

CHANGES, ADDITIONS AND OTHER NOTES

The engine baffle modifications are intended to be used in conjunction with the appropriate engine installation manual published by Rutan Aircraft Mfg.

A 1 Qt set of "pour in place" urathane foam should be sufficient.

Use 12" template for Cont. 65hp-100hp.

Use 14" template for Lyc. 0-235.

Either Inlet Lip contour can be used when Lip is built as part of cowling or as part of the fuselage.

Green foam for lip is cut to 15"x3"x1" or for alternate method, 14"x8"x1".

Ignore all misspelled words.

CONT. BAFFLES

Old front baffles can be modified to work with new baffles. The right front baffle is unchanged.

The center front and rear baffles are unchanged.

Check fit of rear cylinder baffle strips before attaching new rear baffles.

Old rear cylinder baffles can be modified by pop riveting new extensions to them.

Make new bracket as shown, to attach right side rear baffle to #4 lower valve cover screw. Jog right rear baffle back 1/4" from #4 exhaust port.

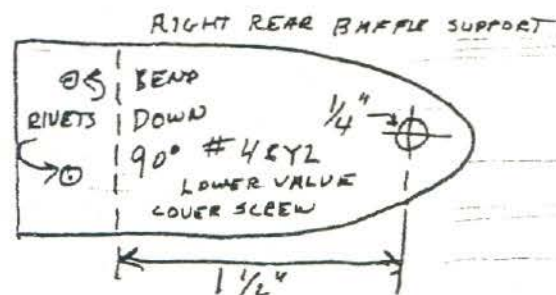
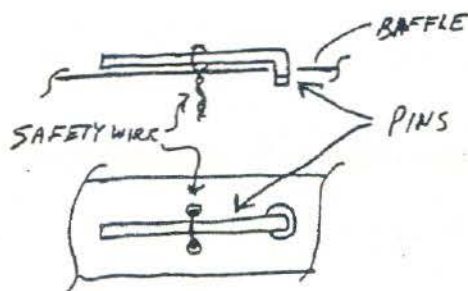
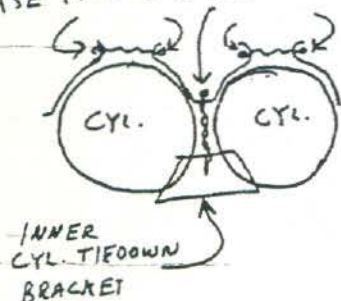
Outer middle baffles must be bent down slightly so that they will press down tight against heads.

Head baffles lap over outer head baffles.

Pop rivet patches on outside of #3 and #4 outer head baffles after everything else is pop riveted in place. Then wrap baffle strips around cylinders and heads. Curl ends up 1/2" to form 1 1/2" gap over cylinders and 2 1/4" gap over heads. Make 1/8" dia. pins and install as shown to be used to tie baffles together with safety wire for a 1" gap over cylinders and 2" gap over heads.

The Inner cylinder tie down bracket is used to hold the inner head baffles down instead of steel wire because it doesn't give when tightening down the baffles. The bracket slips in between the cylinder fins on the under side and is tied to the inner cylinder baffles with safety wire.

USE PINS IN THESE PLACES



LYCOMING BAFFLES MODIFICATIONS

Cylinders-Install original inter cylinder baffle on top side of cylinders. Add 3'' wide extensions to rear baffles, wrap around cylinders and curl ends up 1/2'' to form 1 1/2'' gap over rear cylinders. Attach 3'' wide baffles to back side of front baffles where front baffles touch cylinders. Wrap baffles around cylinders and curl up 1/2'' to form 1 1/2'' gap over front cylinders. Install pins as shown, and tie baffles together with safety wire (1 1/4'' gap min.).

Heads-Add 2 1/2'' wide extensions to rear baffles, wrap over heads and curl ends up 1/2'' from push rod tubes. Attach 2 1/2'' wide head baffles to back side of front baffles where front baffles touch heads, wrap over heads and curl ends up 1/2'' from push rod tubes.

Oil Coolers-Make 4 5/8''x.060 2024-t3 straps 6'' long with a 1/4'' hole in one end. Round ends with file and install on 1st and 3rd case bolts aft of oil sump with 1 or 2 AN 960-416 washers between each strap and the case so the straps don't touch the sharp edges of the case. Twist straps 90 deg. and bend so that oil cooler can be suspended 1/2'' below case and 1/4'' forward of third case bolt. Drill 3/16'' holes in straps, trim ends and bolt to oil cooler attach angles with 4 AN3-4a bolts, 8 AN 60-960-10 washers and 4 AN 365-1032 self locking nuts. Straps must not touch core of oil cooler (1/8'' clearance min.)

New rear center baffle-Remove rear bolts from oil cooler and fit cardboard center rear baffle template between oil cooler and rear straps. Template goes from right rear baffle across to head of left rear cylinder, then back 90 deg. to left rear baffle. Template must match contour of case and should line up with right rear baffle but not left rear baffle. Box in corner below left rear cylinder barrel to insure airflow to back side of cylinder. Make aluminum baffle and install with rear oil cooler bolts and temporary fasteners. Check fit and then mark air hole full size of cooler core. Remove baffle, cut out hole and reinstall. Make certain that baffle cannot touch core of oil cooler. Attach baffle to lower end of oil cooler attach angles with AN3-4A bolts etc. and pop rivet both side and box section to rear baffles. Trim bottom to match cowling and attach baffle seal. Use silicone rubber to seal around the oil cooler to dampen vibration and prevent air leaks.

Connect oil cooler to engine oil system in accordance with engine manufacturers specifications for your model engine.

(END)

NACA INLET Installation Details for the VARIEZE with the 0-200 Cont. Engine.

In this set of Plans, the following is covered:

- 1. How to construct and install the Flush NACA Inlet on the VARIEZE.
- 2. Baffles for the 0-200 Cont. series engine.

COMMENTS:

On Varieze 56EZ, we found that under some conditions the cooling was insufficient. This was largely due to poor installation of the original set, with a lot of air leaks. We later discovered that having the baffles held close to the cylinders is one of the most important items in having cooler cylinders. At any rate, the following set of baffles was designed and installed. The result was about 100 degree drop in head temps from 500 down to 400. Satisfied with this, we then determined the minimum inlet area required to sufficiently cool the engine. From this data, the NACA Inlet was designed. While doing research on the inlet, we found that we were getting uneven fuel distribution to the different cylinders. To enable us to test different carburetor inlets, we built the boat tail cowl. We have since learned that some of the fuel distribution is caused by the carburetor butter fly valve being say half open in the medium power ranges disturbing the air mixture to the cylinders. The boat tail also allows more room around the oil tank so the oil now runs around 175-190 rather than 140-160 with the original cowl.

