2244 Airport Way, Redmond, Oregon 97756 Phone 541 923-2233 Fax 541 923-2255

SERVICE BULLETIN **SB034-0597**

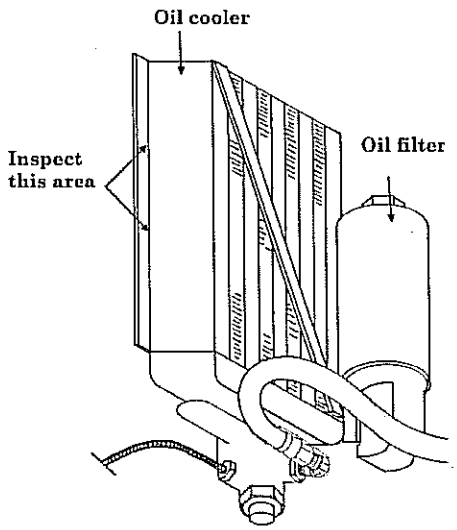
Subject: Lancair IV and ES
Date: 1 May, 97
Ref: Applies to IV and ES TSIO-550 and IO-550
Pages: 1
Status: Advisory

Background:

During a recent annual we noticed an oil cooler flange crack on the Lancair IV's TSIO-550 and the Lancair ES's IO-550. The crack is normally located on the left flange and runs along the bend in the cooler. Keep in mind that the bend is located on a piece of the cooler that does not contain any oil.

Action:

Inspect and repair if needed.
Put a bead of weld along the bend area of the oil cooler.



Note:
If you do have a crack in you flange please make a copy of this service bulletin, mark where it is located, and return it to Lancair.
R&D Fax# is 541-923-7462.

2244 Airport Way, Redmond, Oregon 97756 Phone 541 923-2233 Fax 541 923-2255

SERVICE BULLETIN **SB038-0997**

Subject: Lancair Filter Bypass Doors (IV & IV-P)
Date: 17 September, 97
Ref: Chapter 31, Section G.
Pages: 1

Background:

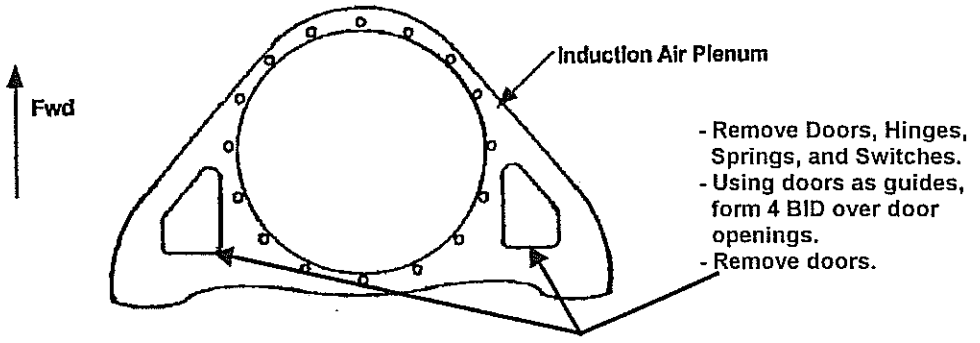
Recently we discovered that the engine inlet/alternate air bypass doors, located between the air filter and turbo chargers, may vibrate during flight. This vibration could cause the doors' closing springs to fatigue and break, or cause the safety wire to break, which will release the hinge pin. Any of this material released into the intake system will damage the turbo compressor or possibly the engine.

If you have this system installed, the aircraft should not be flown until the following partial correction has been completed.

Note: A new alternate air bypass door system is being designed and will be supplied as a kit as soon as possible.

Action:

Remove the bypass door, hinges, and micro switch assemblies from the aircraft. Put release tape on bypass doors and use them as a temporary form for a 4 BID patch over the door openings. Remove the doors after the 4 BID has cured.



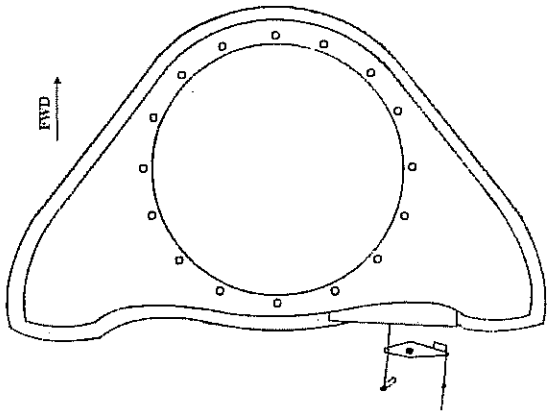
IMPORTANT: The aircraft can be flown after completing the above patch and prior to installation of the new bypass system. But be aware of the obvious, for there is now no engine alternate air bypass system!

Air Filter Bypass Door

The engine induction air comes from a plenum built into the lower front cowl area and is "fed" by a NACA duct also built into this area. In this set of instructions an air filter bypass door will be installed. This allows air to flow to the engine should the filter clog.

Induction air plenum

Figure 1

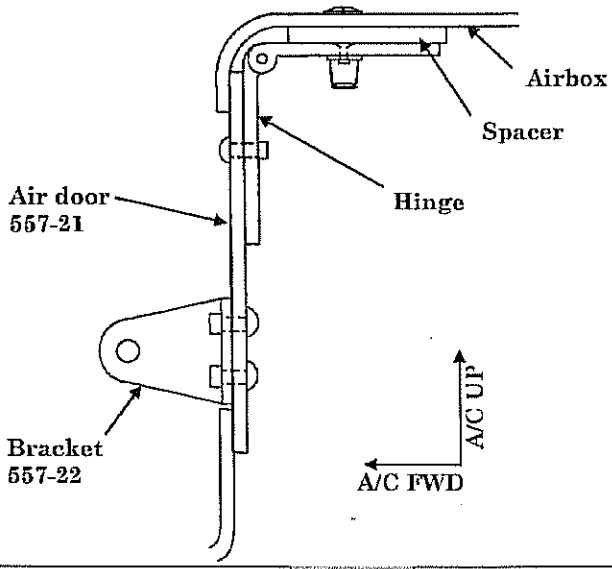


1. Assemble the airbox before bonding it to the plenum.

a). Temporarily fit the hinge to the door with superglue and, using a spacer made from aluminum scrap, fit the assembly inside the airbox (see figure 2).

Cross Section of Airbox

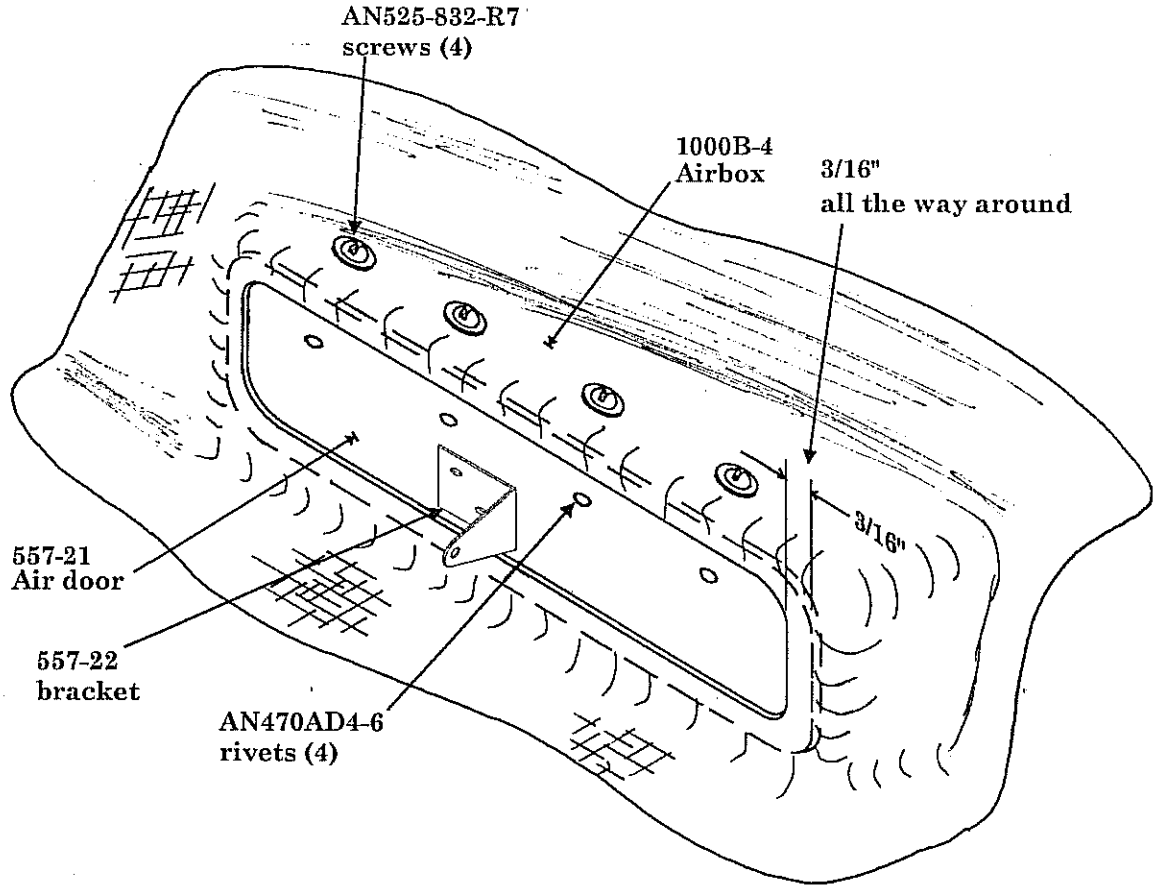
Figure 2



Draw a line around the door on the inside of the airbox. Remove the door and draw another line inset 3/16" from the first line. Cut out the opening for the air door along the inner line (see figure 3).

Assembling the Airbox

Figure 3



b). Install the assembly using AN-525-832-R7 screws, K1000-08 nutplates, and AN426A3-5 rivets. Use AN470AD4-6 rivets to attach the door to the hinge.

c). Mount the 557-22 bracket on the door as close to the bottom as possible using AN470AD3-4 rivets.

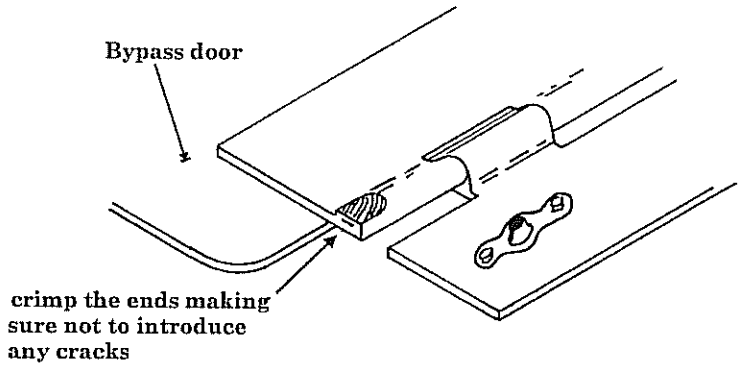
d). Secure the hinge pin (see figure 4).

e). Make sure that the door seats well against the air box and moves freely on the hinges.

NOTE: It is recommended that you silicone a 1/8" or 1/4" mesh screen over the door opening, with a small slot cut out for the 557-22 bracket to pass through.

Secure the Pin

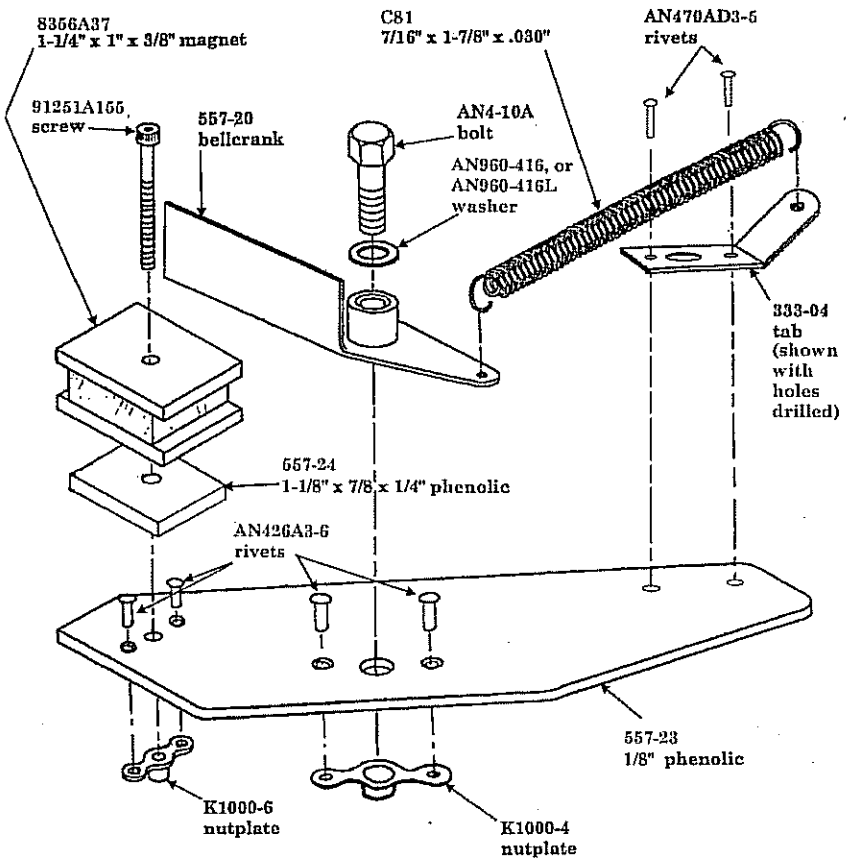
Figure 4



2. Complete the bellcrank assembly.

Exploded View of Bellcrank Assembly

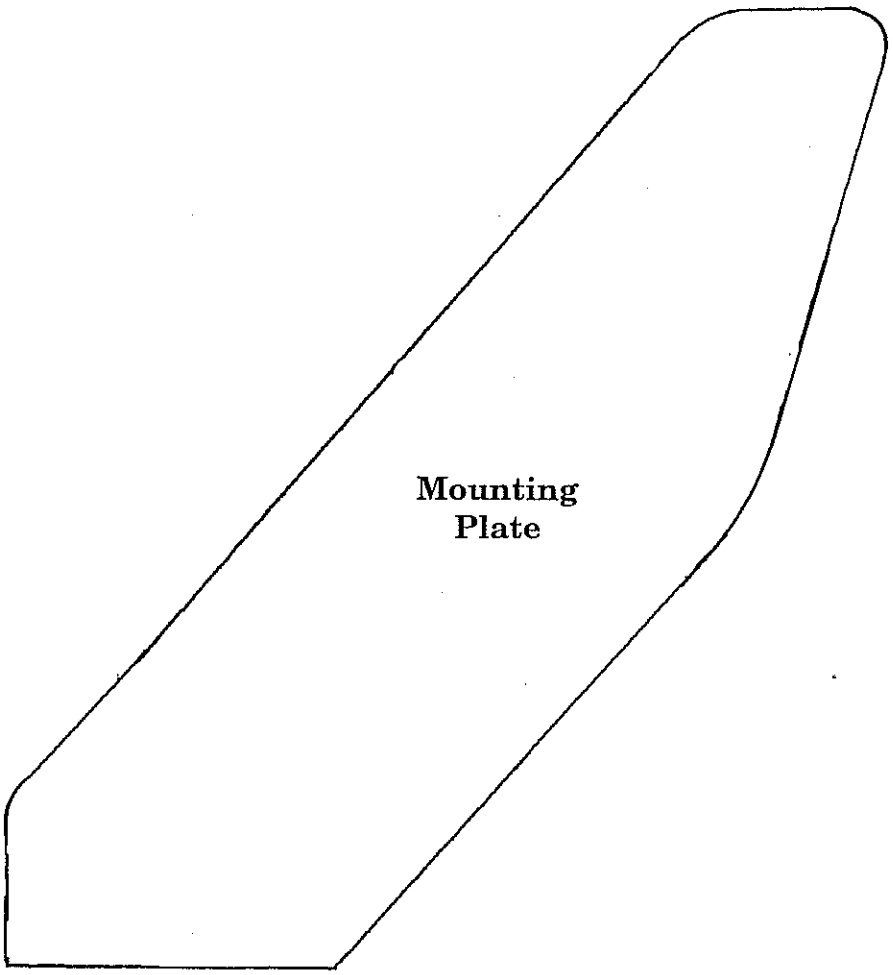
Figure 5



a). Use the template to cut the 1/8" phenolic mounting plate (p/n 557-23). Cut a 1-1/8 x 7/8 x 1/4" phenolic spacer (p/n 557-24). Drill the two #40 holes in the 333-04 bracket (see Figure 5).

Phenolic Template

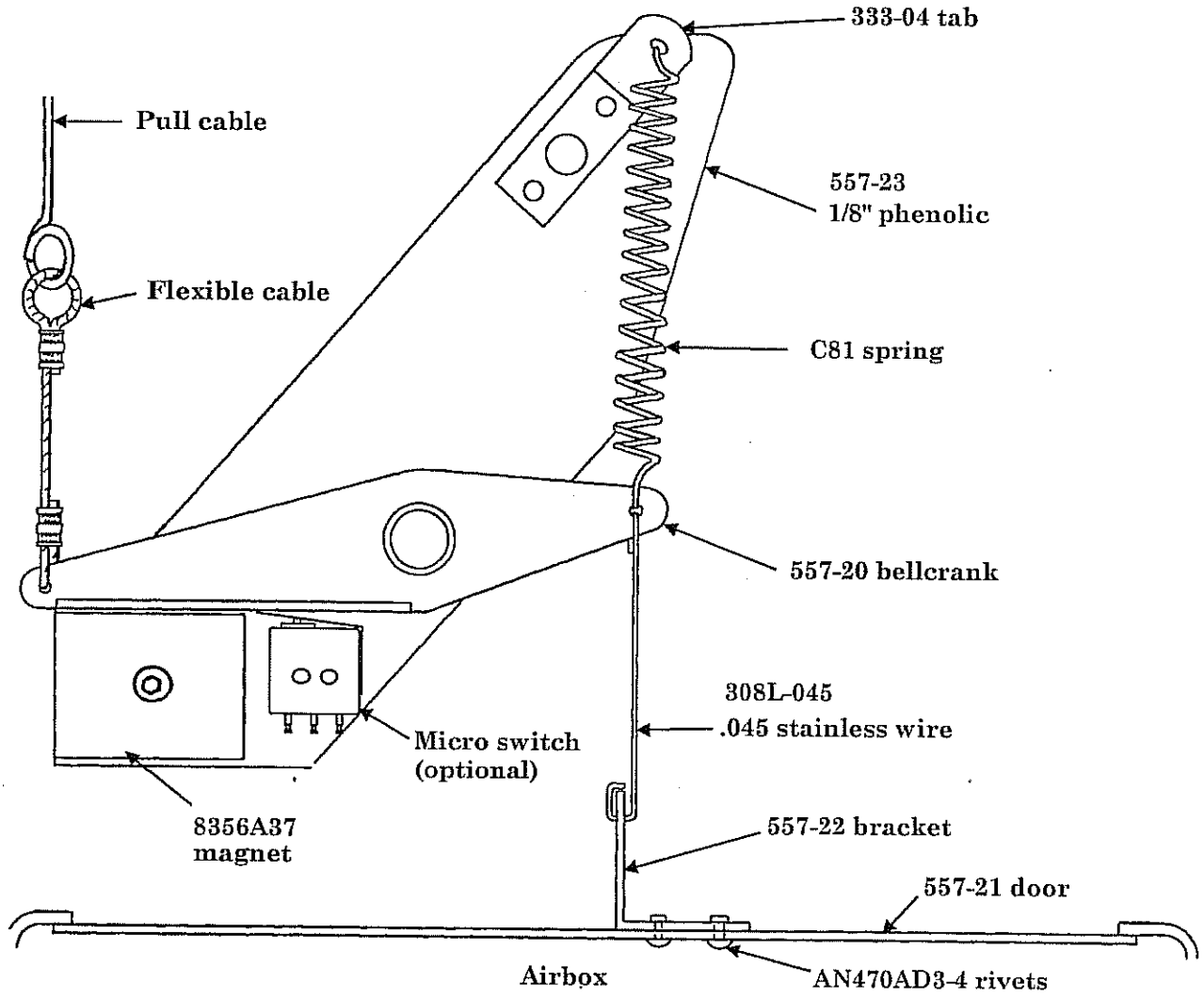
Figure 6



b). Set the magnet, bellcrank and bracket on the plate (see Figure 5 & 7). Mark the position of the mounting holes and mount the components. If you plan to install an optional alternate air door light, you should also install a micro switch on the plate.

Assembling the Bellcrank & Plate

Figure 7



Note: The magnet pole plates must be perfectly aligned with the bellcrank. While the mounting screw is slightly loose, put some superglue between the magnet, spacer, and plate while everything is aligned properly and let the glue set up. Then tighten the screw and check again to make sure the magnet is still aligned.

c). Put loctite on the K1000-4 nutplate and tighten the bolt so the bellcrank swings freely with no wobble or binding (see Figure 5).

d). Make up a short length of cable if you intend to install an optional manual pull cable.

Note: If you have already mounted the plenum, continue with step 3. If the plenum is not yet mounted in the cowling, go to step G4 in chapter 31 of the manual and install the plenum, then return to step 3.

3. Prefit the alternate airbox assembly and the bellcrank assembly in the cowling. Bond them in place.

a). Cut the stainless wire to length allowing for a loop at each end (see Figure 7).

b). When you are satisfied with the final fit, establish the position of the box on the plenum. Set the box on the plenum bottom flange and push it as far to the right as possible. Make sure the left side of the airbox is as far down and forward as possible to clear the motor mount. With the box temporarily in place, trial fit the bottom cowling and check for clearance between the box and engine mount. Trim as necessary. Bond the airbox in place. Make sure not to twist it in a way that would throw the door out of alignment.

c). Protect the nut plates and bolt threads on the bottom of the bellcrank mounting plate with a foam dome or tape and bond the assembly to the bottom of the cowl.

d). Fit the stainless wire so that the door is shut tight and the loops are bent back over the wire.

e). Check the complete assembly for proper operation and freedom of movement.

Note: If you have the large exhaust openings on the bottom cowl, you will need to modify them to fit the bellcrank assembly. A support shelf bridging the deeper bottom cowl would work.

WARNING: Verify that all mechanical fasteners are properly secured. Apply locktite to the nutplates inside the plenum. Sand off excess epoxy/micro that may break off. Any loose parts inside the plenum will more than likely find their way into the engine.

CHAPTER 31
REVISION LIST

The following list of revisions will allow you to update the Lancair IV construction manual chapter listed above.

Under the "Action" column, "R&R" directs you to remove and replace the pages affected by the revision. "Add" directs you to insert the pages shown and "R" to remove the pages.

Page(s) affected	Current Rev.#	Action	Description
31-1 thru 31-12	0	None	
31-13	C10	R&R	Added baffle numbers to Fig. 31:C:1.
31-14	C10	R&R	Edited baffle numbers on Fig. 31:C:2.
31-15	0	None	
31-16	C10	R&R	Added part numbers.
31-17	0	None	
31-18 thru 31-20	C9	R&R	Edited Figures.
31-21	0	None	
31-22	C9	R&R	Edited Fig. 31:C:8
31-23	0	None	
31-24	C16	R&R	Changed Turbine Inlet Note in Fig.
31-25 thru 31-27	0	None	
31-28	C11	R&R	Edited Fig. 31:D:5.
31-29	0	None	
31-30	C12	R&R	Edited Fig. 31:D:8.
31-31	0	None	
31-32	C12	R&R	Edited Fig. 31:E:1.
31-33 and 31-34	C13	R&R	Deleted Cessna gascolator.
31-35	C9	R&R	Re-numbered paragraphs.
31-36 & 31-37	C10	R&R	Changed part numbers.
31-38	C9	R&R	Re-numbered paragraphs.
31-39	0	None	
31-40	C12	R&R	Edited part numbers.
31-41 & 31-42	0	None	
31-43	C13	R&R	Added note to Fig. 31:F:4
31-44	C12	R&R	Crouded Part of next page
31-45 thru 46.4	C16	R&R	Updated Induction Air System
31-46.5	C16	Add	Newpage.
31-47	C12	R&R	Edited paragraph G3.

CHAPTER 31
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Under the "Action" column, "R&R" directs you to remove and replace the pages affected by the revision. "Add" directs you to insert the pages shown and "R" to remove the pages.

Page(s) affected	Current Rev.#	Action	Description
31-48	0	None	
31-49	C12	R&R	Cleaned up so section H really starts on next page.
31-50 thru 31-54	C11	Add	Hartzell Installation.

Chapter 31
Firewall Forward

REVISIONS

From time to time, revisions to this assembly manual may be deemed necessary. When such revisions are made, you should immediately replace all outdated pages with the revised pages. Discard the outdated pages. Note that on the lower right corner of each page is a "revision date". Initial printings will have the number "0" printed and the printing date. All subsequent revisions will have the revision number followed by the date of that revision. When such revisions are made, a "table of revisions" page will also be issued. This page (or pages) should be inserted in front of the opening page (this page) of each affected chapter. A new "table of revisions" page will accompany any revision made to a chapter.

