



<u>Process</u>
Fit Mount to Firewall
Fit Mount to Engine
Fit Mount & Engine to Firewall
Fit Air Filter Box
Cabin Heat Mixer Box
Battery Support
Oil Recovery Bottle
Firewall Fuel System
Regulator & Solenoid
Ram Air Cooling Ducts
Control Cable Termination
Choke Cable
Throttle Cable
Oil Cooling System
Cowls
Propeller
Spinner

List sequence above is a logical build order but certainly is not the only sequence that will work. Builders can mix and match as desired. The manual procedures are only a general guide to the proper installation of a Jabiru engine and firewall forward system and are not represented as mandatory or required procedures.. Each builder should become familiar with standard aircraft practice as outlined in various FAA Advisory Circulars, books by Tony Bingelis (available from EAA) Bob Nuckols (aeroelectric connection) and others and continue installing a firewall forward system only after fully understanding the basic principles involved.

How to install oil line fittings.

Tools needed:

Braided oil line

Fittings

Pipe jaws for vise

$\frac{3}{4}$ " socket and ratchet

9/16" open end wrench (for 45 degree fitting)

11/16" combination wrench (for straight fitting)

A touch of engine oil

Masking tape

Dremel tool or similar device with cutoff wheel

Step 1.

Carefully measure the oil line. A good tip is to install a fitting on one end of the line and then attach it to the oil cooler adapter fitting. Screw the other fitting onto the oil cooler outlet and then mark the needed length on the oil line. The scored line on the hose end of the fitting is the point where the oil line stops inside the fitting.

Step 2.

Tightly wrap the oil line with masking tape using several turns. Your goal here is to keep the oil line from fraying while cutting it.

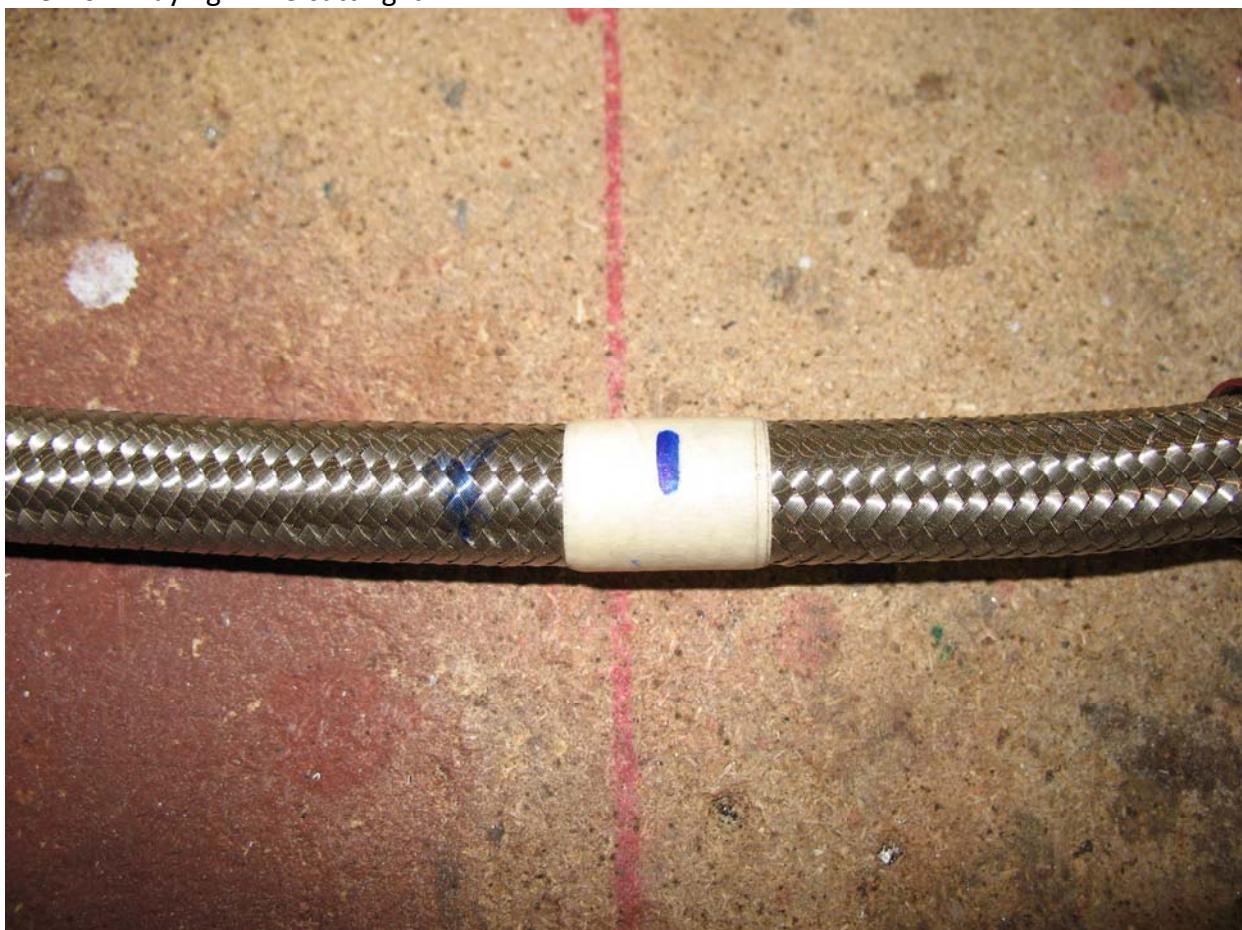


Figure 1

Step 3.

Cut the braided line using a Dremel tool, RotoZip, chop saw or similar device that has a metal cutting disc. You want as clean a cut as possible. Do not attempt to cut the line with any device that has teeth such as a hacksaw, you will end up fraying the oil line and frustrating yourself!



Figure 2

Step 4.

Remove the tape and insert the oil line vertically in the jaws of the vise.



Figure 3

Step 5.

Take the fitting apart. Place a small dab of engine oil on the hose end of the fitting. Carefully place the hose end of the fitting over the oil line taking care not to fray the end of the line. Place the 9/16" socket over the fitting and while pressing downward "tighten" the fitting onto the hose.



Figure 4



Figure 5

The oil line should bottom out against the threaded portion of the fitting.

Step 7.

Wrap a piece of masking tape around the oil line at the base of the fitting. This will let you know if the oil line pushed out of the fitting during the next step. Place the oil line and fitting horizontally in the vise locking the fitting into the jaws of the vise.



Figure 6

Step 8.

Place a small dab of motor oil on the nipple of the fitting. Gently start the nipple into the hose end fitting until finger tight and make sure it's not cross threaded. Grasp the oil line with one hand and apply pressure to keep the oil line from backing out of the fitting. While applying pressure screw the nipple into the fitting using the 9/16" (45 degree fitting) or 11/16" (straight fitting) wrenches. Screw the nipple in until you have about a sheet of paper's width between the nut and the hose end.

