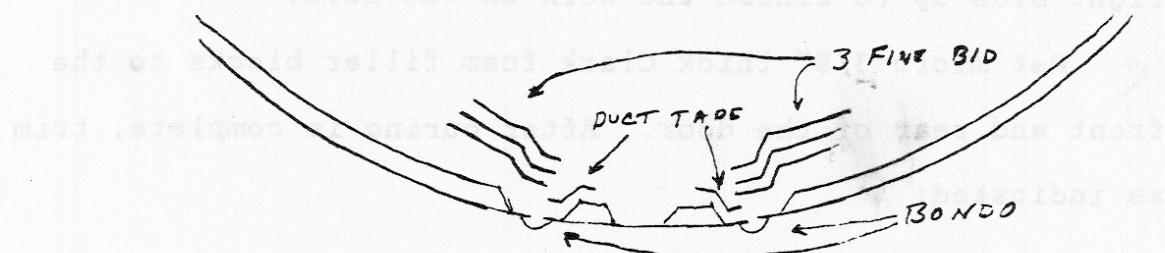


✓ After all edges are properly trimmed and squared, place gear door into position and bondo from the outside to hold.

Duct tape around the gear door to prevent flange from

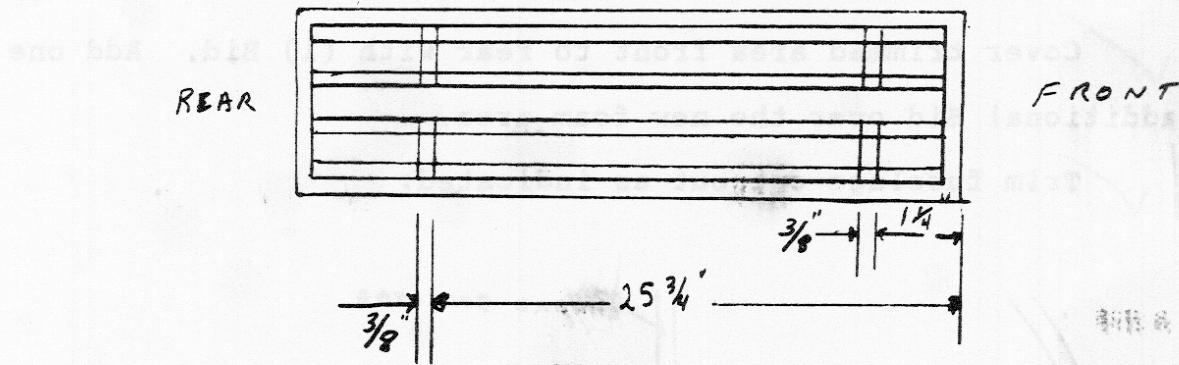
adhering. Two dup bus clamps, two standoffs and nut

- ✓ Glass a (3) fine bid lip, extending onto the door at least $1/4"$ and onto the fuselage at least $2-1/2"$:



- ✓ After curing is complete, break the gear door out and trim lip to $1/4"$ or so all the way around.

Cut four $3/8"$ grooves in the gear door through the inside skin as in the diagram, for swing arm attachment:

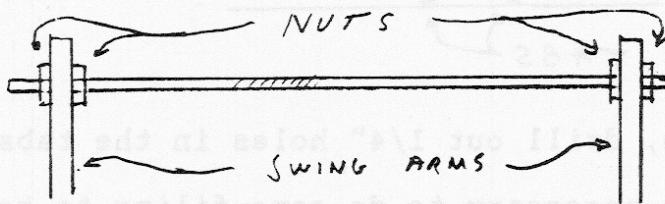
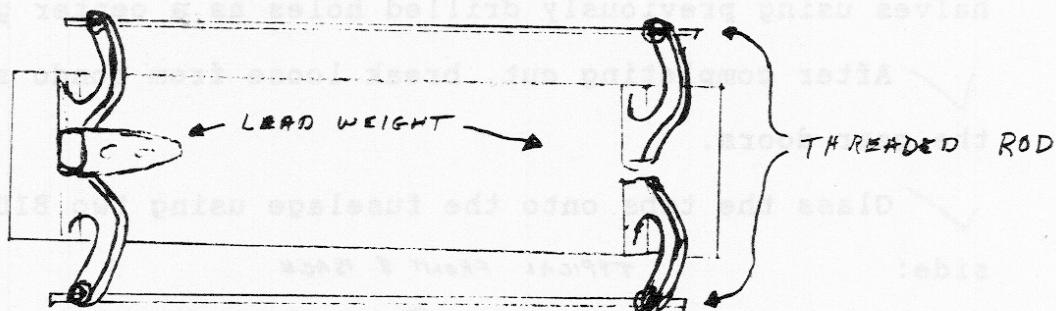


- ✓ Re-install gear door and bondo securely in place from the outside. Place the swing arms in place on the gear doors and check for contact with the bottom skin. File swing arms until a good "seat" is achieved.

- ✓ Assemble two $25\frac{1}{2}$ " long $1/4"$ threaded rods, along with the swing arms, in such a way that the swing arms seat themselves in the previously made $3/8"$ grooves in the gear door. Trial fit and adjust as necessary. Once satisfied

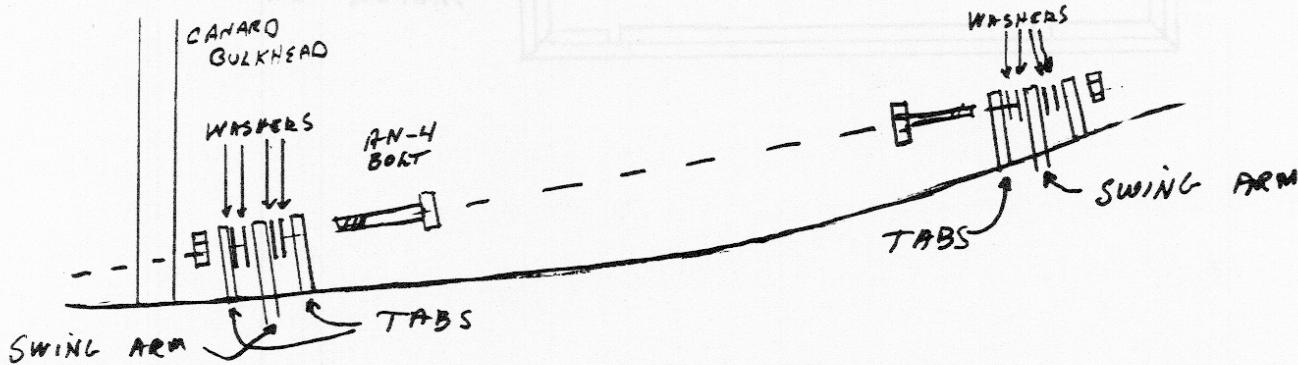
NOTE FROM VELOCITY RG CONVERSION

- ✓ with the fit, microglass the 3/8" grooves and work the swing arms down into these grooves forcing excess microglass out. You can hold them in position by placing one of the lead elevator counter weights on the center of the swing arms. After curing, remove rods.



- ✓ Make eight tabs out of thin cardboard as a pattern for the permanent tabs. These tabs are used to hold the swing arms to the fuselage and can be made from two layers of cured triax or, as we have done, from the instrument panel trimmings.

- ✓ Attach the tabs to the respective swing arms with 1/4" AN bolts, washers and nuts. See drawing:



The tabs should have a slight amount of clearance between the tab and fuselage to prevent to prevent binding.

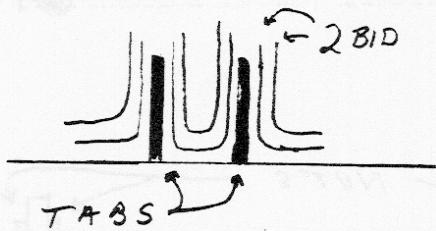
Use five minute epoxy to attach the tabs to the fuselage and allow to cure for at least 30 minutes before moving.

Remove bolts and washers and hacksaw the gear door into two halves using previously drilled holes as a center guide.

After completing cut, break loose from bondo and remove the gear doors.

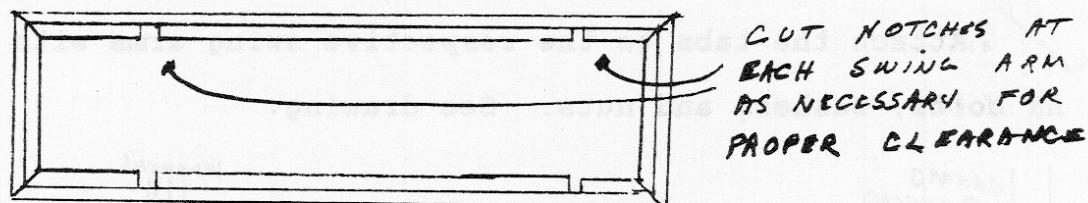
Glass the tabs onto the fuselage using two BID on each side:

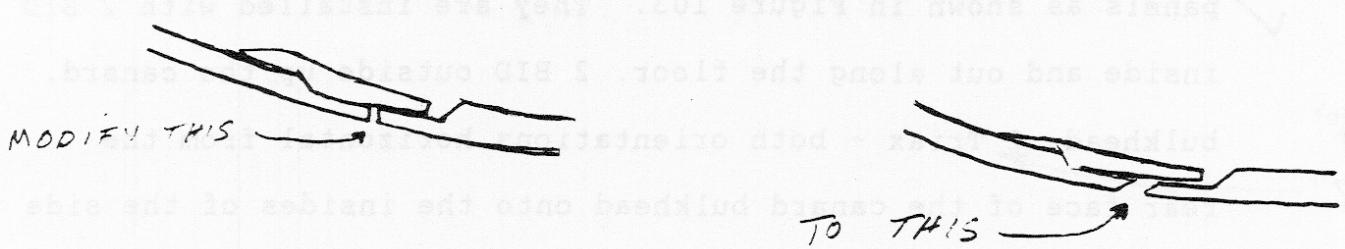
TYPICAL FRONT & BACK



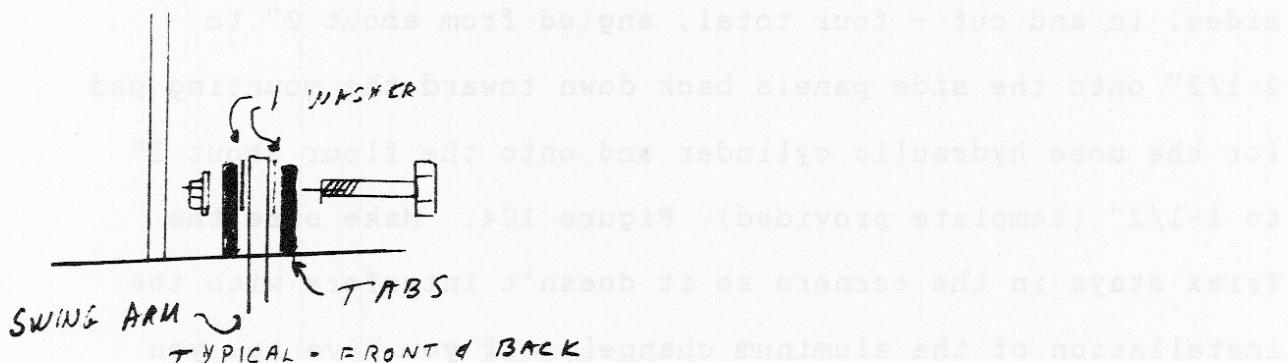
After cure, drill out 1/4" holes in the tabs.

It will be necessary to do some filing to keep the gear doors from "catching" on the fuselage.





✓ Final assembly will look like this:



✓ Note: Add a wooden filler wedge on the front swing arm location as a spacer. (IF BATTERY BULKHEAD USED).

NOSE GEAR

✓ You may now make the two forward console bulkheads or side panels, if you haven't already done so. A template is provided with all the information included.

✓ It might be beneficial at this time to temporarily mount your big nose gear aluminum channel. It mounts on the centerline of the fuselage and flush with the bottom of the canard bulkhead.

✓ Trim your side panels until they fit in place as shown in Figure 103. The channel helps you get the 1/4" spacing you need on each side to leave room for the Triax lay-ups to follow. Sand all areas that will be affected by this installation. Bondo the side panels in place and remove the channel. Proceed with the micro radius and glassing of these

✓ panels as shown in Figure 103. They are installed with 2 BID inside and out along the floor, 2 BID outside up the canard, bulkhead, 2 Triax - both orientations horizontal from the rear face of the canard bulkhead onto the insides of the side panels, 3" and 2" respectively, one BID inside and out at the junction of the console and side panels and one Triax, both sides, in and out - four total, angled from about 2" to 2-1/2" onto the side panels back down toward the mounting pad for the nose hydraulic cylinder and onto the floor about 1" to 1-1/2" (template provided). Figure 104. Make sure the Triax stays in the corners so it doesn't interfere with the installation of the aluminum channel. If you have to, you can duct tape the channel and slide it in place before this lay-up is cured and this will help.