Arrows

Most drawings will have arrows to show which direction the parts are facing, unless the drawing itself makes that very obvious. **"A/C UP"** refers to the direction that would be up if the part were installed in a plane sitting in the upright position. In most cases the part shown will be oriented in the same position as the part itself will be placed during that particular assembly step. However, time goes on and changes are made, so careful attention should be paid to the orientation arrows. That old cartoon of the guy agonizing over the plans for his canoe, built one end up, one end down, should not happen in real life. Especially to you.

CONTENTS

A. Mounting the Engine

Note 1. The engine requires several modifications to properly fit the Lancair IV. These include:

- Turbo intercoolers
- Lower intercooler induction tubes
- Oil separator cans (mount to bottom of turbos)
- Left side exhaust tail pipe

These parts can be modified by Neico Aviation. When returning, please call inventory to get a Return Material Authorization (RMA) number for proper internal tracking.

Note 2: Review pages 31-43 for engine installations most easily performed prior to mounting the engine. Most important are the turbo oil return ftgs. which mount into the engine driven oil scavenge pump (pg. 43).

Note 3. To install the engine over the mount, the turbo chargers and the back waste gate/crossover tubes should be removed. During this process, use a band saw to cut the clearances on the left and right turbo support brackets per Figure 31:A:2. Be sure to break edges with wire wheel or sand paper.

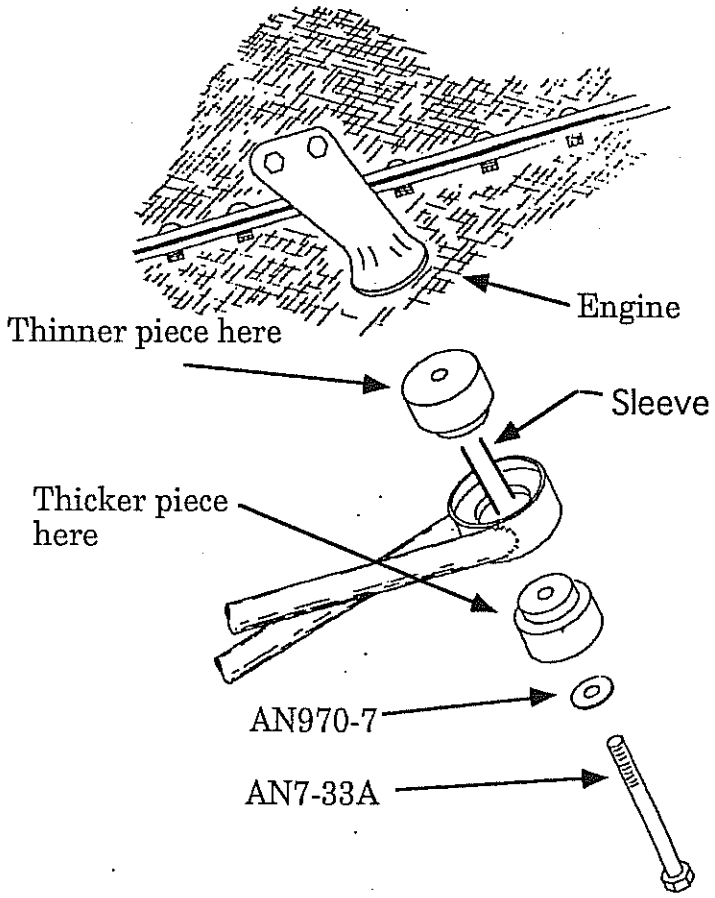
1. Position the vibration isolators on the mount. The high temp. ones must be to the aft. The thinner half of the isolator is used between mount and engine.

(fwd) Std isoloators:	#94011-20
(aft) High temp. isolators:	#94001-01
Bolts:	AN7-33A
Washers: (in isolator box)	

2. Set the engine on the isolators and bolt up. Gently ease the engine down using a suitable hoist. As you make contact, holding some of the weight off, begin by setting the front two pad bolts. Be careful to not cross thread the "feet" on the engine. After that, set the aft two bolts, this process will take a little wiggling. DON'T FORGET THE INSERTS IN THESE ISOLATOR ASSEMBLIES.
NOTE: Torque the AN7-33A bolts to 400 in/lbs.
Reinstall the turbos with the clearanced turbo support brackets.
Reinstall aft waste gate tube.

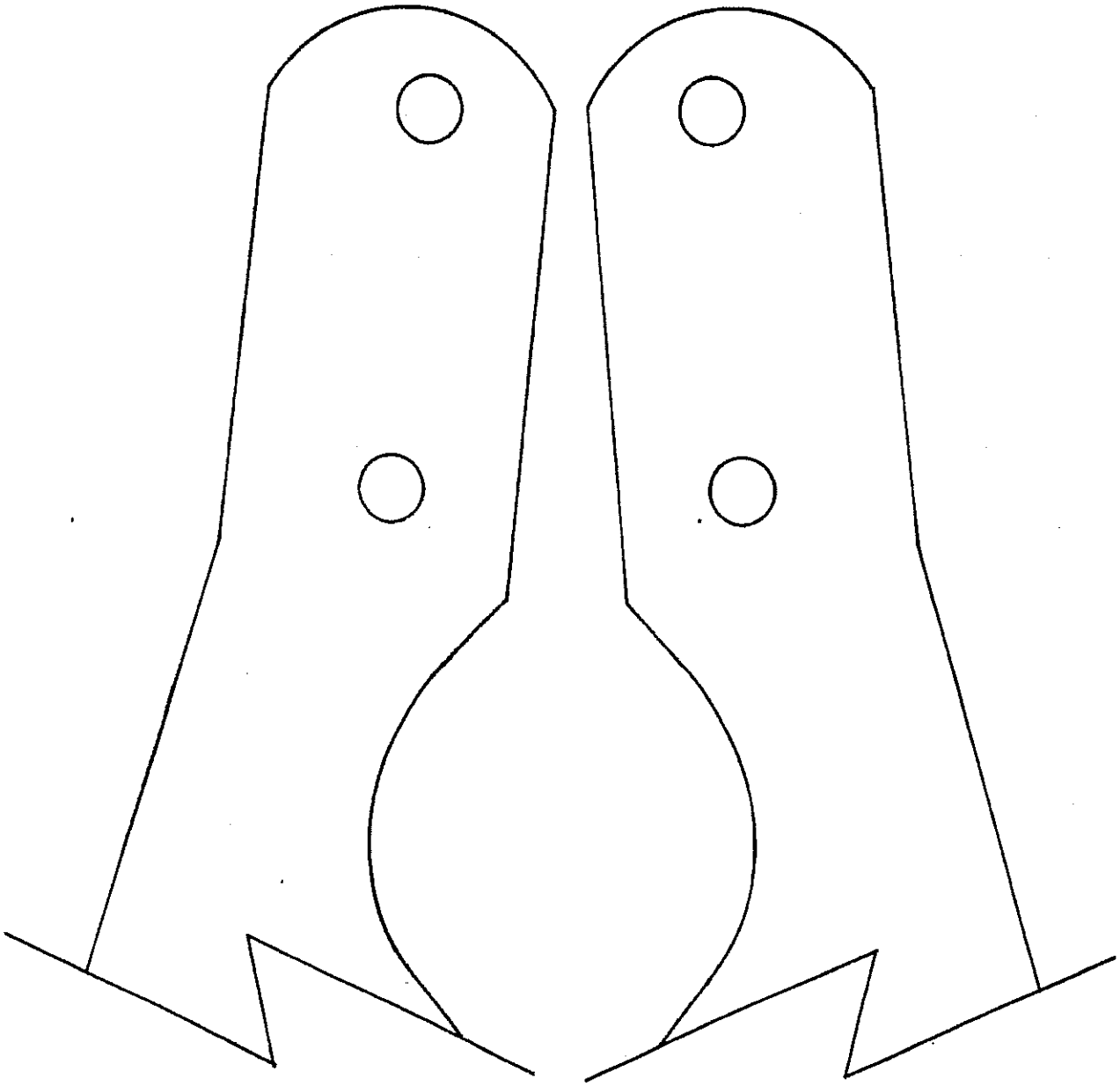
Engine Mount Pads

Figure 31:A:1



Turbo support bracket trim patterns

Figure 31:A:2
(Shown full size)
Note: Be sure to remove all grinding & bandsaw marks. All edges must be smooth.

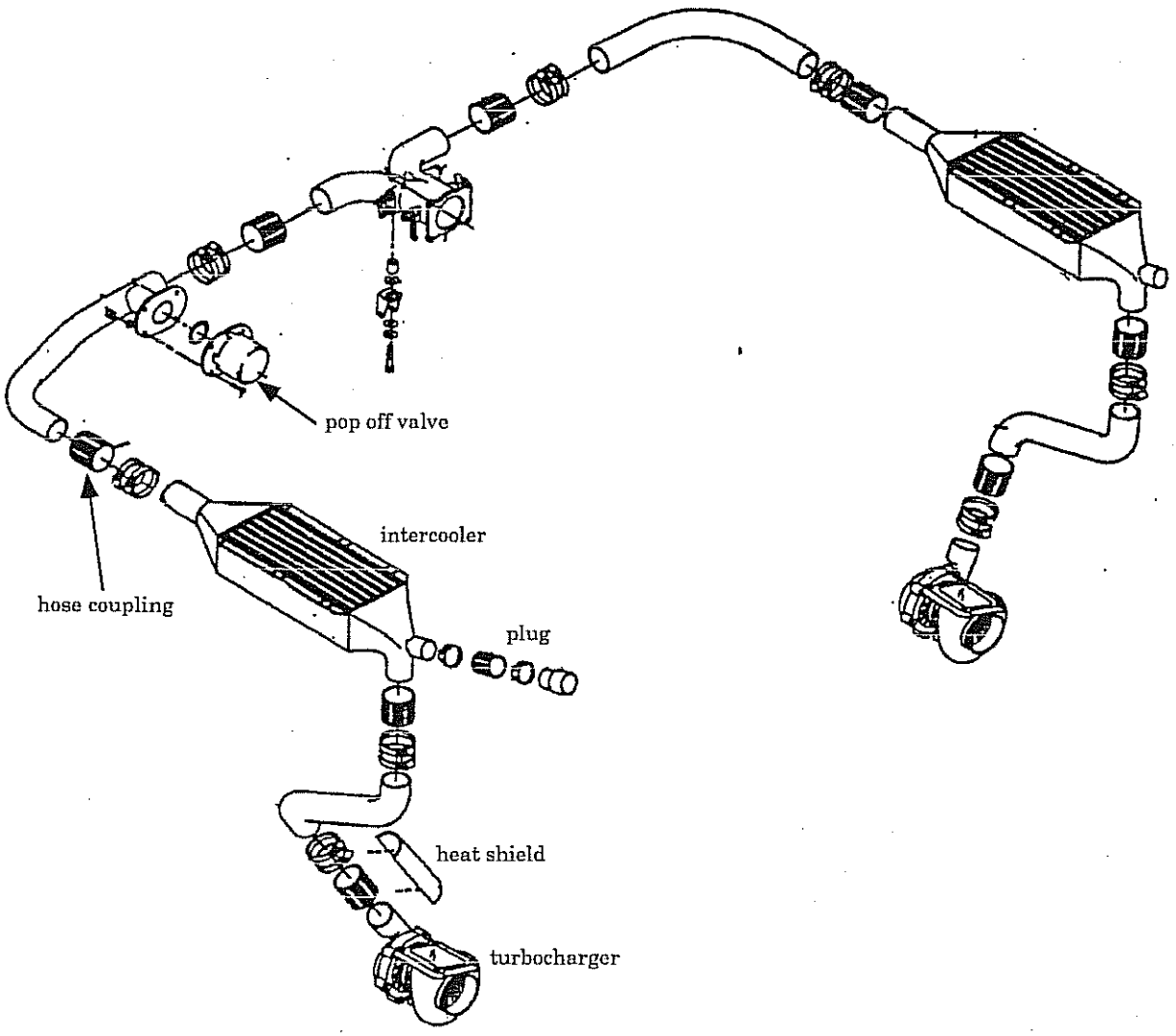


A3. Install the intercoolers. Note that these require modification. You should only temporarily install them since when the baffling is installed, it becomes advantageous to remove them for better access. But it's good to temporarily install them now to assure a proper cowl fit.

WARNING: It is critical that all induction lines and related hose connectors, be secured properly. All induction hose connectors must be centered over the joint where two tubes meet and tightly secured with the double ring clamps supplied. Failure to secure these properly could result in them being blown off. That could cause engine failure, particularly true at higher altitudes.

Intercooler assembly

Figure 31:A:3

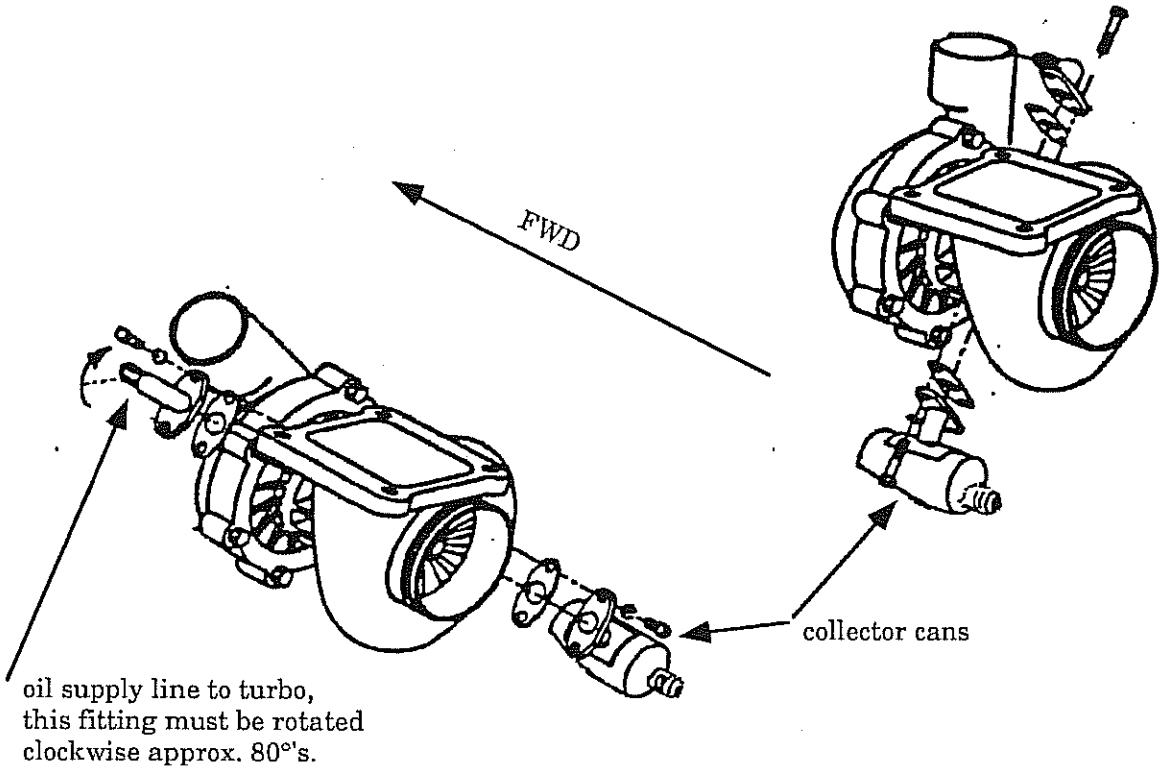


A4. Mount the pop off valve. This is the small, round canister which attaches to the left, fwd. induction tube. A flat mounting plate is attached to this induction tube for this mounting. This valve is merely a safety device which opens and releases pressure if manifold pressure were to exceed limits.

A5. Mount the oil collector cans onto the tubochargers. These cans require modification. They should be orientated such that the ftgs. face aft and the entire can locates slightly inward and down from the turbocharger.

Turbochargers

Figure 31:A:4



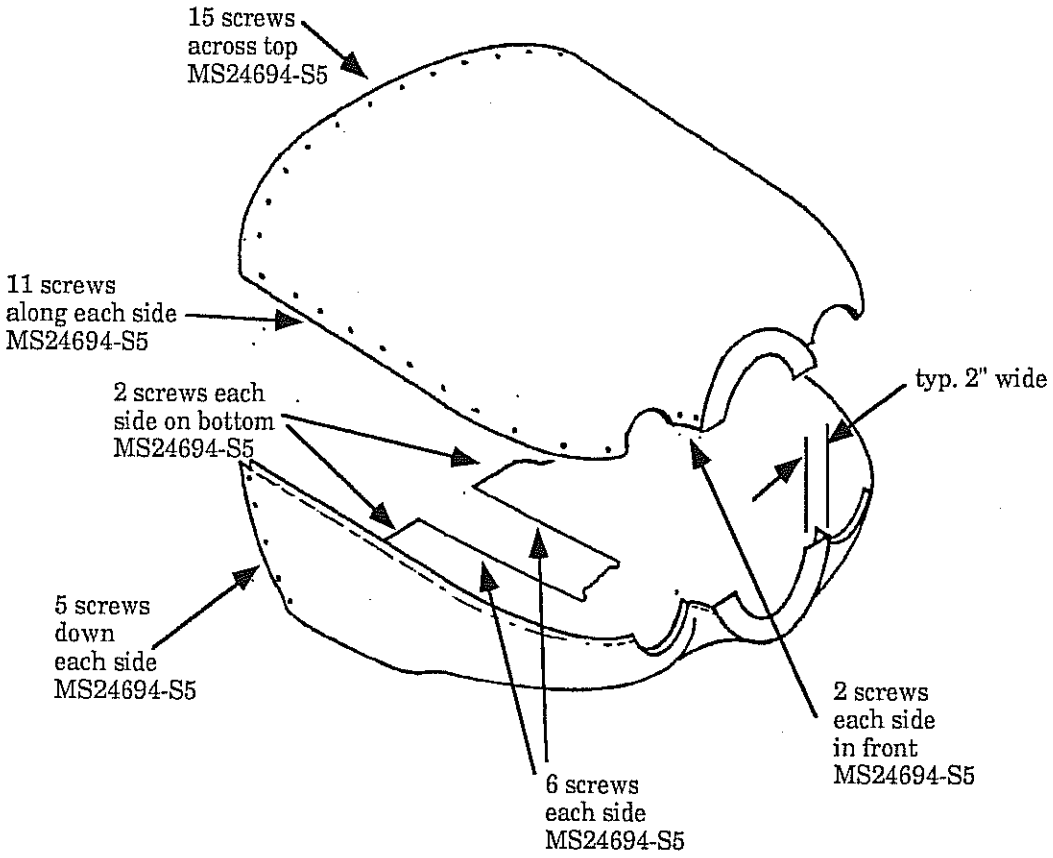
A6. Realign the left turbo, oil intake ftg. This 90° ftg. is located on the top of the turbocharger housing. It needs to be rotated clockwise about 90°'s so that the connecting line can route toward aircraft centerline, between the turbo housing and the air impeller housing. It is typically necessary to remove the ftg. plate, place the assembly in a vise and carefully rotate as needed. Be sure to leave the inbd bolt in place during this rotation since the rotating process prevents the bolt from being fully removed from its flange.

B. Cowling

Temporarily bolt the propeller and back plate to the engine. This will locate the correct cowling position. If you don't have your prop & spinner, you can mount up a 16" diameter piece of plywood, 4" fwd of the crankshaft flange. That will represent the position of the cowl. (This must obviously be centered on the crank.)

Cowling / screw patterns

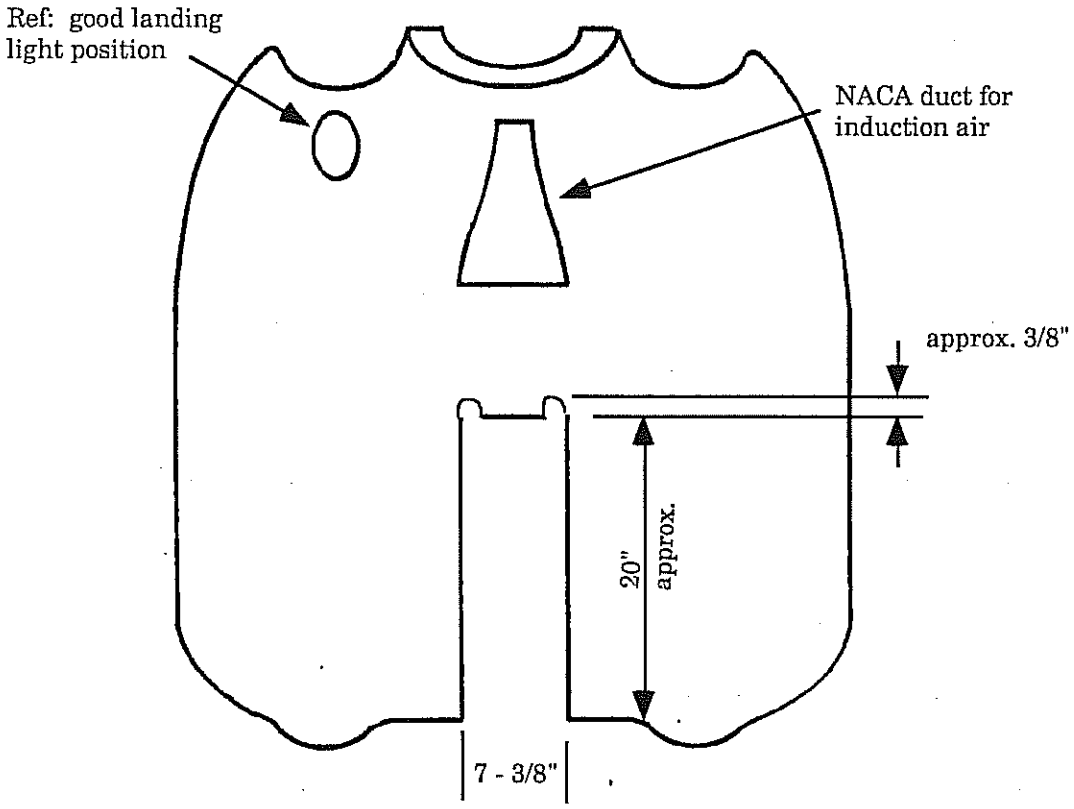
Figure 31:B:1



B1. Measure and cut the lower cowl, gear door clearance hole. You'll need a little help to hold the cowl during early fitting stages. The gear door hole should measure about 7-3/8" wide by 21" long. At the front, leave the cowl cutout such that the nose gear doors overlap onto the cowl by about 1/4". Your installation may vary slightly so use your own dimensions. Note that there are two little notches cut in the front corners of the otherwise rectangular opening. See Fig31:B:2 This is to provide room for the nose gear door to clear as the cowl is slid up into position on the plane.

Lower cowl / gear door clearance

Figure 31:B:2

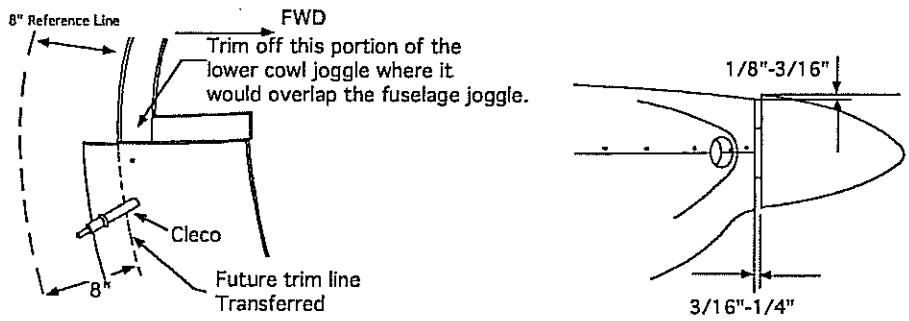


B2. Place reference lines around firewall joggle which will located screw positions. This reference will also locate the TE of the cowling. The easiest way to locate the screw positions is to simply mark, on the fslg., a horizontal line which intersects the screw location in the joggle. Extend such a line through each individual location center and about 8" back on the fslg. Then place a crossing line exactly 4" aft from where the hole should locate, based on the fslg joggle. Make another cross line 4" aft of the joggle, this will tell you where to trim the cowling.

The long line will give you an alignment reference later and the cross marks will tell you exactly how far forward to locate both the screws and the trim line for the cowling. See Fig.31:B:3

Cowl- aft joggle & fwd position

Figure 31:B:3



LOWER COWL (RT. side shown)

B2. Slip the lower cowl into relative position on the plane. Use spring clamps or similar to grip the cowl to the firewall joggles and align with the spinner back plate. There should be about 3/16" - 1/4" space between back plate and front of cowling. You can also use clamps with wood spacers between spinner back plate and cowl to hold position. The goal is to establish a relatively uniform spacing between cowl LE and spinner back plate TE and you'll want to get the air inlets level. If achieving a perfect spinner alignment becomes difficult, just do the best possible and adjust with either micro or scarf a thin piece of foam on the cowl, sand to establish a uniform gap from spinner back plate and cover with 1 BID. Note that the vertical flange on the cowl LE (material running directly behind the spinner) should be trimmed to about 2" max. in width.