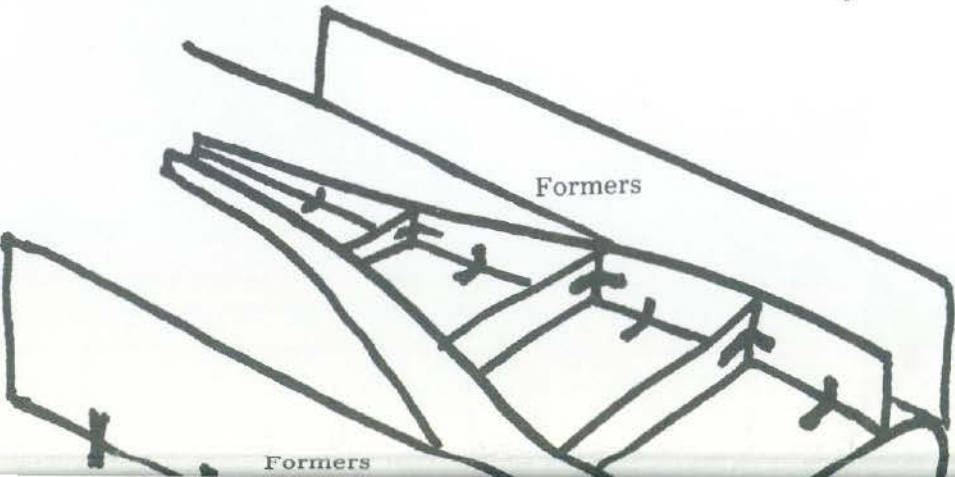
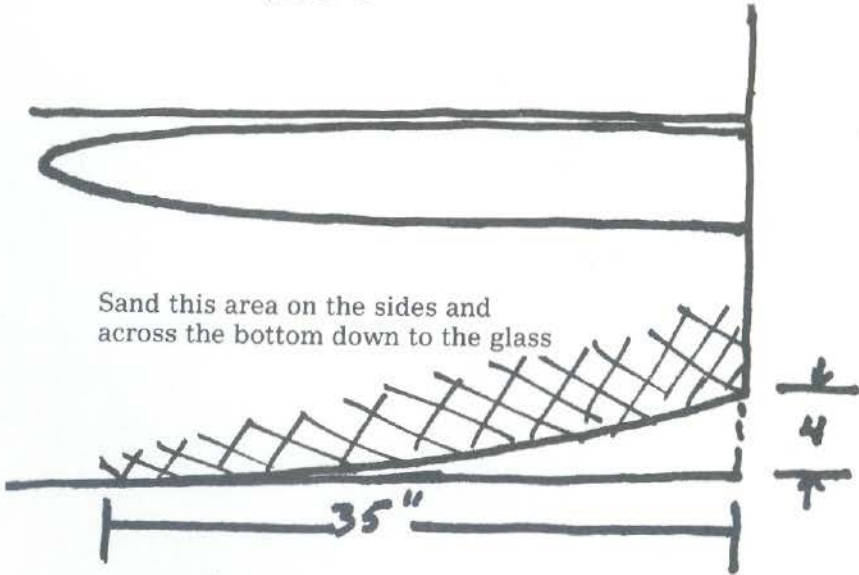
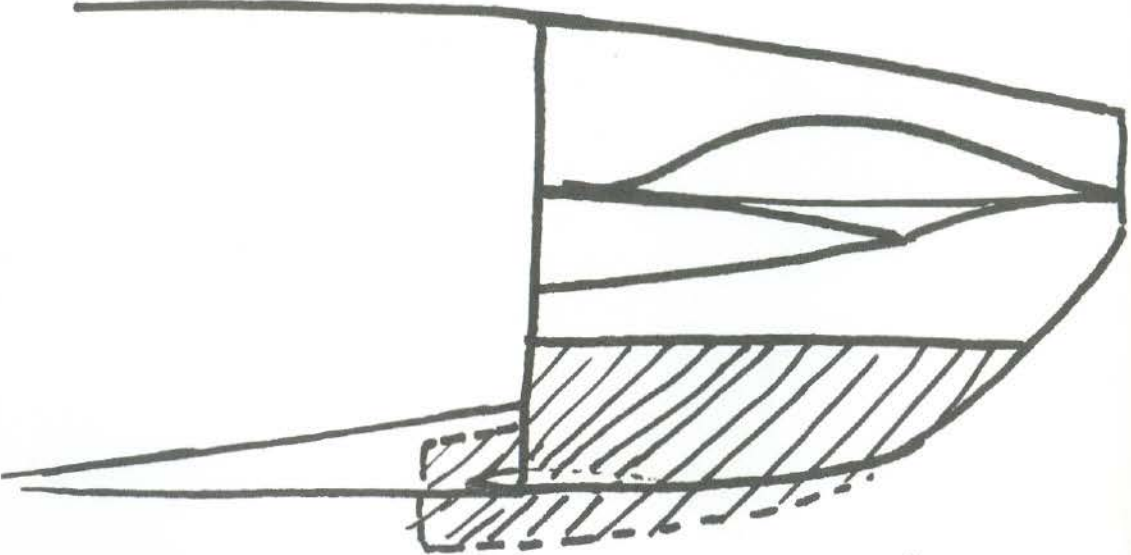
There are a few things to keep in mind that will provide you with a safe installation. All air leaks around the aelirons, exhaust, and cowl in general must be kept to a minimum. Four way cylinder temp. gauges are highly recommended since things can go different than planned and this is the only way you will really know. One area of concern is the baffles pulling away from the cylinders as was discussed earlier. Another area is the Inlet itself, which is some what critical in that if the air flow is disturbed in the Inlet, the lip will stall out causing the Inlet to in effect, close off the air flow by some amount, which if enough, could cause the temps to go over red line.

One very good feature of the Inlet is that at slower speeds, such as when climbing, more air is packed in at the higher angles of attack. The Inlet also raises the question in the minds of many bewildered people, "Where does the air go in?"

NACA INLET Construction:

The floor of the scoop is the bottom to the existing fuselage skin, while the top of the scoop starts at 35" forward from the firewall, flush with the fuselage and continues in a straight line to a point 4" below the bottom edge of the firewall.