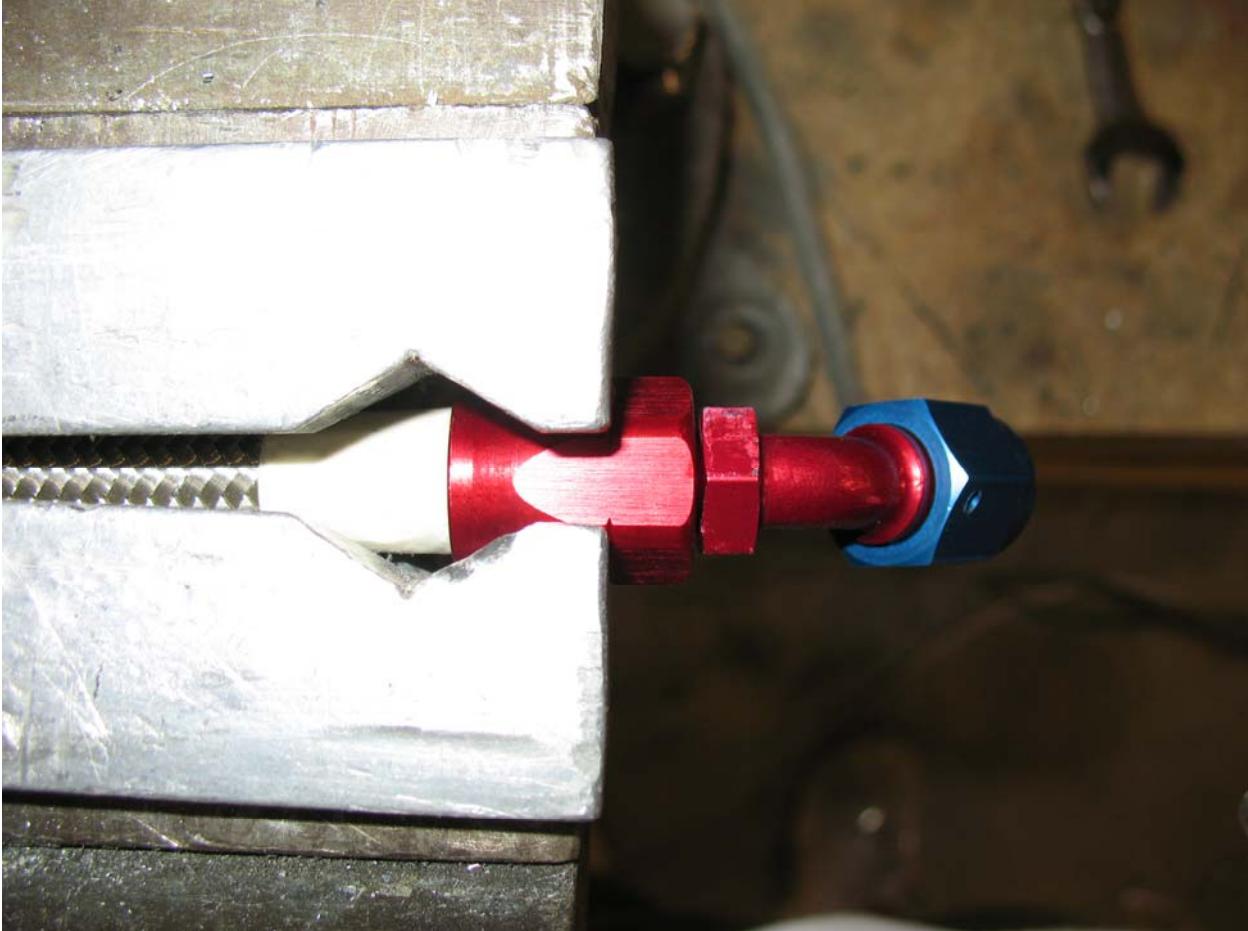


Figure 7



Figure 8

Finished product.

The engine mount will have to be trimmed so that the mount pads that contact the firewall will fit correctly on the firewall. These five pads have been left over size to allow builders to trim to match their firewall and to allow room to match firewall components that may have been installed slightly “off” from the standard plans.

1. Position the mount on the firewall and mark the top center mount pad. Trim if necessary for clearance at the top and sides of the mount pad. Make sure the top does not extend above the firewall (trim about 1/4 inch down) See photo 1.
2. At this time you can mark and drill the two 3/16 holes that will mount the top pad to the firewall and fuselage brace tubes. It is best to position the cabin brace tubes correctly and then backdrill through the top engine mount pad.
3. Position the lower two mount pads in the correct position and mark for trimming so that the pads fit along the curved bottom outside corners of the firewall inside the overhanging fuselage skin..
4. Remove mount from firewall and trim off excess lower pad material. See photos 3 and 4.



5. Reposition the mount on the firewall. The mount should be in its normal shape and the center mount pads should be near their final position.
6. Push the center pads up and under the stiffener shelf.
7. The predrilled mount holes should line up with the bolt holes in the firewall. If a bit of extra clearance is needed you can stretch the hole in the engine mount horizontally. Take care not to stretch the mount itself as it is possible to distort the mount so that the mount will not fit the engine.



8. Prep & Paint Mount

Clean all manufacturing oils or oxidation from the steel tubes of the mount. Use steel wool and a solvent to loosen deposits. Wipe clean and dry with a soft cloth.

Prime the mount with a good self etching primer (available at most auto stores).

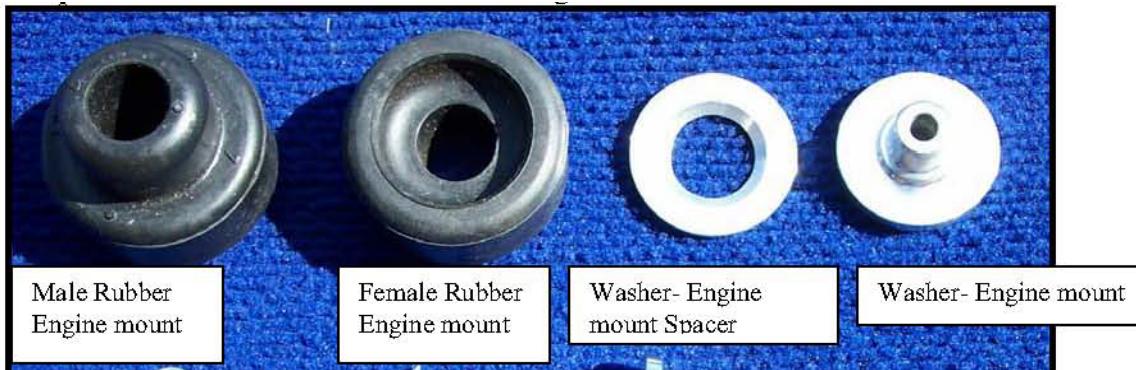
Top coat with a good spray enamel like Rustoleum Hi Performance. We suggest a light color like white or light gray as it makes it easier to spot any cracks that might occur during the life of the mount.

9. When satisfied with the mount fit remove mount and go on to step two: Fit Mount to Engine.
10. If building with the single throttle system be sure to install the throttle arm extension onto the carb. Much easier to install before engine is on mount or on the airplane.

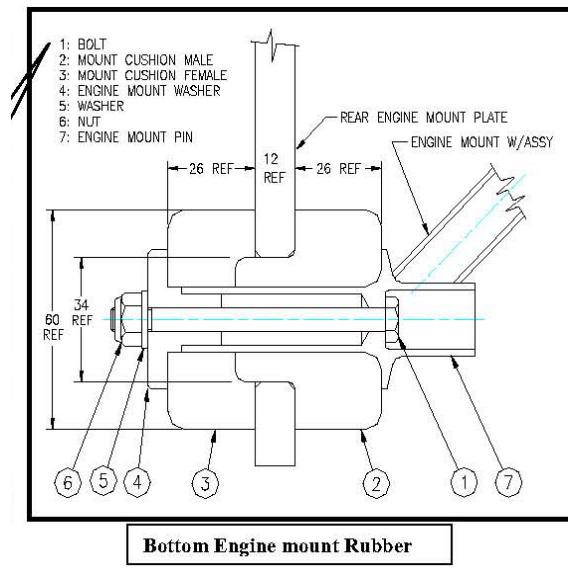
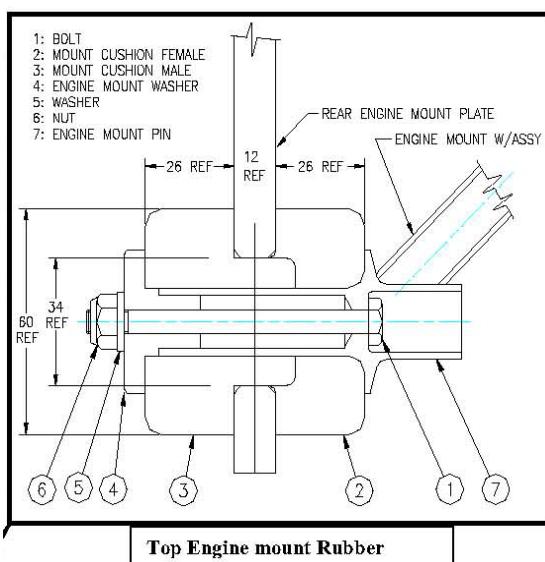
Builders may find it easier to mount the engine to the engine mount and then mount the assembly to the firewall. However, it is not necessary to attach mount to engine first and the mount can be attached to the firewall if the builder prefers.

There are a few procedures that are easier to do before the engine is mounted to the firewall, though. Attaching the throttle arm extension, installing the electric carb heat, and attaching the throttle cable is easier to do with the carb off the engine and on the bench. See the instructions for those procedures.