✓ On the forward side of the canard bulkhead, centered and at the bottom, lay-up 2 Triax, 9" x 9", with the orientation horizontal. It is easiest to lay-up these layers on a piece of plastic and let them sit for a while before applying them so they won't drain so bad. Don't forget to sand this area first.

Nose G. Cont P.32
and to modify or

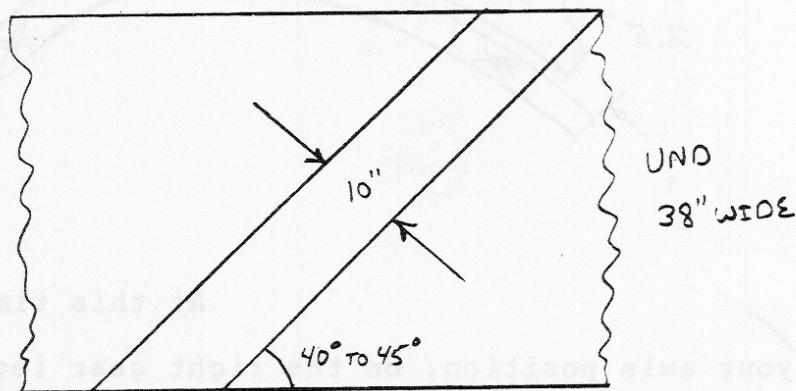
MAIN GEAR INSTALLATION

✓ The main gear comes to you with a 5/8" hole where the bushing will go. This hole should have been reamed for a good fit here at the factory so you shouldn't have to do any fitting.

✓ After that has been checked, remove the bushings, and completely sand the legs with 36 - 40 grit sandpaper in preparation for the tortional lay-ups.

✓ Jig the gears, leading edge down with the tips on the table, and lightly bondo them so they can't move around.

Try to avoid getting any bondo on the other surfaces of the gear. Cut several 10" wide strips of UNI at a 45 in preparation for these lay-ups.

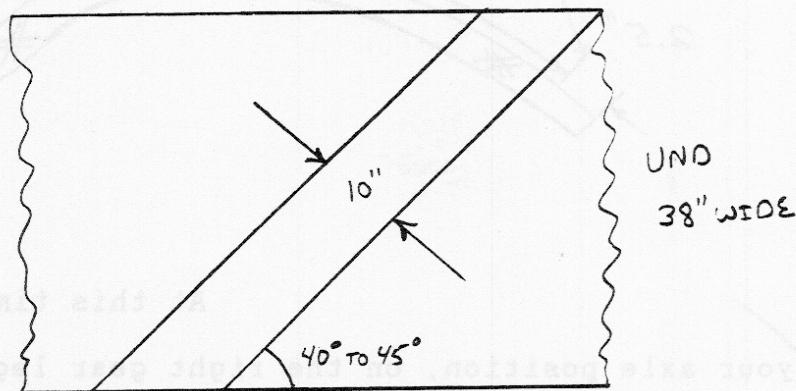


✓ Now lay-up four UNI at a 45 over the gear's trailing edge, down both sides of the gear. Each layer should be applied at opposite angles so you end up having two one way and two the other. The first two crossed layers go the full length of the gear and the last two go from the tip to about 3" past the bushing location. If you need to splice pieces together, do not overlap them. Just butt them together.

✓ After this four UNI lay-up has cured, break them loose from the table, turn them over, and trim the rough edge. Taper it so there will be a fairly smooth transition for the last set of four UNI. Completely sand the gears and bond

✓ After that has been checked, remove the bushings, and completely sand the legs with 36 - 40 grit sandpaper in preparation for the tortional lay-ups.

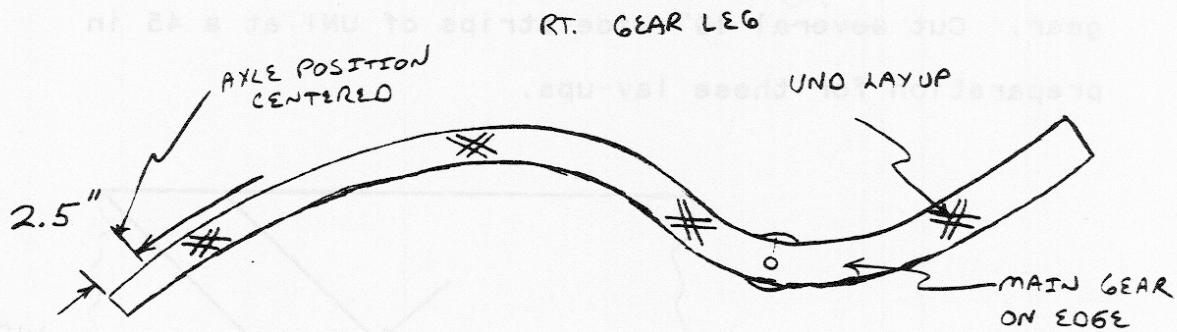
✓ Jig the gears, leading edge down with the tips on the table, and lightly bondo them so they can't move around. Try to avoid getting any bondo on the other surfaces of the gear. Cut several 10" wide strips of UNI at a 45 in preparation for these lay-ups.



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✓ After this four UNI lay-up has cured, break them loose from the table, turn them over, and trim the rough edge. Taper it so there will be a fairly smooth transition for the last set of four UNI. Completely sand the gears and bond

✓ them on the table again, this time trailing edge down. Lay-up the last four UNI plies exactly like the first four. When cured, trim and sand smooth, without getting into your earlier lay-up. Re-open the bushing holes using a drill and a round file:



✓ At this time you can locate
your axle position, on the right gear leg only, by measuring up from the bottom of the gear leg tip (from the mold line if there is one) - 2.5". This mark should be on the outside surface and centered on the leg. You'll mark the other one later when the gears are installed so you get them level.

✓ Before you can do anymore work in the main gear area, you must install the main spar as shown in the original plans. After this is done, you are ready for the lay-ups that beef up the rear of the fuselage. Most of these lay-ups are the same as the originals, so it helps to look at those plans.

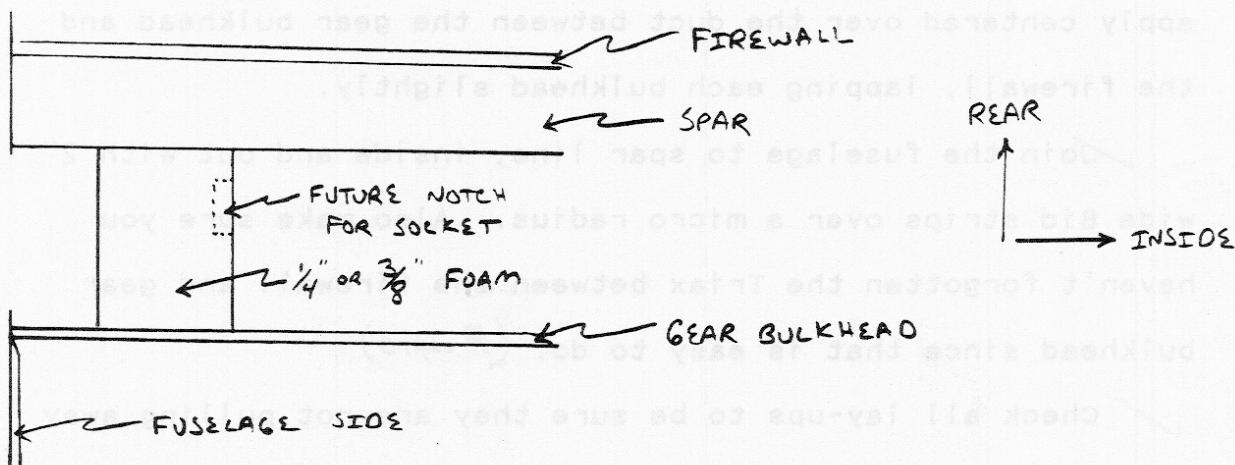
Spar → ✓ Cut two pieces, one for each side of 1/4" or 3/8" Clark foam, template provided, to fit between the bottom forward edge of the spar and the bottom of the vertical 3" part of

*should
be 1/4"
forward.*

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the gear bulkhead. It fits toward the center of the fuselage, leaving room outside for the landing gear to come in. Bondo in place:



Cut two pieces, one for each side of 1/4" or 3/8" Clark foam, 6-1/4" wide by 8^{3/4}" long, to fit between the top forward edge of the spar angled down onto the top of the gear bulkhead at the fuselage flange. Bondo this piece into position.

Cut four plies, two for each side of 6-1/4" x 8" Triax and apply to the top of the spar and up the firewall.

Cut four plies, two for each side of 6-1/4" x 22" Triax and apply to the firewall about 6" above the spar, across the top of the spar, down the angled foam and onto the gear bulkhead about 7" to 8".

Cut four plies, two for each side, of 6-1/4" x 34" and apply over the previous lay-up, and on down to the fuselage floor.

Cut four plies, two for each side, of 4" x 12" Triax and apply over the gear bolt hole area, one lapping onto the

changed +
get 6" up
F.W.

see
P. 426

✓ fuselage side and the other onto the duct and floor. Use Figure 101 for location of bolt hole.

✓ Cut four plies, two for each side, of 7" x 8" BID, and apply centered over the duct between the gear bulkhead and the firewall, lapping each bulkhead slightly.

✓ Join the fuselage to spar line, inside and out with 2" wide Bid strips over a micro radius. Also make sure you haven't forgotten the Triax between the firewall and gear bulkhead since that is easy to do. (P-410)

✓ Check all lay-ups to be sure they are not pulling away from the corners.

✓ After these lay-ups are done and cured, you can make the cut-out for the gear. Using the template provided, line it up 1/4" in front of the bottom forward edge of the spar to approximately 3-1/2" in front of the cowling cut-out line, which should be about 1"+ in front of the firewall. If your spar has been put on out away from the firewall on one side, you'll need to consider this when lining up your template. The cut should come within 1-1/2" of the duct along the bottom. Also, it should leave at least 1/2" of flange behind the gear bulkhead at its narrowest points. This cut out will be undersized so later you will have to enlarge it to get some clearance. You will be doing your lay-ups through this hole.

✓ Sand the areas inside between the firewall and gear bulkhead in preparation for these next lay-ups. See Figure 105.

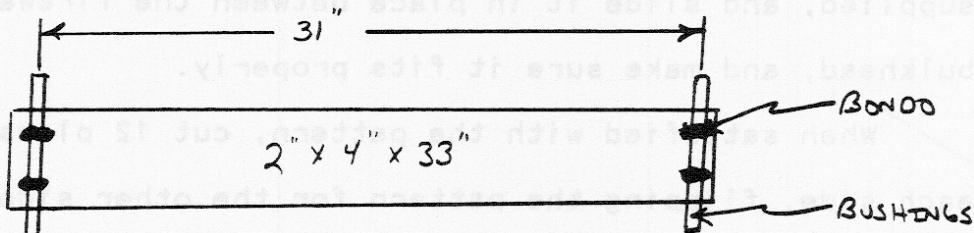
✓ Cut several 4" wide strips of Bid at a 45 and lay-up five Bid from the side of the hole cut-out, across the inside portion of the fuselage onto the firewall, gear bulkhead, and duct, approx. 1". Along the duct and gear bulkhead, the strips will be narrower since there is less fuselage skin to stiffen. To make a smoother transition for your next lay-up, you can stagger the amount of glass onto the firewall and gear bulkhead by starting at 1-1/2" and going down to only 1/2". in $\frac{1}{4}$ " steps.

✓ While the above lay-up is still tacky, take the pattern supplied, and slide it in place between the firewall and gear bulkhead, and make sure it fits properly.

✓ When satisfied with the pattern, cut 12 plies, six for each side, flipping the pattern for the other side, and apply under the horizontal microed 1/4" or 3/8" foam, lapping the bottom spar cap and down the forward face of the firewall and aft face of the gear bulkhead. It is possible to lay-up all six layers at once on a piece of plastic first, then slide and push them up in place. Be careful to get everything lined up before you push it up permanently because it doesn't move too easy once it's up in there. Remove the plastic and squeege to get all the air out. Check the corners to make sure they are not sagging. See Figure 105.