When the cowl is up snug along the firewall joggles, centered as best a possible left to right and fitted to the spinner back plate, mark all the TE trim lines. To do this, lay your ruler along the straight lines made on the fslg. Transfer the line onto the cowl. Then measure fwd from the aft most cross mark and transfer a reference line for the TE trim line onto the cowl. Also transfer the fwd cross mark which will represent the location for the screws, being roughly centered on the fslg joggle.

With all the marks made, remove the cowl for trimming. With a flexible straight edge, use the tick marks to create a smooth line around the TE and trim the cowl using a sabre saw or equiv. Sand it lightly to get a smooth edge.

Remove the joggle at the top, rear of the cowl to allow the cowl to set down into the fslg. joggle. (fig. 31:B:3)

B3. Drill for the attach screws. Replace the cowl and drill for all the attach screws. Use MS24694-S5 screws with K1000-08 anchor nuts. We typically drill for a cleco first and start at the gear door (bottom of cowl) and work our way up the sides. In this way, you're sure to get the cowl snug against the fslg joggle and not be left

with a bulge between screws. This, by the way is also important to remember when setting the spinner screws as well!

B4. Install the top cowl in a similar maner as used for the bottom cowl. Note that the fwd air inlets may tend to "backlock" on themselves. If this is a problem, grind a little off the lower cowl joggle, at the inlets, to eliminate the back lock. With the cowl fitted over the lower cowl, set the remaining screws. Again, start at the center top of the cowl and set each screw position progressively as you work your way across and down the top toward the side where top cowl meets bottom cowl.

B5. Micro finishing the seam between fslg and cowl. With the cowl installed, prep and spread a layer of micro (thickness as required but thin as possible) along the joint between cowl and fslg. Don't bother laying release tape or anything else, just spread the micro right over the seam.

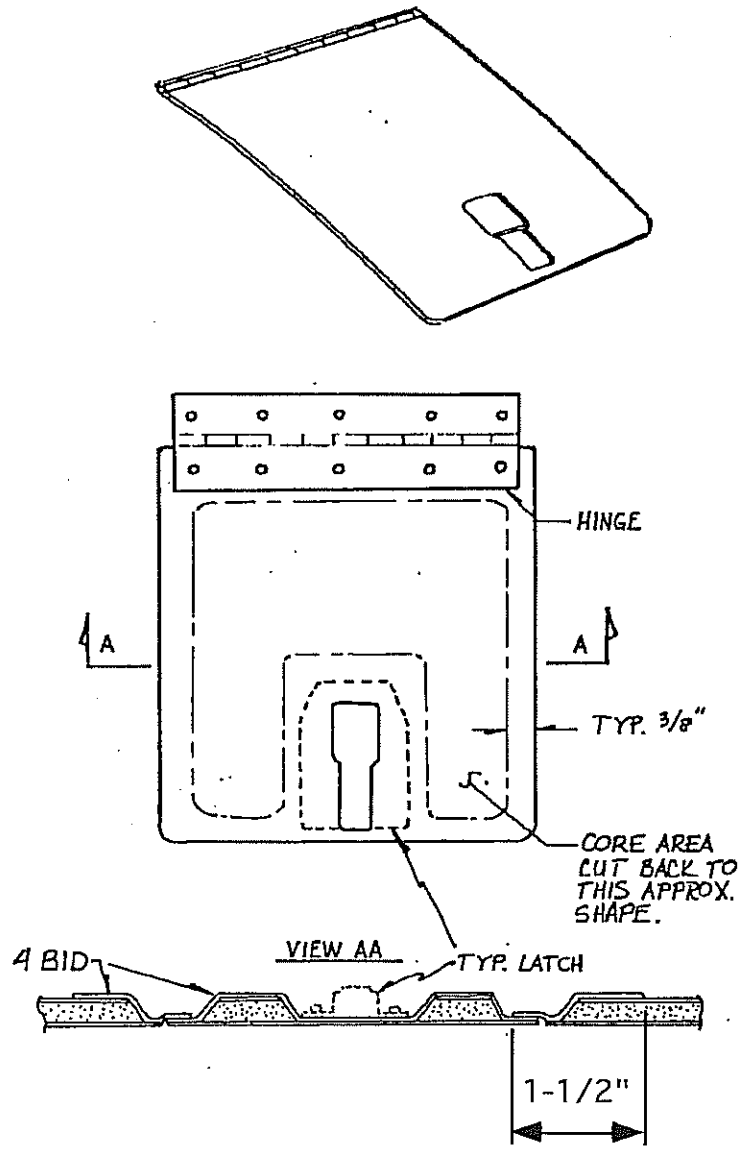
When the micro is slightly firm, but not set up, take a knife blade (twisted sideways just a little) and run it around the joint. It is easy to stay in the joggle, just keep the knife blade against the cowl edge which has a good edge and keep the knife twisted just a little to set the size of the gap. The micro will mound up just a bit - that's o.k. Make this quick, simple circling maneuver and then let the micro cure. Sand smooth, remove the cowl, give it a little final prep and you've got a great seam!

B6. Install the oil access door. Cut the door following the scribe lines (faint but they're there) and assemble the door per Figure 31:B:4. You'll note we add a 4 BID ply schedule over both the door itself (once the core is trimmed down to shape) and the perimeter of the opening on the top cowl. This is to stiffen the area. (The force from the plenum chamber formed under neath is quite high.)

1. Trim the door out using a fine bladed sabre saw or equiv.
2. Trim the core area to shape.
3. Cover the door with the 4 BID (cover from edge to edge.
4. Trim the cowl core back around the opening.
5. With the door held in temporary position and having release tape on it, lay the 4 BID ply schedule around the hole perimeter on the top cowl. Extend this 4 BID about 1-1/2 inches all around the door hole and extend at least 1/2" onto the door to form the joggle.See Fig.31:B:4:a
6. Install the hinge. (the joggle will have to be trimmed away to fit the hinge and you'll need to notch the door to accept the center portion of the hinge.)
7. A typical Hartwell latch installation is shown. This latch can be either riveted or bonded into position. If bonding, flox in position and add 3 BID over it to secure the edges

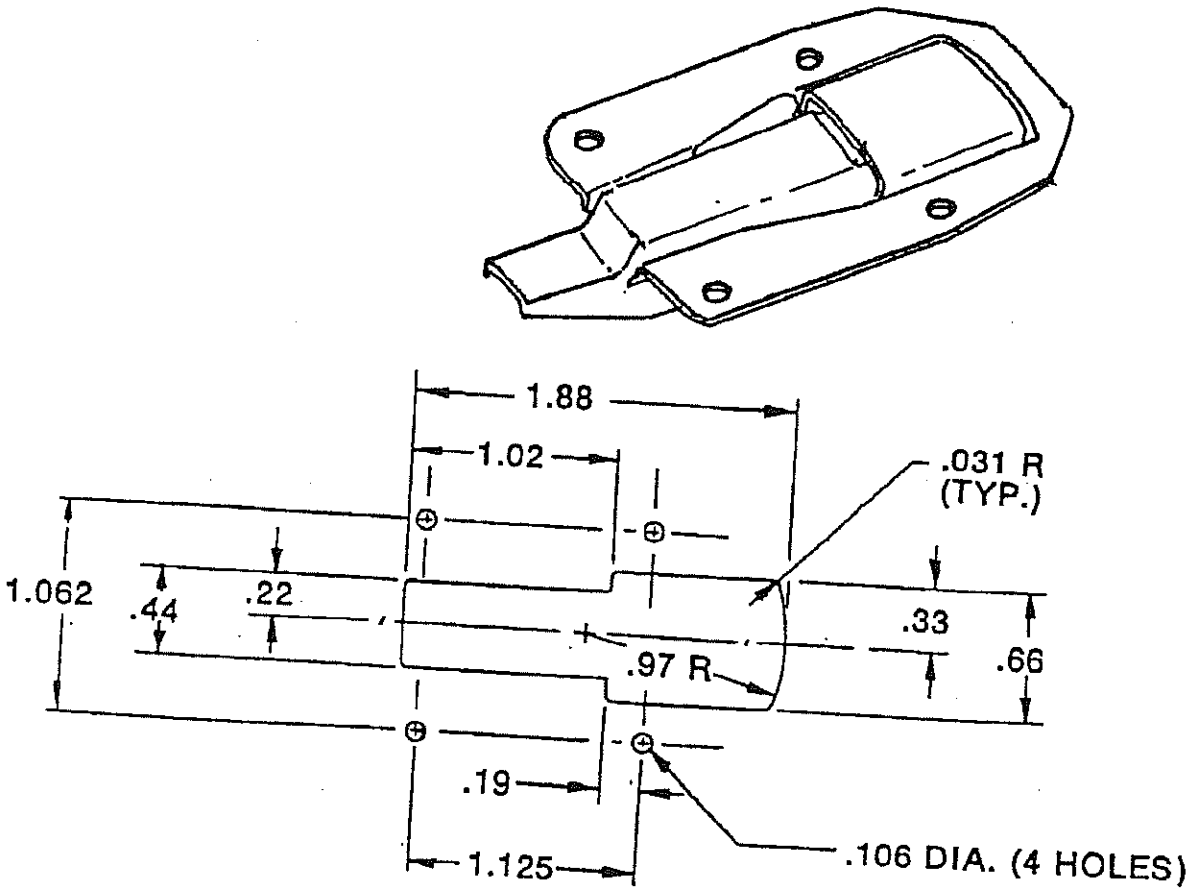
Oil access door

Figure 31:B:4a



Typical Hartwell latch

Figure 31:B:4b



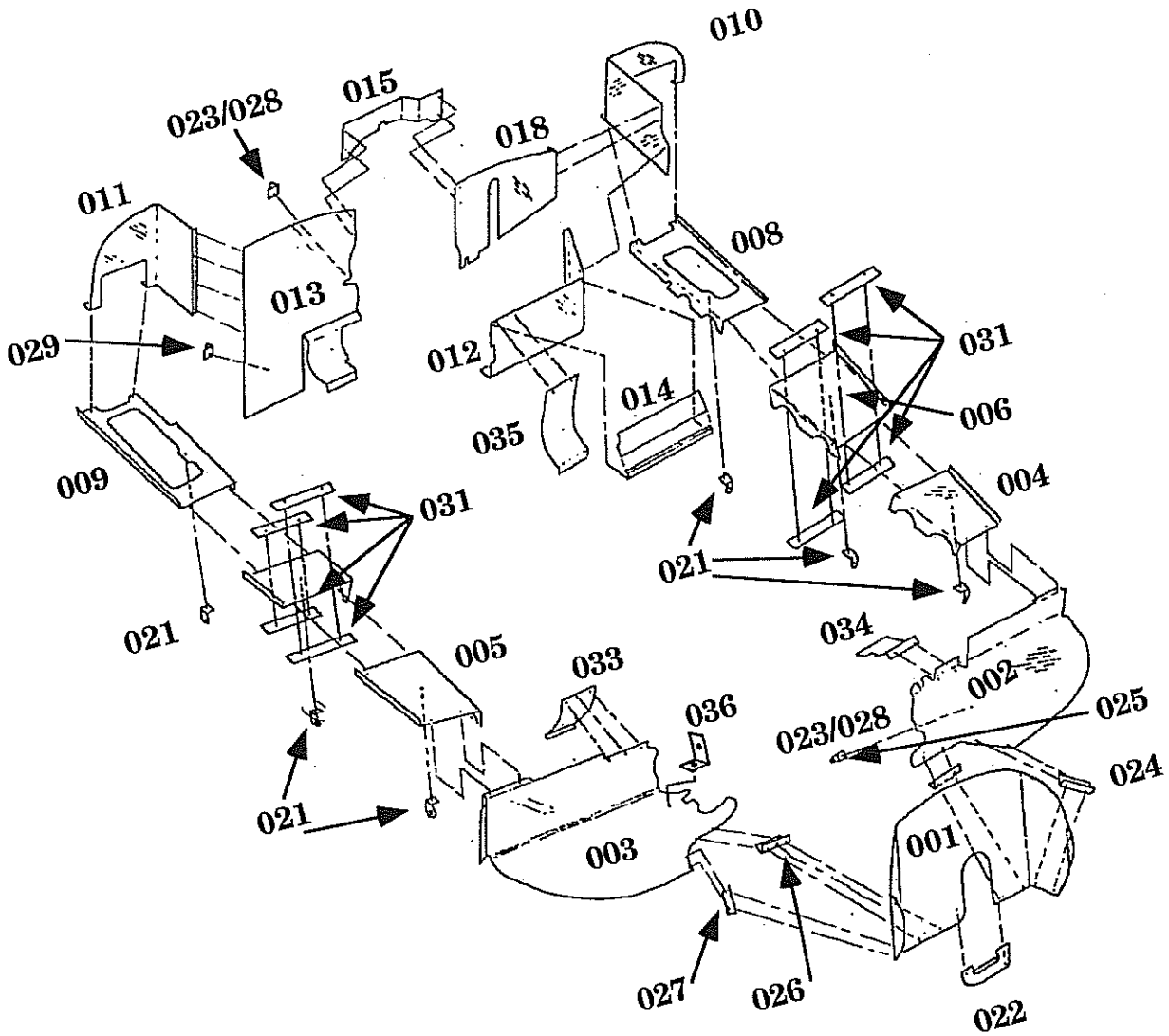
SUGGESTED CUTOUT

C. BAFFLING

The baffling is at first glance, a lot of odd looking pieces of alumiunum. If taken systematically, it's not too tough to install. The factory new Continental 550 engines all come with the center, lower cylinder baffles already in place. If you don't have a factory new engine, be sure to install these baffles as they are critical.

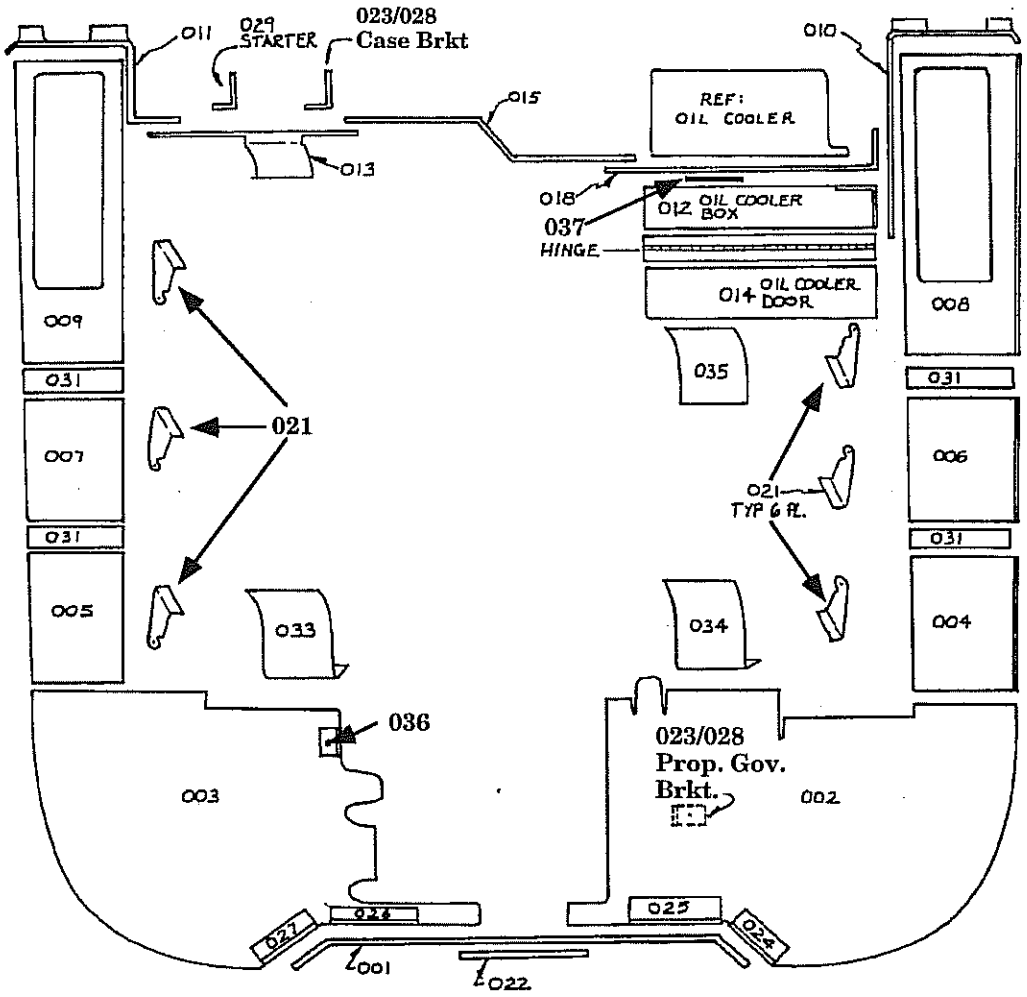
Baffling exploded view

Figure 31:C:1



Baffling alternate view

Figure 31:C:2



NOTE: Install oil cooler now. It is too difficult to reach later. (See page 18.)

C1. Install 6, (-021) brackets, one to each cylinder head.

Use: six -021 steel brackets

AN500-A416-6 screws and lock washers.

Note: These screw into the threaded hole located between the cylinder head valve covers. The hole in the head is shallow, do not use longer screws or bolts. Local grinding may be necessary as the castings can vary slightly. Grind only enough to allow the -021 brackets to set flat and relatively level across their tops, ie: in alignment with each other.

C2. Install the horizontal side plates outboard of the cylinder heads.

Use: Left side: 004, 006, 008
Right side: 005, 007, 009

Note that these horizontal pieces are connected with what becomes a slip joint (to allow the engine cylinders to move without cracking the baffling plates). This slip joint is made by riveting the small pieces (031's) onto one horizontal baffle plate to form a "sandwich" for the adjacent plate to slide into. Note that these small 031 pieces are supplied all one length, you'll have to trim to length as required.

The horizontal side plates should be orientated outbd as much as practical and down close overtop the flat areas of each rocker arm boss. The 021 brackets should adequately establish this vertical orientation. Note that each 021 bracket is secured to the horizontal plate with one screw (front two plates use AN526-1032-R8's and the rear plate uses a flat head MS24964-S48 so as to clear the intercoolers).

Note: the following table lists the parts and associated attach hardware needed. This type of listing should be more helpful that spreading the parts throughout all this text!)

Panel #	Connects with	Hardware required
001 L. Front	022	2) AN526-1032-R8, 2) K1000-03, AN426-A3-5, AN970-3
002 L. Front	024 / 025 corner brkt	7) AN470AD4-6
	001	5) AN526-832-R8, 5) K1000-08
	023 gov. brkt	1) AN526-832-R8, 1) K1000-08, 2) AN426A3-5
	034 cyl. #6 Baffling	2) AN526-832-R8, 2) K1000-08, 4) AN426A3-5
003 R. Front	026/027 RF corner brkt	6) AN470AD4-6
	001	5) AN526-832-R8, 5) K1000-08, 10) AN426A3-5
	033 cyl #5 baffle	4) AN426AD4-5
	036 aft corner brace	2) ANANAD4-6, 1) AN526-832-R8, 1) K1000-08
004 L.F. baffle	002 L. Front	2) AN526-832-R8, 2) K1000-08, 4) AN426A3-5
	021 cyl support	1) AN526-832-R8, 1) K1000-08, 2) AN426A3-5
005 R.F. baffle	003	2) AN526-832-R8, 2) K1000-08, 4) AN426A3-5
	021 cyl support	1) AN526-832-R8, 2) K1000-08, 4) AN426A3-5
006 L. baffle	031 sandwich plates	5) AN470AD4-6
	021 cyl support	1) AN526-832-R8, 1) K1000-08, 2) AN426A3-5
007 R. baffle	031 sandwich plates	5) AN526-832-R8
	021 cyl support	1) AN526-832-R8, 1) K1000-08, 2) AN426A3-5
008 L. R. baffle	031 sandwich plates	5) AN470AD4-6
	021 cyl support	1) MS24694-S48, 1) K1000-3, 2) AN426A3-5
009 R. R. baffle	031 sandwich plates	5) AN470AD4-6
	021 cyl support	1) MS24694-S48, 1) K1000-3, 2) AN426A3-5
010 L. rear	008 baffle	3) AN3-4A, 4) AN960-10L, 1) AN365-1032A, 2) K1000-3, 8) AN426A3-5, 2) AN526-832-R8,

		2) K1000-08
	012 oil cooler box	2) AN3-3A, 2) AN960-08, 2) K1000-3, 4) AN426A3-5
	018 L. R. inbd	2) AN526-832-R8, 2)K1000-08, 4) AN426A3-5
012 oil cooler box	014 Door/ cooler box	9inches) MS20001-5 hinge, 13) AN470AD4-6
	035 baffle #2 cyl	2) AN3-4A, 2) AN960-10L, 2) K1000-3, 4) AN426A3-5
	oil cooler	3) AN3-4A, 3) AN960-10L, 3) K1000-3, 6) AN426A3-5
018 L.R. inbd	oil cooler	3) AN3-4A, 6) AN960-10L, 3) AN365-1032
	015 center rear	2) AN526-832-R8, 2) AN365-832A
	037 close out	2) AN526-832-R8, 2) AN365-832A
015 ctr rear	013 R. R. inbd	2) An526-832-R8, 2) AN365-832A
013 R.R. inbd	028 case brkt	2) AN526-832-R8, 2) AN365-832A
	029 starter brkt	2) AN526-832-R8, 2) AN365-832A
	011 R. rear	4) AN526-832-R8, 4) K1000-08, 8) AN426A3-5
	009 baffle	7) AN526-832-R8, 7) K1000-08, 14) An426A3-5

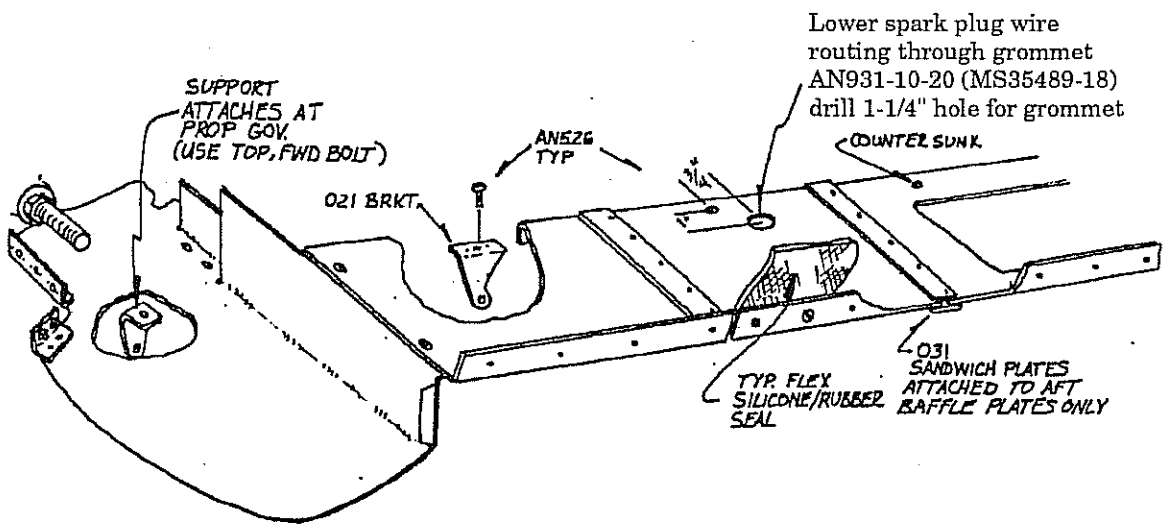
C3. Install the 001 front center plate. Remove the two special 3/16" bolts on the engine, above the crankshaft that retain the oil seal cover plate. Align the 001 front plate with the crankshaft, centered in the top of the cut out. A small level on the bottom edges will help keep this part level. Mark and drill for the two 3/16" engine bolts. Install the plate and reinstall the original bolts with AN970-3 area washers and a spot of thread locking compound (Locktite or equiv.).

C4. Assemble the front side plate assemblies to the center plate. Using clamps / cleco's and quick set glue, temporarily assembly 002 and 003 to 001 and to the side baffles. Use the four small angle pieces to secure the left and right panels to the front panel.

The 023 prop gov. bracket (which supports the 003 right front panel) may be installed and pilot drilled at this time. Install 036 using the existing nut plate below and aft of the alternator base. Pilot drill and cleco to 003.