To install the NACA air scoop, it helps to have the fuselage up side down. Then the paint needs to be sanded on the bottom from the firewall forward 38" and on the sides down to about 2" from the fuel tanks at the firewall angling up the sides foward to the 34"



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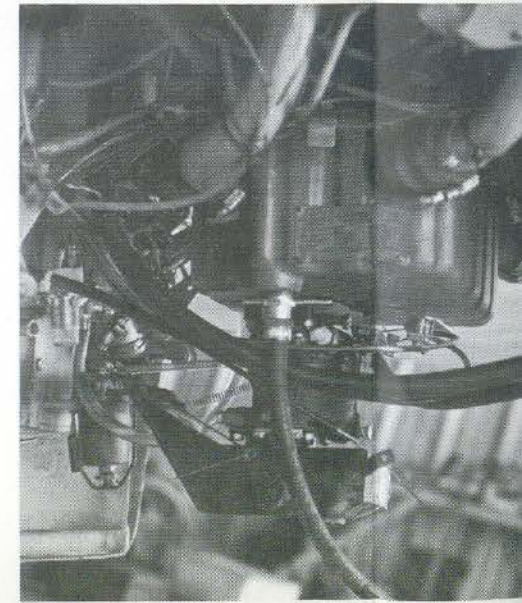
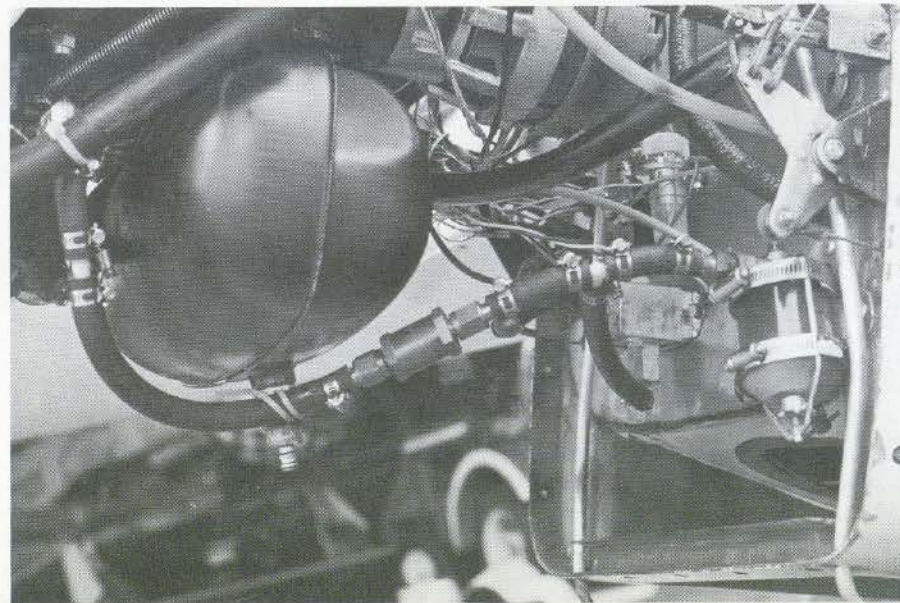
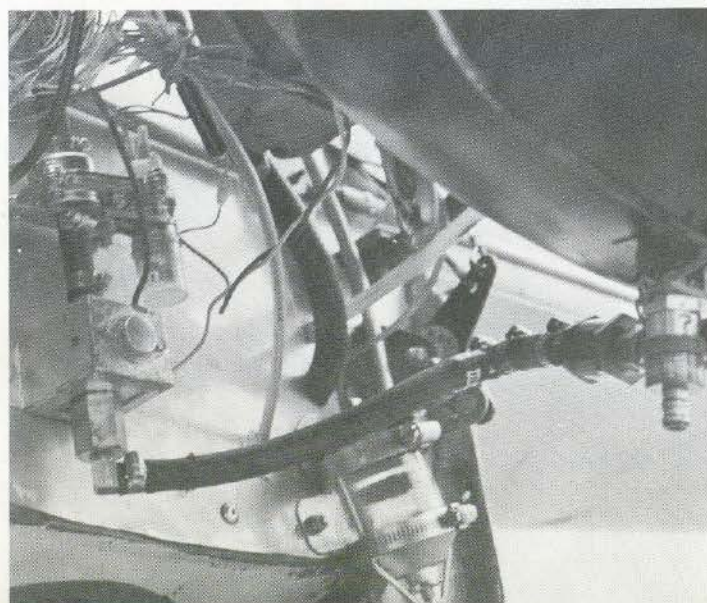
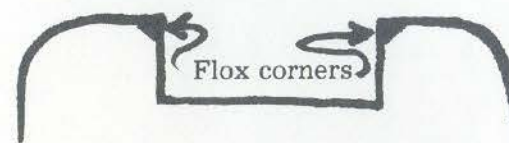
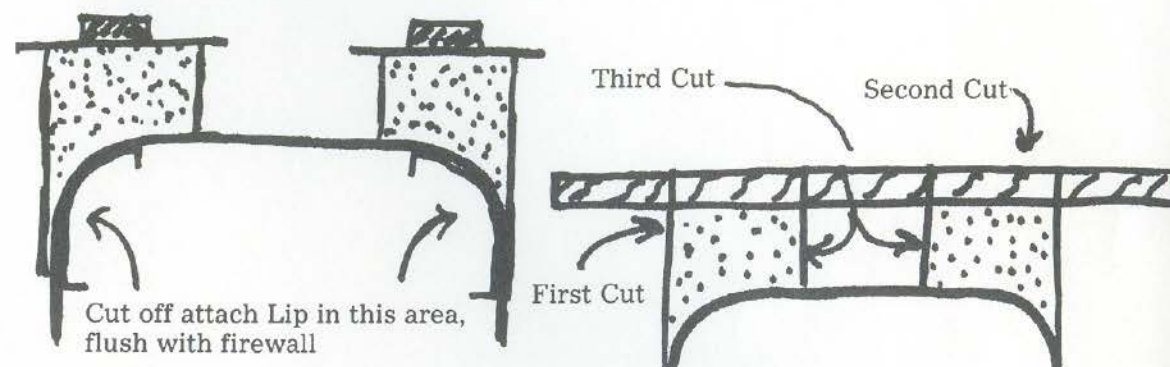
line. Mark out a center line on the bottom of the fuselage, then line up the template centerlines with the trailing edge flush with the firewall, then trace the outline of the template on the fuselage.