✓ Before you install the transverse bulkhead, you must first install the landing gear. Earlier, you got your bushing holes drilled out and your gear wrapped. You will now make a jig that will enable you to drill your holes

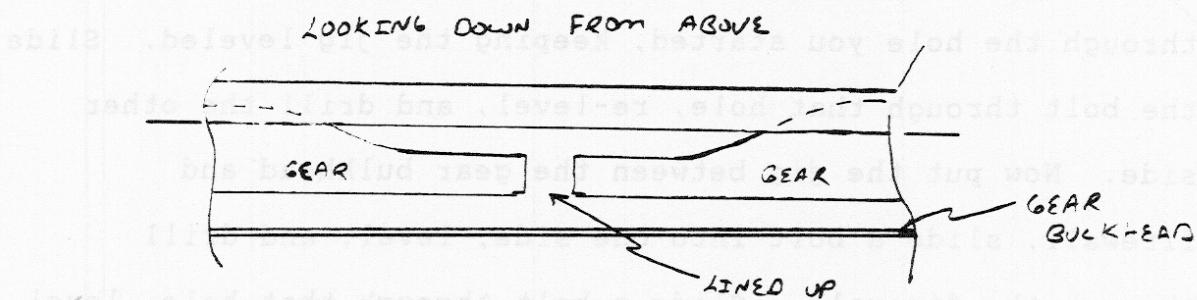
✓ accurately in your gear bulkhead and firewall. Find a good two x four approx. 33" long. Using a square and a yard stick, mark two lines 31" apart. Enlarge these marks to 5/8" centered on the original marks. With a circular saw, cut 5/8" wide grooves about 3/8" deep at these marks 31" apart. Fit your 5/8" steel gear bushings in place in these grooves and check their fit. Make sure they are parallel with each other, level with each other, 31" apart center to center, etc. When satisfied, bondo them in position so they don't move around when you start drilling holes:



✓ With the fuselage level both ways, mark your bolt hole locations. Use one of your aluminum I-beams, laying across the fuselage from flange to flange in front of the gear bulkhead. Find the center of the fuselage and mark it on the I-beam. Go out 15-1/2" each way from the middle and plumb line down to find your bolt locations. Double check the 31" measurement between the bolts as well as the other measurements shown on Figure 101. When satisfied with your marks, drill a 3/8" hole part way into the gear bulkhead at one of those marks. Set your jig in place on the front side of the gear bulkhead. Prop it up in place and level it both ways. Using a long 3/8" bit through your jig, drill on

✓ through the hole you started, keeping the jig leveled. Slide the bolt through that hole, re-level, and drill the other side. Now put the jig between the gear bulkhead and firewall, slide a bolt into one side, level, and drill through the firewall. Slide a bolt through that hole, level, and drill through the other side. Now you should have $3/8"$ holes through the bulkhead and firewall that are level, perpendicular, and parallel (got that).

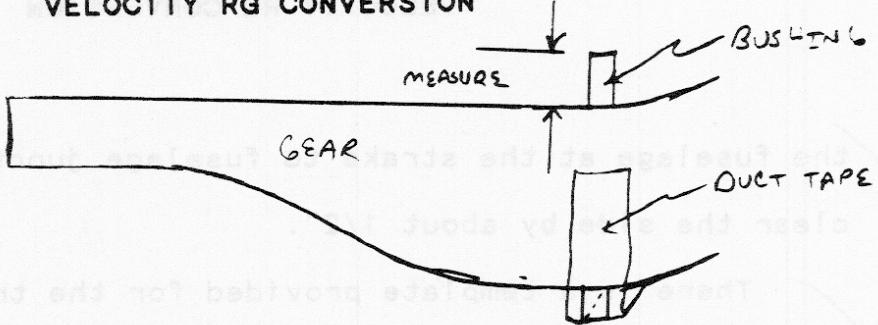
✓ Slide your gear up into the hole, slide the bushing in place, lower the gear, and insert the bolts. The bushing should be roughly centered in the leg. Try rotating the gear up and down through the hole. You'll have to file, and/or grind the fuselage around the gear to get it to go through there. If your spar was put in biased out on one side, you can trim the hole on that side up closer to the spar. On the front side you should have between $3/8"$ and $1/2"$ flange left at its smallest point. Later, when the bushings are permanently mounted, you'll work to get at least $1/8"$ clearance all around. Both bushings should be centered between the bulkheads and be positioned in the gears within $1/16"$ of each other. Also, in order to make sure your bushings are in right, check the tops of the gears when the gears are up to make sure they stay parallel to the firewall and line up in the center. If one bushing seems to be in crooked, you may have to file the hole a little so you can get the bushing to line up:



✓ When satisfied with the trueness and fit of the bushings,
 → send them back to me for modification. After modification,
 re-install and mark them on both sides of the gear and remove
 $L = \frac{7}{8}''$
 $R = \frac{7}{8} - \frac{1}{32}''$ the gears and bushings. Sand the bushing between the two
 marks but don't sand off your marks. You might also measure
 the amount of bushing sticking out so you can check it later,
 along with the mark. Make a mixture of wet micro-glass, coat
 both surfaces, and insert the bushings in a turning motion.
 Remove excess mixture as it pushes out. Set the gear on a
 table so bushing is vertical. Line it up to its marks or
 measurements, and duct tape around the bottom hole right next
 to the bushing to prevent micro-glass from running out. Now
 wrap duct tape around the bottom of the bushing to keep it
 from sagging in the hole. Measure and check them once in a
 while to make sure they haven't moved because it's a real
 pain to do it over again. If it looks like you need more
 epoxy around the bushing, you can use a piece of safety wire
 to poke around it and keep putting more epoxy around it until
 it is full. Before these things get totally cured, you might
 want to slip them into the fuselage to make sure they ride
 parallel to the bulkheads and the tops line up. Don't leave
 them in place to cure as they may move:
 Not
Req.

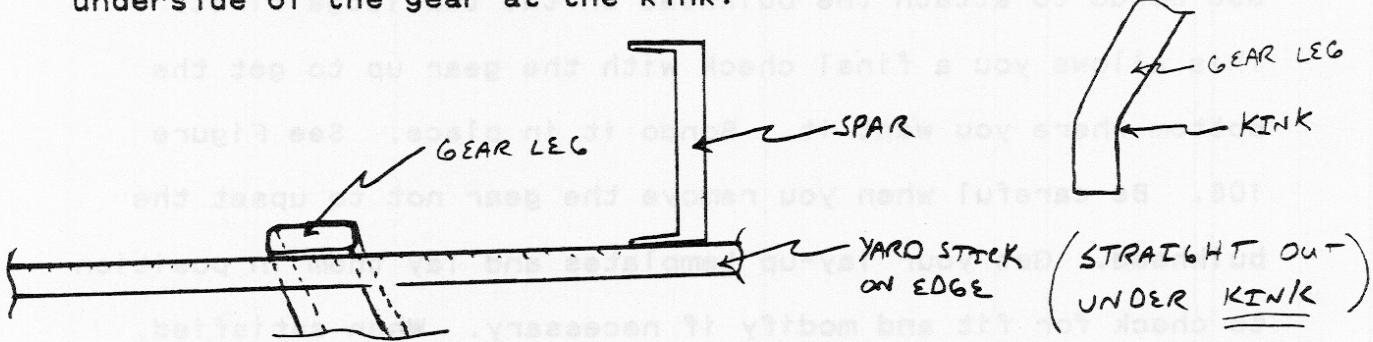
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✓ Re-install the gear through the fuselage inside to outside, gear tip first. Once you get it in place, rotate it up and trim the sides of the fuselage so you have at least 1/8" clearance. As I mentioned earlier, be careful not to cut out too much by the gear bulkhead as you are taking away important glass that attaches the gear bulkhead.

✓ Now bring the gear all the way up and extend a straight edge, on edge for stiffness, straight out from the bottom of the spar toward the kink in the gear near the tip. The gear should come high enough so the straight edge just clears the underside of the gear at the kink:



✓ If the gear is hitting that horizontal bulkhead you will have to dremel, file, or cut the bulkhead back far enough to allow the gear to come up all the way and still have room for two Triax that will be added later. You will need at least 3/32" clearance. You can also check the gear as it comes in

✓ the fuselage at the strake to fuselage junction. It should clear the side by about 1/2".

✓ There is a template provided for the transverse bulkhead and before you cut out your foam, you should check the fit of the template so your foam isn't undersized. This bulkhead joins the firewall and gear bulkhead above the bolt from the bend, up to that horizontal bulkhead (underside). See Figure 106. With this piece up in place, re-check with the gear up to make sure you have clearance. When the gear is all the way up, that bump on the gear should touch the bottom of the transverse bulkhead, so keep the bottom out as far as you can. If you don't, the engine mount bolts may interfere with it. When you are satisfied and you have marked this portion, use bondo to attach the bulkhead on the top ledge first. This allows you a final check with the gear up to get the bottom where you want it. Bondo it in place. See Figure 106. Be careful when you remove the gear not to upset the bulkhead. Get your lay-up templates and lay them in position to check for fit and modify if necessary. When satisfied, cut four plies, two for each outside off one template, and four plies, two for each inside off the other template. Pre-wet these on plastic, micro the foam, radius corners, and apply across the transverse bulkhead lapping onto the firewall, gear bulkhead, across the bolt holes in both directions, up to the horizontal bulkhead on the outside, and up onto that bulkhead on the inside. Once in place, remove plastic and squeege. Make sure the lay-up stays in the

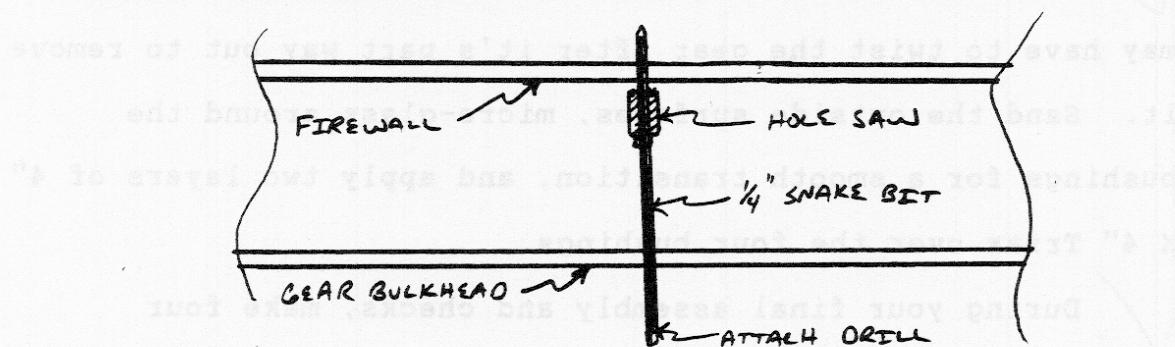
✓ corners.

✓ The last lay-up is two BID, template ~~provided~~, that extends from the underside of the top spar ledge, down across the inside surface of the angled piece, onto the gear bulkhead, and across the top of the horizontal bulkhead onto the lower spar ledge. It also laps around about 1" onto the transverse bulkhead. See Figure 105.

BUSHINGS

✓ The aluminum bushings (4) that come with the kit need to be bushed with the supplied Oilite bushings. They are $7/16"$ ID x $9/16"$ OD and 1" long. Drill your bushings out to $9/16"$ and install the bushings. If they are loose, use Loctite sleeve retainer to install them.

✓ There should be 4 Triax over the previous $3/8"$ holes. Using a piece of $3/8"$ OD, $1/4"$ ID tubing in the hole, drill all four holes to $1/4"$. This keeps your holes centered. Get a long $1/4"$ drill bit or shaft to use with a good 1" hole saw. Using your shaft through both holes as a guide, attach your hole saw in the middle or outside and drill the holes out. Alternate bulkheads while drilling so you don't heat up the bulkheads too much. When you get almost through one way, switch to the other side so your guide is still intact:

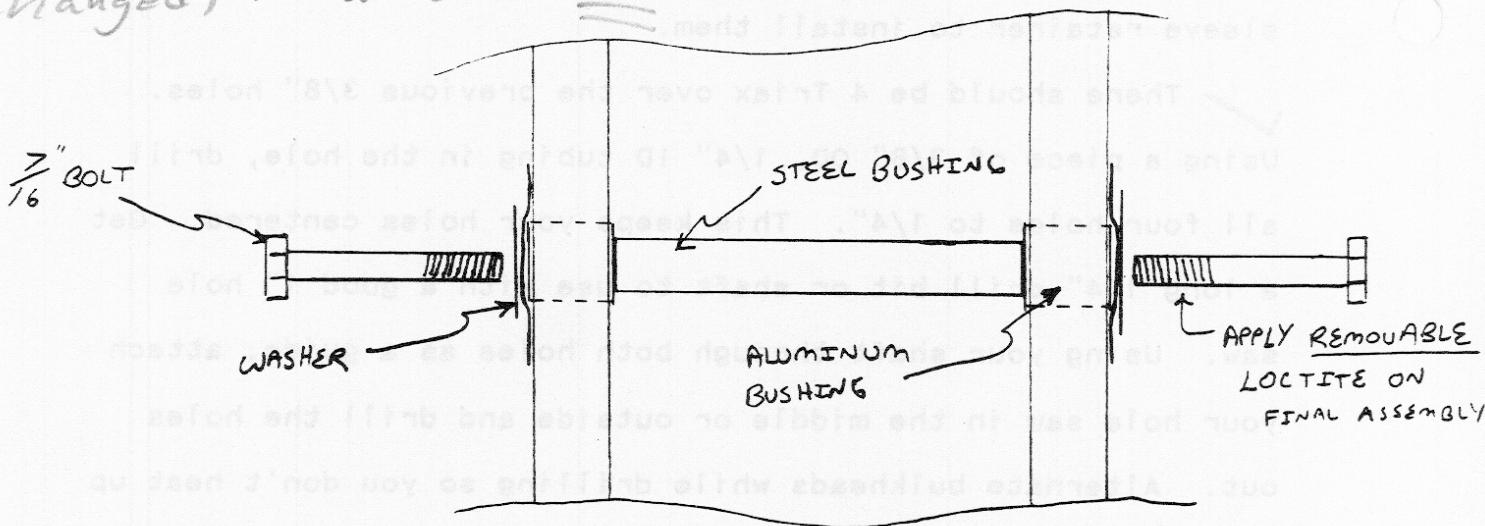


✓ Slide your gears in place and slide the bushings and bolts in place so your bushings are centered and against the steel bushing. Leave the aluminum bushings full length as they may stick out of the gear bulkhead and firewall.