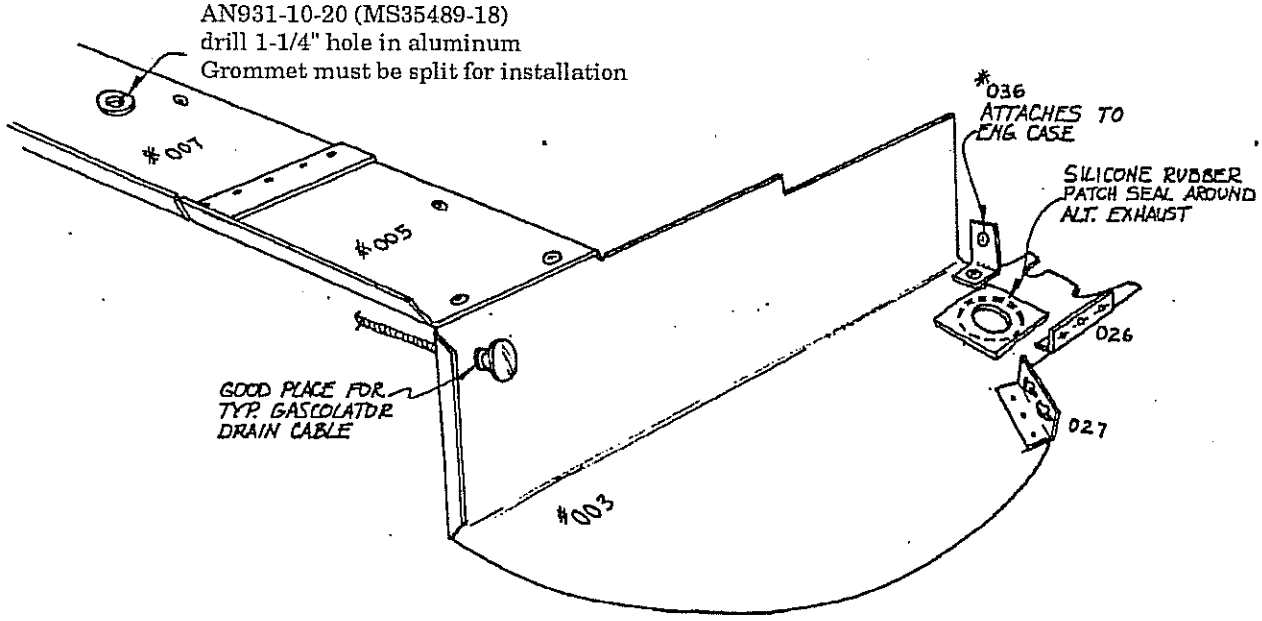
Baffling horizontal plates

Figure 31:C:3



Baffling - right front

Figure 31:C:4



C5. Install the aft bulkhead panels. These are 011, 013, 015, 018 & 010. The right rear baffle (013) is supported by the starter bracket (029) located under the lower forward starter case bolt (1/4" bolt on the outbd end). This rear baffle (013) is also

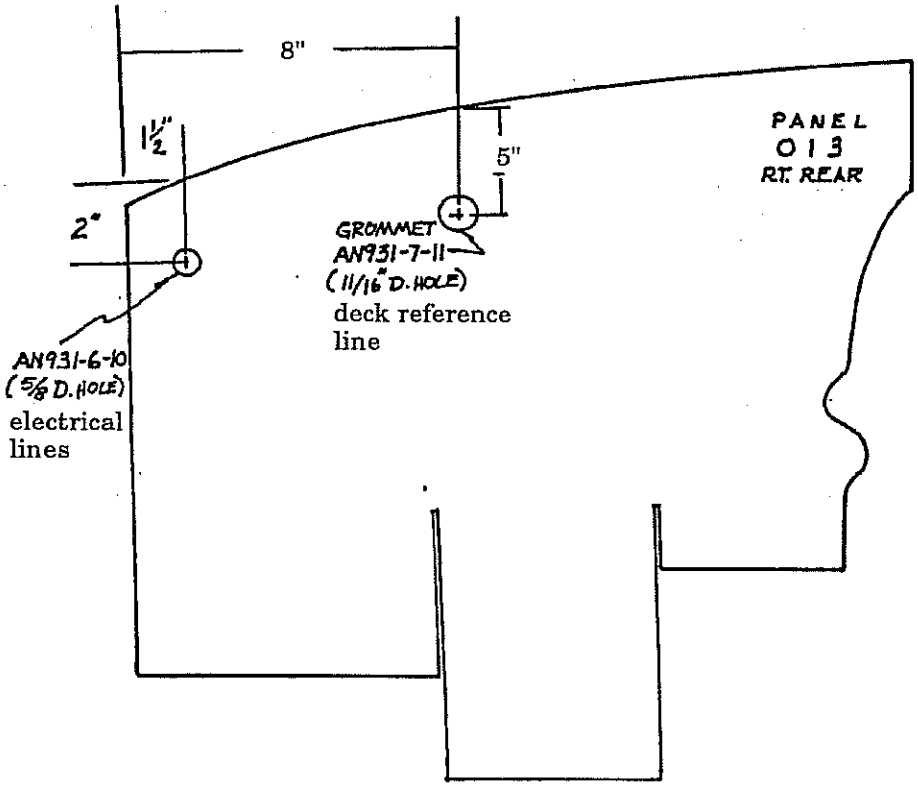
supported by the case bracket (028). These small brackets will establish the fwd / aft position of the 013 baffle panel.

NOTE: The starter should be removed and rotated 180°'s in its mounting flange. This is for starter cable clearnace from the battery box (pressurized IV's will all have the battery box on the firewall, just behind the starter and it is possible that some standard IV's may too).

The 013 panel has three holes in it for various system cabling passage. It is easier to punch these holes prior to final assembly.

013 baffle through holes

Figure 31:C:5



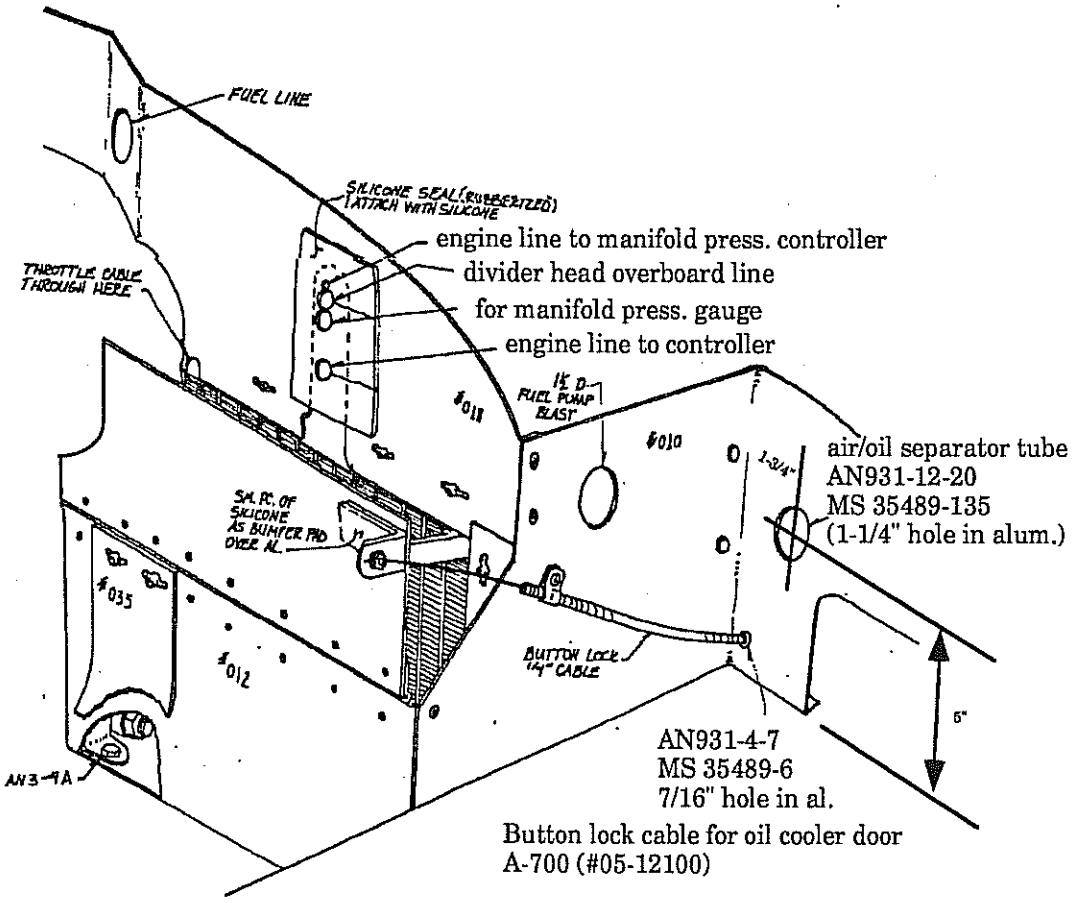
Dimensions for the holes are suggestions only. The actual size will depend upon how much wiring is installed.

C6. Install the oil cool box assembly. The oil cooler box, (012) has the cylinder fin plate (035) bolted to it which should be fitted tightly against the cylinder fins. (It is difficult to install this box if the fin plate is riveted in place.) The bottom of the oil box connects with one bolt through the engine bracket as shown. The hinged oil door (014) is fitted to the top fwd edge of this oil cooler box and attached with rivets.

C6. Fabricate the oil door control arm. Use the 1" x 3" aluminum angle and install onto the top edge of the oil door using two AN470AD-4-6 rivets. Route the control cable as shown.

Oil door assembly

Figure 31:C:6

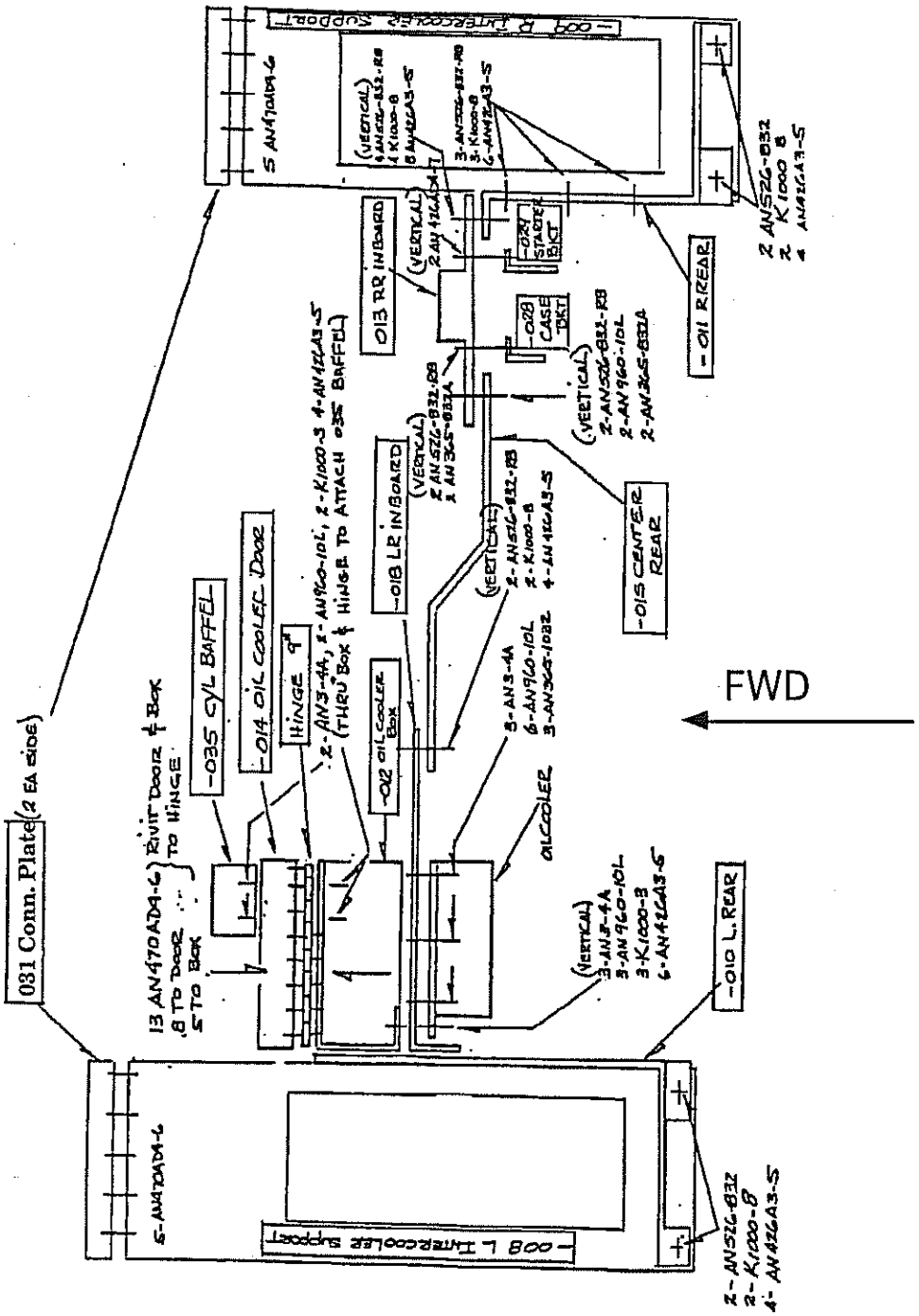


C7. Assemble the oil cooler box and oil cooler door. Align this assembly to the oil cooler and temporarily attach all parts from the aft bulkhead, left to right

C8. Install the front cylinder fin plates. #'s 033 and 034. These plates should be riveted to the front panels such that they fit tightly against the cylinder fins, wrapping under the cylinders.

Aft baffling assembly detail

Figure 31:C:7



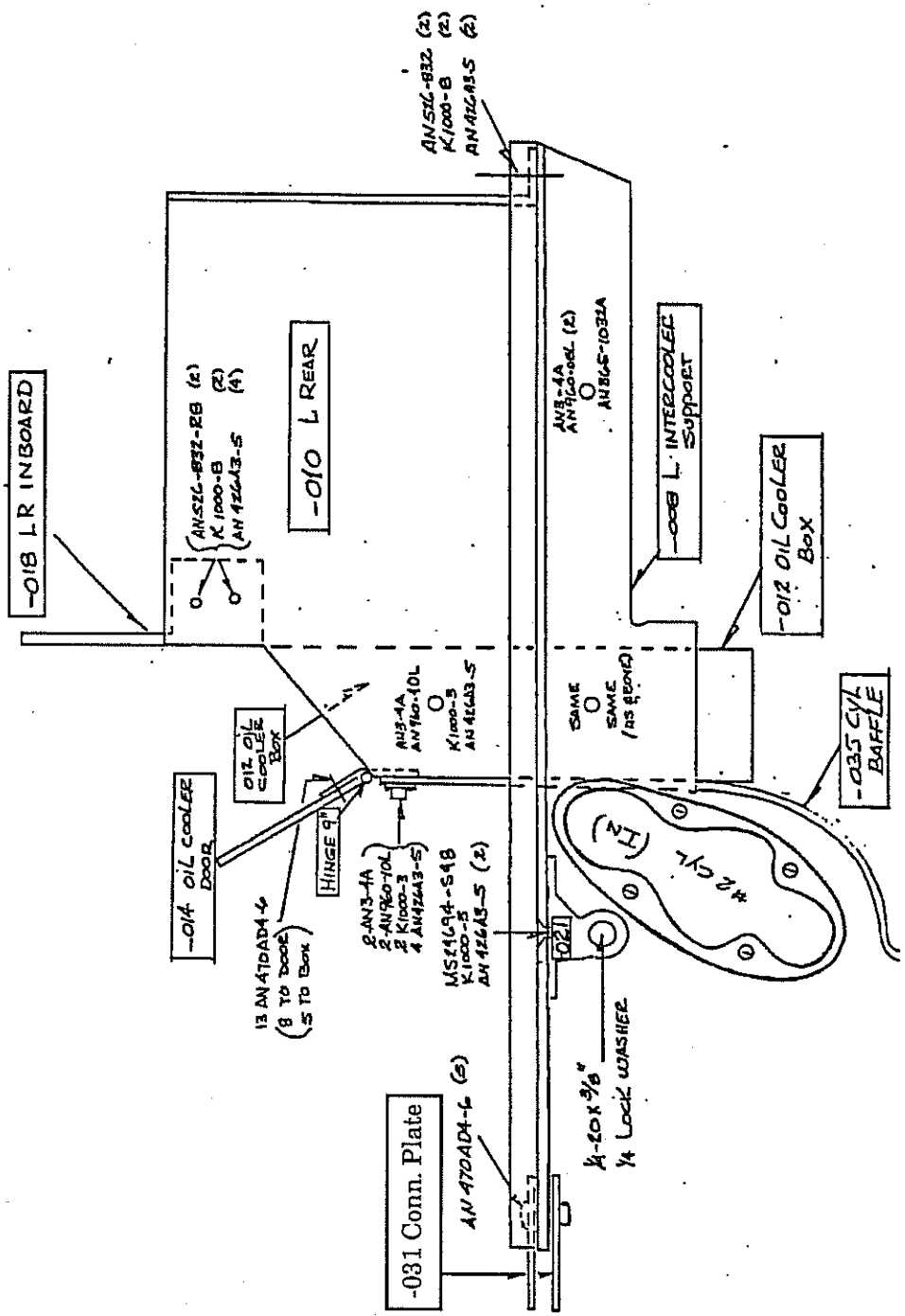
important that the "pressure cowl" be tightly sealed. Failure to do so will cause overheating of the engine.

C10. Add the flexible baffling seals. This is a soft, silicone based material that should be pop riveted (using the wide head pop rivets) to the entire perimeter of the pressure cowl area. The material should be installed from the inbd side of the aluminum baffle panels and it must lay inward against the cowling top to form a good seal that tightens when pressurized with ram air. If a flexible baffle were to get blown back, a massive air leak would result and the engine could easily overheat.

You'll find that once you've installed all the flexible seals, the top cowl will seem particularly difficult to get installed into proper position. The aft seals (across the back of the engine) will be challenging at first. Have patience, as the engine heat works on these seals, the "fit" will improve and after a few hours of running time, the cowl will not be a problem to install.

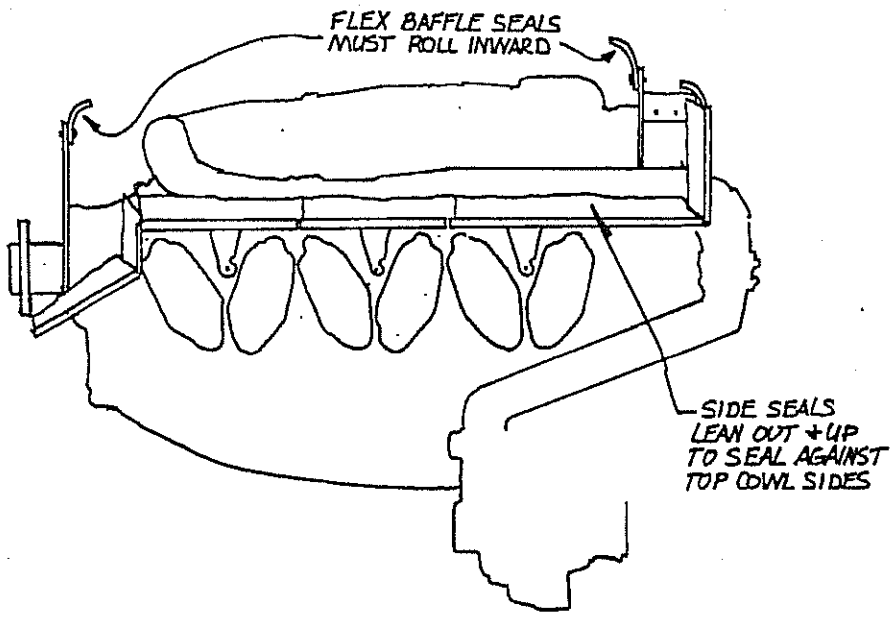
Oil cooler / baffling assembly detail

Figure 31:C:8



Flexible baffle seals

Figure 31:C:9



C11. Install a fuel pump blast tube. We recommend a 1.5" diameter SCAT blast tube. The source is located along the inbd side of baffle panel 010 (at the rear of the left intercooler). From there a hose is run to the top of the fuel pump. A shroud should be made around the pump for optimum cooling.

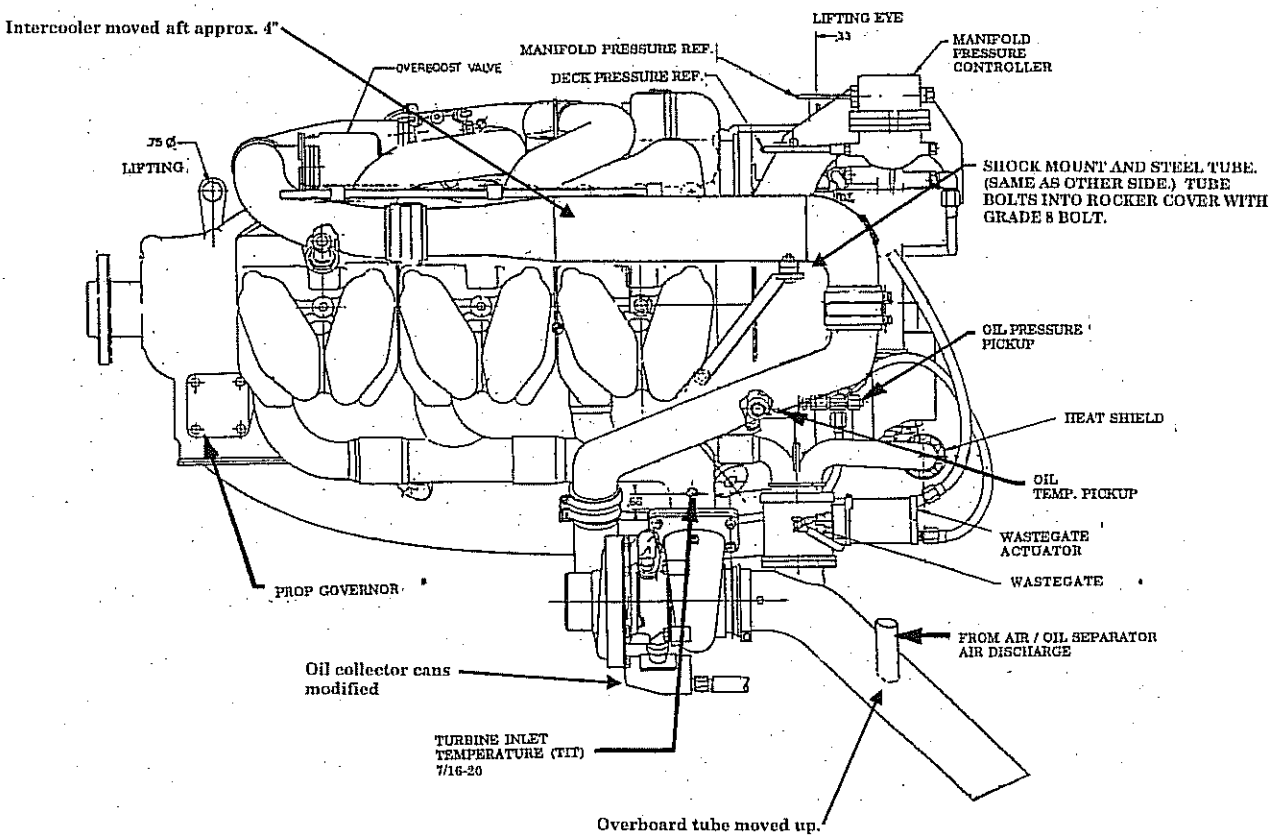
C12. Install a gascolator blast tube. This line is 1" in diameter SCAT tube, originating at the right rear intercooler baffle panel.

D. ENGINE PRIMARY CONTROL SYSTEMS

The following three view drawings of the TSIO-550 engine will acquaint you with the significant control system locations. Several items will be standard, such as throttle, prop and mixture but others will vary based on your chosen equipment, ie: type of fuel pressure gauge, manifold pressure gauge, oil temp & pressure.