1. Locate the engine mount cushions and hardware in photo 1 that came with the Jabiru engine in the accessory bag. Also find the engine mount bolts, washers, and nuts from the FWF kit.



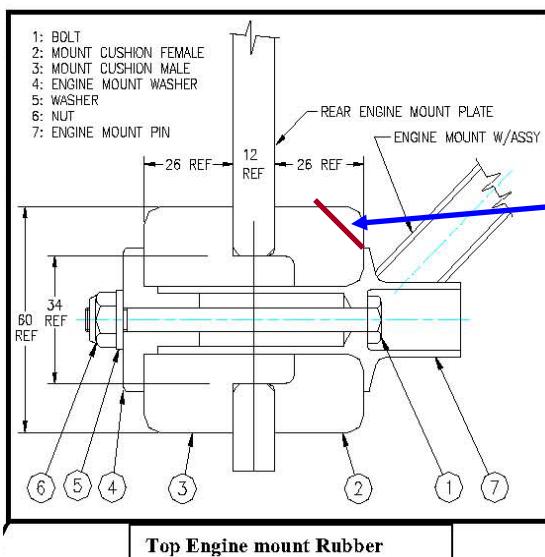
2. Refer to the mount cushion assembly drawings below.
3. Install the female half of the mount cushion on the top mount pins.
4. Install the male half of the mount cushion on the bottom mount pins.
5. Stand the engine up on its prop flange.



Trim Female Cushion

The female mount cushion that will go on the upper right side of the engine must be trimmed a bit to provide clearance for the ignition module. This is most easily accomplished on a band saw but a hack saw or similar tool will do the job as well.

Complete this job as you trial fit engine to engine mount



Remove rubber shoulder with a bevel cut. Rotate cushion so that the beveled area is over the ignition module lead. Remove enough so that the cushion does not interfere with or contact the module or lead. Remove only in an area just large enough to provide clearance for the module and lead. Do not bevel the entire radius of the cushion!

6. Lower the mount down onto the engine, inserting the male cushions into the engine back plate.
7. Insert the AN4-31A mount bolt in the top mount pins
8. Install the male half of the cushion onto the engine mount pin and into the engine back plate.
9. Install the mount washer into the end of the mount cushion and engine mount pin.
10. Using an extended length socket to hold the bolt in place, compress the mount cushion and mount washer until the mount bolt extends far enough through the mount washer to get the washer and AN363-428 nut started. See photo below.
11. Tighten the nut until the mount washer bottoms on the engine mount pin. There should be about two threads showing on the mount bolt.
12. Repeat for other mount bolts.



Builders may find it easier to mount the engine to the engine mount and then mount the assembly to the firewall. There are a few procedures that may be easier if done before final engine installation:

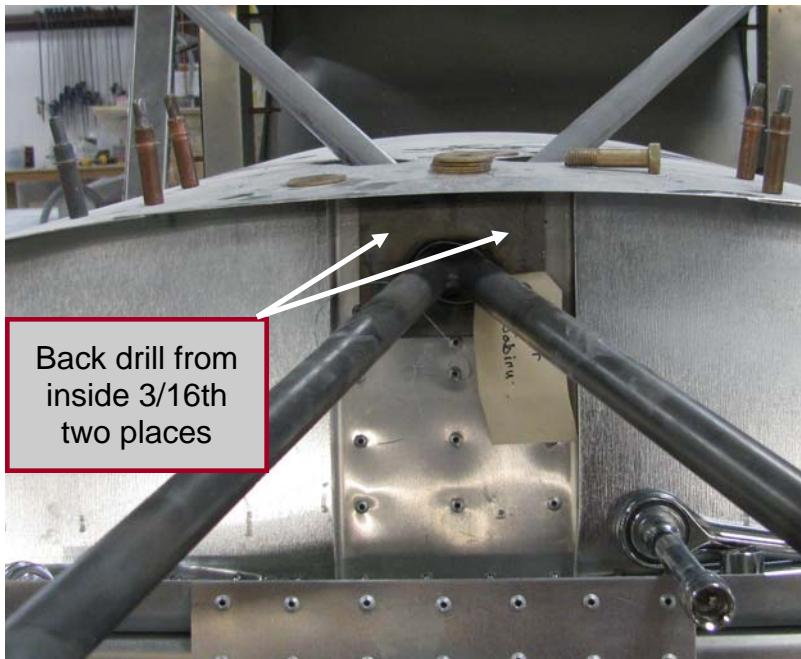
Single throttle carb throttle lever extension is easier to install before engine is on the plane (not needed for dual throttle option)

Female mount cushion for the upper right mount should be beveled for ignition module clearance

Once those tasks are complete and the engine is one the mount use an engine hoist (or a few strong helper) to lift the engine and mount into position for a temporary fit up. Install the bolts and nuts in all firewall mounting holes and lightly snug up the bolts.

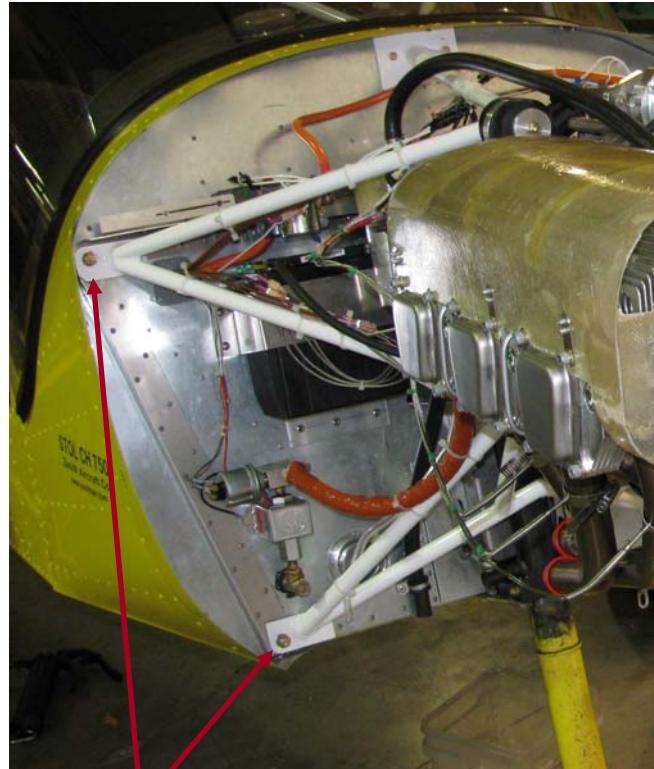
Typically a builder would temporarily hang the engine and then locate the positions of other accessories on the firewall. Using the photos and instructions in other sections of this manual locate the accessories by holding in place and marking their perimeter or mounting hole locations with a Sharpie marker.

See page three for list of items to locate on the firewall



Install two upper mount bolts by positioning the mount in place and back drilling from inside the cockpit through the center plate on the fuselage down tubes, then through the firewall and through the engine mount upper plate weldment.

Install AN3-5A bolts (2) with AN960-10 washer and AN 363-1032 lock nut and torque to 35 inch lbs



Install AN6-7A bolts with AN960-616 washer and AN363-624 Locking Nuts (4 places) with nuts on engine side of firewall. Torque to 24 ft lbs



Airbox

Place the carb heat air filter / mixer box on the firewall on the left side of the aircraft below the shelf on the firewall. Try to position the box so that the outlet to the carb is as closely lined up to the carb inlet as possible. The less down or up angle in the SCAT duct from airbox to carb inlet the better.

Check to see that there is clearance under the firewall stiffener shelf for the cam to operate freely and for the cable to attach to the cam.

Mark the outline of the airbox with a felt tip marker.

Cabin Heat Mixer Box (optional)

If installing cabin heat locate the mixer box close to the center of the aircraft to the right side of the nose leg channel.

Mark the location with your marker

Battery Support & Clamp

Locate the battery on the right side of the firewall under the stiffener shelf. Keep it as high as you can to allow more room for other firewall items to be installed later. Also – keep the battery as far toward the outside of the aircraft as possible to allow as much room for other components as you can.

Mark the outline of the battery

Oil Recovery Bottle

Locate the Oil Recovery Bottle in an open space on the right side of the firewall where it does not conflict with cabin heat or battery.

The bottle does not have to be vertical but can be slanted to help with the fit.

Mark the outline of the bottle.

Fuel fitting

Fuel should pass through the firewall on the right side. Hose will run from the firewall to the pump mounted on the right rear side of the engine.