*Best Fit
with Al
bushings $\frac{1}{64}$ "
out of gear
blk-hd.
(to front).*

Install them in the normal fashion, after cleaning, with micro-glass. You will have to leave the gears in place during this so the aluminum bushings will fit right up against the gear bushings. Vaseline the bolts and washers before you insert the bolts and tighten lightly. If there is any slop around the aluminum bushing, make sure you get the load off the gear or get the gears in a good position while the installation cures:

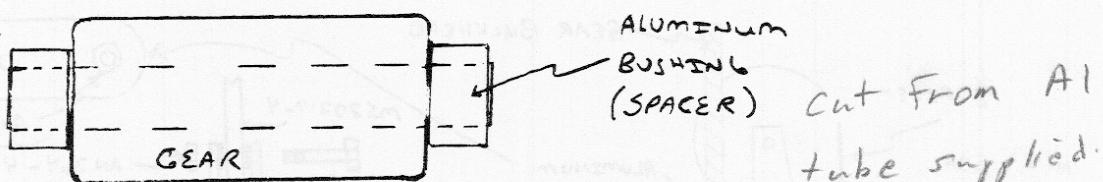
Changed, now use one $\frac{1}{2}$ " bolt.



✓ Carefully remove the gear up through the fuselage. You may have to twist the gear after it's part way out to remove it. Sand the outside surfaces, micro-glass around the bushings for a smooth transition, and apply two layers of 4" x 4" Triax over the four bushings.

✓ During your final assembly and checks, make four

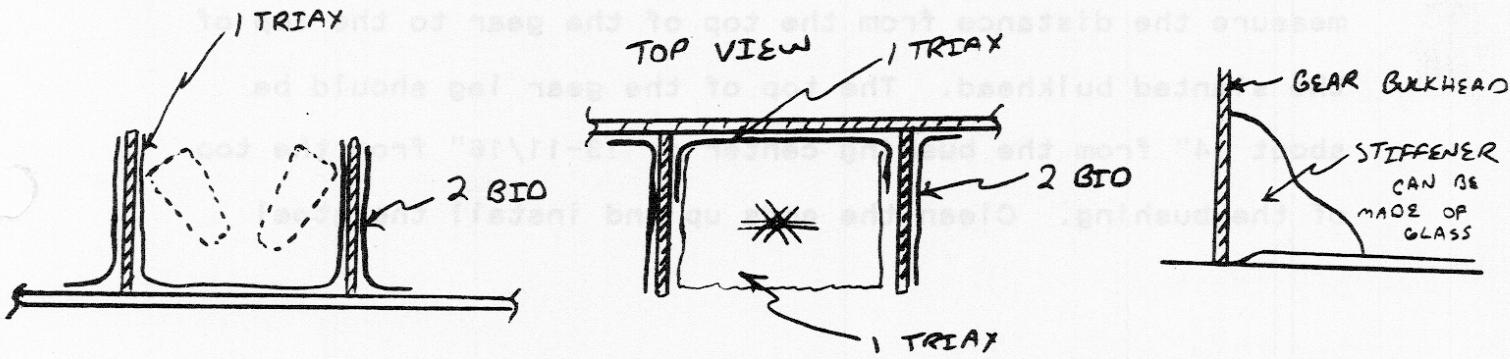
✓ bushings or spacers that fit over your 5/8" bushings against the front and back sides of the gear. Measure the amount of bushing sticking out and make them slightly small so that when it place, the gear will fit between the aluminum and the bushings without being tight:



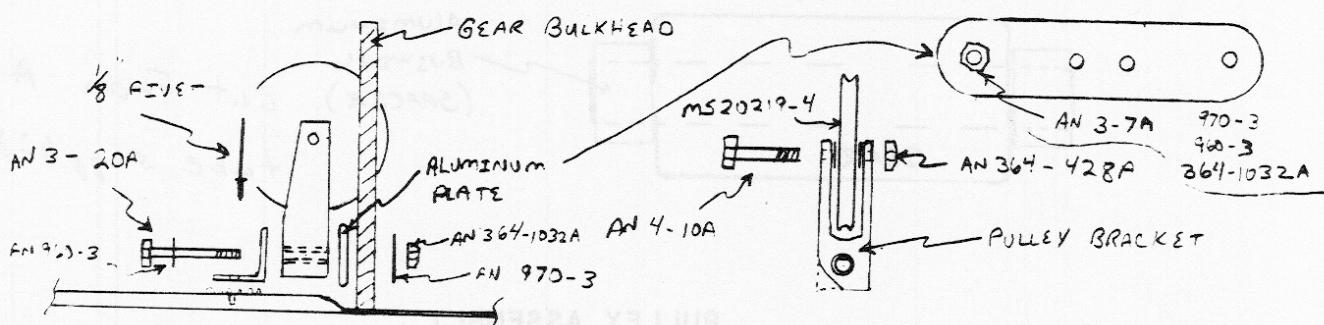
PULLEY ASSEMBLY

✓ Center the template between the bolts at the bottom of the bulkhead. Mark the holes and cut them out. Drill a good sized hole first, then use a jig saw to do the work.

✓ Cut out your stiffeners and bondo in place 6" apart and glass in place as shown below. Basically you have 1 Triax from stiffener to stiffener across the floor and 1 Triax from stiffener to stiffener across the bulkhead and holes. Use two BID on the outsides of the stiffeners. Cover the stiffeners with two of the BID from the floor up and then just two BID tapes from the bulkhead onto the stiffener:



✓ The pulley system consists of various aluminum parts, pulleys, and hardware. Bolt the system in place as shown below, and enlarge the holes so the pulleys work freely through their motions. The aluminum angle is the last thing you install here. Slide it up in place in front of the pulley holders to find the hole position. Drill the holes and slide in place to check the fit:



✓ With the aluminum angle against the pulley holders and with the bolts slid in place, drill a couple of 1/8" holes down through the aluminum angle and skin. Now sand the surfaces, micro-glass, and rivet the angle in place.

✓ Clean off excess micro-glass, slide and bolt the pulley holders in place. Don't tighten it up since you want them to move freely after the installation is complete.

OVERCENTER LINKAGE AND SOCKETS

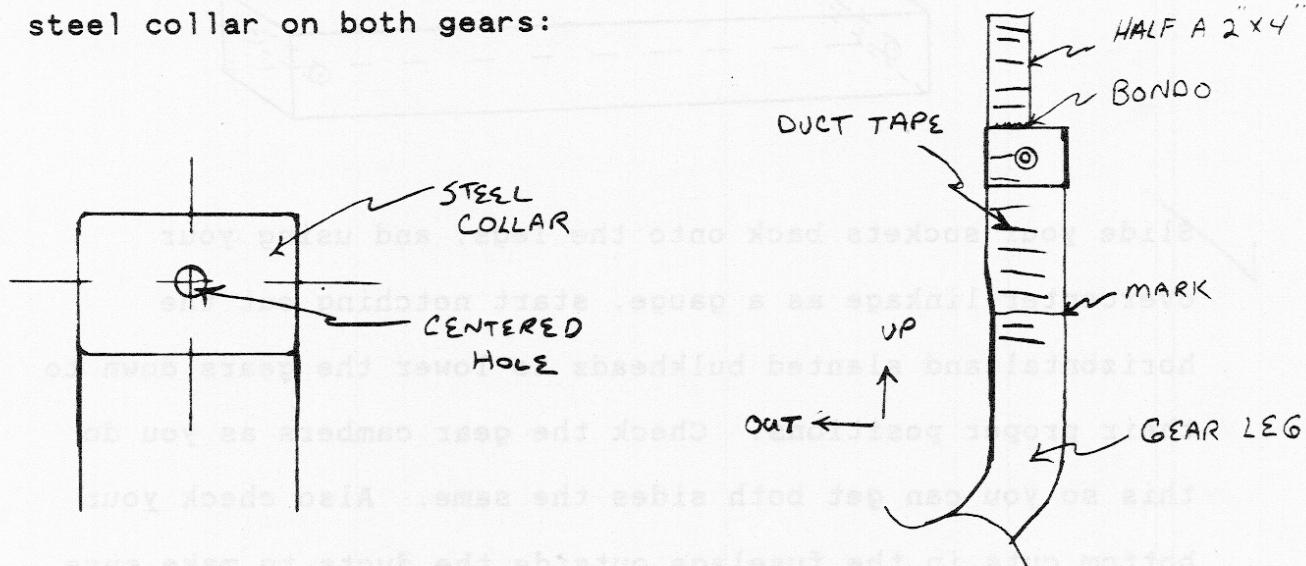
✓ While your gears are in the fuselage, mark them where they touch the bottom of the horizontal bulkhead and also measure the distance from the top of the gear to the top of the slanted bulkhead. The top of the gear leg should be about 14" from the bushing center or 13-11/16" from the top of the bushing. Clean the ends up and install the steel

✓ collars flush with the top of the gear leg with micro-glass.

Put the welds toward the outsides. Now bondo or hot glue half a 2 x 4 -- 3" to 4" long, at the top outside edge of the gear above the collar. Duct tape the whole area down past the mark you made. Pre-wet 3 Triax, axis long way, wide enough to reach at least 1/3 the way around and long enough to go past your mark at the bottom and up over the wood.

After cured, remove them, knock the wood off, and remove the duct tape.

✓ Find the center of those collars on the forward side (facing the nose), and drill 3/8" holes just through the steel collar on both gears:

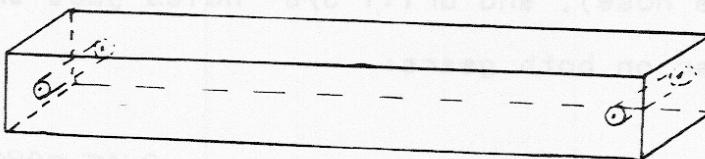


✓ Make a jig by taking a nice piece of straight lumber -- 2" x 2" x 28", and drill two holes 26", apart parallel to each other and level. It's easiest to do this on a drill press. Slide two bolts through the holes to check their alignment. Put your drilling jig up in place against those collars.

Make sure the gears are even as far as their distance out from the firewall. If one gear is further back than the

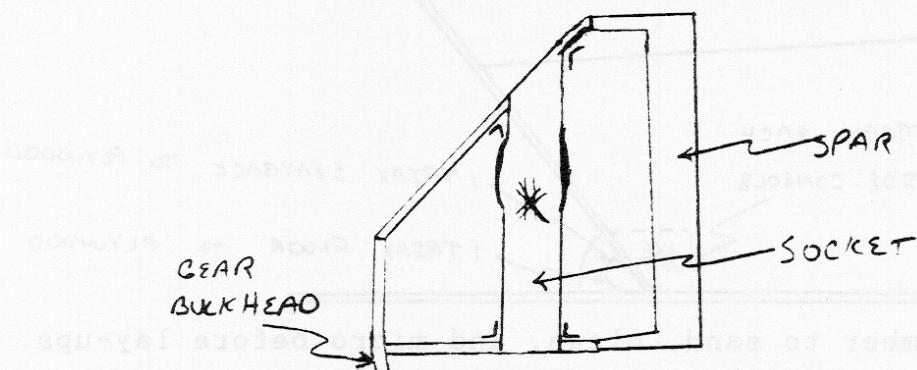
✓ other, you will have to position your jig out away a little so your holes will go through straight and parallel to the centerline of the fuselage. Have someone help you. Level the board as you drill the hole a little at a time. Drill half way through, slide a bolt in the hole, drill half way through the other side, etc. Confirm your straightness by installing your linkage then remove it and step the drill size up to 1/2". Drill your jig out to 1/2" first and confirm its trueness then drill your gear tops out to 1/2" as well. Install the bushings with LOCTITE or micro glass.