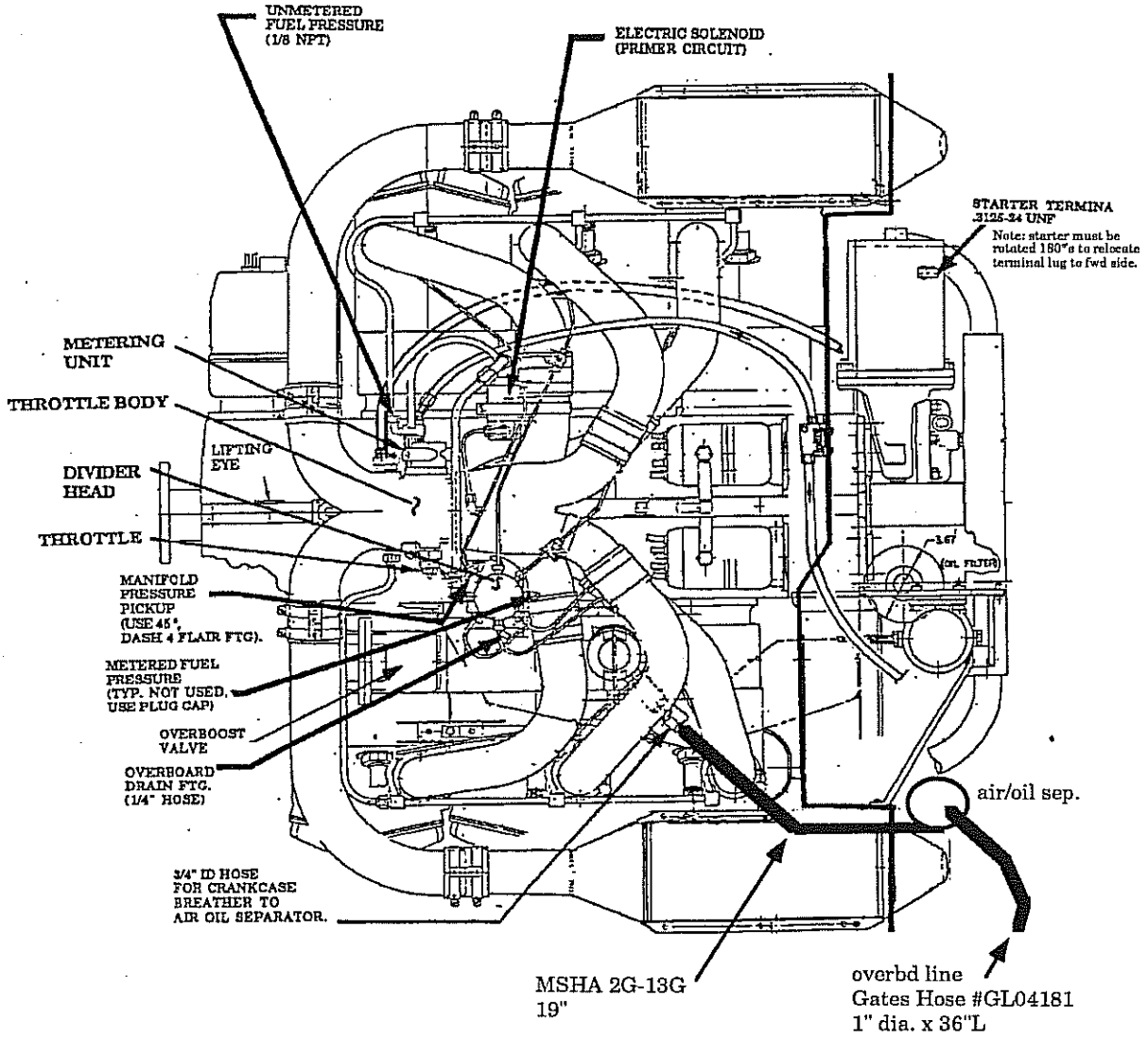
TSIO-550 side view

Figure 31:D:1



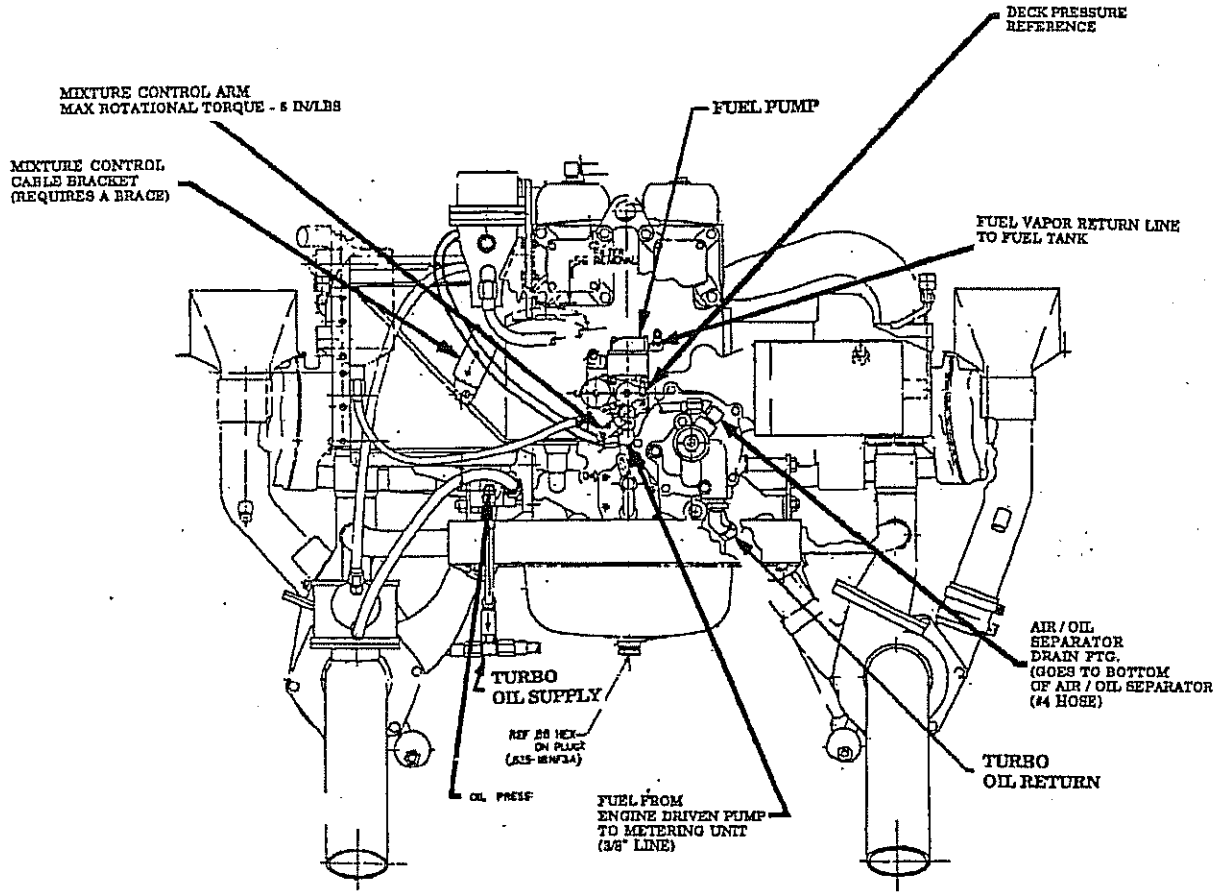
TSIO-550 top view

Figure 31:D:2



TSIO-550 rear view

Figure 31:D:3



Throttle Cable

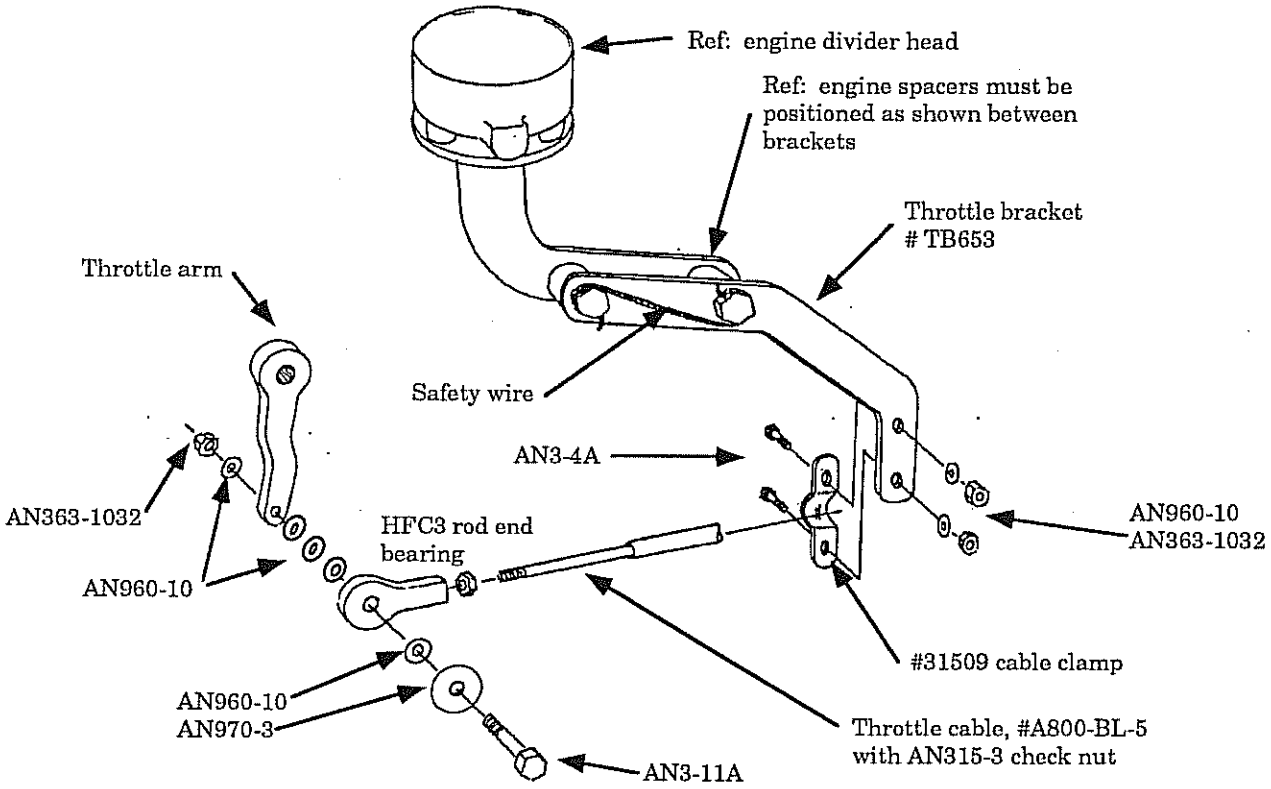
D1. Install the throttle cable.

a) From the full size blueprint, #586, sheets 1 & 2, locate and drill for the firewall hole.

b) Install the throttle cable attach bracket by disassemblying the two bolts that support the divider head bracket. Insert the throttle bracket and reassemble.

Throttle cable attach bracket

Figure 31:D:4

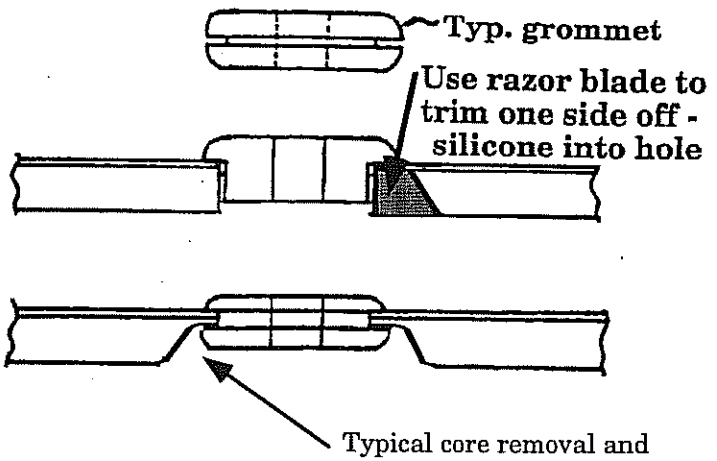


c) Drill the baffling for an access hole for the throttle cable. Use 7/16" dirll. Simply pick a straight alignment and drill it. Use a grommet AN931-4-7.

d) Set the throttle arm on the engine and connect the throttle cable as shown.

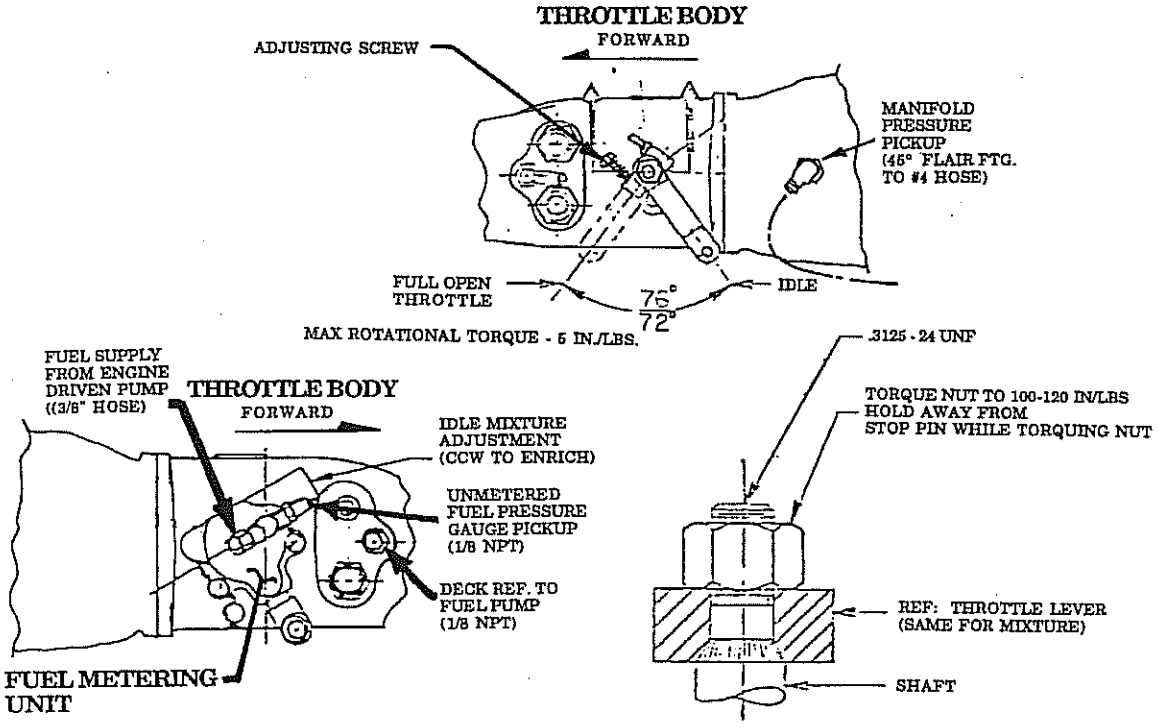
Typical grommet installation

Figure 31:D:5



Throttle body on engine

Figure 31:D:6



Prop Governor

D2. Install the prop governor.
Use Governor # D-20309-39

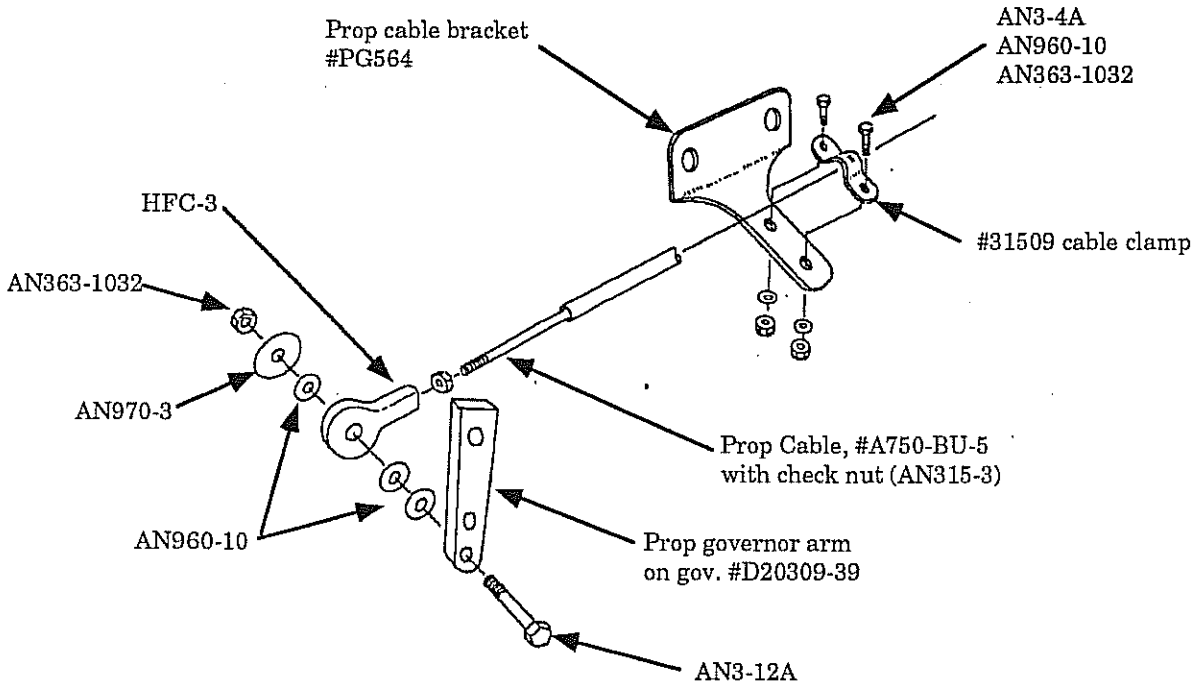
Carefully, bolt the governor in position on the pad as shown on the engine side view. Do not overtighten, the mounting pad could break.

D3. Attach the prop governor cable bracket to the engine. Use the firewall blueprint to locate the firewall hole. Drill with a 7/16" bit. Use grommet # AN931-4-7. Remove the two nuts from the left, fwd engine mount "foot", slip the bracket on and replace the nuts.

Route the cable through and attach per figure 31:D:7.

Prop governor cable attach

Figure 31:D:7



Mixture cable

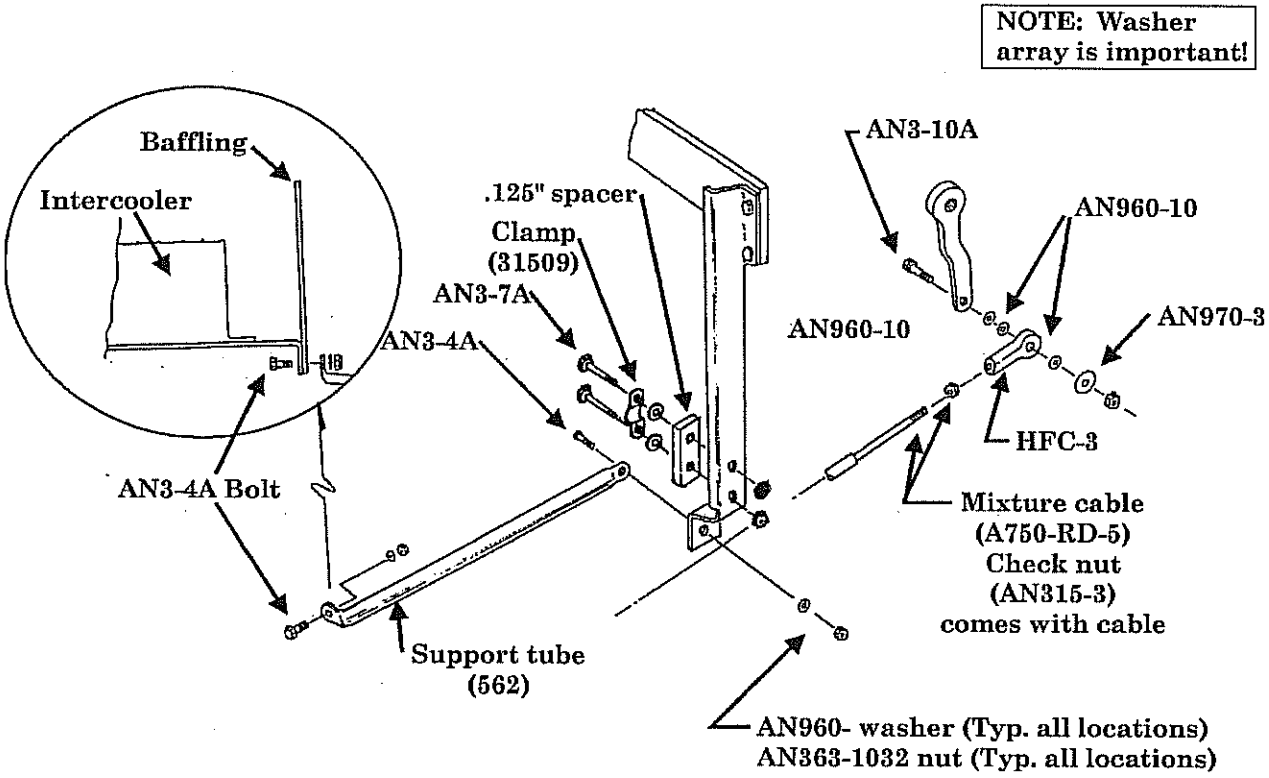
D4. Install the mixture cable. Use firewall blueprint to locate firewall hole and drill with a 7/16" bit. Use the grommet # AN931-4-7.

D5. Install the mixture support brace. This is a tubular support brace which provided the necessary support the the bracket installed on the factory new engine. This brace attaches to the side of the engine baffling at the aft, inbd section below the left intercooler.

Install the mixture arm onto the engine in a manner similar to that used for the throttle arm.

Mixture cable

Figure 31:D:8



D4. Adjust all cables. The cable is adjusted properly when full open throttle, full mixture and flat prop pitch result in the handle being about 3/16" out from the bezel of the handle (on the instrument panel). This is the "cushion" and is a visual check that you've really got full travel and haven't simply bottomed the handle out on the panel face. Adjust the rod end bearings so that you achieve this "cushion" at the instrument panel.

Tachometer

D5. The Continental engine does not provide for a mechanical tach drive cable attachment. Therefore, one must use an electronic type tach drive. There are a couple of more common approaches.

1.) Use of a mag sensor which sends a signal based on the revolving magnets in the magnito. Typically the mag sensor is a small metalic clip which attaches to the outside of the magnito case, using one of the existing case screws.

2.) Another method is to use the wires emerging from the right mag. These were originally designed for a "RD Co. tach unit" and can be adapted for other applications.

Continental Magnito Drive Ratio to Crankshaft: CCW, 1.5 : 1

Manifold Pressure Gauge

D6. The manifold pressure is picked up at the fwd, left side of the induction pipes, by the throttle body. See figure 31:D:6. Once again, the final installation will depend on the type of MP gauge you select. Typically, a 1/4" flex line with flair ftgs. will be attached to this ftg. on the engine. From this point, the line is routed aft to either an electronic sender which could be attached to the engine in the pressure cowl area (over the cylinders) with an Adel clamp or the line could be routed through the aft baffling and either to a sender behind the pressure cowl area or completely through the firewall to the gauge. (If this approach is selected, you should use a firewall bulkhead ftg., AN832-4D. Fire shield is generally not used on this line.

D7. Connect breather hoses and oil return line. Use 19" long MSHA 2G-13G hose from the oil filler to the air/oil separotor. Use 1" dia. x 36" (Gates GL04181) hose from the air/oil separator to the left exhaust pipe.
(Note that this exhaust pipe requires modification. The hose ftg. on the pipe must be relocated upward on the exhaust pipe.)

Connect the oil return line which exits the bottom of the air/oil separator and returns to the engine. See fig. 31:D:3 for location of ftg. on back of engine. The line (-4 size) is supplied with the engine. Install a 90° ftg. in the bottom of the air/oil separator (AN822-4D).

E. FUEL SYSTEMS

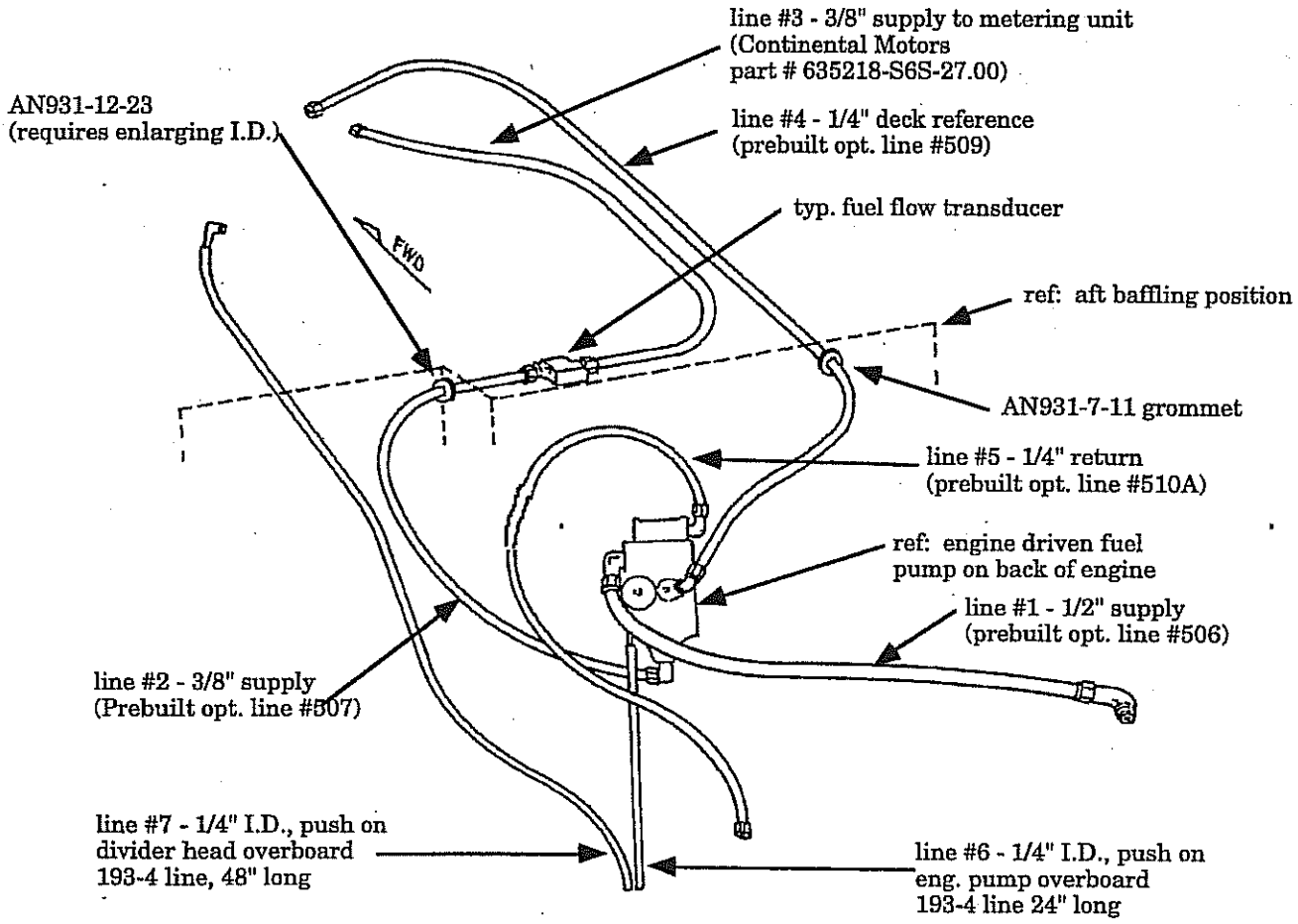
Your fuel system has already been developed up to and through the firewall with the adaptor ftg. A gascolator is attached fwd of this being used as a last catch for large particulates and water.