Using Poster board, set up rough formers by taping them to the sides as shown. Formers are also set in the center inside of the inlet tracing. We taped in 4 cross members to support the center formers. The fourth support is taped to the fire wall and goes all the way across the fuselage so the foam won't run out the back end of the formers. This set up allows you to grow the foam right on the fuselage and is then carved down to shape. Also, the foam will have a perfect fit and sticks very well to the glass.

The best way that we found to mix the foam, is to cut the top off a gallon milk jug and mix a half a can of foam at a time. By mixing large quantities, the heat generated will cause the foam to expand quite well. Mixing in small batches doesn't expand nearly as well. Stir until the foam starts to rise. Let it expand to about 2 times the original volume before pouring into the forms. You will notice that the color will change from a dark brown to a creamy white. At this point, the foam can only be poured and not stirred any more or the bubbles will be destroyed. If you have low places, they can be filled later by just mixing up more. Sort of like mking a cake. After about an hour, the foam is ready to carve to shape.

To Contour the foam, use a 3' sanding board and start on the sides by sanding the foam so that it is flat with the fuselage side as shown. To do the second cut, nail a 1 in. board across the back of the foam at the firewall measuring up 4" from the bottom of the firewall. This board is to give you a guide to sand to. After you have sanded the second cut, the bottom of the fuselage should be in a straight line from the landing brake back to the firewall. The third cut is the inside walls of the Inlet. They are cut vertically along the template lines marked earlier on the fuselage. Finally, the outside corners are sanded to match the fuselage corners.

Use cardboard lid with wieghts to force the foam to spread evenly



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To make the lip, cut out 2 templates from poster board and nail them on the long ends of a green block of foam cut to 13"by 3"by 1" Using a block sander, shape the foam by sanding between the templates like you were hot wiring out a wing. Next lay up 2 plies of BID as shown. When this is cured, cut out on the back side of the lip, 1" in and lay up 2 plies as shown. This provides a locking channel for the cowling. When this is cured, recess the lip into the foam inlet with the back edge sticking out 1" past the edge of the firewall.

If this is a retro fit, part of the cowling attach lip needs to be sawed off as shown and reformed to follow the new contour. In any case, the attach lip is rebuilt so that it will continue from one side down across the Inlet lip and up the other side by nailing a block of 1" foam on the back of the Inlet at the firewall on both sides, then carving it down so that it matches the contour of the outside edges of the inlet. This will provide a former to glass over so that the cowling lip is built at the same time the Inlet is glassed.

Before glassing, micro the Inlet lip in place. If you are careful at sanding the finish, one ply of BID is sufficient to cover the Inlet since the only structure that requires any beefing up is the attach lip. If you feel that two plies are better, that's fine also. First lay up the outside skin, lapping about 1 1/2" on to the fuselage, orienting the glass at a 45 degree angle to the firewall. Then lay up 3 layers of 2" wide BID across from on side of the fuselage over the Inlet lip and down the other side at the firewall to form the attach lip for the cowling. After this has set up some, make a small Flox corner as shown and lay up one ply of BID on the inside walls of the Inlet. The top edge of the walls MUST be square. The most important area is at the very front of the Inlet, so don't lap the wall skins down on to the floor for the first 8" from the front making it bumpy. After curing, finish the skin as done on the rest of the EZ.

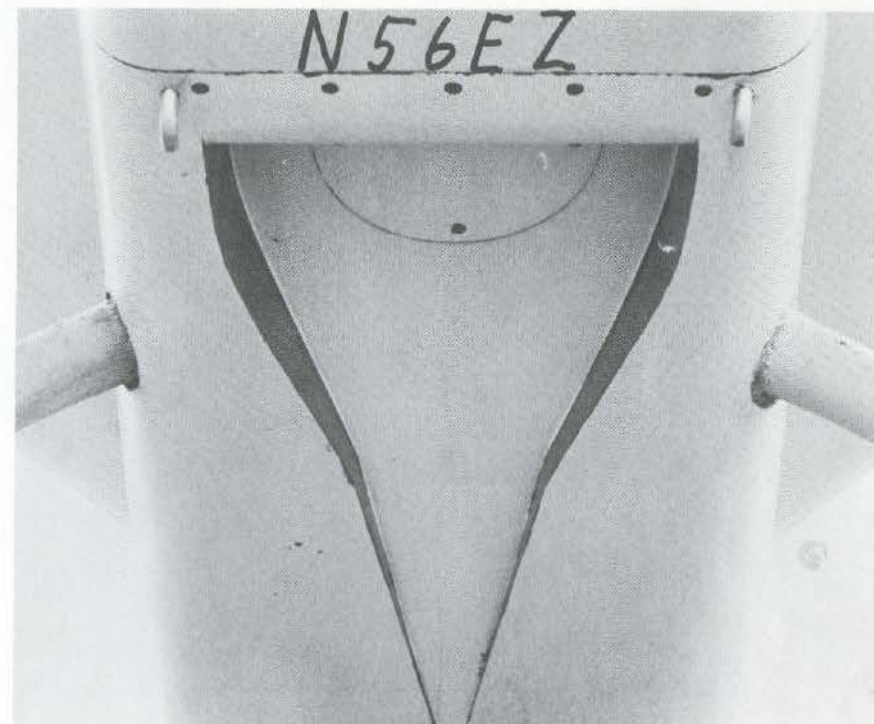
On the back edge at the firewall, cut out the 1" foam under the lip and lay up 2 plies of BID under the attach lip lapping down and covering the back ends of the Inlet.

An alternate method of constructing the Lip is to build the lip into the cowling rather than having it built into the fuselage.

To do this, all of the above would be the same except that you would leave out the lip. After completing the Inlet on the fuselage, carve out the lip from a block of foam 12in.x 1in.x 6-8in. and fit it in the inlet. Use duck tape on the sides of the Inlet so when glassing the lip later, it won't be the source of a lot of grief. When you are working on the cowling, fair this block into the cowl and cover with 3 plies of BID running at 45 degrees to the leading edge of the lip. Lap these layups back about 2 to 3in. on the inside. When the outside of the cowling is cured, you will need to slope the back side of the lip down to the cowling and lay up 2 plies of BID. This part is discussed in more detail later.

Cowling Modification:

The old cowl is cut off at the firewall and the new cowl is built on the new firewall.