"2x2x28"



✓ Slide your sockets back onto the legs, and using your overcenter linkage as a gauge, start notching out the horizontal and slanted bulkheads to lower the gears down to their proper positions. Check the gear cambers as you do this so you can get both sides the same. Also check your bottom cuts in the fuselage outside the ducts to make sure you have clearance. We find it easiest to use a saw for the initial cuts, then a coarse file to finish them.

✓ When the linkage goes easily through its motion, trim the sockets down in size so they are flush with the top of the slanted bulkhead, flush with the bottom of the horizontal bulkhead, and wrapped around the gear within about 1/4" of the hole:

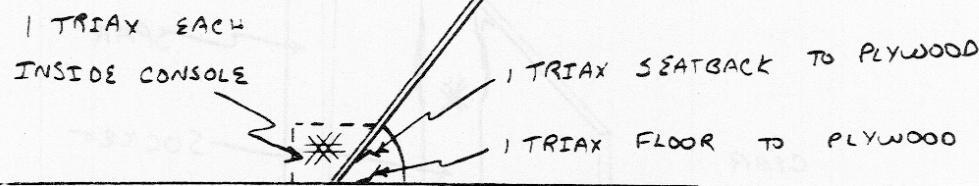


Do not install these sockets yet as they make it difficult to do your tape glassing when you put your strakes on.

CYLINDER

✓ On the seatback bulkhead bottom above the speed brake and behind the actuator, is where you will be bolting the main gear cylinder. Cut out your seatback bulkhead flush with the insides of the console from the aileron torque tube to the floor. Sand the insides of the console a few inches back in preparation for the lay-ups. Cut out and install the 1/4" plywood brackets right along this hole. The template for these is sized assuming the seatback bulkhead is about 1/2" rear of the standard position. Since your cylinder will mount between the front seat bulkhead and the bottom rear seat bulkhead, if your seatback differs from this placement (forward), you will have to either extend those brackets or place your rear seat bulkhead forward of our placement which is 27 1/4" from the gear bulkhead. Got it? Since the original placement of the bulkhead is 28", there is room for movement. At any rate, use the hydraulic cylinder to make sure your attachment locations are good. When satisfied with the bracket size, modify the template for the glass to match these brackets and install.

Mine
standard
so
27 3/4



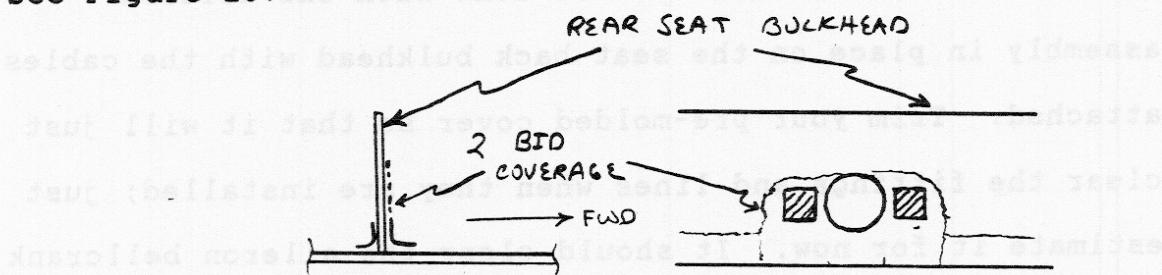
Note: Remember to sand, clean, and micro before lay-ups.

Now make your bottom rear seat bulkhead and install it at 27 1/4" from the gear bulkhead or wherever you have figured it should go. Use 1 bid all along the bulkhead and 2 up the sides. Remember when installing this bulkhead that you want your cylinder to stick out through the bulkhead about 1/8", but this will be determined when you drill your holes in the brackets up at the front. After this rear seat bulkhead has been installed, cut a round hole about 1 1/2" to 1 3/4" in diameter in the bulkhead centered about 1 5/8" from the floor and in a straight line from the middle of the gear bulkhead between the pulleys to the middle of the front attach point assuming the console was put in the middle. The cylinder should end up perpendicular to the gear bulkhead.

Place the hydraulic cylinder in its place with the cylinder sticking out through the bulkhead enough so that with the aluminum bracket on the end, it doesn't quite touch the bulkhead. You want the cylinder as low as you can get it so it will clear the aileron control. Leave 1/8" or so beneath the cylinder. Use a shorter 5/16" bolt through the cylinder attach hole to mark where the hole should be on the inner surfaces of those brackets. Measure back from the bracket to the mark and transfer those marks to the outside. If you have a right angle drill you can use that as well.

✓ Drill the hole with a small bit first to make sure you are close to the mark, then drill both sides out to 5/16". With the aluminum bushing material supplied, make two that will strengthen the bolt and position the cylinder between the brackets. One may be shorter than the other to get the cylinder squared up. Bolt the cylinder in place but don't bother with the nut. Extend the cylinder all the way. The cylinder may sag in the middle since there is no pressure in it so put a spacer under it to make the cylinder straight to the pulleys. It doesn't take much. With the rod end lined up with the bottom of and between the pulleys, mark the rear seat bulkhead around the aluminium bracket. Remove all the parts and mark a 1" X 1" square on the forward side of the bulkhead approximately where the bolts for the aluminium bracket will come through. Remove the glass and foam on the forward side but don't get into the rear skin. Clean the hole out and install a 3/8" plywood block with micro and glass with 2 BID from 1" around the hole down onto the floor.

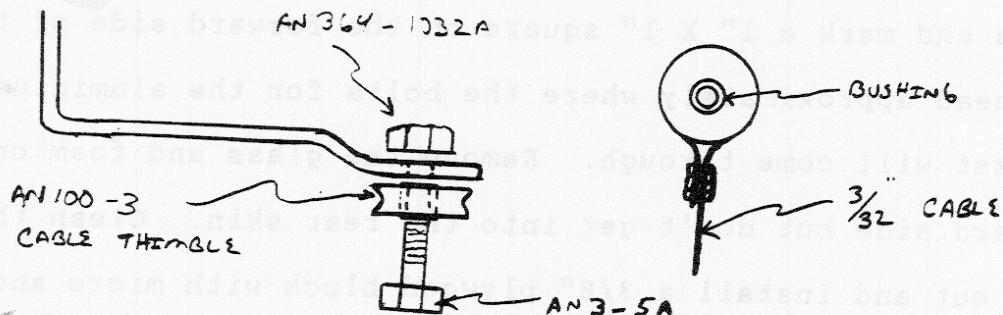
See Figure 107:



✓ When you install the aluminum bracket, you may have to use a washer between the bracket and bulkhead to keep from loading it up. This bracket is meant as a positioner and back-up, so don't make it too tight.

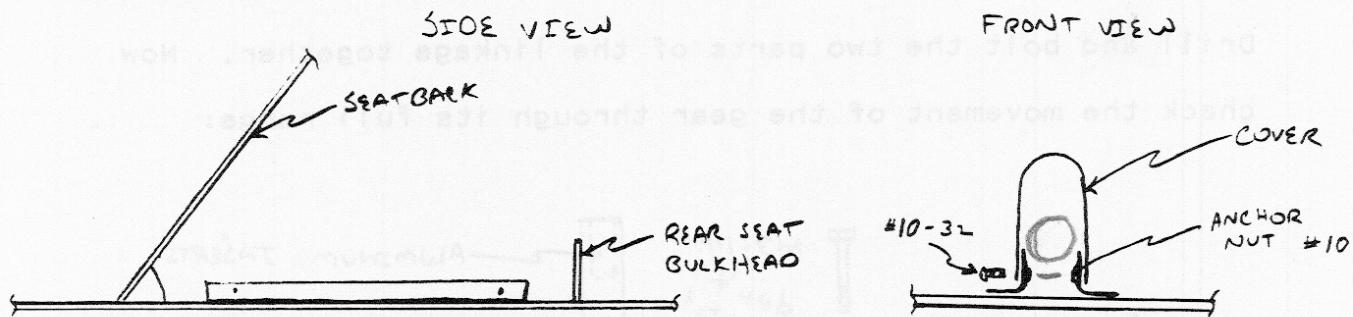
~~THIS PAGE SHOWS SOME OF THE CABLES~~

With the gear down and centered and the linkage ~~overcenter~~ overcenter or straight, you can install the cables. You may want to wait until your gear sockets have been permanently mounted before doing this but as long as the legs are in the right position, you can proceed. Adjust all of your rod ends (3) to about the middle of their travel. Bolt all of them together and extend the clean end through the pulleys and up the overcenter linkage tabs. Route the cables around the bushings with the bolt in place to simulate the proper length and mark the cables. Make sure the rod ends are all lined up since they will angle when pulled one at a time.



✓ After your main gear cylinder is mounted, you will need to fit the cover. This must be done with the aileron assembly in place on the seat back bulkhead with the cables attached. Trim your pre-molded cover so that it will just clear the fittings and lines when they are installed; just estimate it for now. It should clear the aileron bellcrank and rod ends. Now sand the floor on each side of the cover, duct tape the bottom outside surface of the cover, and put in place over the cylinder. Lay-up two Triax from the floor up onto the duct tape about 1". After cure, remove the cover and duct tape and trim the attach lips. Slide the cover

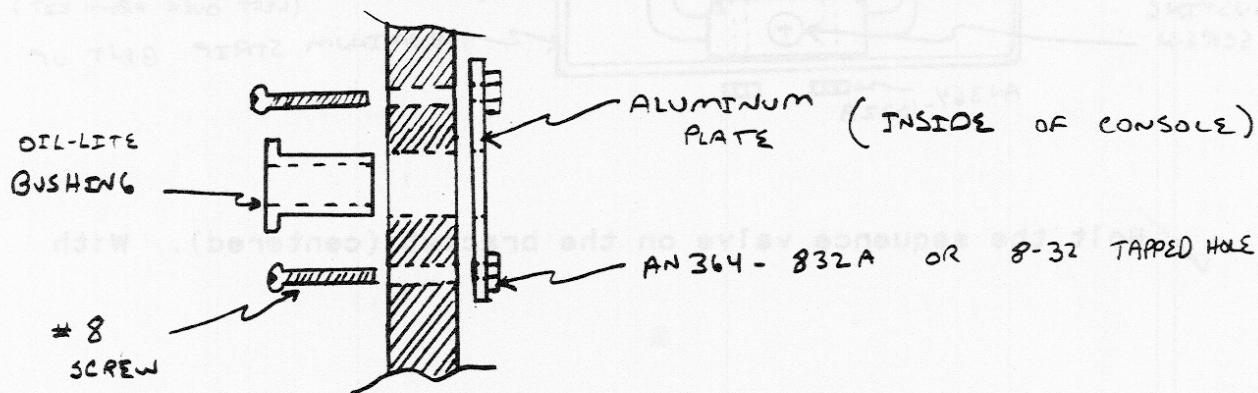
✓ Over this lip and re-trim, if necessary, to fit down low enough. When satisfied with the fit, drill four holes down low and use four #8 or #10 anchor nuts on the lip to attach the cover:



✓ Now we can switch gears a little and go back to the nose. Get it.

NOSE GEAR

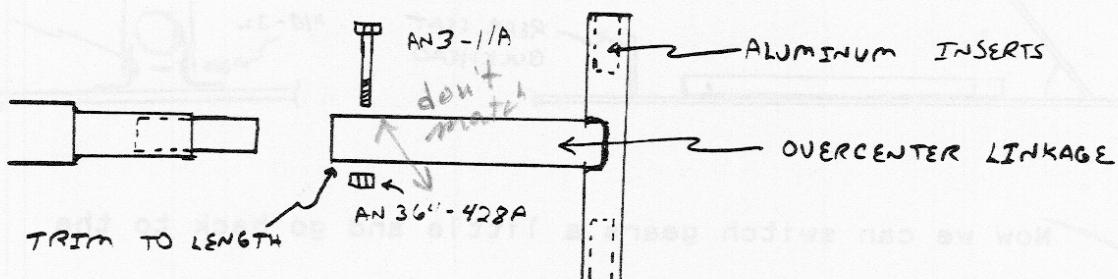
✓ Re-install the nose gear channel. Measure back 17-5/8" from the face of the channel and up 9-3/4" from the floor and mark that position. Re-check until you are sure of your mark. Drill that hole out to 5/16". Using the overcenter linkage as a jig, put it in place, slide a long 5/16" bit through the hole and linkage. Line the linkage up between the panels, level it sideways, and drill through the other side. Drill the holes out to 7/16" and install the bushings and aluminum plates as shown in Figure 104 and below:



OVERCENTER LINKAGE

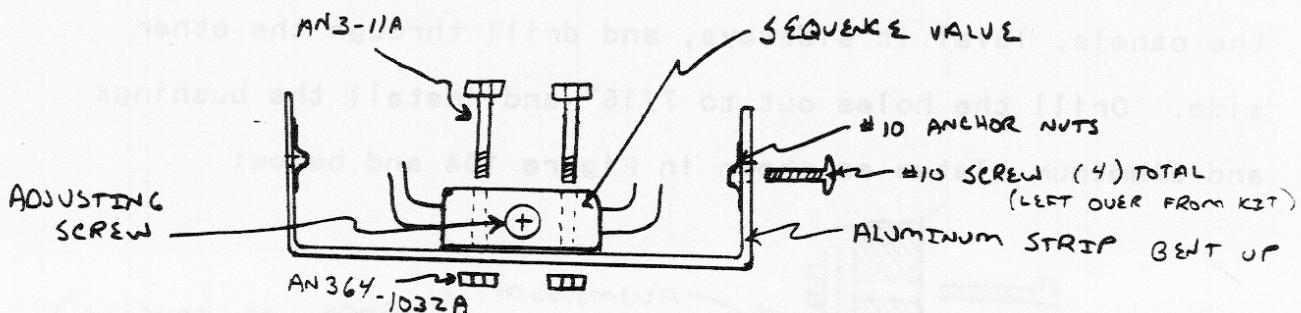
✓ Install the nose gear, shock and linkage temporarily.