Locate the fuel fitting on the firewall where it will not conflict with other firewall mounted items.

Mark the location.

Starter Solenoid

Since the battery is on the right side of the aircraft and the starter cable comes back quite naturally toward the right side of the engine, it is natural to locate the solenoid close to the battery on the firewall stiffener shelf.

Regulator

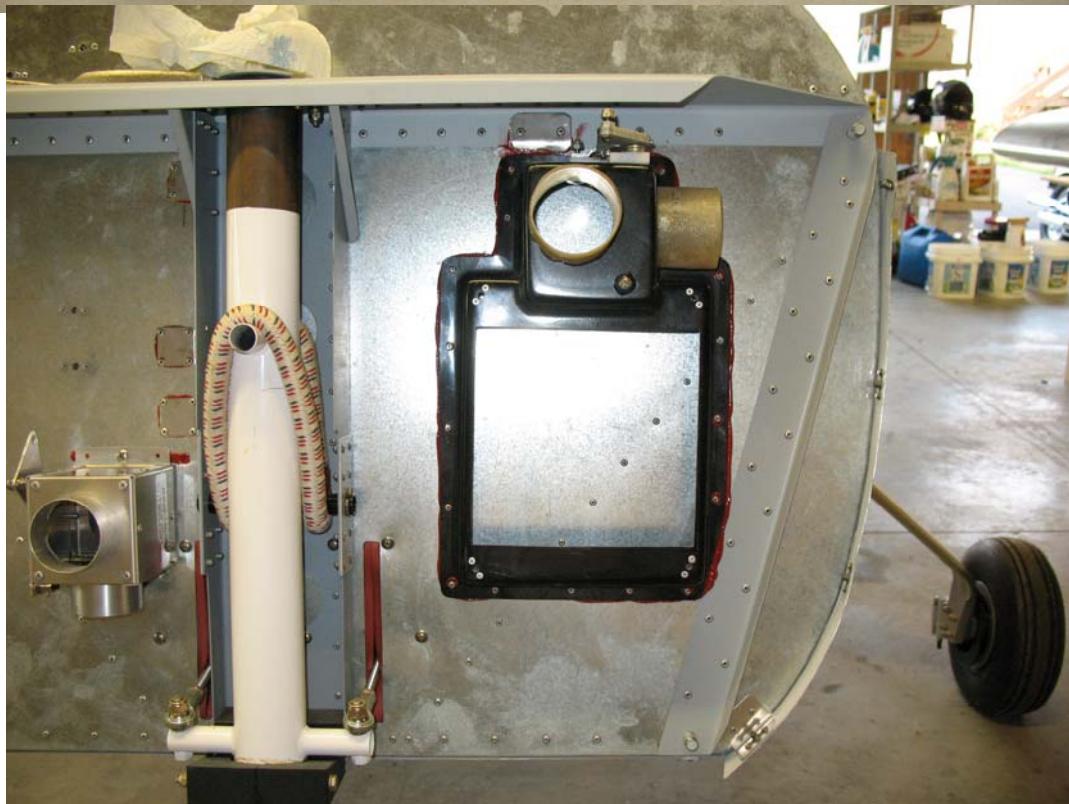
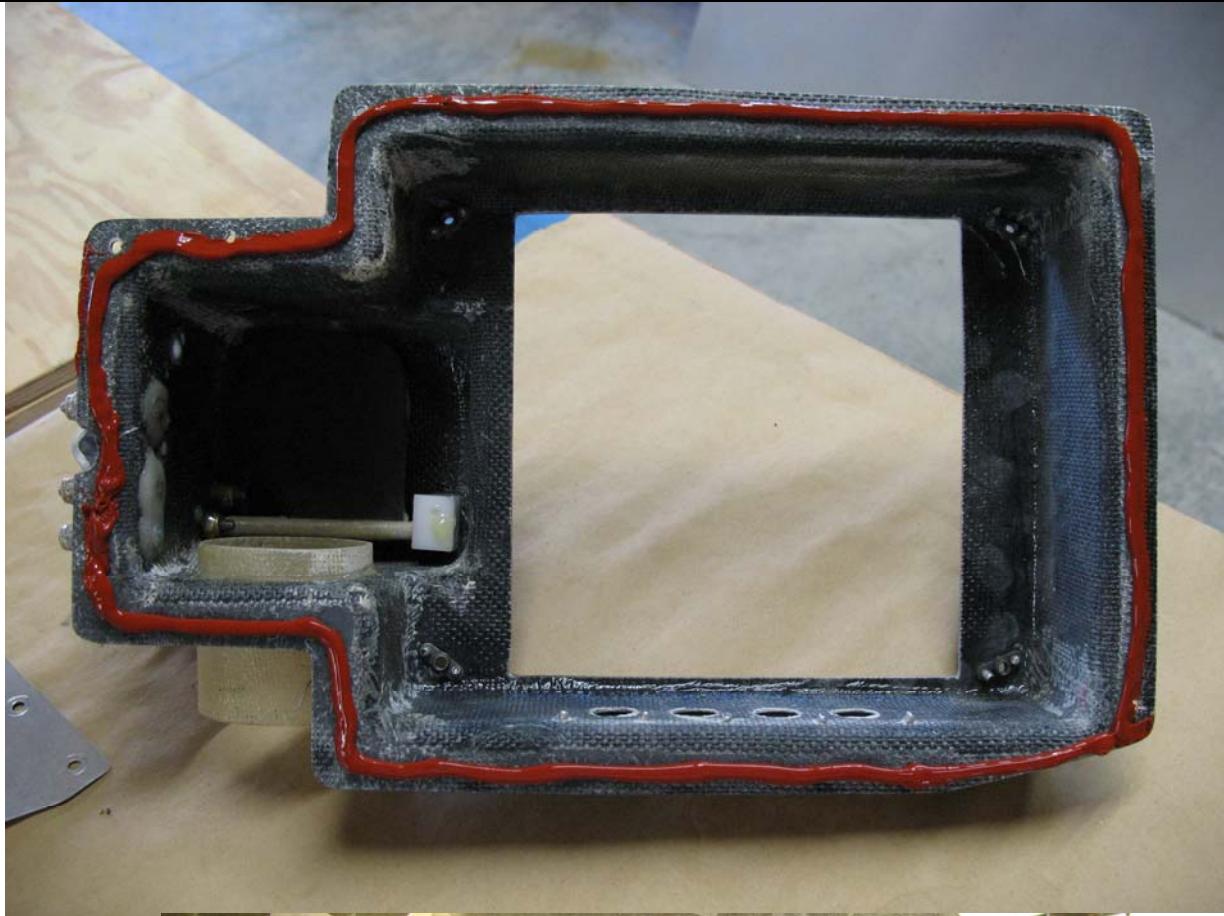
Locate the regulator on the shelf as well near the battery. Make sure that solenoid and regulator are located so as not to interfere with the dual throttle cross rod if dual throttles are being installed.

After firewall items are located it may be easier to remove engine to permanently install those items that are on the firewall.

Final engine installation then is accomplished by installing all bolts and tightening to the appropriate torque for aircraft AN bolts.