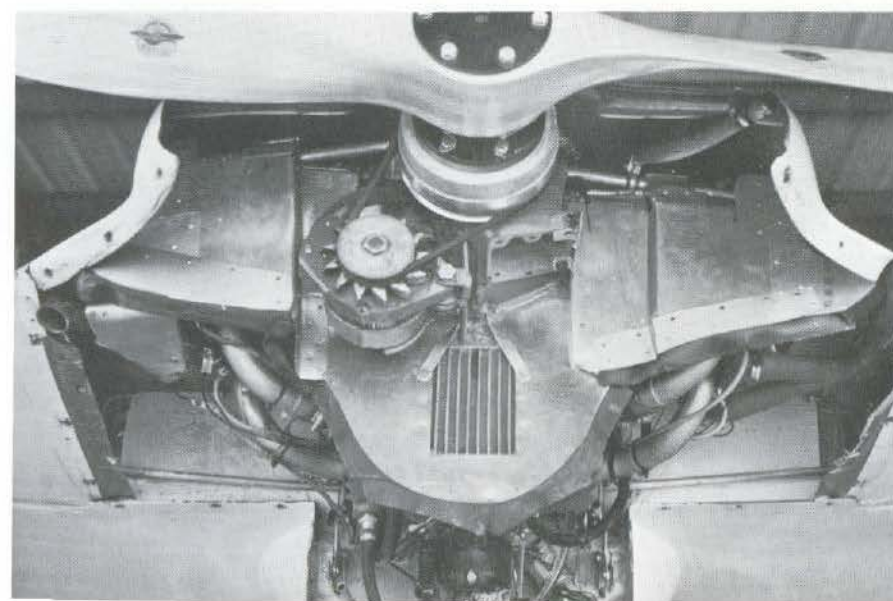
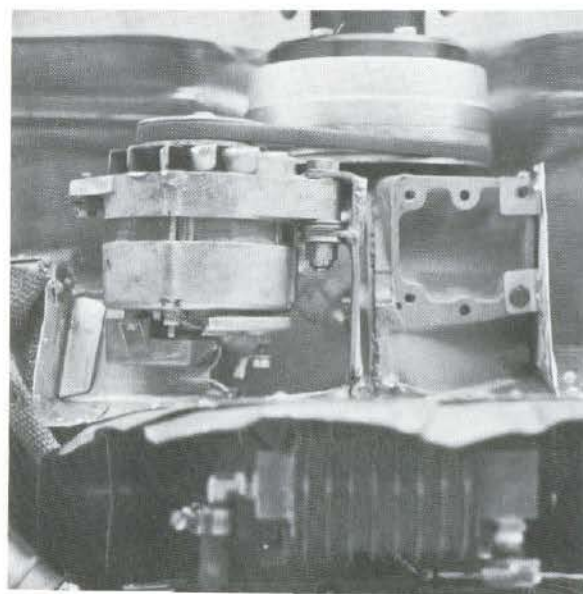
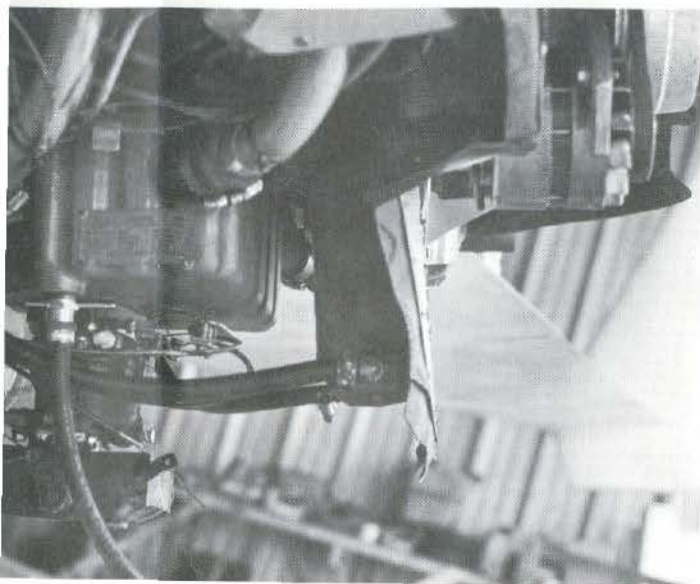
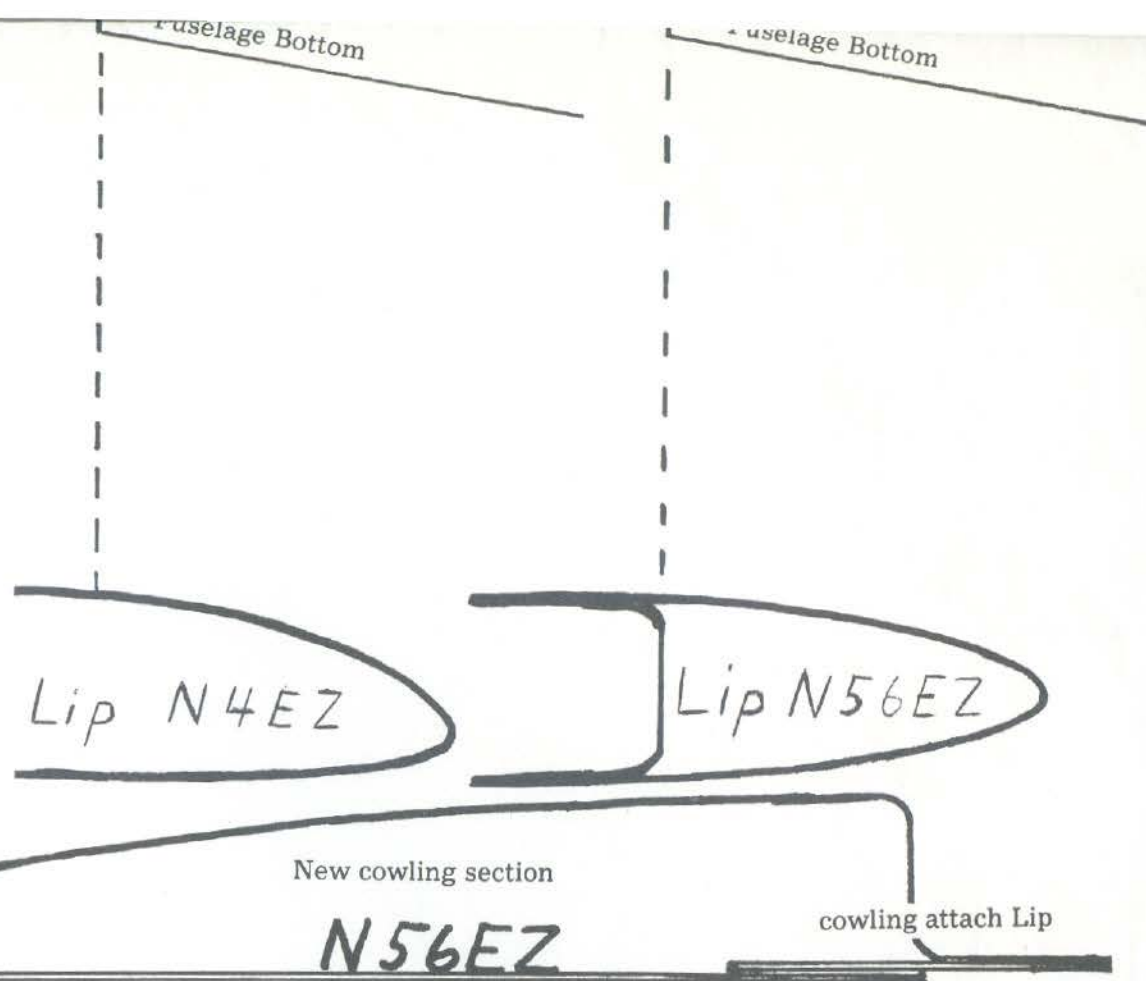