See Figure 104. You'll have to cut and file the linkage until you get it to just barely put pressure on the shock. You won't see movement in the shock, but you will feel it. Drill and bolt the two parts of the linkage together. Now check the movement of the gear through its full range:



SEQUENCE VALVE

✓ With the tire just up into the fuselage you can fit the sequence valve. It will activate by contacting the head of the shock. Measure the distance between the console sides, right beside the shock head. Bend up your mounting bracket as shown:

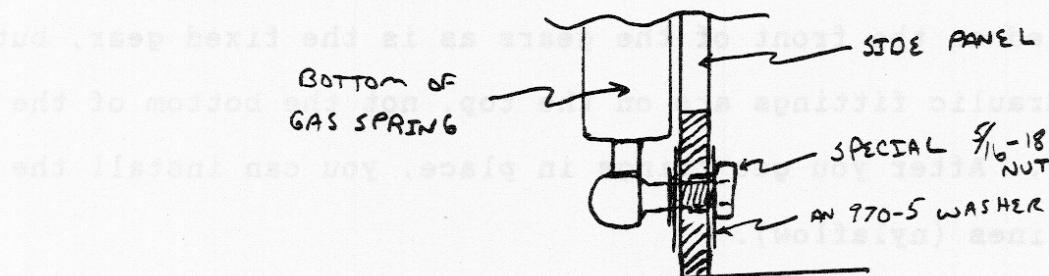


✓ Bolt the sequence valve on the bracket (centered). With

the adjustment screw all the way in, slide the assembly in place in its approximate position. You may have to remove the shock and linkage temporarily since there is not a whole lot of room. You'll have to set the assembly on a block of wood if it doesn't fit in there very tight. Move it around until the gear just touches the valve screw when the gear and tire are all the way up. When satisfied, shine a light inside the console so you can see the bracket. Drill two holes per side through the console and bracket. Mount the anchor nuts on the bracket so it is ready for mounting.

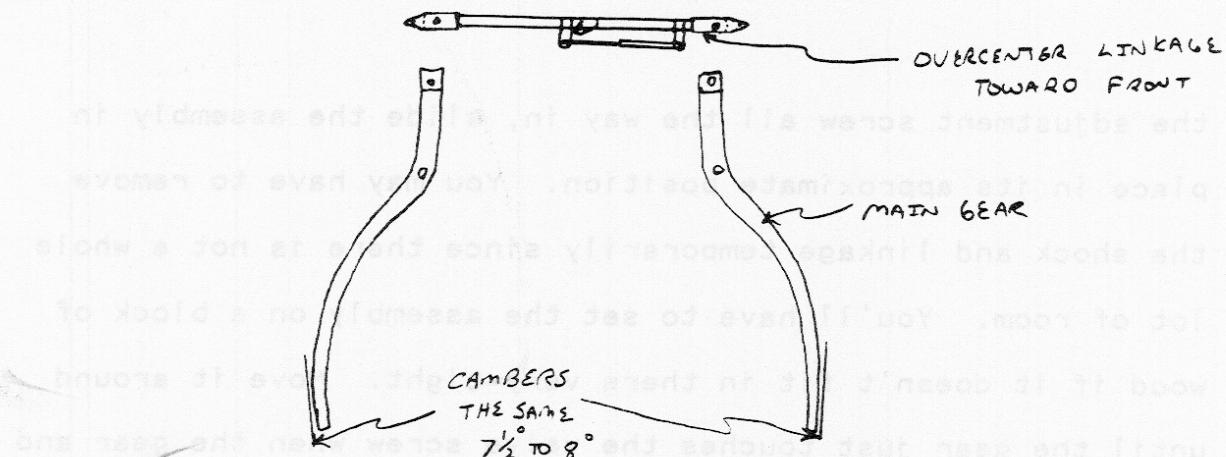
GAS SPRING

The gas spring is mounted to the plywood insert in the side panel directly below the pivot, and extends up to the arm off the overcenter linkage. See Figure 104. It is adjusted to be almost fully extended when the linkage is slightly overcenter:



MAIN GEAR

Install both gears in the fuselage, the overcenter linkage in place and centered, the fuselage leveled laterally, and the cambers the same.



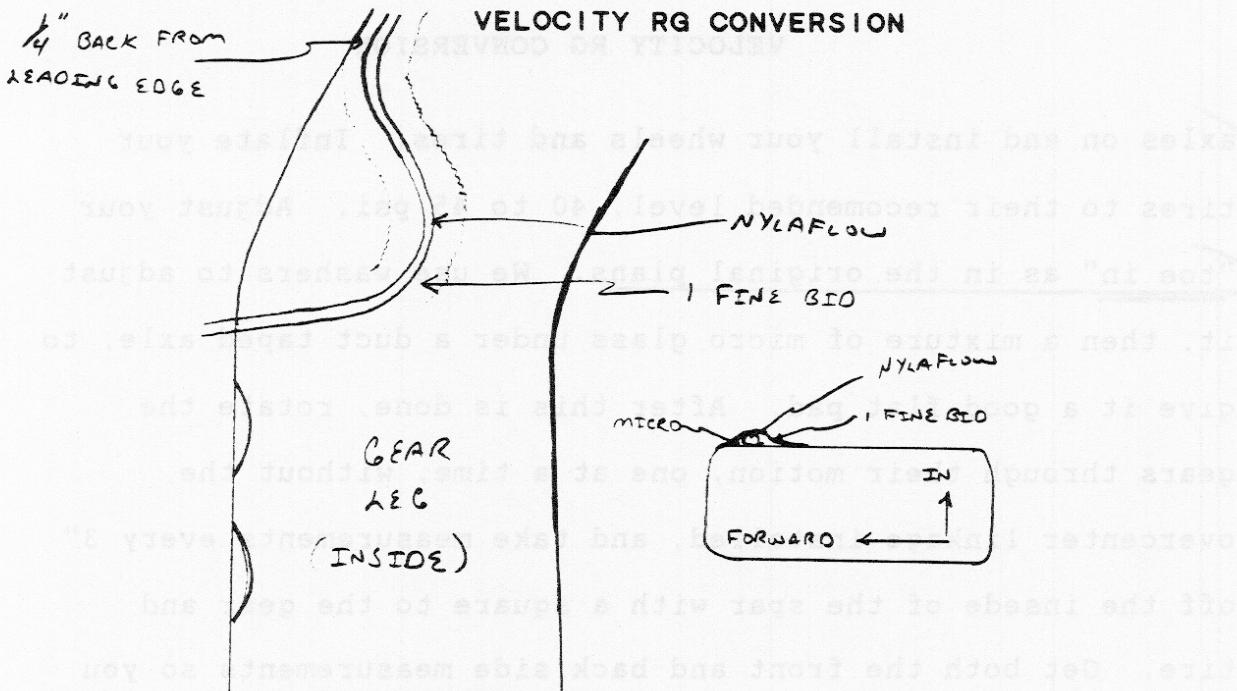
move forward

From the previous axle position mark that you put on one leg, pull a string from that mark to the other leg. Use duct tape to hold the ~~string~~ on. Level that string with a 4 foot carpenters level, and mark the other gear. If you are building a standard RG and not a 173 RG you can bias the axle toward the front of the gear, about $1/4"$, so there is less to remove for the brake caliper, otherwise center the axles on these positions and install as in original instructions.

See New drawings

Also, these gear legs do not need any Triax lay-ups at the axle position like the fixed gear does. Our calipers are installed on the front of the gears as is the fixed gear, but the hydraulic fittings are on the top, not the bottom of the caliper. After you get things in place, you can install the brake lines (nylaflow).

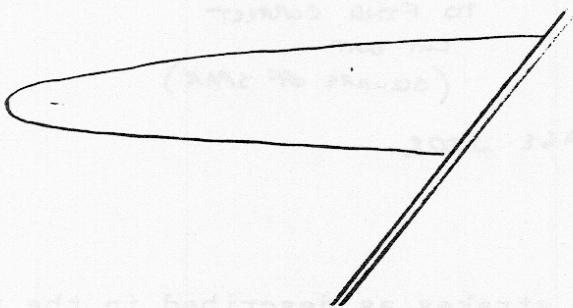
Cut two pieces of nylaflow, one for each side, that will reach from the calipers up about 1 foot inside the fuselage. You'll trim and hook the lines up later. First, 5 minute epoxy the line in place along the bottom leading edge of the gear leg. Once installed, micro the sides of the nylaflow and glass with one fine bid all the way to within $1/2"$ of the fuselage:



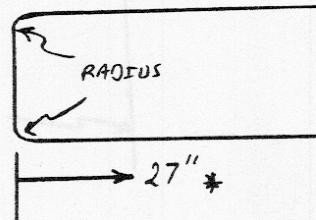
BAGGAGE ACCESS CUT-OUTS

The only difference between these cut-outs and the originals, is thier positioning. Since your gear bulkhead is different, in that it sticks forward, ~~room~~ your cut-out gets moved forward. We also add a little extra because of the aileron cables which you will ~~you will~~ run later. Follow the plans in all other respects when glassing the fuselage to strake junctions etc.:

* BACK TO GEAR BULKHEAD



REAR WINDOW



WING STRAKES

See N.L.

5-29-93

P.4

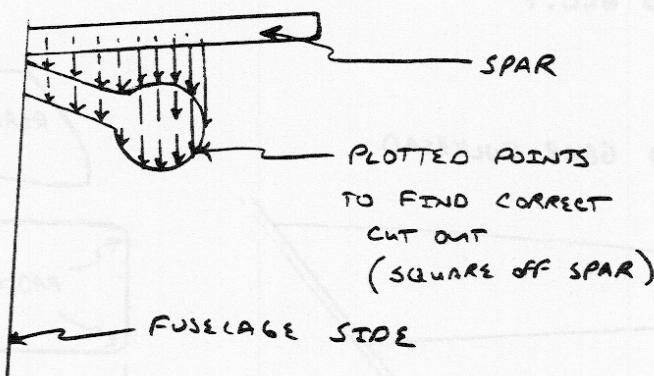
Before you put your bottom wing strakes on, you will want to make a map of your gear and tire hole. Bolt your L. strake L.E. at outbd 15 42^{5/8}" From FLOOR.

OK

✓ axles on and install your wheels and tires. Inflate your tires to their recommended level, 40 to 45 psi. Adjust your "toe in" as in the original plans. We use washers to adjust it, then a mixture of micro glass under a duct taped axle, to give it a good flat pad. After this is done, rotate the gears through their motion, one at a time, without the overcenter linkage installed, and take measurements every 3" off the insede of the spar with a square to the gear and tire. Get both the front and back side measurements so you get the whole picture. You'll have to raise the gear a little at a time as you plot your points so you get a realistic outline of the gear as it goes up through the strake: Another method is to install the strake bottoms first, then just bring the gear up against the strake and start trimming until you get it to go through.