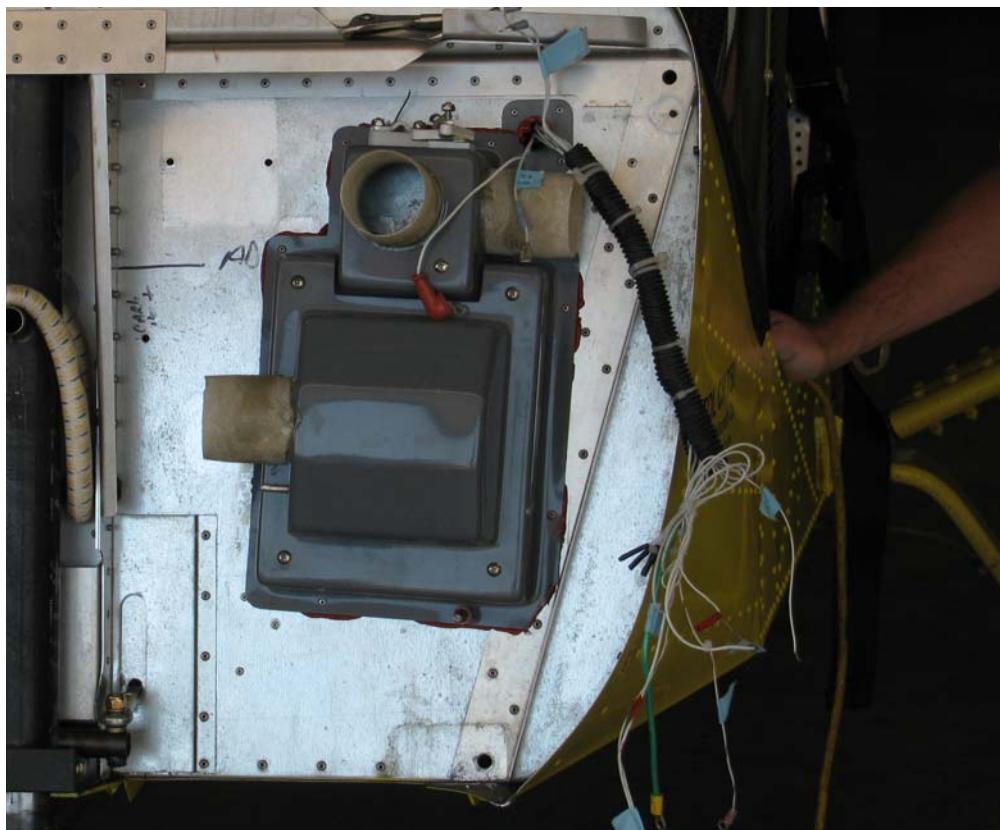
1. Remove the airbox top from the airbox base
2. Position the base per your previous markings on the firewall
3. Drill one hole in each corner of the base and one additional hole in the center of the long side of the base through the airbox flange and through the firewall with a 1/8 inch drill.
4. Temporarily secure the airbox in place with Cleco's.
5. Finalize the drilling by drilling one hole in each corner of the base and one additional hole in the center of the long side of the base.
6. Remove base, scuff the flange and coat edge with silicone sealant
7. Reinstall base with 6 x 1/8 dome head rivets.
8. Insert K&N air filter
9. Replace airbox top and screw to base with the #8 screws provided.







These photos show more rivets than necessary. More won't hurt but are not needed.



Cabin Heat Mixer Box

With a 2" hole saw cut a hole in the firewall per your earlier mark for the cabin heat mixer box