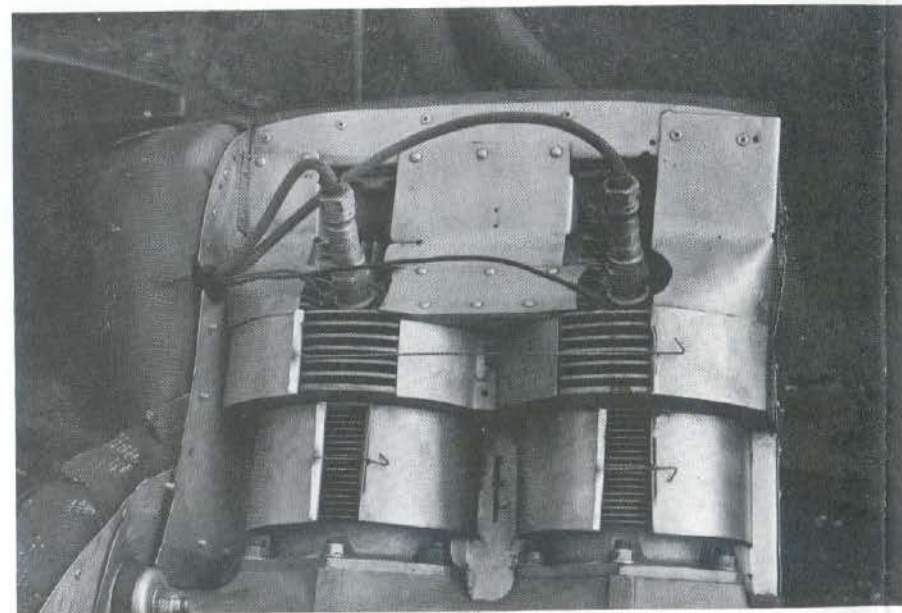
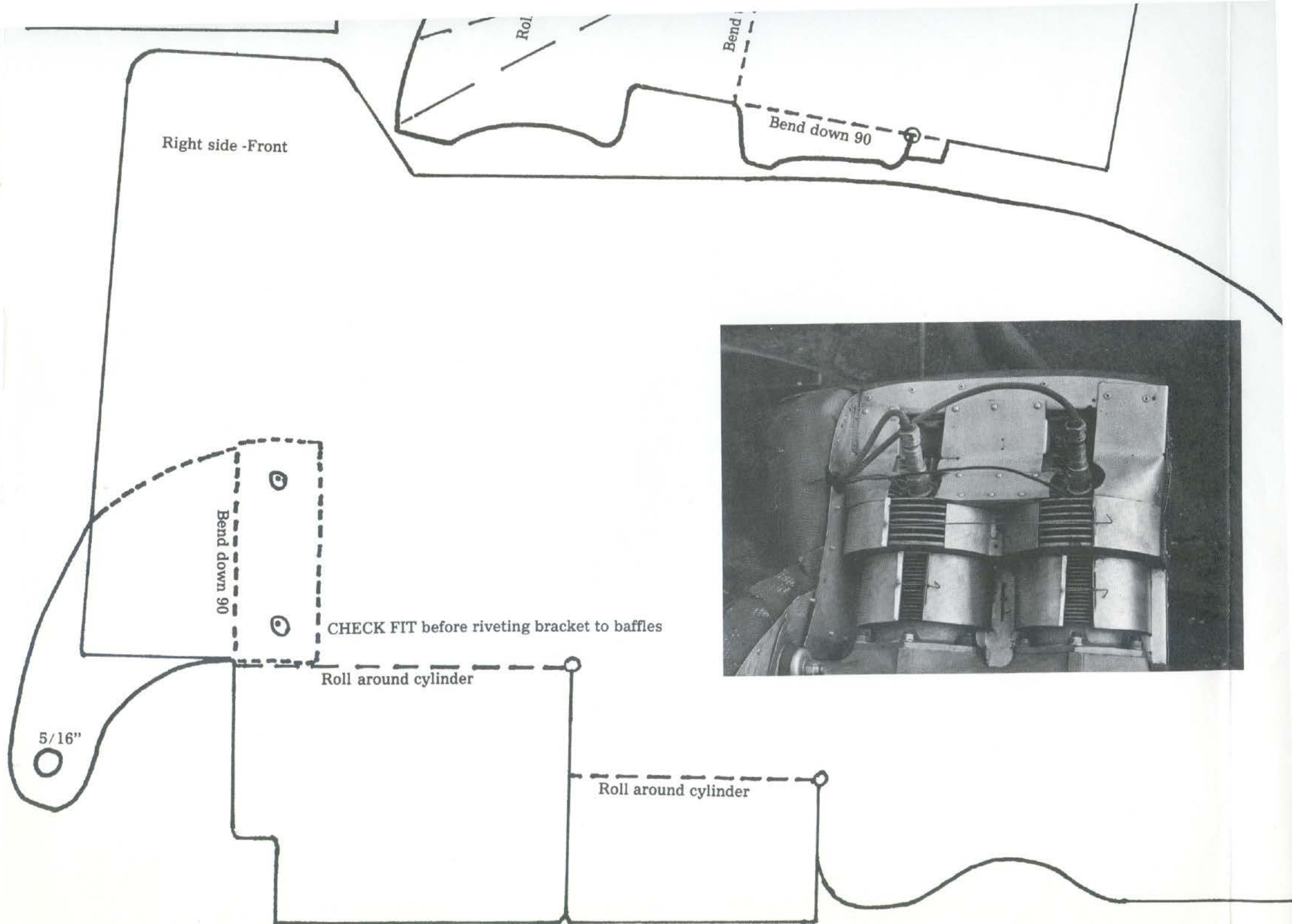
from the fuel tanks and proceeding back as shown. If you cut the cowling at the beginning of the project, you will get really committed. Sand 3" around the outside edges of the cowling along the cut. Next attach both the top and bottom cowlings to the fuselage. Using foam blocks, build up the voided area so that the cowling can be reshaped to match up to the new Inlet. Use duck tape on the fuselage so that the glass from the cowling doesn't get stuck to it. Then lay up 3 plies of BID lapping 2" onto the cowling. Trim the edges at the fuselage so that they are flush. After curing, remove lower cowling and foam from inside of the lower cowl, then sand the forward edge on the inside so that the attaching lip can be mounted.