FIRESHIELD:

Yes, all fuel supply lines should be wrapped in fireshield. This not only protects against fire, it also helps insulate and keep fuel temperatures lower.

Primary fuel system, general layout

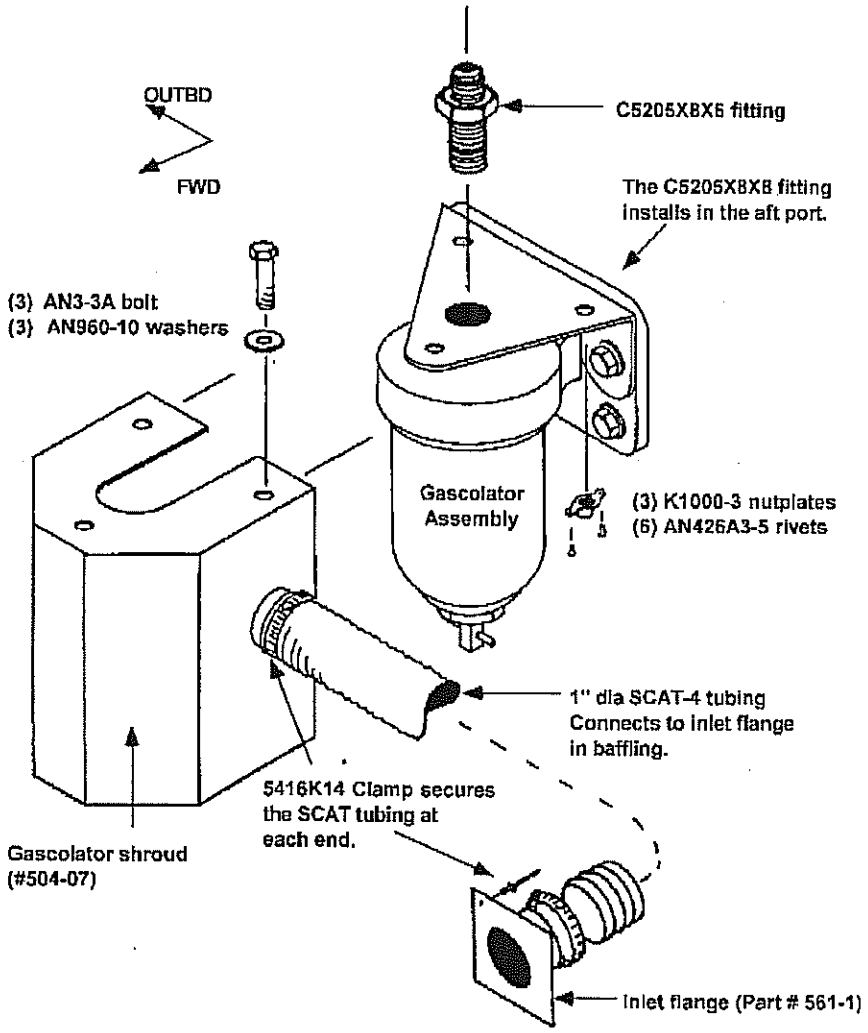
Figure 31:E:1



E1. Install your gascolator. A cooling schroud should be added around it and fed cooling blast air from a 1" dia. duct. A 90° ftg is used to exit the gascolator. While we've had no problems with an aluminum AN822-8D ftg., it is common practice to use steel ftgs which connect between stationary items and moving items (engine). This would then be an AN822-8 ftg. Set this ftg. at approx. a 45° angle, (inward and up).

Gascolator Installation
(Lancair Type)

Figure 31:E:2

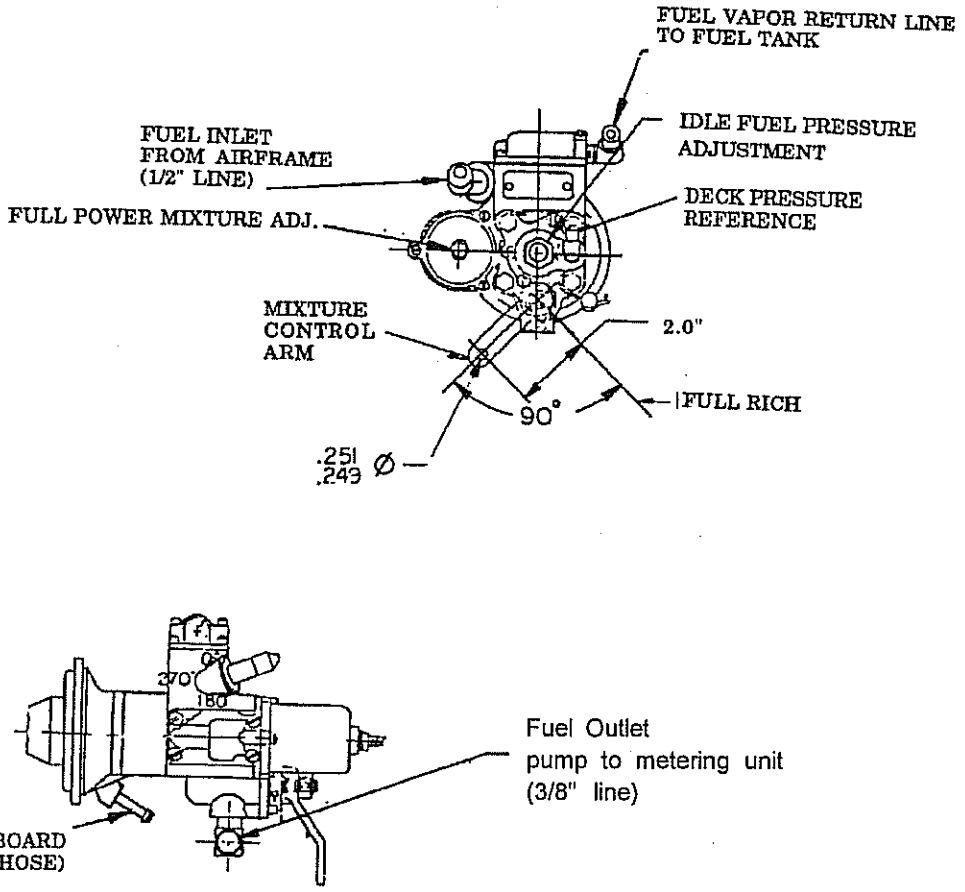


Note: Also refer to blueprint A-504 supplied with the gascolator.

E2. Lancair type gascolator: The fuel drains by pushing the valve underneath the gascolator up. It does not require a cable, just an access from underneath the gascolator to drain the fuel. Refer to the Gascolator supplement.

Engine Driven Fuel Pump

Figure 31:E:3



E3. <u>Install the #1 fuel line - supply line from gascolator to engine driven pump.</u>
Use: 1/2" flex line, 32" long.
(prebuilt optional line #506)

E4. Install the #2 fuel line - engine pump to fuel flow transducer .
Use: 3/8" flex line,30" long.
(prebuilt optional line #507)
It is highly recommended that you use a fuel flow meter to monitor and set engine parameters.

E5. Install the #3 fuel line - fuel flow transducer to metering unit.
Use: 1/4" flex line, 27" long.
(prebuilt optional line #508)
Note that this is a Continental supplied part (#635218-S6S-27.00).
The engine driven fuel pump establishes correct working fuel pressures to the metering unit. The metering unit determines the amount of fuel allowed into the engine.

E6. Install the #4 fuel line - deck reference between manifold and engine pump.
Use: 1/4" flex line, 46" long .
(prebuilt optional line #509)
The Deck Reference line is required to provide the engine driven fuel pump necessary pressure information within the engine manifold system.

E7. Install the #5 fuel line - return line from engine pump to firewall ftg.
Use: 1/4" flex line, 12" long.
(prebuilt optional line #510A)

E8. Install the #6 fuel line - engine pump, overboard line.
Use: 1/4" hose, push on type, 24" long.
(prebuilt optional line #512)
This line is simply an emergency overboard line, should the engine driven pump fail internally and somehow begin to spew fuel.
This line should be routed to the fslg bottom joggle where it routes overboard.

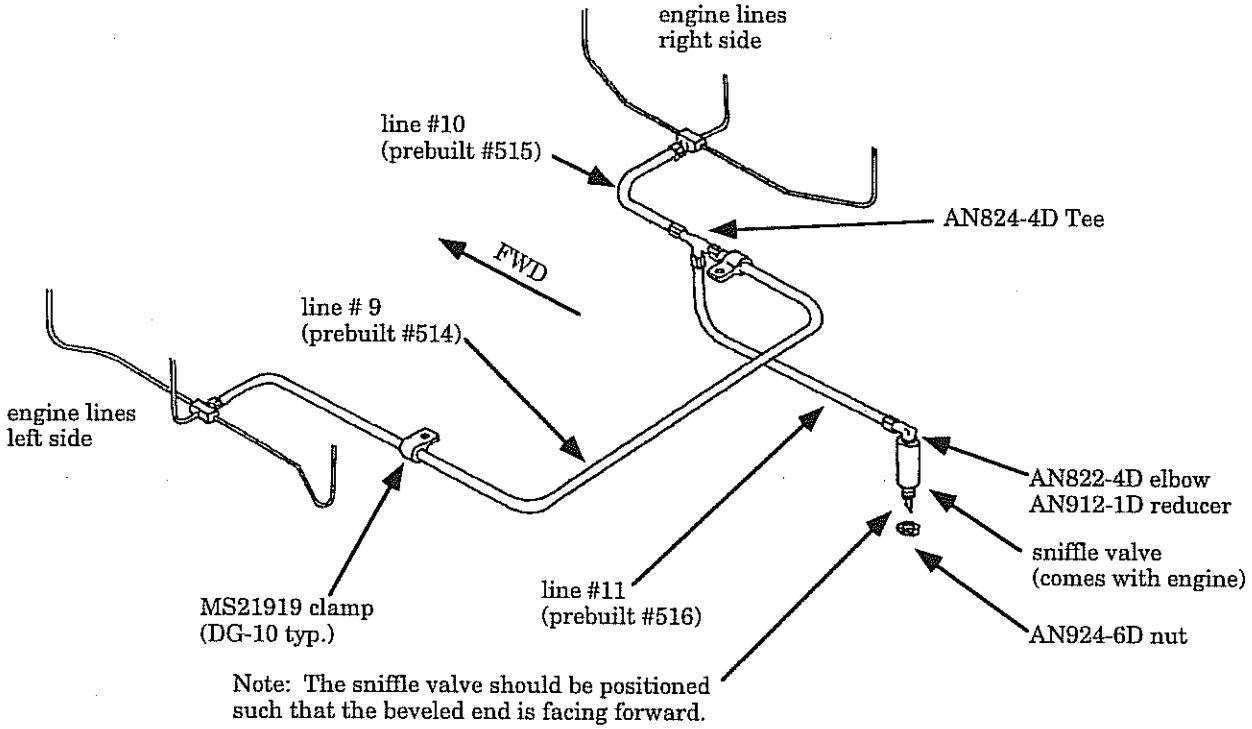
E9. Install the #7 fuel line - divider head overboard line.
Use: 1/4" hose, push on type, 48" long.
(prebuilt optional line #513)
This is merely a precautionary line, used in the unlikely event that the diaphram in the divider head were to rupture.

SNIFFLE VALVES AND LINES

These "sniffle" lines simply provide an escape of excess fuel that accumulates during both priming and after shut down. The fuel is allowed to drain out of the cylinders through these lines and drip out of the "sniffle" valve which will be located adjacent to the right side nose gear door. This valve allows fuel to drain out but during engine operation, the valve will seal closed as a result of the application of either vacuum or pressure, since with a turbo charged engine, the net effect vs. ambient pressure could be either one of these conditions.

Sniffle valve and line assembly

Figure 31:E:4



E10. Install the #9 fuel line - left cylinders sniffle valve line, (L cyl's to Tee).

Use: 1/4" flex line 34" long.
(prebuilt optional line #514)
Adel clamp #DG-10

This line connects to the factory installed line coming off the engine just below the cylinders. The three cylinders (#2,4,6) on the left side are all Tee'd together with a single #4 flair ftg. under cylinder #4, middle cylinder).

Route the line along the top of the oil sump, supporting the line with an Adel clamp off one of the sump attach bolts. (We use the 9th bolt back from the front corner area.)

E11. Install the #10 fuel line - right cylinders sniffle valve line, (R. cyl's to Tee).

Use: 1/4" flex line, 8.5" long.
(prebuilt optional line #515)
Adel clamp #DG-10
AN824-4D flair Tee ftg.

This line connects between the three cylinder (factory mounted) Tee ftg. to the flair Tee ftg. Route the line along the oil sump and connect to the AN824-4D Tee ftg. which is secured to the sump bolt with the Adel clamp.

E12. Install the #11 fuel line - lower cylinders to sniffle valve line (Tee to valve).

Use: 1/4" flex line, 22" long.
(prebuilt optional line #516)
AN822-4D 90° ftg.
AN912-1D reducer
AN924-6D bulkhead nut
(Sniffle valve supplied with factory new engine)
Aluminum mounting bracket (fabricate)

This line connects from the above Tee ftg. under the #3 cylinder, down to the sniffle valve.

There are two methods of mounting the sniffle valve.

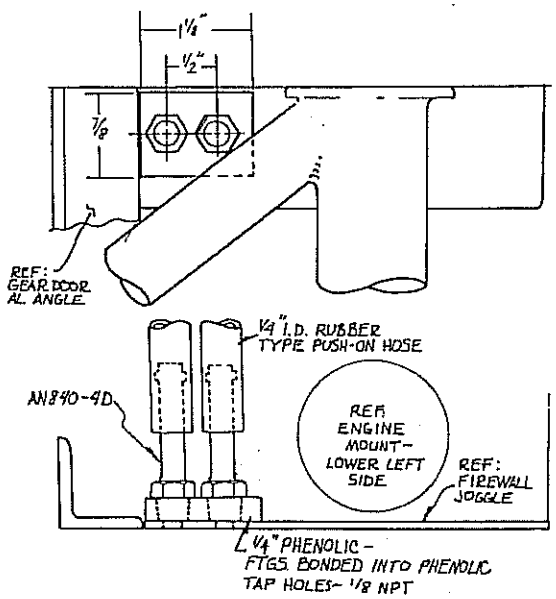
1) Drill a 7/16" hole in the lower, right firewall joggle flange (on the far, outbd side) and secure the sniffle valve to the flange with the AN924-6D bulkhead nut. This will require making a clearance hole in the lower cowl for the bulkhead nut.

2.) Another method is to fabricate a small aluminum angle bracket and rivet it to the side of the aluminum angle which supports the right nose gear door. The sniffle valve will only be able to dump overboard when the nose gear is open, but start up and shut down are the only times that this valve will be allowing fuel to escape, so all will be well.

E13. Fabricate and install the overboard line cowl attachments. These overboard lines must do just that, be routed overboard. A relatively easy means is illustrated in figure 31:E:5. This assembly is bonded to the fuselage joggle just left of the nose gear .

Overboard line terminations on firewall joggle

Figure 31:E:5



E14. Fuel pressure tranducer installations:
Use: 1/4" flex line
(prebuilt optional line #517)
While this is not a standard item and installations will vary based on type of gauge selected, it should be noted that the recommended method of sender installation is to "remote" locate the sender. Typically, an electronic sender will have a pipe port on the sender and from the sender, one runs #18 or #20 wire to the instrument panel. As an example, Vision Micro Systems uses a male 1/8 NPT port their senders, others we've seen use a male 1/4 NPT. Since vibrations can cause failures in these senders (the worst being a cracked housing which then begins to spew raw fuel over your hot engine!), one should mount the sender at a convenient location on the engine using an Adel clamp or similar means, then run a 1/4" flex line to the pickup port on the engine. (See figures 31:D:2 and 31:D:6.)

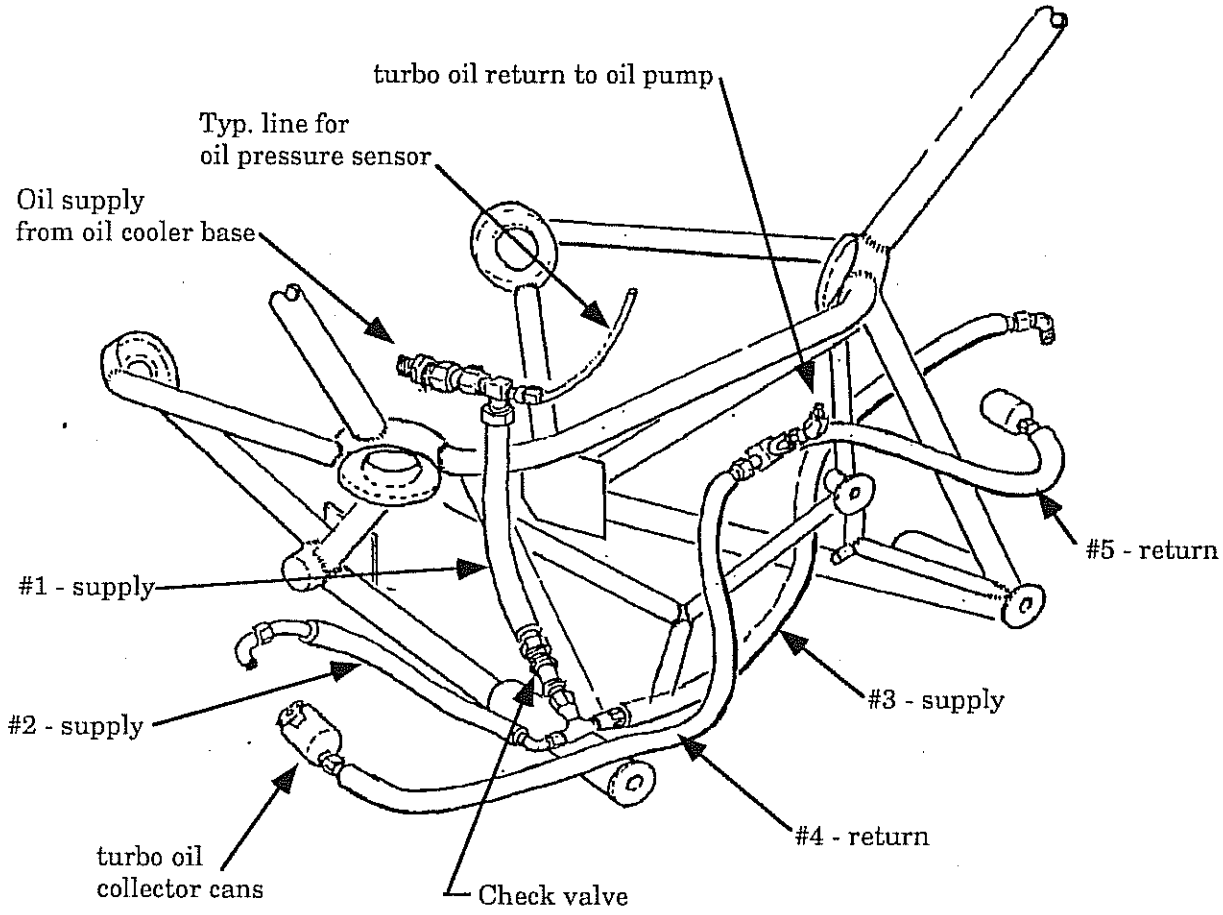
F. ENGINE OIL SYSTEM

The oil system address several areas, the turbo systems, oil cooler, air/oil separator and gauge line installations. Note that your turbo oil collector cans must be modified to fit within the cowling of the Lancair IV. Three of the turbo oil lines supplied with your factory new Continental 550 engine will be used, the remaining two lines are of differing length requirements and must be fabricated or purchased.

Note: All oil lines must have fire shield covering.

Engine oil lines

Figure 31:F:1



F1. Install the #1 oil line - turbo supply, from back of oil cooler to check valve.

Use: 3/8" flex line, 5" long. (not a Continental stock part)
(prebuilt optional line #520)
Check valve (Cont. #TCM-14)
Tee ftg. (Cont. #TCM-13)

You'll see a combined set of ftgs. emerging from the back of the oil cooler. connect this line to the bottom flair ftg. At the end of this line, connect the check valve (Continental part #TCM-14) The check valve allows oil OUT only.

On the other end of the check valve install the Tee ftg. for left and right routing of supply oil to the turbos.

F2. Install the #2 oil line - turbo supply, from check valve Tee to left turbo (top).
Use: Continental line #641047R6Y-18.50 18.5" long line.
From the oil supply Tee ftg. attach this line and route it to the top port on the left turbo.

F3. Install the #3 oil line - turbo supply, from check valve Tee to right turbo (top).
Use: Continental line #641047S6Y26.50) 26.5" long line.
In a similar manner, connect this line from the right side of the Tee to the right turbo top ftg. Follow line routing illustrated in the drawing.

F4. Install the oil pump scavenge ftgs into the bottom of the engine pump. This is a collection of 3 ftgs.
Use: 3359x8 (1/2" pipe street 45°) screws into pump body.
9100x8x8 (1/2" pipe to 1/2" hose) screws into above ftg.
C5707x8 (1/2" flair Tee, female with males on the run) *(sounds good, eh!)*

F5. Install the turbo oil collector cans, left and right. Note that these cans must be modified to fit into the cowl.

F6. Install the #4 oil line - turbo return, left side.
Use: 1/2" flex line, 25.5" long. (not a Continental stock part)
(prebuilt optional line #523)
Connects from the left turbo oil collector can to the Tee ftg. at the oil pump.

F7. Install the #5 oil line - turbo return, right side.
Use: Continental line #646644S8S19.00) 19" long line.

Oil Pressure Sensor

F8. The Tee ftg. at that back of the oil cooler has a restrictor in the end of it (reduces the size of the through-hole in the ftg.). This ftg. is sized to accept a 3/8" line (dash 6 flair nut). This is the oil pressure gauge source. The connection will vary depending on the type of oil pressure gauge selected. Typically, an electronic pressure sender is used. These senders usually have either a 1/8 NPT male end or a 1/4 NPT male end although we've seen them with female ends too.
The best method is to attach your sender, using an Adel clamp to a convenient location on the engine (the mixture support tube is a good place that we use) and route the 3/8" line from the Tee ftg. to the sender.

Oil Temperature Sensor

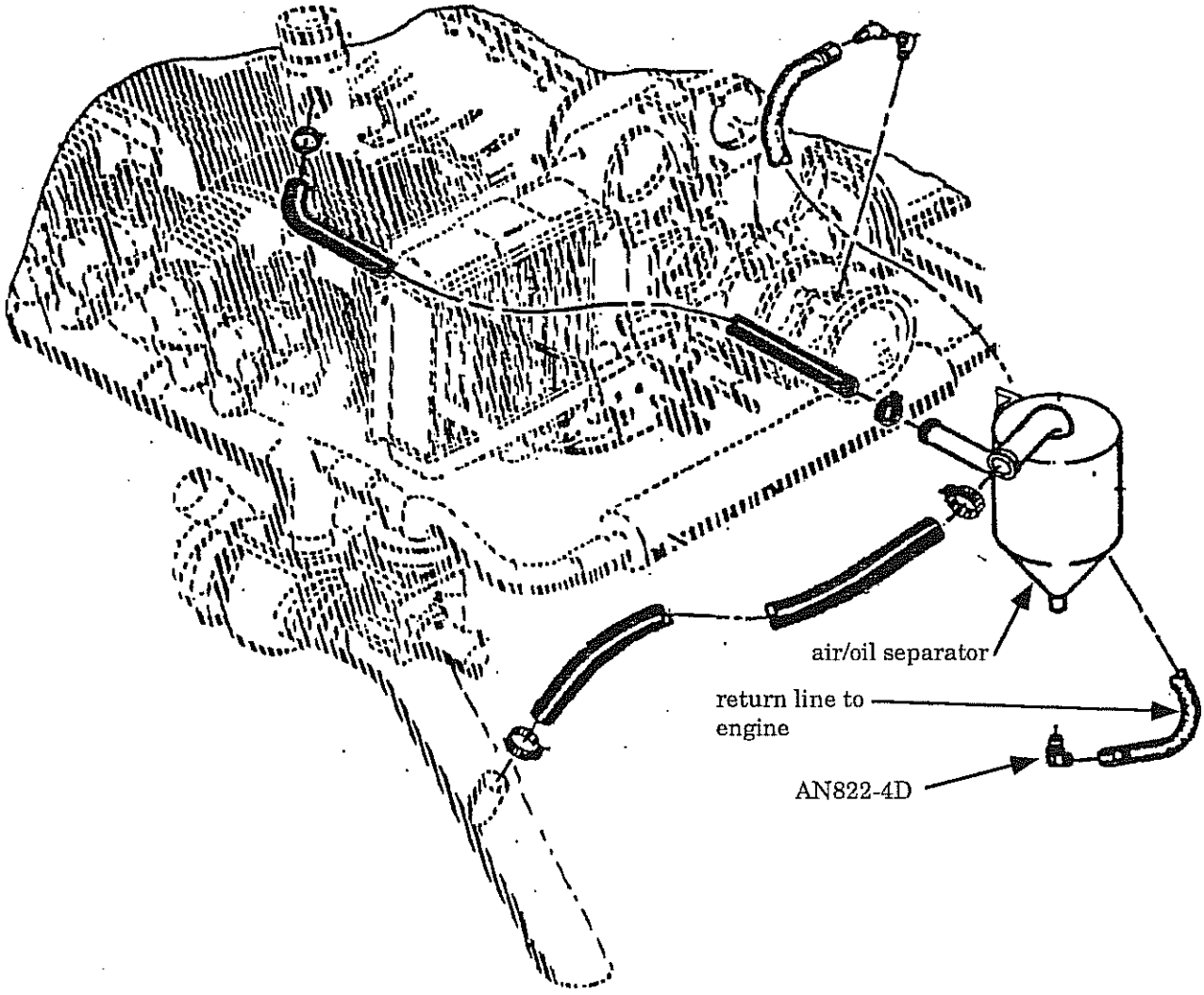
F9. The oil temp. pickup is located under the fwd. lower end of the oil cooler. It is a large ftg. which is designed to accept a common brass typ, screw in thermocouple. Refer back to the engine side drawing, figure 31:D:1.