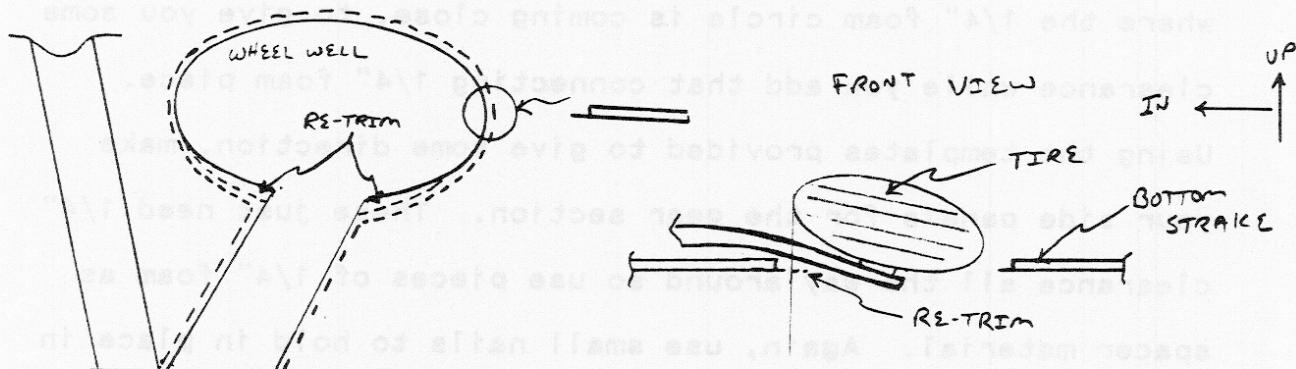
*Cut from top
to keep trimming off Face N.L. 11-7-91 Pg 2.*

Turn A/c over?

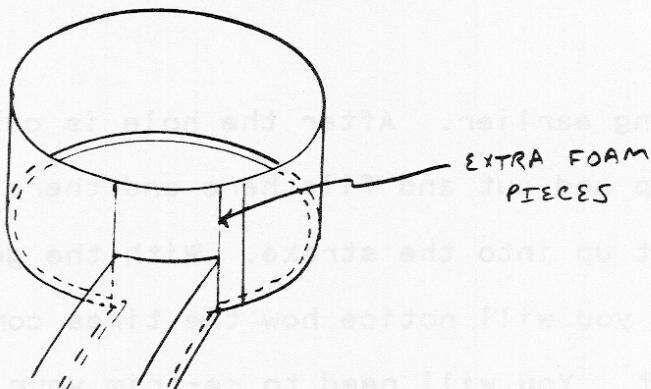


✓ Install the bottom strakes as described in the plans. Transfer those measurements onto the inside surfaces of the bottom strakes. Cut the holes out. You may want to cut a little undersized at first in case you made a mistake

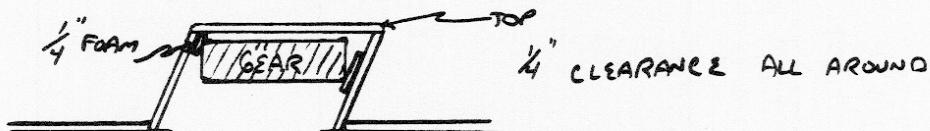
✓ measuring earlier. After the hole is cut out, rotate the gears up and cut and file here and there until the gear and tire fit up into the strake. With the gears up in the strakes you will notice how the tires come back inside somewhat. You will need to re-trim your strakes around the inside portion of your tire so that the wheel well is not slanted. You'll want about 1/4" clearance around the gear leg and closer to 3/8" to 1/2" around the tire, especially around the front and outer end of the tire toward the tip. After you have the hole looking good, mark your inside skin 3/4" to 7/8" outside your cut-out and remove the inside skin and foam of the strake. Sand those skins real good. Now we'll make wheel wells:



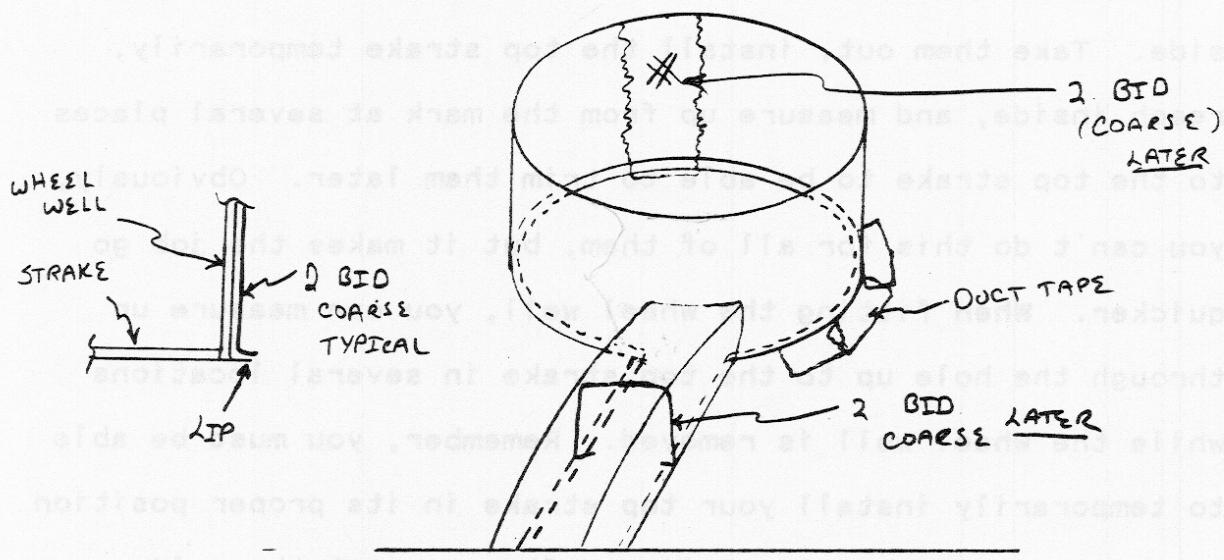
✓ Take a piece of 1/4" Clark foam, 10" x 48"-50", and put it down into the cut out around the hole. The ends should end up at the gear leg. You may have to 5 minute epoxy a small piece onto your original 48" sheet to make it all the way around.



Now cut another small piece to span the gap across the top of your gear and to connect your circle. As we mentioned before, 5 minute epoxy is good to put foam together. Use small nails to hold the foam out against the hole while you fit things together. Also, put the tire up all the way, or about where you think it will be, and prop in place with a 2 x 4 or something. Go off the top of the spar for an estimate of the gear up position. Slide some 3/8" foam on the tire where the 1/4" foam circle is coming close, to give you some clearance while you add that connecting 1/4" foam piece. Using the templates provided to give some direction, make your side panels for the gear section. These just need 1/4" clearance all the way around so use pieces of 1/4" foam as spacer material. Again, use small nails to hold in place in the slot. These pieces will lean somewhat to keep them close to the leg. Make sure the sides are high enough so that when you cap it off later, you will still have at least 1/4" gap on top of the gear:



Now with the wheel circled and the gear sides in place, duct tape the wing strake right next to the wheel and gear wells. Cut small pieces when going around the wheel well foam. Try to stay off the 1/4" foam, but if you are on it a little, it doesn't matter. Also, duct tape anywhere you might get epoxy on when glassing the wheel well. Micro the foam and glass with one layer of fine bid at a 45. You can overlap pieces to get full coverage, especially across the part of the wheel well that goes over the gear. Check your nails after glassing to make sure the wheel well hasn't moved:



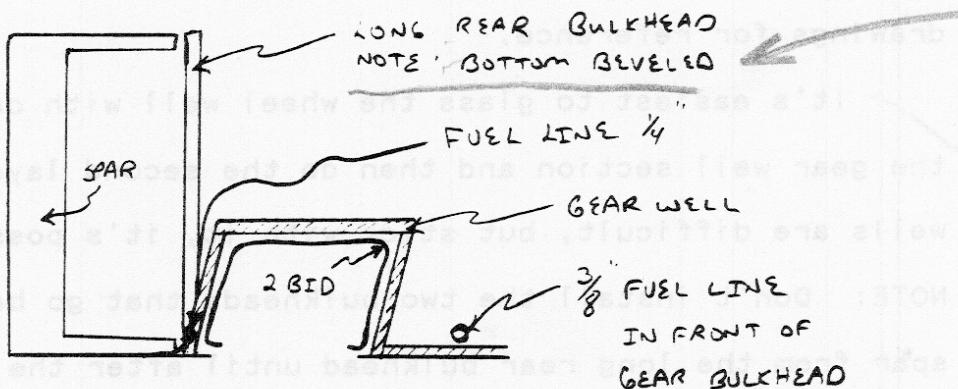
When cured, remove and clean up the shell that looks like an igloo with the top missing. Put it back in place and with the gear up, fit the top in place, (~~door~~ door to the igloo), also 1/4" foam. You may 5 minute it down if you want using those small nails to hold it in place while it

✓cures. Remove the nails, clean it up, and round off the sides of the top for a smooth transition onto the sides. Sand, micro, and glass with one fine bid about 1" onto the sides and wheel well. Do not glass it into the strake yet. Now you can treat this "igloo" just like a bulkhead when fitting and glassing it in. Templates are provided for the bulkheads and baffles and pictures for clarity when installing them.

✓ Here are some hints when fitting the wheel wells, baffles, and bulkheads. After you get them fit into the bottom strake, mark their position with a pencil on each side. Take them out, install the top strake temporarily, reach inside, and measure up from the mark at several places to the top strake to be able to trim them later. Obviously, you can't do this for all of them, but it makes the job go quicker. When fitting the wheel well, you can measure up through the hole up to the top strake in several locations while the wheel well is removed. Remember, you must be able to temporarily install your top strake in its proper position in order to get the pieces fit. After you get them close, fit and bondo one piece at a time in place and keep working with it until you get just a little clearance. A good coarse file and sureform work well for this. Before you permanently install them, the rear most bulkhead should be modified for the 1/4" fuel line. In order to get the most clearance for the wing attach nut and for the lay-up behind this bulkhead, you'll need to bevel the corner where the bulkhead hits the

No, see
Fig 112

✓ gear well so it moves the bottom forward some:



✓ Then, at this intersection, make a 1/4" hole by filing and grooving. This is for the fuel line that will take fuel out of the strake behind the wheel well. When glassing the bulkheads into the bottom strake, be careful in this corner, so your line will still slide through. Also, you can groove the bottom corner of the gear well a little where that line comes through, to give you more room. So, instead of having one fuel line per side, you have two. The other fuel line is in front of the gear well and just in front of the gear bulkhead. It still fits behind the seat. Make sure when you put the lines in, that you pot them good and even put a little glass on them so they don't leak. Don't forget the vent. The plumbing in the strakes is just like the original plans, but you can also look at the pictures and diagrams for help. Figures 112, 112A.

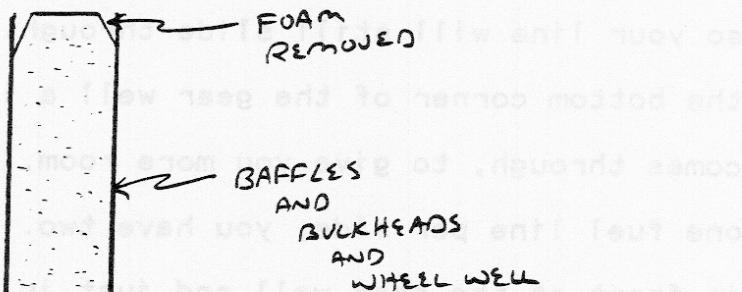
✓ After the wheel well has been microed in place, nailed for security along the inside bottom, and glassed with two fine bid around the outside like a bulkhead, you will micro

✓ and glass the inside of the well with two BID, lapping onto the bottom skin of the bottom strake. Refer to the earlier drawings for reference.

✓ It's easiest to glass the wheel well with one BID then the gear well section and then do the second layer. The gear wells are difficult, but stick with it, it's possible.

NOTE: Don't install the two bulkheads that go back to the spar from the long rear bulkhead until after the top strakes are installed.

Another thing to do after the baffles and bulkheads are installed on the bottom and re-checked for fit, is to groove the two edges of the bulkhead for a better bond to the top skin.



Before you put the top strake on, you'll have to install your fuel caps. They do not go in the same position as the original. Refer to Figure 112 for approx. location. Its easiest to find a central location in that triangular section, with a measurement off the wheel well at right angles.

✓ You will also need to remove some glass and foam in the inside skin where the tire would hit. With the top strake in

✓ position, hold the gear in the full up position and rotate the tire. This will mark the upper strake where skin and foam must be removed. Continue to do this until the tire marks appear on the lower side of the upper skin. Clean and glass over with two BID.

✓ After the top fuselage is on and before the top strakes are installed, make sure you seal all areas around the gear well, fuselage line, and bulkhead with a two fine bid wet lay-up. Note: Put your fuel lines in first and plug them before you glass the rest. *Can also seal inside of gear wells* *VV-2* *P7*

✓ Remember to use the same glassing and epoxy coating procedures as outlined in the plans.