To make the cowling attach lip, lay up 2 rows of duck tape side by side along the outside of the cowling along the front edge. Then lay up 4 plies of bid 2" wide over the tape and use peel ply over the last layer. When the glass has set up, pop it off the cowling and install on the inside using floc with screws to hold it in place. The screws are removed later. Let the glass extend 1" over the edge of the cowling.

When the attach lip is cured, install a block of foam with microed into the bottom of the cowling at the back of the Inlet lip and slope it back about 8", then cover it with 2 ply BID. This gives some strength to the cowling and provides a smooth ramp for the incoming air in back of the Inlet lip. Install 3 cowling fasteners across the bottom of the cowling and 3 on each side in addition to the others installed for the rest of the cowling.

Finish the surface as per Rutan's finishing manual.





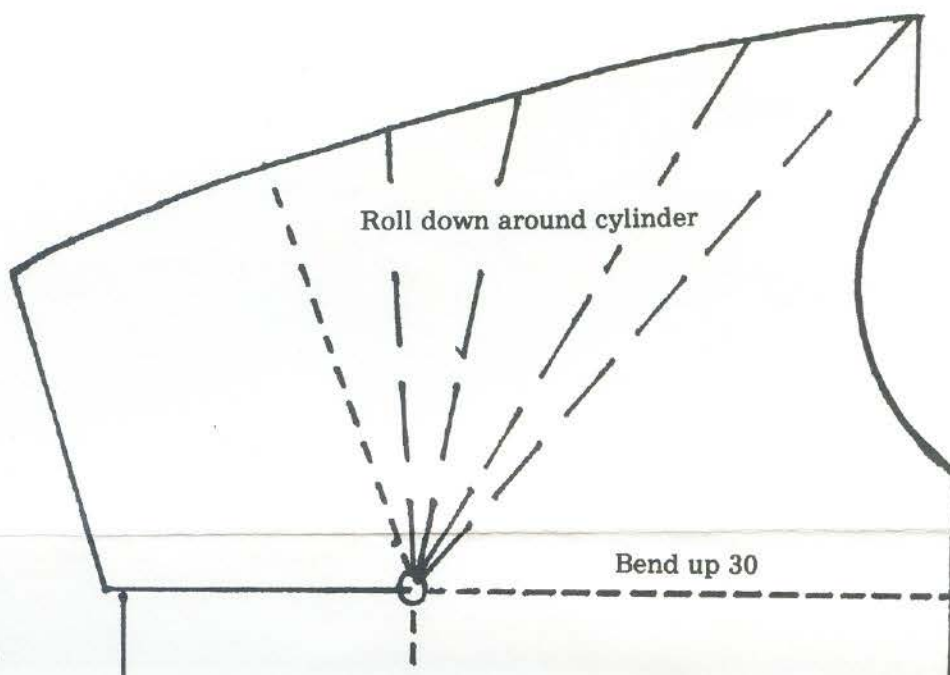
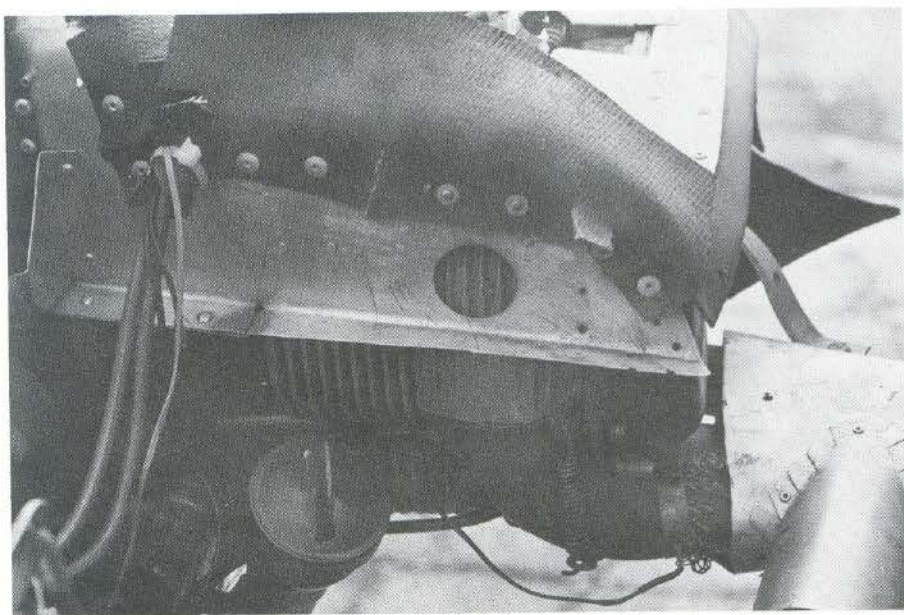
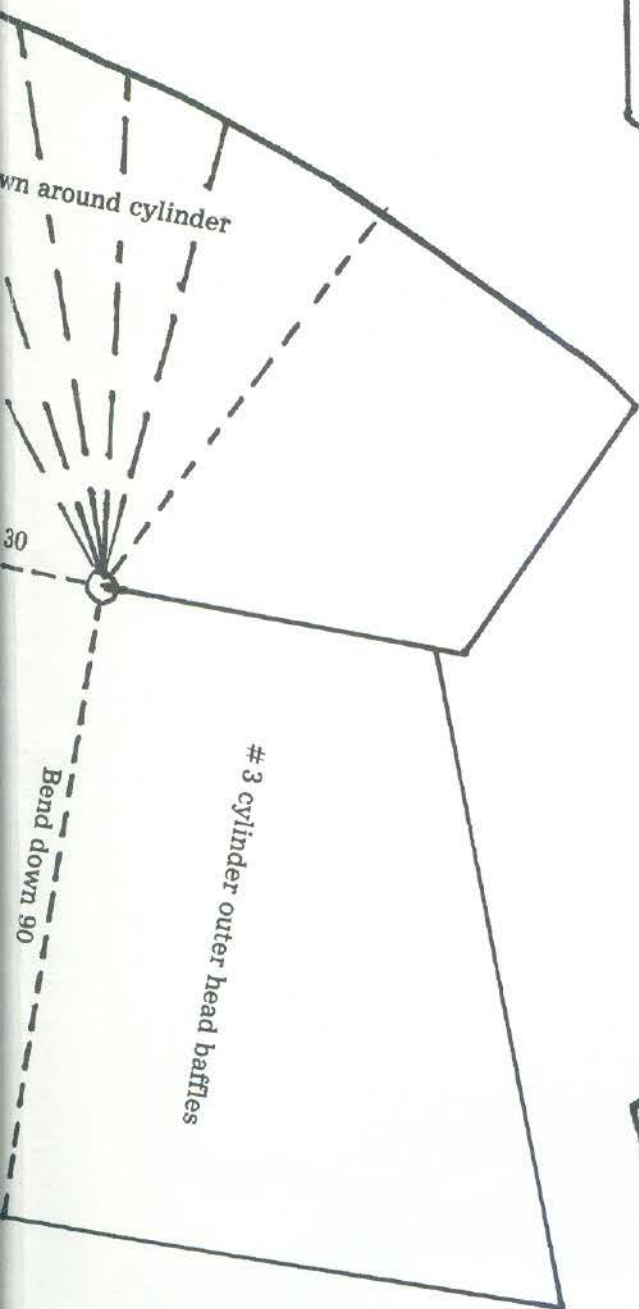
Roll down around cylinder