Air / Oil Separator

F10. The air / oil separator does just that, it separates out any oil that may be escaping through the crankcase breather line. The separator allows the oil to collect in the bottom and drain back into the engine (at the rear) and the overboard air hose is connected into the left exhaust pipe. This is to burn any oil that may tend to find its way out the breather line. (Note that the tube on the left exhaust line must be relocated up the exhaust pipe and that a modification for the air / oil separator can is available that provides a nice mounting flange for it.)

Air/oil separator location

Figure 31:F:2

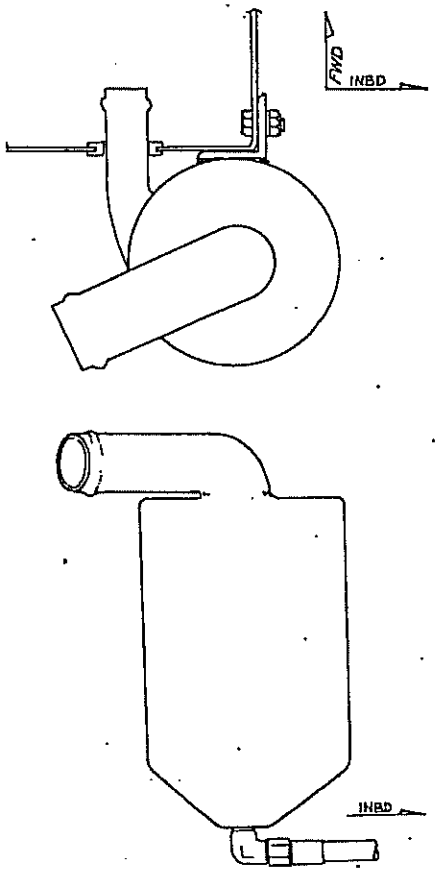


F11. Install the modified air / oil separator can onto the baffling. The modified can has a welded mounting flange on it. This flange is designed to attach the the inbd side of the baffling by the aft edge of the left intercooler. Use two AN3-5A bolts with metal AN363-1032 nuts.

Screw the AN822-4D ftg. into the bottom of the separator and align it to face inbd toward the oil pump.

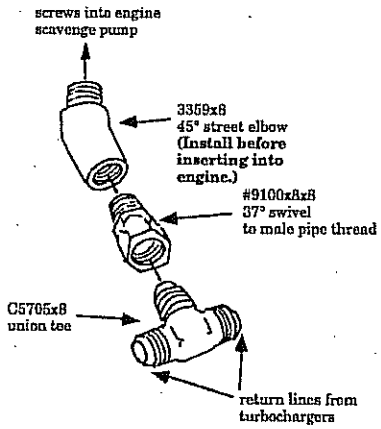
Air / oil separator can installation

Figure 31:F:3



Turbo oil return ftgs in engine

Figure 31:F:4



NOTE: When installing the 3359x8 part into the scavenge sump, be careful not to over tighten it. Over tightening may cause a crack or damage to the pump housing. It might be necessary to reduce the thread diameter by using a 1/2 NPT pipe thread die. On the C3359x8 fitting, you should be able to tighten the part until it becomes snug without pipe dope to the 3:00 clock position or 90 degrees to the final position. Remove the part and install with teflon pipe dope.

F12. Install the #6 oil line - air / oil separator return to engine.

Use: 1/4" flex line, 21" long.
(prebuilt optional line #526)

This oil return line attaches from the bottom of the separator to the top ftg. on the oil pump.

Wastegate Overboard Line

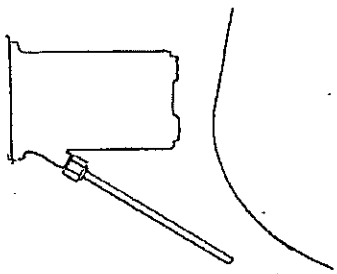
F13. Install the wastegate controller overboard line.

Use: 1/4" aluminum line
AN816-4D ftg.

This line is an aluminum line coming off the bottom of the wastegate controller. You'll see the female 1/8 NPT hole.

Wastegate controller overboard line

Figure 31:F:5



Oil Cooler Control

We have included within the baffling kit, a controlable door which can close off the cooling air supply to the oil cooler since during winter operations, we've seen the oil running a bit too cool. Recommended minimum operating oil temperature is 180°F. (We'll also note here, just for the heck of it, that minimum *take off* oil temperature is 100° F.)

A control cable mounted to the side of the baffling will serve as a control for this oil cooler door.

F14. Install the oil cooler door control cable. This is a simple button lock type cable. Note that a button lock cable is required since the air pressures can close the oil door if you were to use a simple slide type push pull cable. Since this cable has a wire end (vs. a hard, threaded shaft end as used on the throttle cable), a different means of securing the cable housing must be used. DO NOT USE an Adel or MS21919 type clamp (with a rubberized coating over it), those will slip when used in an environment of heat, oil and vibration. Also, the plain AN742 type clamp will also slide.

Below is a sketch of a very easy method of converting the AN742 plain clamp into one that will indeed "grip" the cable housing and not slip.

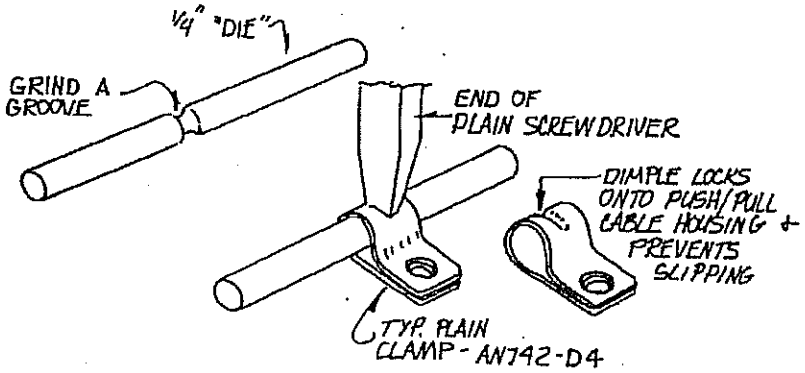
F15. To make such a clamp, start by making a "die" to slip into the AN742-D4 clamp. This die can be made from any 1/4" metal shaft (old drill bit shank, etc.) On a hand grinder, our using a file, cut a groove around a mid section of the 1/4" metal shaft. Make the groove about .05" deep.

Slip the shaft into the clamp until the grooved portion is in the middle of the clamp.

With the end of any plain screwdriver, align and give it a wack with a hammer. You'll have a nice groove thumped into the clamp that will allow you to "thread" the clamp onto the cable housing and when you set the attach bolt, the cable will be firmly held in place. Simple, cheap and effective as it works great every time!

Modifying an AN742 plain clamp

Figure 31:F:6

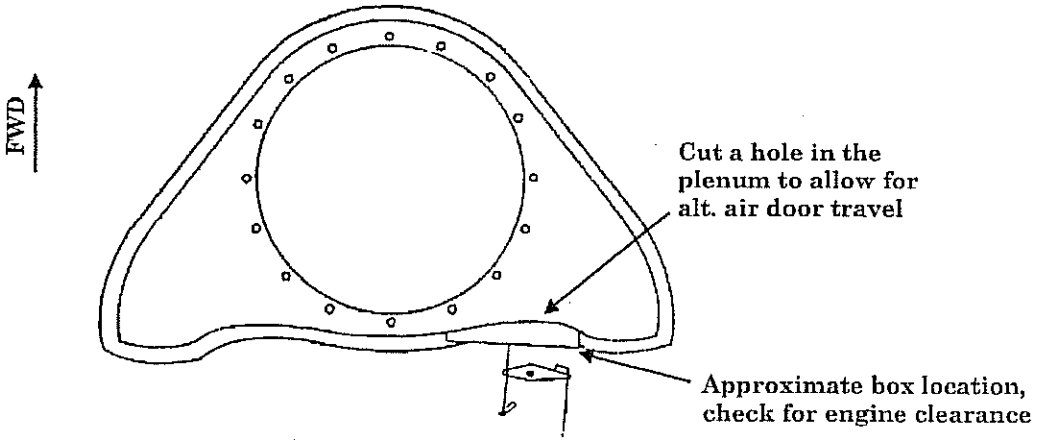


G. INDUCTION AIR SYSTEM

The engine induction air comes from a plenum built into the lower front cowl area and is "fed" by a NACA duct also built into this area. You'll have two molded parts for this, 1) the plenum which is a strange looking piece and 2) the NACA duct. Also in this section, an air filter bypass door will be installed. This allows air to flow to the engine should the filter clog.

Induction air plenum

Figure 31:G:0

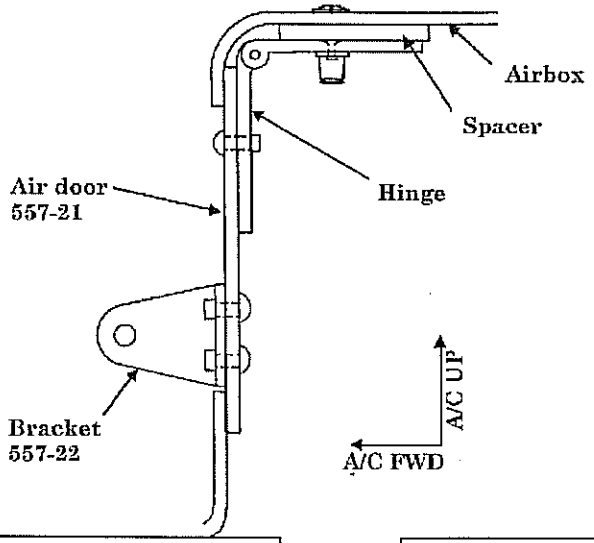


G1. Assemble the airbox before bonding it to the plenum.

a). Temporarily fit the hinge to the door with superglue and, using a spacer made from aluminum scrap, fit the assembly inside the airbox (see figure 31:G:0:a).

Cross Section of Airbox

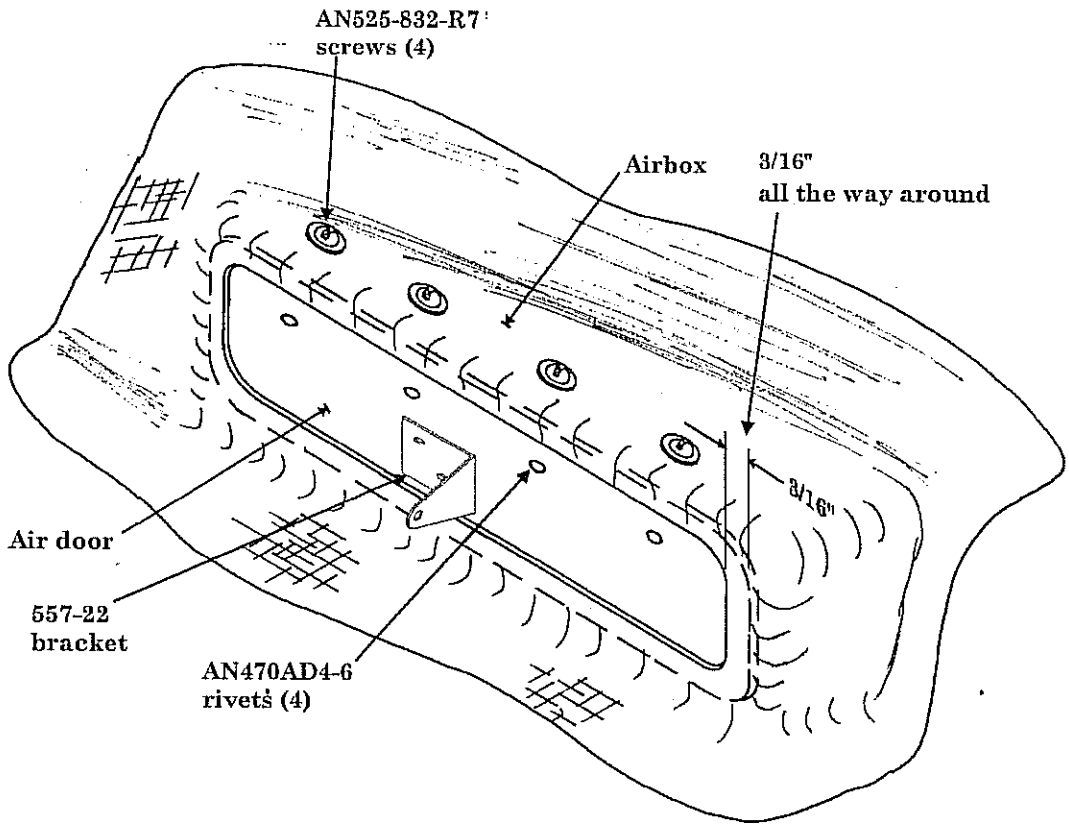
Figure 31:G:0:a



Draw a line around the door on the inside of the airbox. Remove the door and draw another line inset 3/16" from the first line. Cut out the opening for the air door along the inner line (see figure 31:G:0:b).

Assembling the Airbox

Figure 31:G:0:b



b). Install the assembly using AN-525-832-R7 screws, K1000-08 nutplates, and AN426A3-5 rivets. Use AN470AD4-6 rivets to attach the door to the hinge.

c). Mount the 557-22 bracket on the door as close to the bottom as possible using AN470AD3-4 rivets.

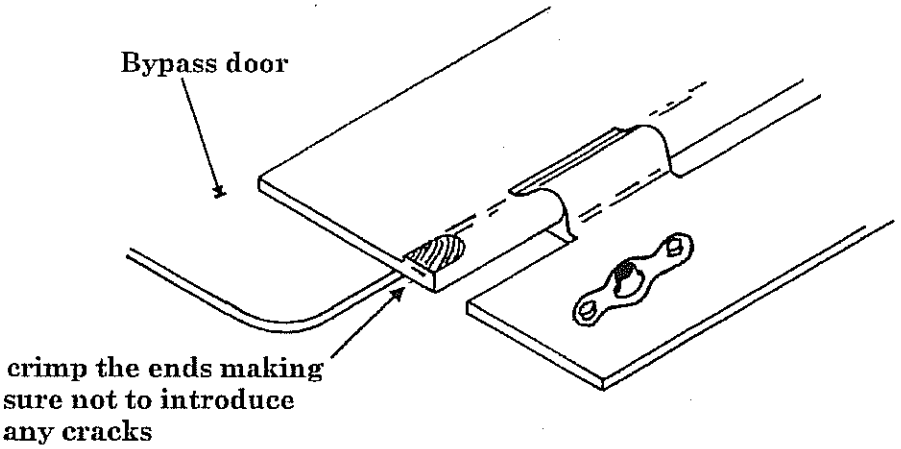
d). Secure the hinge pin (see figure 31:G:0:c).

e). Make sure that the door seats well against the air box and moves freely on the hinges. A micro release might be necessary for a good seal.

NOTE: It is recommended that you silicone a 1/8" or 1/4" mesh screen over the door opening, with a small slot cut out for the 557-22 bracket to pass through.

Secure the Pin

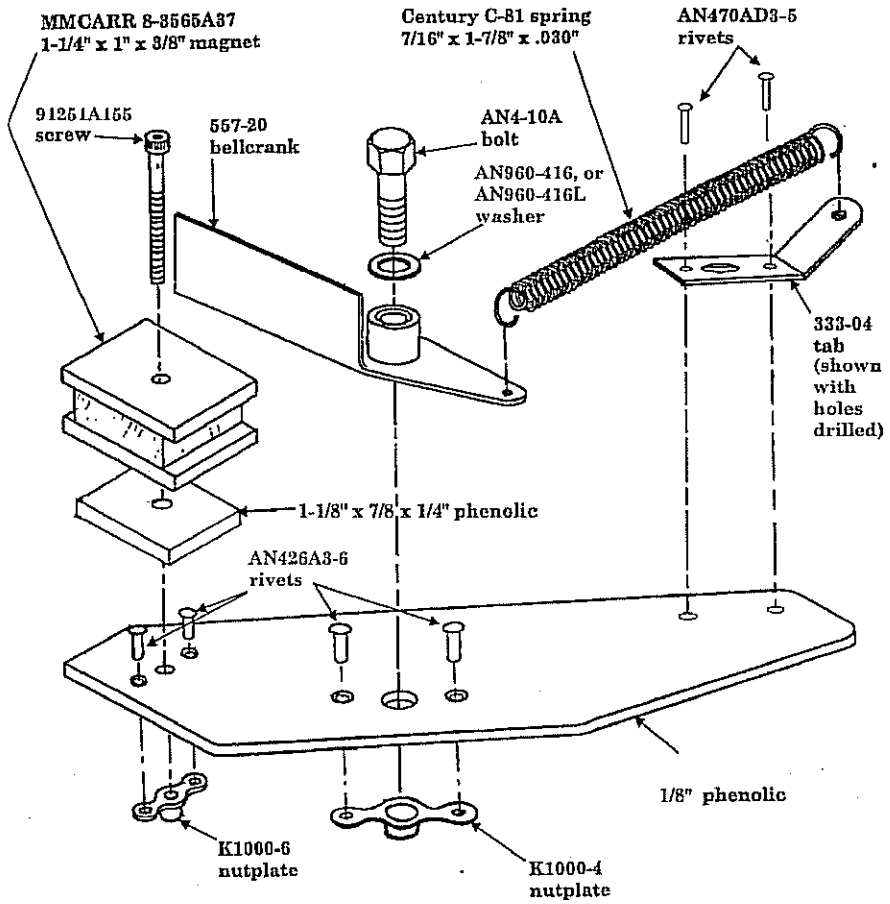
Figure 31:G:0:c



G2. Complete the bellcrank assembly.

Exploded View of Bellcrank Assembly

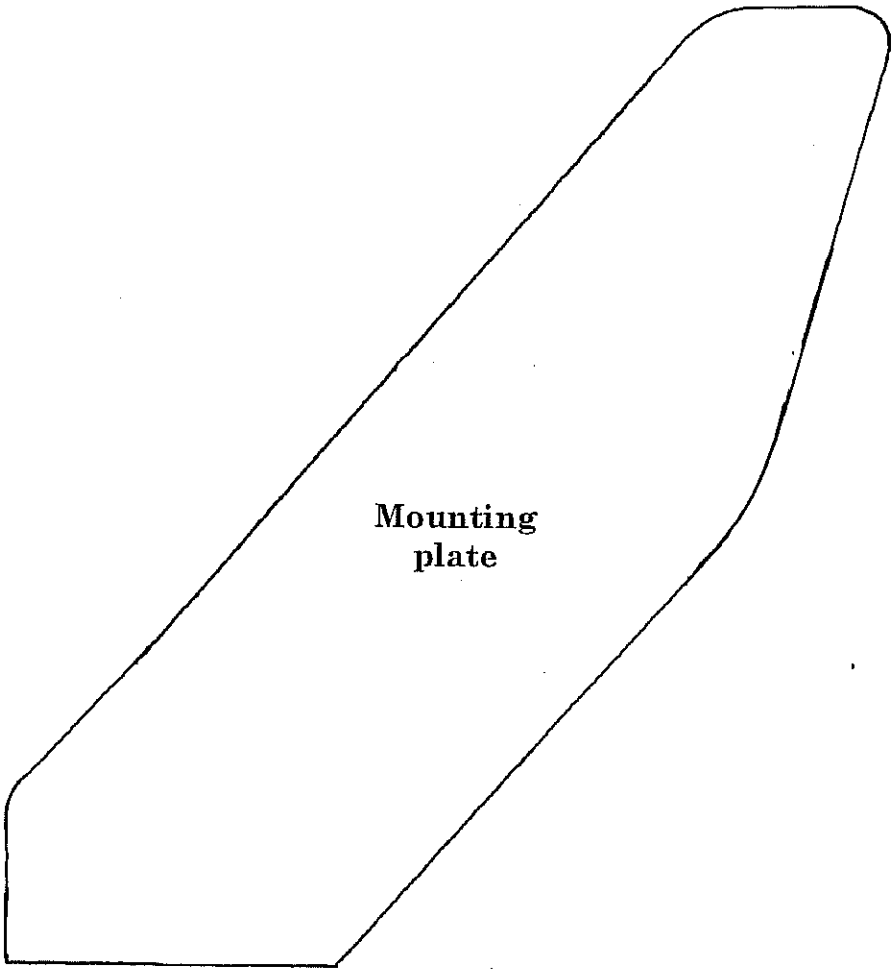
Figure 31:G:0:d



a). Use the template to cut the 1/8" phenolic mounting plate. Cut a 1-1/8 x 7/8 x 1/4" phenolic spacer. Drill the two #40 holes in the 333-04 bracket (see figure 31:G:0:d).

Phenolic Template

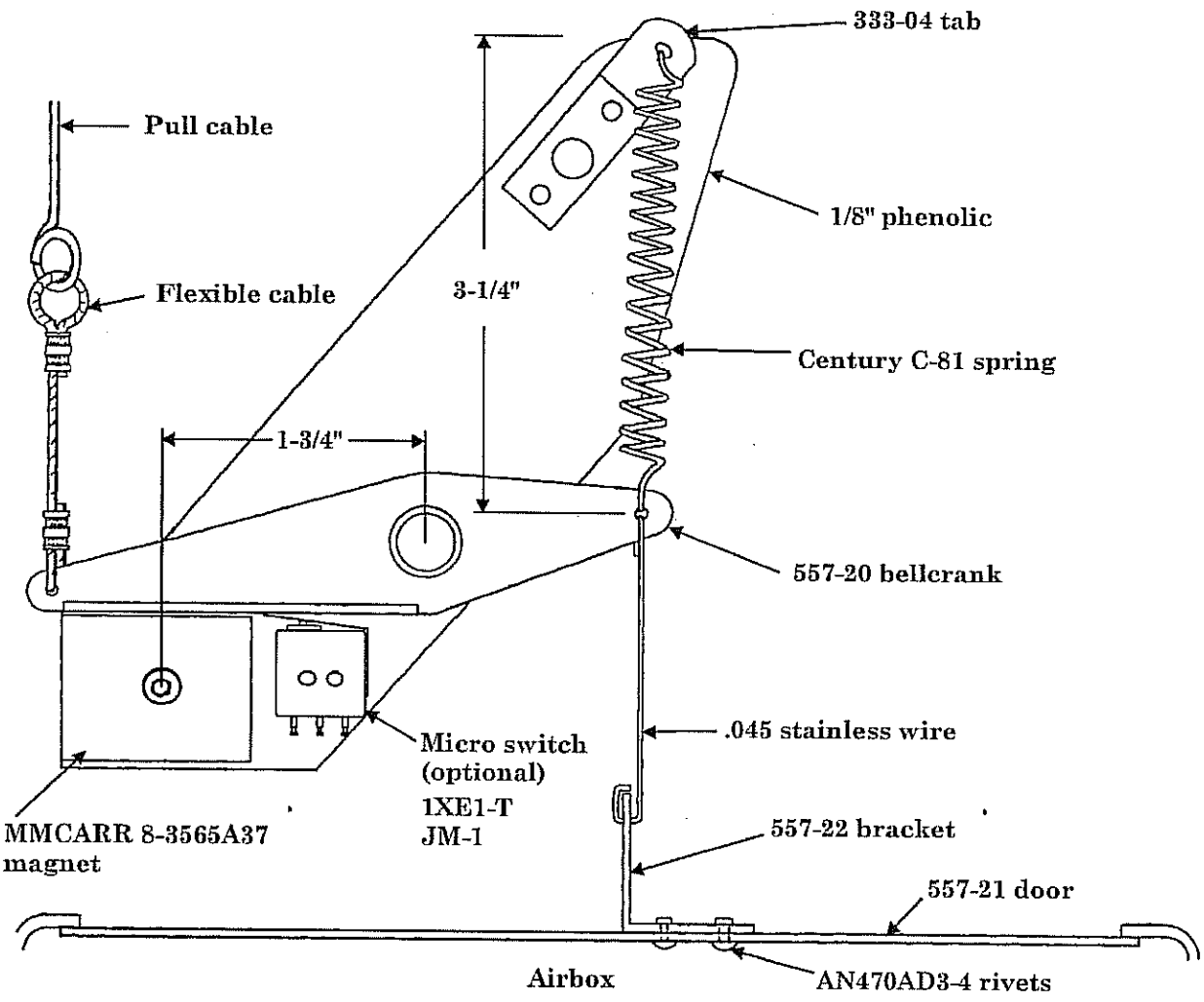
Figure 31:G:0:e



b). Set the magnet, bellcrank and bracket on the plate (see figure 31:G:0:d & f). Mark the position of the mounting holes and mount the components. If you plan to install an optional alternate air door light, you should also install a micro switch on the plate. First mount the magnet on the bottom left corner and then position the remaining components according to the figure.