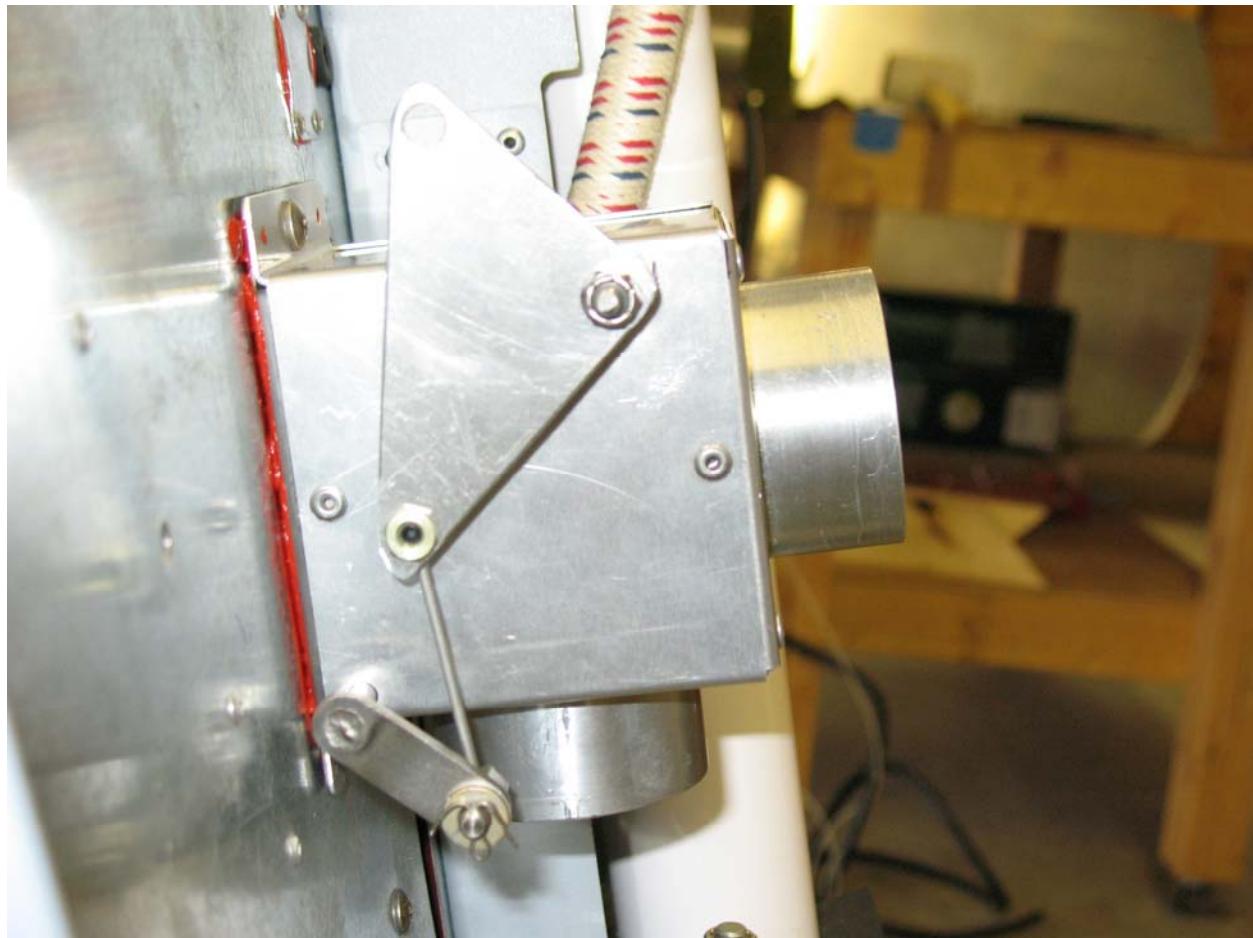
Deburr hole

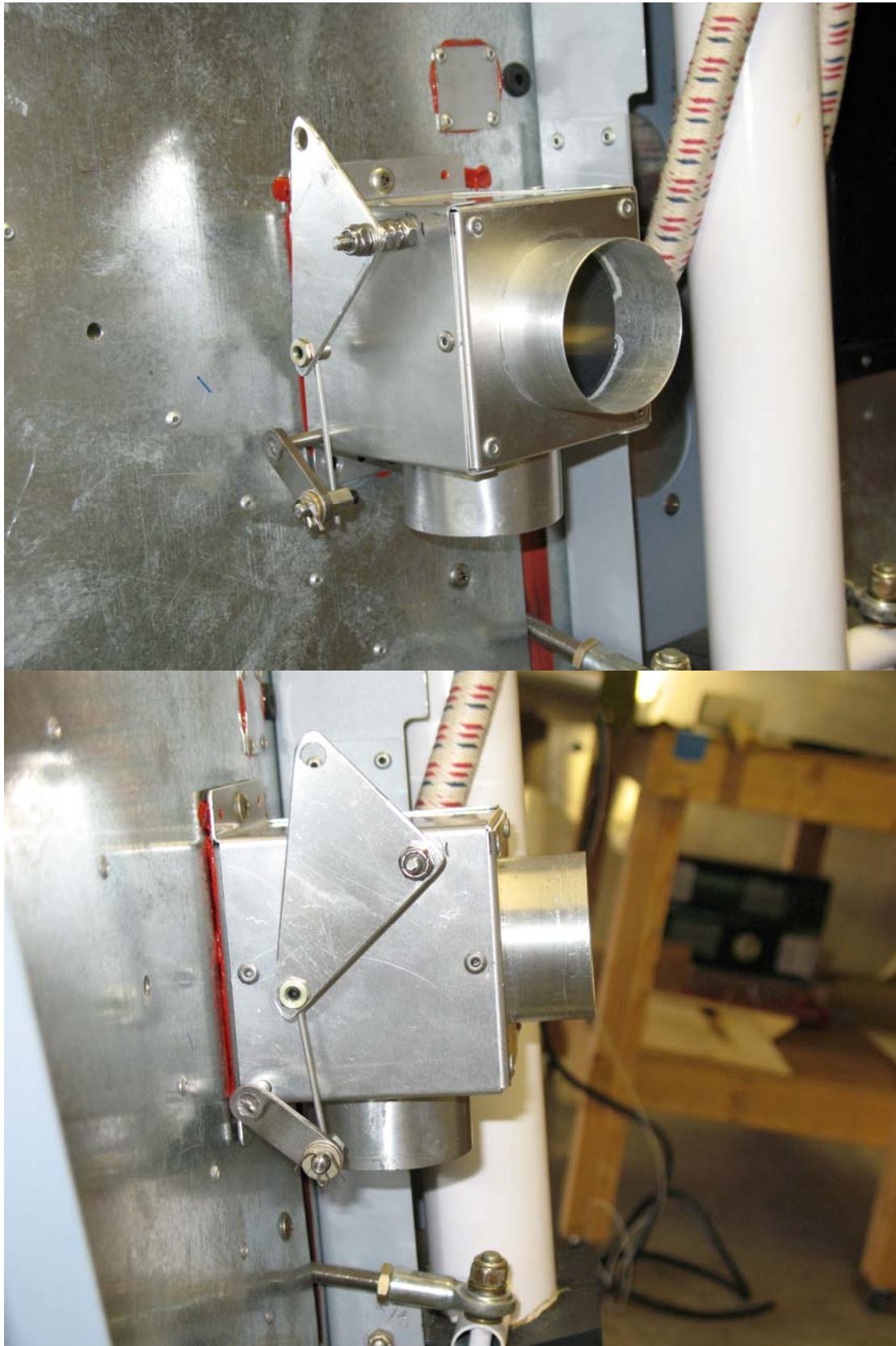
Install box with 4 x 1/8 inch rivets

Typically builders would locate the cabin heat box on the co-pilot side of the firewall just outboard of the center nose leg channel. However the location is not critical and builders can locate the box in any location where it may fit.



Many builders choose to fabricate a bell crank to reverse the direction of the cabin heat box flapper door. This may be easier than running the actuator cable up from the bottom. See photos below for details. Scrap aluminum from the airframe kit can be used.





Battery Support & Clamp

Locate the battery on the right side of the firewall under the stiffener shelf. Keep it as high as you can to allow more room for other firewall items to be installed later. Also – keep the battery as far toward the outside of the aircraft as possible to allow as much room for other components as you can.

Mark the outline of the battery

Install the 1.5 inch x 6" aluminum angle battery support at the bottom of your battery layout mark so that it is centered on the battery. Install with 3 x 3/16 blind rivets.

Install the battery hold down clamp about 1.5 inches down from the top of the battery. Predrill two 1/8 inch holes in each side of the battery hold down clamp each hole about 1/2 inch in from the edge.

Hold the clamp in place (you may want to position the battery on the support and place the clamp around the battery as you do this step) and drill through the predilled holes in the clamp and through the firewall. Hold with Cleco's

When satisfied with the fit drill out the holes in the firewall to 5/32 and install the MK1000-8 nut plates on the cabin side of the firewall behind each of the four holes.

Drill out the holes in the clamp to 3/16

Install battery and battery clamp and secure with the four #8 screws provided.

A battery is not supplied with the firewall forward kit. We recommend an Odyssey PC625 battery. It is available on line at the lowest price. Try Googling for Odyssey PC625 or try www.batteries4everything.com as one source.







Oil Recovery Bottle

Locate the Oil Recovery Bottle in an open space on the right side of the firewall where it does not conflict with cabin heat or battery.

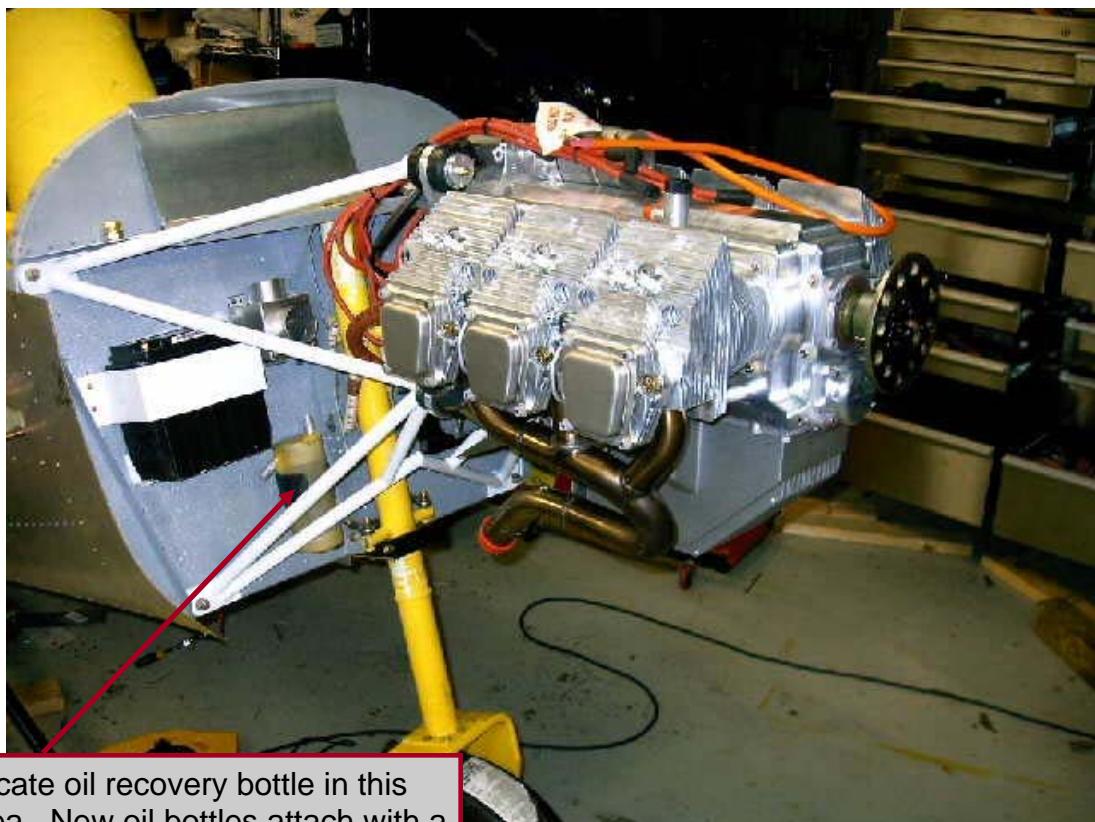
The bottle does not have to be vertical but can be slanted to help with the fit. Mark the outline of the bottle.

Predrill two 3/16 holes through the oil bottle clamp evenly spaced on the flat part of the clamp.

Place the clamp on your mark and drill through the predrilled holes and on through the firewall

Using the 3/16 rivets, secure the clamp to the firewall.

Slip the bottle into the clamp.



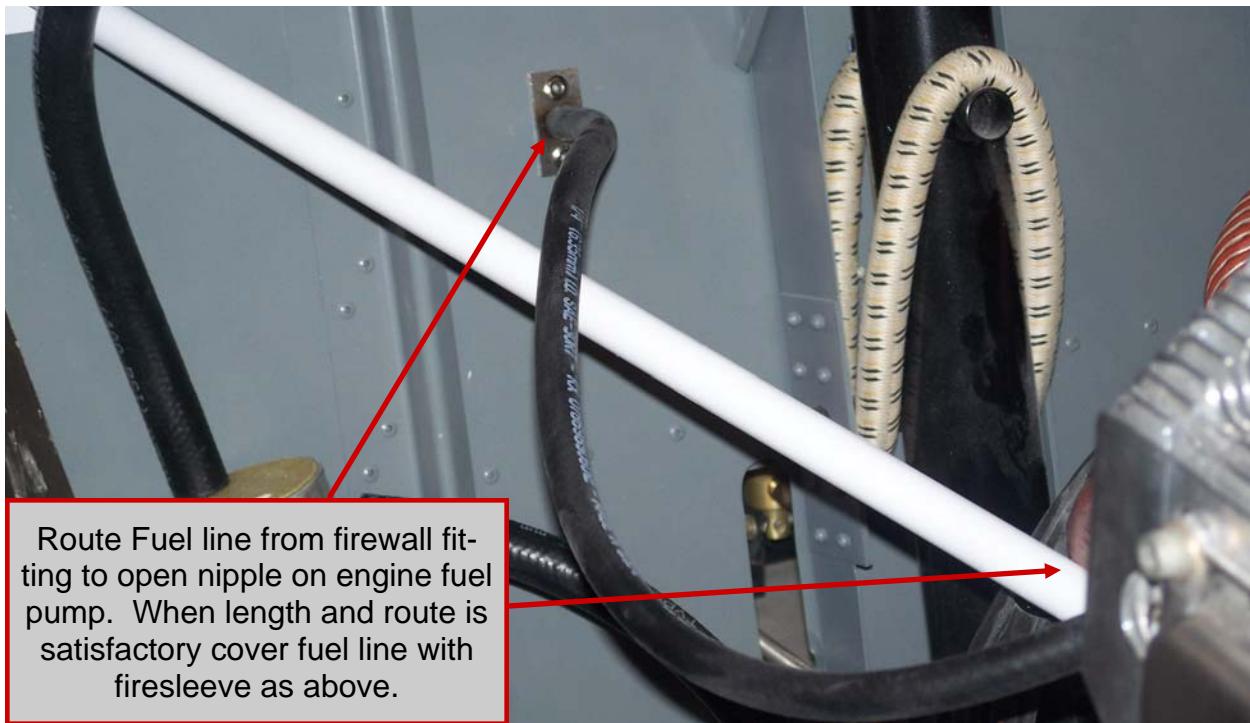
Locate oil recovery bottle in this area. New oil bottles attach with a clamp on top and bottom. Bottle may optionally be mounted to engine mount with cushioned clamps