Bend up 90

inner cylinder baffles
2 required

Bend up 90

Roll down around cylinder



Right side

Bend up 90

Bend down 90

Bend up 90

Bend
down 90

Bend up 90

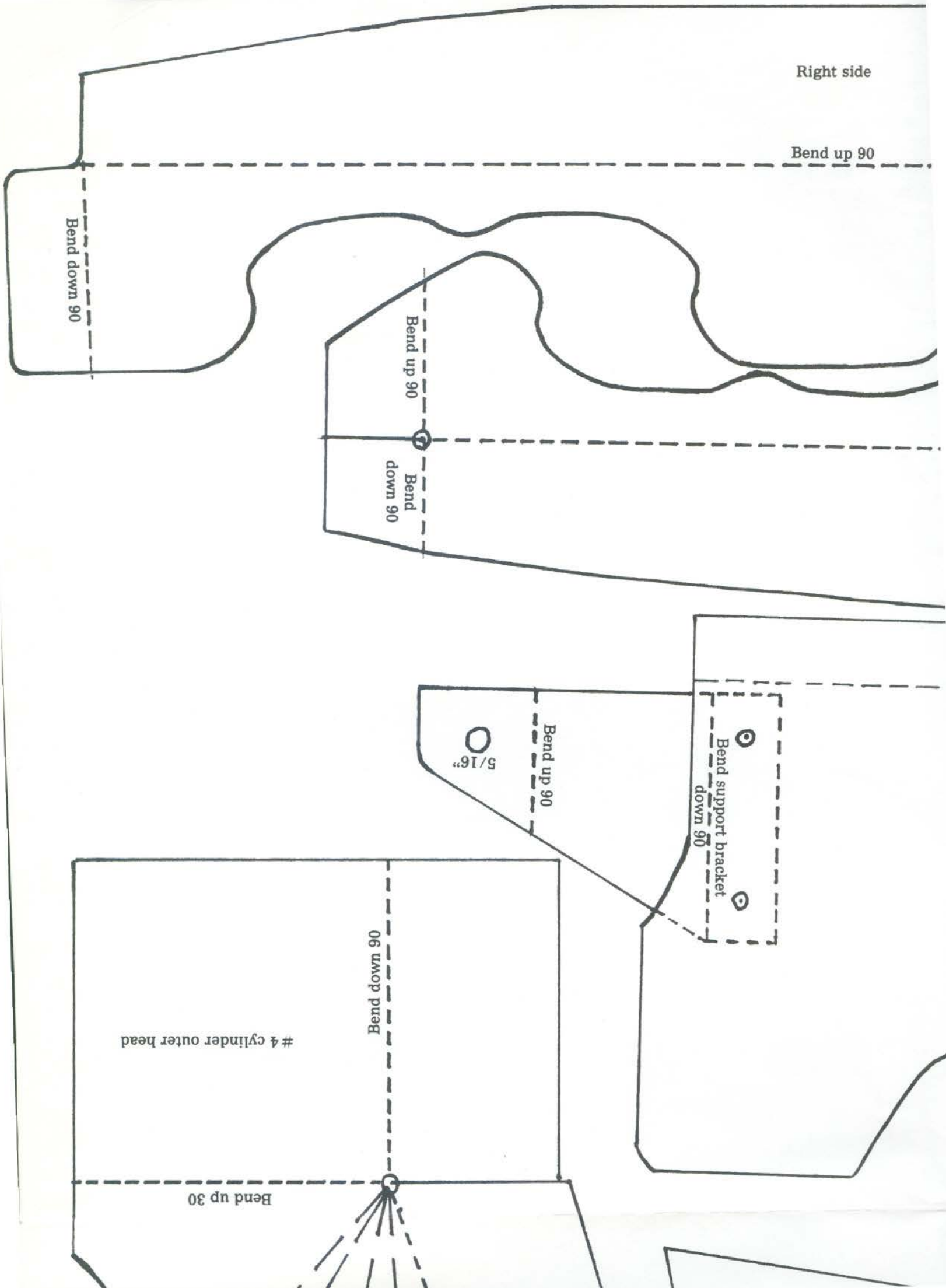
5/16"

Bend support bracket
down 90

Bend down 90

4 cylinder outer head

Bend up 30



inner cyl. hold down bracket
2 required

Bend up 90

Bend down 90

use valve covers as a
guide to mark holes

Bend down 90

Left side

Bend down 90

Cooling
Hole

1 1/2" dia.

Left side-Front