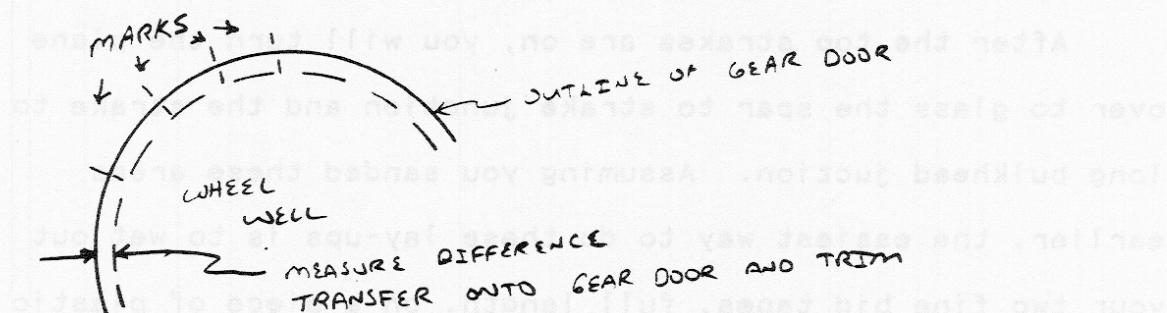
After the top strakes are on, you will turn the plane over to glass the spar to strake junction and the strake to long bulkhead juction. Assuming you sanded these areas earlier, the easiest way to do these lay-ups is to wet out your two fine bid tapes, full length, on a piece of plastic and using a wood dowel with a nail sticking out the end, hold onto one end of the plastic while you reach in and lay it in place. Pull the plastic off and use a yard stick to press the lay-up down. Then you can re-fit and install those two bulkheads, each side, with two Bid all around them inside and out if you can reach it.

MAIN GEAR DOORS

✓ The fuselage should still be upside down to do this section. The gear doors come to you premolded in two sections per side. Set each section in their place, mark, and trim so

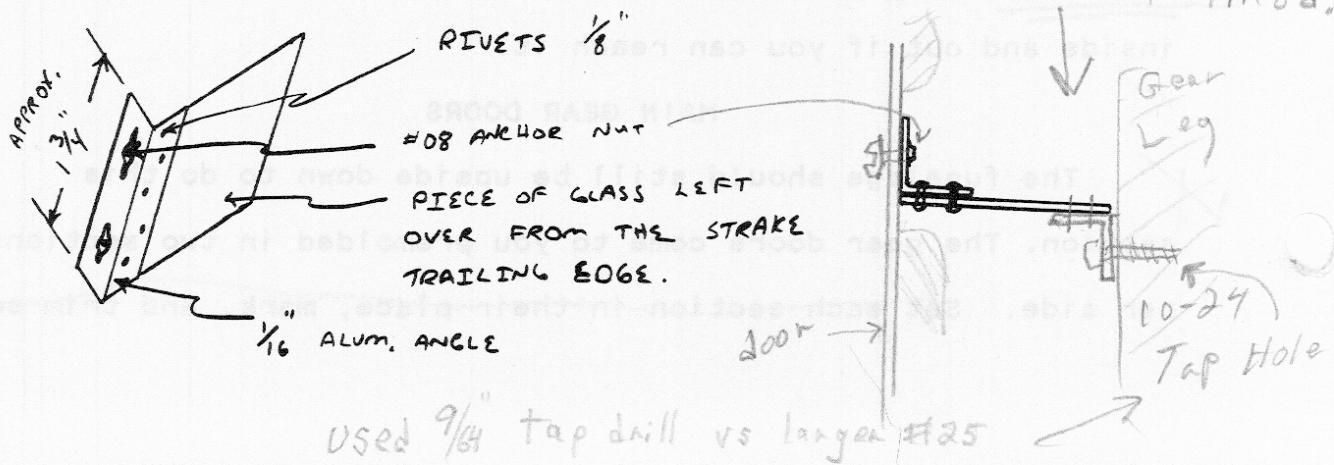
that they make one continuous gear door. Sand the area on both parts and glass together with two Bid outside and three Bid inside lapping both parts by at least 1". Feather the two outside layers and finish out later.

Put the gear up within 1/8" of the top skin with the use of a spacer under the tire. Set the gear door over the hole, and mark the strake all around the gear door and also put marks outward from the gear door every 3" or so. Transfer the marks onto the gear doors. Now remove and measure the amount to trim off all around the gear door and trim. Make sure you don't cut too much away as you will use sandpaper in the slot later to get the fit just right:

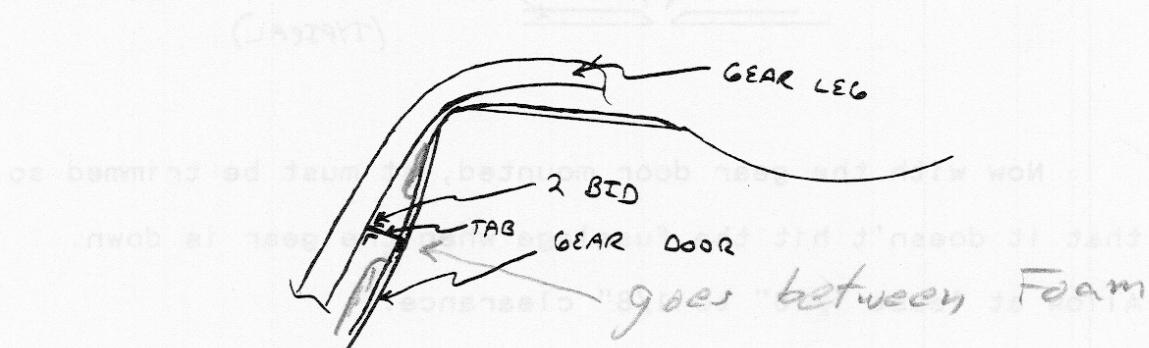


Make the upper bracket for the gear door as shown in the diagram and attach to the gear door at the glass to glass indentation:

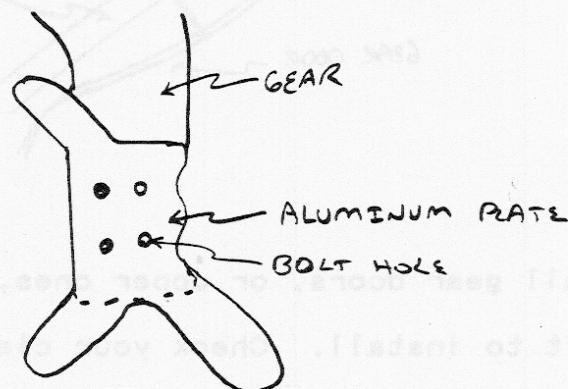
See VV-2 P. 7
For bracket mod.



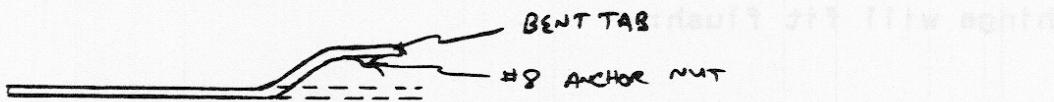
Q X Keep trimming the glass tab back until the gear door is flush with the hole. These doors don't overlap the strake. Also, make sure the gear door is flush everywhere else. Now put a little bondo on the glass tab and set the gear door back in place, flush with the strake. When the bondo is cured, carefully remove the gear door, sand the bondo and matting areas, and glass on with two Bid both sides with at least a 1/2" overlap:



V X At the tire or tip of the gear, you will need to make an aluminum plate with the 1/8" aluminum and template provided:

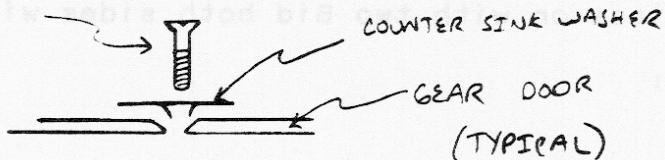


V X Drill the holes and install. Bend the tabs out and then flat to mate with the gear door:

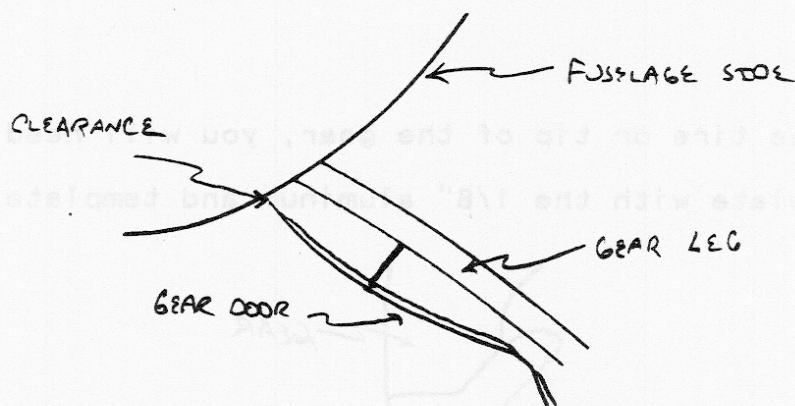


When in place with all tabs touching, shine a light from underneath, and drill the three holes for attachment. Use #8 anchor nuts and attach to the aluminum fingers. As in the rest of the gear doors, you should counter sink the holes and use those counter sink washers to mount them:

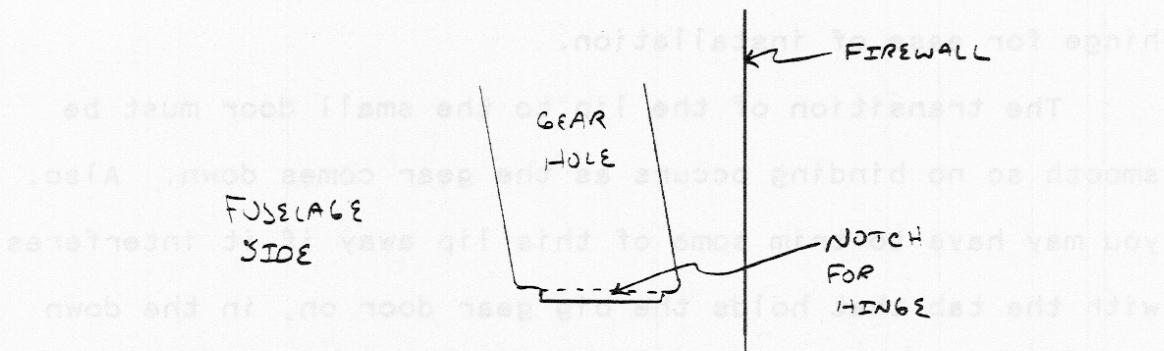
MS 246²⁴ - S3



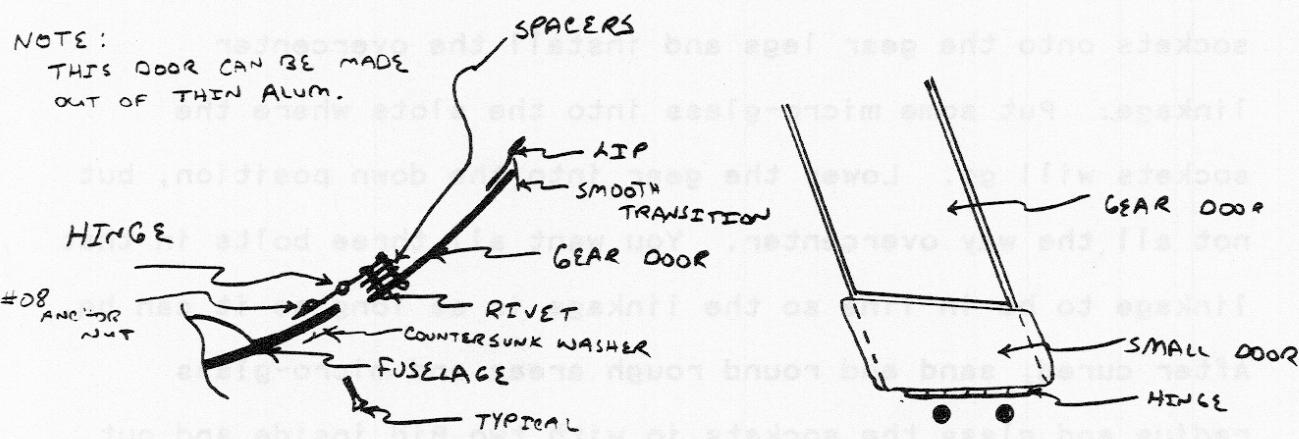
Now with the gear door mounted, it must be trimmed so that it doesn't hit the fuselage when the gear is down. Allow at least 1/16" to 1/8" clearance.



The small gear doors, or upper ones, are the only fairings left to install. Check your clearance under the gear at the fuselage side when the gear is down. You should have about 1/8" or so clearance to the brake line. Using a 3-1/4" section of hinge material, slot the fuselage so the hinge will fit flush:



This flap, or door, will overlap the fuselage on the sides and will come within 1/8" of the big gear door. With the gear up, fit the hinge in place. You'll notice that the hinge will have to be spaced away from the small door with fiberglass spacers so the door will fit without binding. At the other end is a little lip made out of thin aluminum that will catch the big gear door on the way up, thus closing it:



The hinge gets flush rivited onto the door as does the lip. Then two holes are drilled through the fuselage and hinge to secure the small door. Use #8 anchor nuts on the