Locate Fuel Fitting on Firewall

Locate the fuel fitting on the right hand side of the firewall in an open area below the stiffener shelf. Take note in locating the fitting that there is sufficient clearance on the



cabin side of the firewall so that the fuel line running to the fitting does not interfere with the rudder pedals. See photos for general position. Rivet the fitting in place with 3/16 rivets provided.





This photo shows the cockpit side of the firewall fitting installed and angling toward the left side of the fuselage where the fuel line will come from.



Measure the fuel line to length for routing to the fuel pump on the rear right side of the engine.

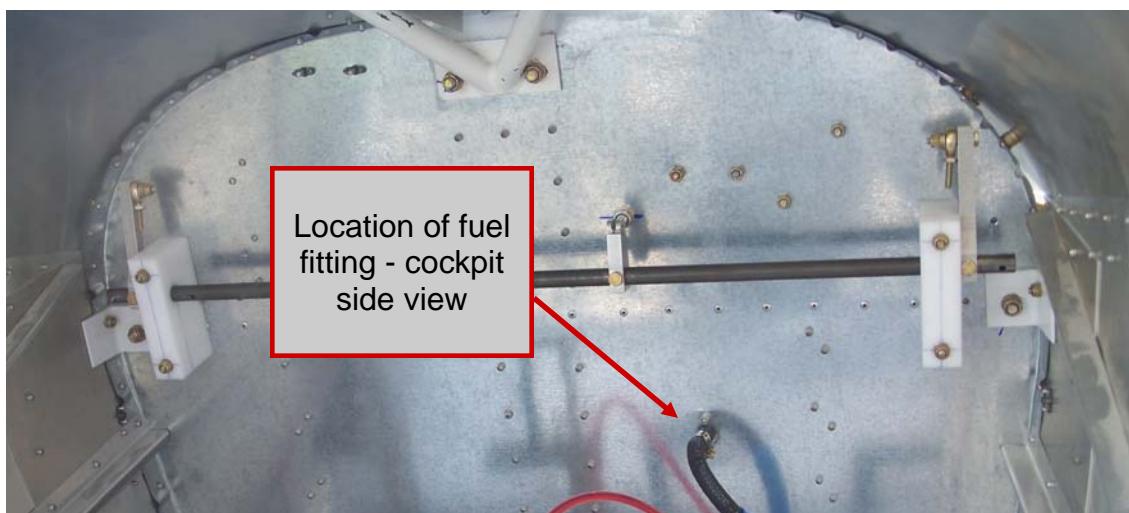
Install firesleeve over the fuel line completely covering the rubber line right up to the fittings at firewall and fuel pump.

Secure the ends of the firesleeve with a few wraps of safety wire.
Clamp the ends of the fuel line to the fitting and the fuel pump with the worm drive clamps provided.



Secure the fuel line to an engine mount member with cushioned clamps or other straps.

See photo below of the cabin side of the firewall fuel fitting.