Assembling the Bellcrank & Plate

Figure 31:G:0:f



Note: The magnet pole plates must be perfectly aligned with the bellcrank. While the mounting screw is slightly loose, put some superglue between the magnet, spacer, and plate while everything is aligned properly and let the glue set up. Then tighten the screw and check again to make sure the magnet is still aligned.

c). Put lock tight on the K1000-4 nutplate and tighten the bolt so the bellcrank swings freely with no wobble or binding (see figure 31:G:0:d).

d). Make up a length of flexible cable if you intend to install an optional manual pull cable. Running flexible cable through Nylo Seal tubing up the side of the cowling and up to the firewall makes it easy to disconnect.

Note: If you have already mounted the plenum, continue with step G3. If the plenum is not yet mounted in the cowling, go to step G4 and install the plenum, then return to step G3.

G3. Prefit the alternate airbox assembly and the bellcrank assembly in the cowling. Bond them in place.

a). Cut the stainless wire to length allowing for a loop at each end (see figure 31:G:0:f).

b). When you are satisfied with the final fit, establish the position of the box on the plenum (see fig. 31:G:0). Cut an opening in the plenum as large as the air door to allow for air door travel. Set the box on the plenum bottom flange and push it as far to the right as possible. Make sure the left side of the airbox is as far down and forward as possible to clear the motor mount. With the box temporarily in place, trial fit the bottom cowling and check for clearance between the box and engine mount. Trim as necessary. Bond the airbox in place. Make sure not to twist it in a way that would mis-align the door.

c). Protect the nut plates and bolt threads on the bottom of the bellcrank mounting plate with a foam dome or tape and bond the bellcrank assembly to the bottom of the cowl with flox or Hysol/flox. Bond shims under the mounting plate to help obtain a better fit over the uneven surface.

d). Fit the stainless wire so that the door is shut tight and the loops are bent back over the wire.

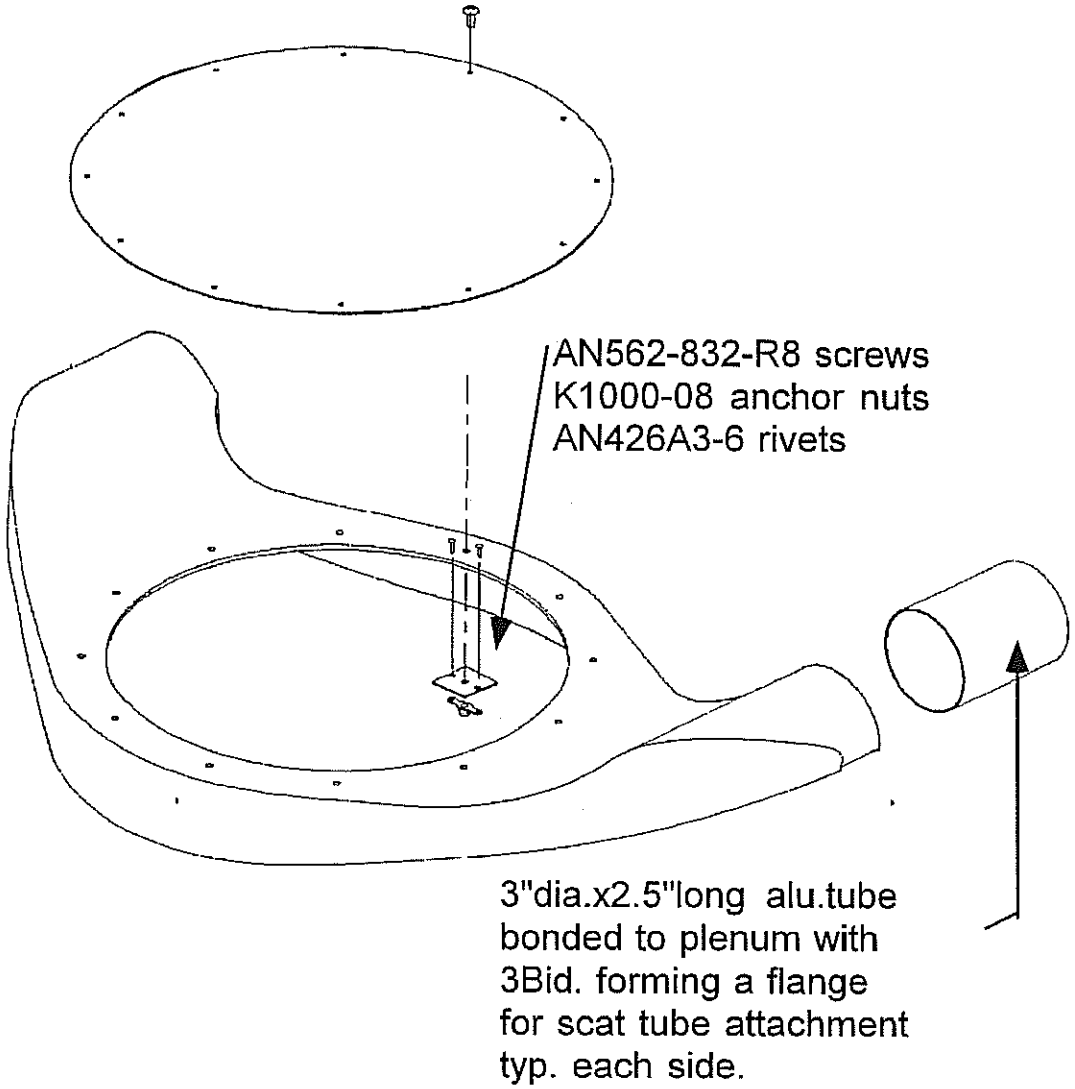
e). Check the complete assembly for proper operation and freedom of movement.

Note: If you have the large exhaust openings on the bottom cowl, you will need to modify them to fit the bellcrank assembly. A support shelf bridging the deeper bottom cowl would work.

WARNING: Verify that all mechanical fasteners are properly secured. Apply locktite to the nutplates inside the plenum. Sand off excess epoxy/micro that may break off. Any loose parts inside the plenum will more than likely find their way into the engine.

Induction Air Plenum

Figure 31:G:O:g

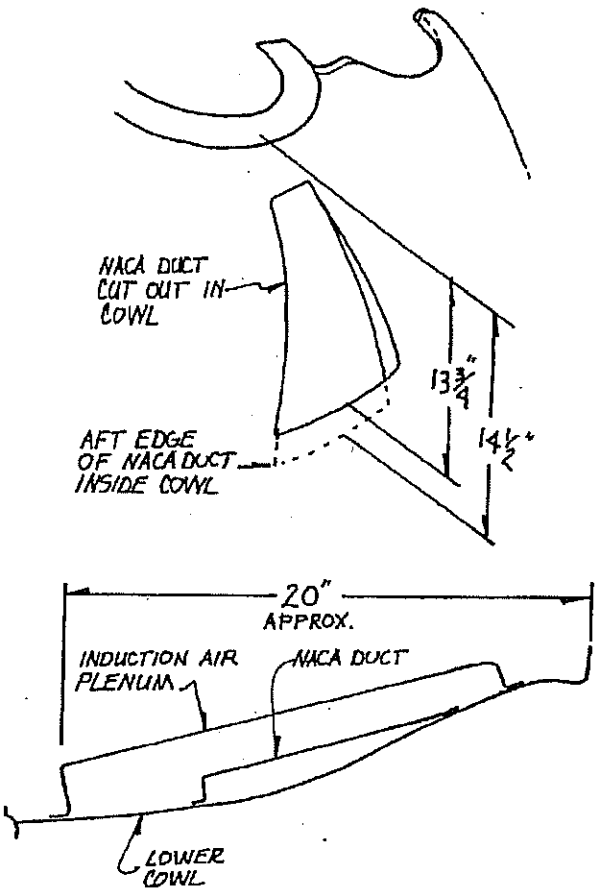


Induction air plenum

G4. Make a trial fit of the plenum. Always a good first step. The plenum should fit into the lower fslg, in an approximately centered position, see drawing for alignment dimensions. While this is not critical, too much aft placement could cause problems with interference between the plenum and engine mount. Also, lay the large NACA duct in a relative position to check that fit as well.

Induction air plenum / NACA duct position

Figure 31:G:1



Cleco the plenum in place. Use a few clecos and set the position, then place the cowl in position on the plane and check for any possible interferences. Adjust as necessary.

G3. Install the aluminum plenum flanges. These are 3" dia. x approx. 2.5" long. The plenum will require the ends trimed out to accept the round aluminum tubing. With the plenum clecoed in position, place the alum. tubes and note their required elevation above the surface of the lower cowl that is required to allow the scat tubing to install. Mark the relative position of the alum. tubing onto the plenum. Note that the aluminum tubing must be kept close to the cowl so as to adequately clear the engine exhaust pipes. (See figure 31:G:0:f.)

Remove the plenum and install the alum. tubes using 3 BID to attach. Make the cutout hole a smooth transition from plenum to tubing pieces.

G4. Fit the NACA duct in place. Use the molded NACA duct to trace off the size opening to be cut in the cowl. Note that the opening is shorter in length than the duct itself - typical of a NACA duct and similar in concept to the installation performed way back when on you vertical stabilizer fin.

Trace the NACA duct outline onto the cowl and cut with a sabre saw. Cleco the NACA duct in place for another trial fit.

When all is fitting well, prep the surfaces and bond the parts in position using epoxy/flox. Clecos spaced every couple of inches will usually suffice to create the clamping pressures. It is generally a good idea to apply 1 BID (can be the light weight 3/4 oz. variety) over the external edge between cowl cut out and NACA part. This is to merely prevent any tendenancy to crack later in life along this seam.

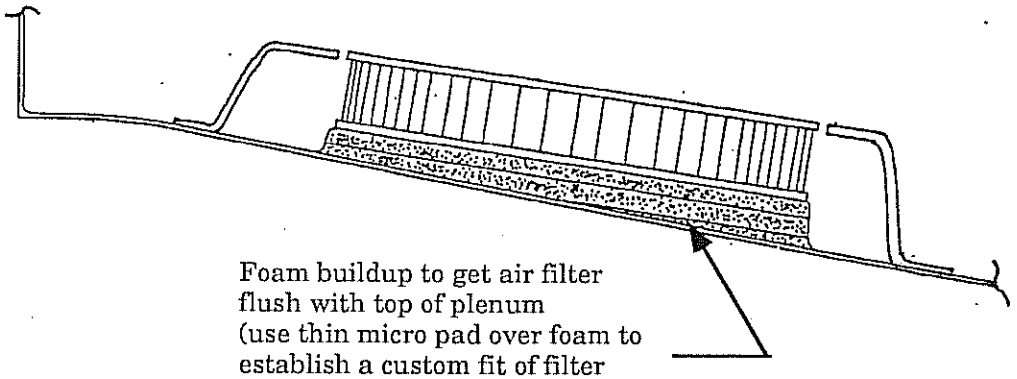
G5. Install the air filter base. The air filter must sit essentially flush with the top of the plenum so that the aluminum lid seals against the aircleaner. To accomplish this, you'll need to build up the base by creating a circular pad under the air filter which is attached to the cowl. This is done with foam and 1 BID over top.

Cut the supplied 1/2" foam into roughly 4"x12" sections. These sections are then pieced around the base of the filter to form a ring onto which the filter will ultimately rest. Using micro, glue these sections down to the cowling. Approximately three pieces are required to the aft and one to two fwd.

After cure, sand flat such that when the air cleaner is placed on top, it will sit flat against the foam and also flush to the level of the aluminum lid. This will create a "wedge" shaped circle of foam ring being thicker at the aft end. As a means for a final custom fit, lay a thin layer of micro onto foam and press the air filter down into position (with release tape on it). This will take up any inconsistencies and lock the air filter in position as well. Then cover with 1 BID to seal.

Air cleaner base

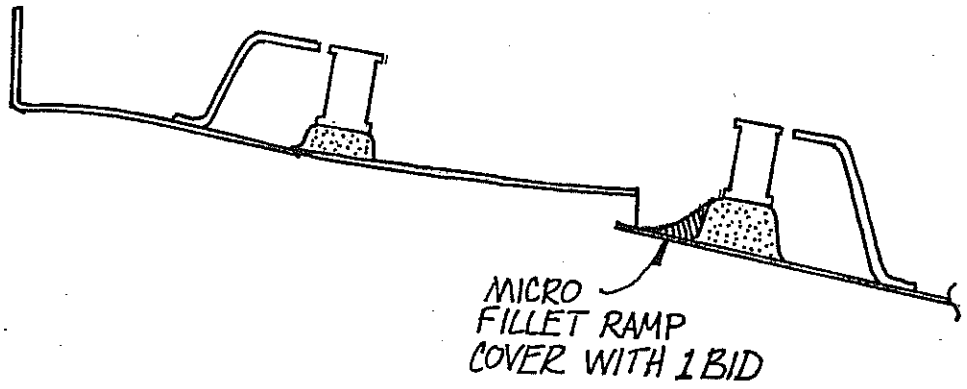
Figure 31:G:2



G6. Make an air ramp aft of the NACA duct. Inside the plenum, make a ramp for the air into the plenum chamber just aft of the end of the NACA duct. This ramp is merely a large micro fillet, sanded to a smooth contour and covered with 1 BID.

NACA duct micro ramp - X/C

Figure 31:G:3



G7. Install the plenum lid. (Part # 557) This lid is aluminum and screws down over the aircleaner into the plenum. This lid also has an alternate air opening built into it with a spring loaded door. Should the main air inlet, through the NACA duct, become clogged (due most likely to icing), the alternate door will be sucked open and the engine will continue to receive induction air from within the cowling. During normal operations, there is a slight pressure rise in the plenum and consequently the alternate air door is not only spring loaded to close but the pressure air holds it closed as well. Thus the alternate air system is fully automatic.

Assemble the lid per the blueprint drawings. This involves riveting the stiffeners and alternate air door in position. The drawing indicates using small fiberglass tabs to hold the anchor nuts around the edge of the lid. While this approach is not required, it may be easier to do it this way.

A micro switch installation is also provided. This is merely a safety device to inform the pilot when the alternate air door is activated open. This micro switch should be connected through a (-) negative circuit to a warning light on the instrument panel.

H. PROPELLER / SPINNER

As of October, 1994, only the MTV9 and Hartzell propellers have been approved on the Lancair IV powered by the TCM TSIO-550-B engine. This will address the installation of these propellers.

In section A of this chapter, you temporarily mounted the prop and spinner backplate to achieve proper alignment of the cowling. Now, the prop must be permanently mounted. (With all MTV9 props, due to their methods of manufacture and balance, spinners are matched to the prop.)

H1. Clean and prep the propeller flange. The prop receives oil from the crankshaft and thus a good seal is essential. Be sure to clean the prop flange with a clean cloth. Check to make sure the propeller mating surfaces are also clean.

H2. Attach the propeller to engine. You'll need someone to help with this, carefully lub the O-ring on the prop hub and slip the prop onto the prop flange of the engine. There are two alignment pins on the prop which will mate to the prop flange. A very slight wiggling motion will allow the prop to slip into position with the studs extending through the prop flange.

H3. Set the prop bolts. Use one washer and the lock nut. Draw up the six bolts equally using an open end wrench and rotating the crankshaft counter clockwise to access the bolts. When snug, use a torque wrench to set the final torque of these nuts. Use 45 - 50 ft./ lbs torque. Generally, an open end, crows foot wrench adaptor works best to access these nuts.
(Note: It is typical for a new prop to sling what appears to be oil out from the hub area for the first few hours. This can often be misinterpreted as an O-ring leak when in fact it is simply some of the packing grease and is normal. This will actually be a bit thicker If it were to persist then further inspection would be required.)

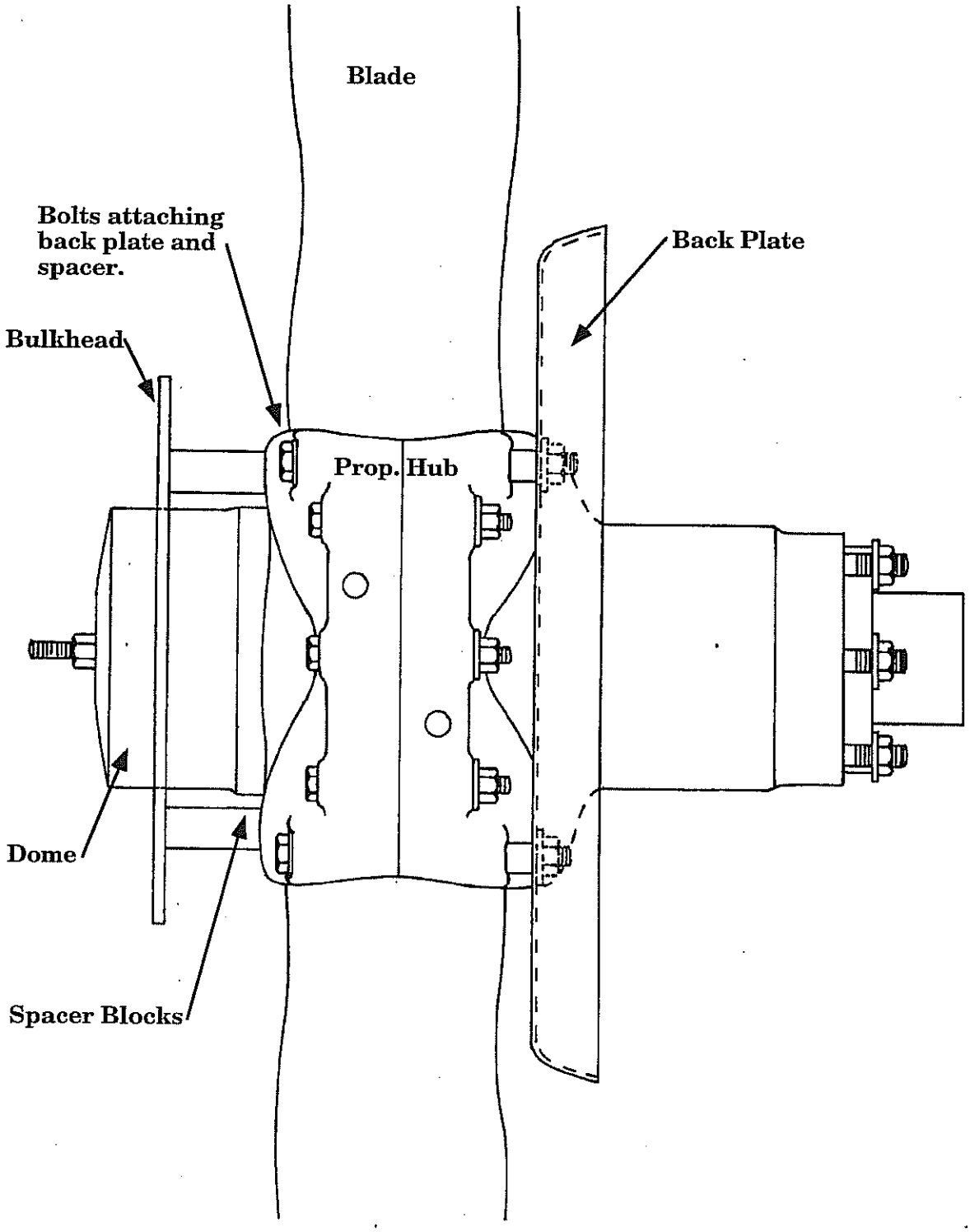
Hartzell Installation

H4. It may be necessary to grind a portion of the back plate in the center cut out for a good fit. Use blueprint #594 to mark areas to grind. Attach the back plate to the prop. hub using the six bolts provided with the propeller.

H5. Cut around the tabs on blueprint #595. Bend the tabs at the specified locations and place the template on the spinner. Trace the shapes of the tabs onto the spinner. Carefully cut out the tab shapes with a hacksaw. Notice that the tab is reshaped using blueprint #595 (see the heavy outlined tab). Keep this portion of the tab in one piece. It will be used later. The remainder of the tab can be ground out any way that is possible.

Hartzell Propeller

Figure 31:H:1



H6. Fit the spinner over the hub and clamp it to the back plate. Check for run out.

Run out is how much wobble there may or may not be when the propeller is turned with the back plate and spinner template mounted.

a.) If the run out is acceptable, align the rear of the spinner with the rear surface of the back plate and move onto c.).
b.) To correct run out, support the air frame from the two jack points on the fuselage. Support the engine mount so that the nose gear is off of the ground. Remove half of the spark plugs. Set up a stationary marker at the tip of the spinner and turn the prop. slowly. Try not to disturb the rest of the air frame. **Success depends upon how stationary the air frame is kept.** Adjust the spinner to the least amount of run out.
c.) When satisfied with the run out, drill three, 1/8" holes through the spinner and back plate. Space these between the prop blades. (See blueprint #595.) Check for run out again and if satisfactory, enlarge the holes to 3/16." Remove the clamps and install three, 3/16" bolts and nuts to hold the spinner in place. Drill four more 3/16" holes. (See blueprint #595 for placement.) Drill three holes, one centered behind the prop. blade through the back plate. (Used for mounting the cut out pieces.)

H7. Remove the spinner and install 18 (K1000-3) nutplates on the inside of the back plate.

H8. Mount three, temporary spacer blocks of equal size, to the prop. hub. The spacer blocks should end somewhere near the middle of the hub dome. Measure the diameter of the dome at the location where the spacers end.

H11. Remove the spinner and sand off the excess micro. Put a 1 BID layup, 1" onto the bulkhead and 1" onto the spinner, all the way around. Remove the temporary spacers from the prop. hub.

H12. Match the three cutout pieces to the area they were removed from. Tape in place from the outside. On the inside of the spinner, apply release tape to each side of the cut pieces. Apply 3 BID over the release tape making sure that the BID is far enough forward to be between the cut outs and the back plate.

H13. After curing, pop the pieces out and trim to the shape that is shown on blueprint #595. Replace the pieces in the correct positions. Drill holes for No. 6 screws through the BID tape "ears" and spinner. (See blueprint #595 for location.) Install K1000-6 nutplates for the No. 6 screws.

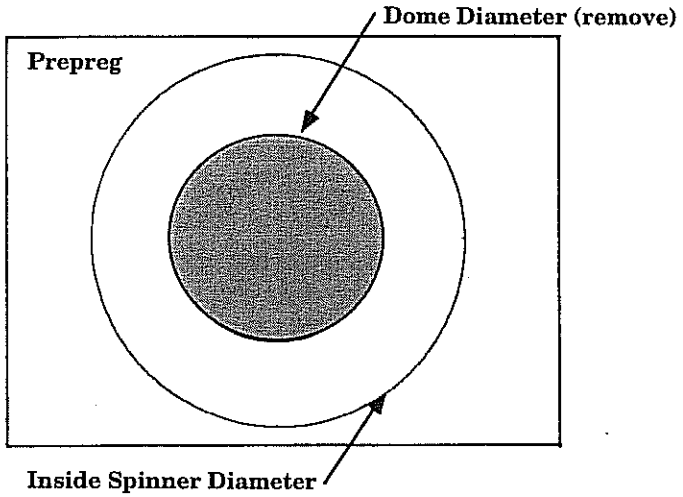
H14. Replace the spinner over the prop. hub and attach with the No. 6 screws. Drill through the remaining three holes left in the back plate and through the filler pieces. Enlarge for No. 10 screws.

H15. Flex the prop. blades for an 1/8" clearance between the blades and spinner or filler plates.

H9. Out of 2 core 2 prepreg, cut a circle with a diameter the same size of the dome and remove. See Figure 31:H:2. Wrap release tape around the dome. Slip the prepreg over the dome and push up against the spacers. (It may be necessary to make the diameter a little larger.) Push micro around the hole cut and the dome to fill any spaces. Allow to cure. Pop off. Then, cut the diameter of the spinner out around the first circle.

Spinner Bulkhead

Figure 31:H:2



H10. Remove the core from the outside diameter of the bulkhead and fill with micro. Sand and clean the inside of the spinner where the bulkhead will mount and 2" towards the rear. Put the bulkhead over the dome against the spacers. If necessary (it shouldn't be), flex the prop. blades and carefully replace the spinner over the dome. Attach the spinner to the back plate with three bolts at 120°. Allow the micro to cure.

Flexing the Prop. Blades

Figure 31:H:3