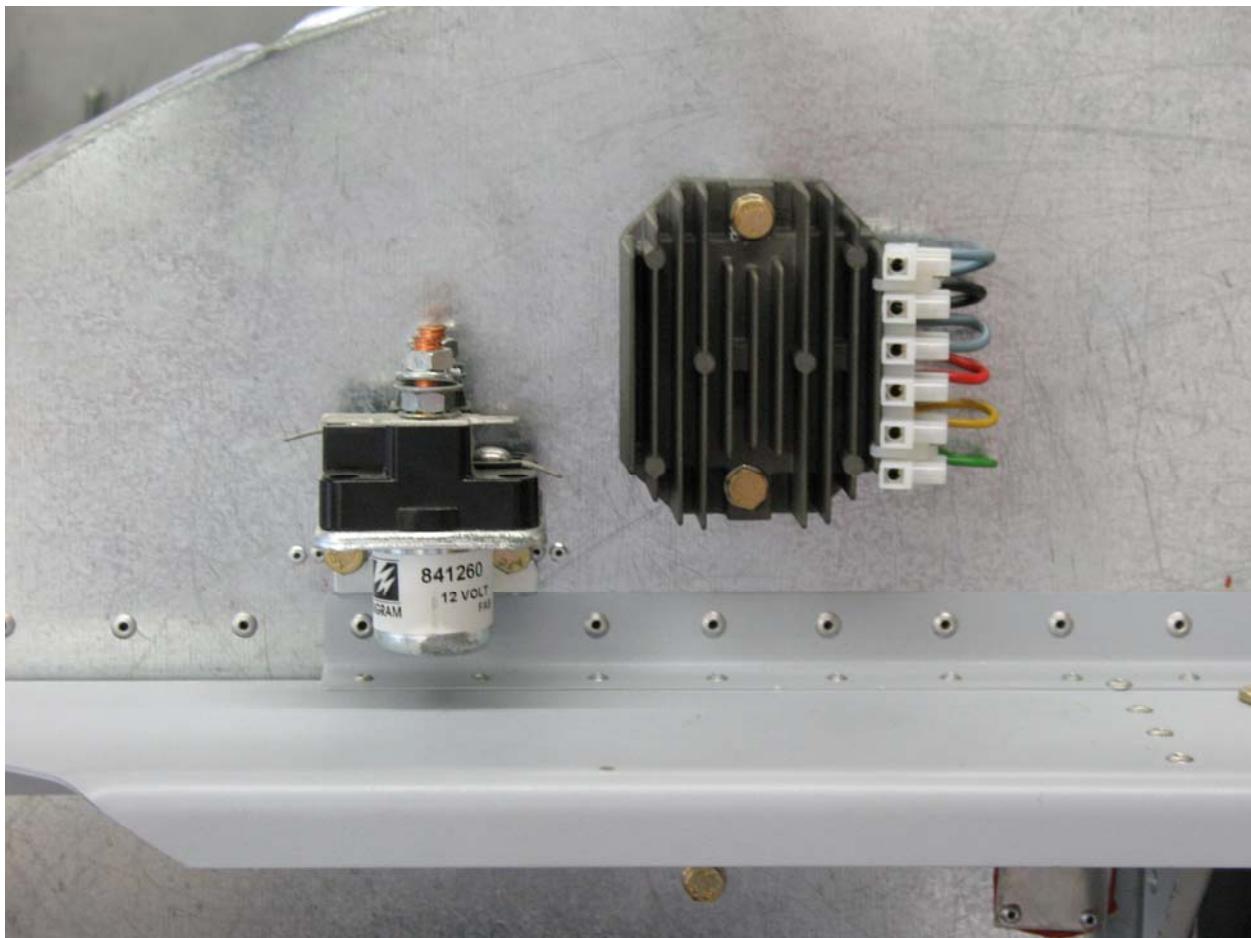


Starter Solenoid

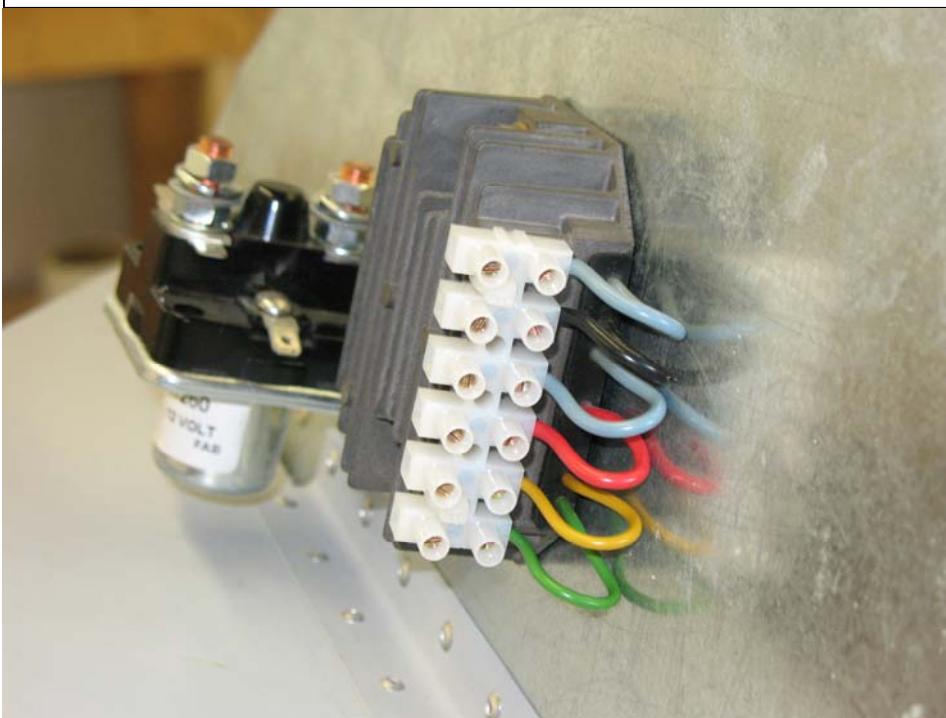
Since the battery is on the right side of the aircraft and the starter cable comes back quite naturally toward the right side of the engine, it is natural to locate the solenoid close to the battery on the firewall stiffener shelf.

Regulator

Locate the regulator on the shelf as well near the battery. Make sure that solenoid and regulator are located so as not to interfere with the dual throttle cross rod if dual throttles are being installed.



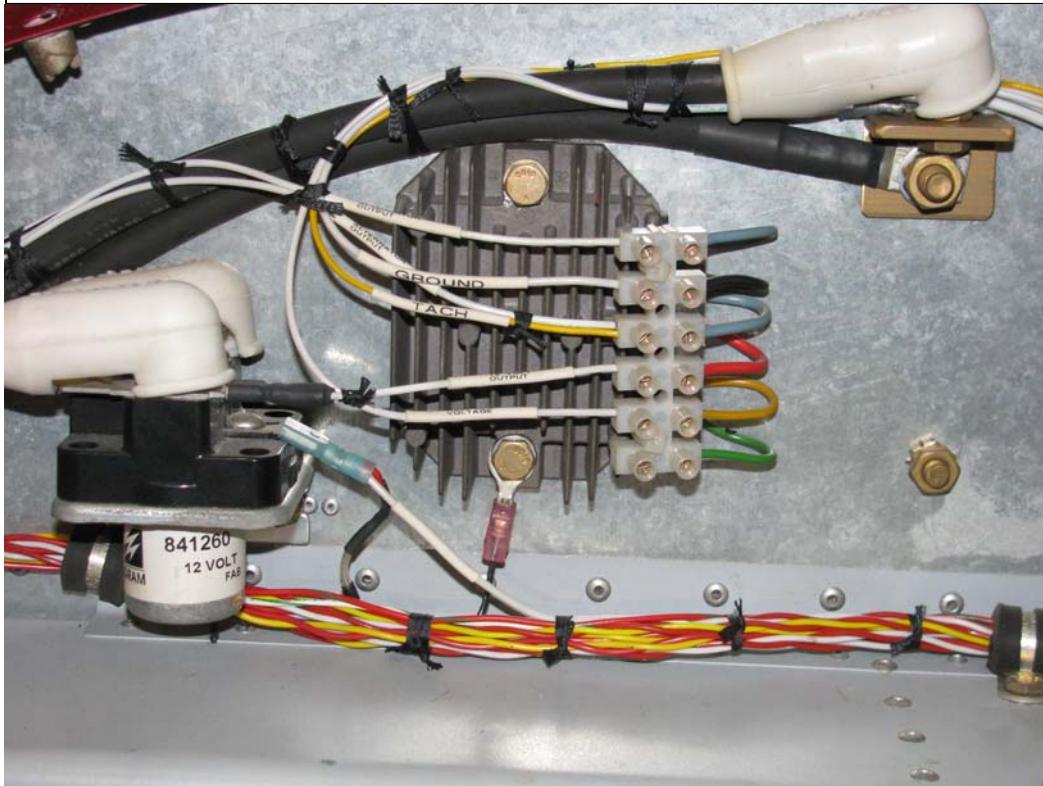
The electrical connector pictured is a neat way to connect the regulator to the various input and output wires involved in the charging system. This connector is available at most radio shack stores or other similar retail outlets.



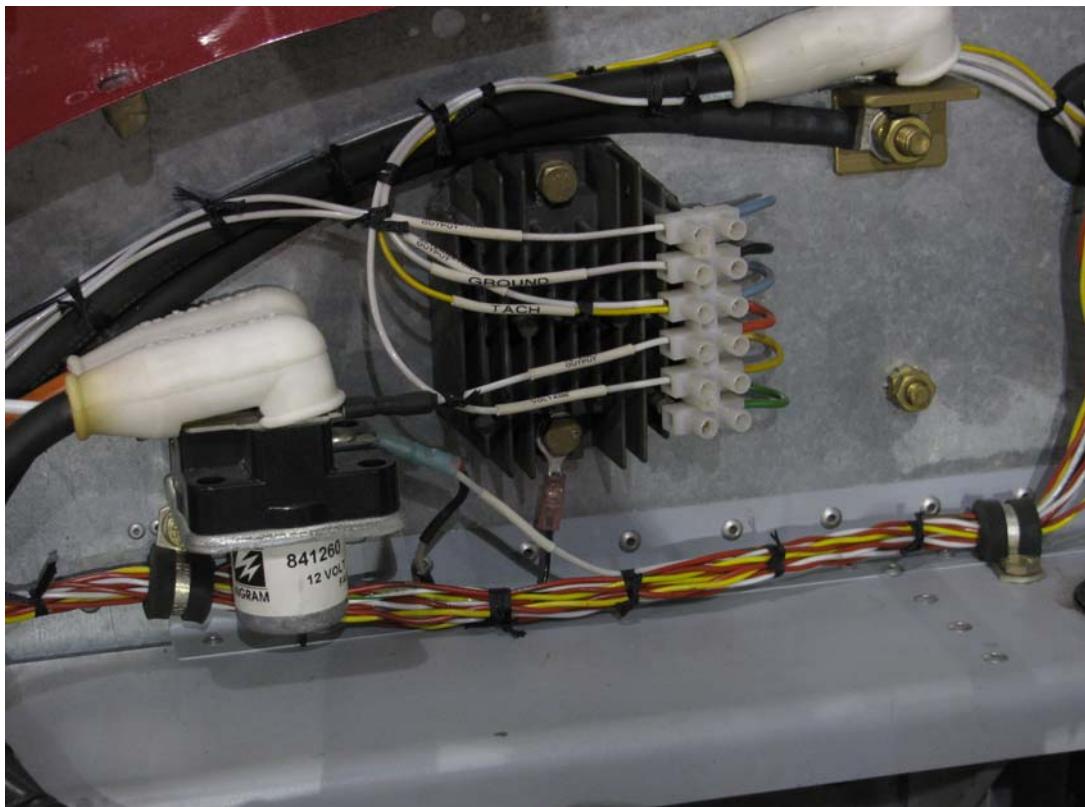
This photo shows the electrical connector. A small hole is drilled into the regulator fins to accommodate a small plastic cable tie at each end. The connector is then zip tied to the regulator.



The photos shown are from a Zenith CH601 but firewall is identical to the CH750 with the exception of the upper center engine mount position.



Photos shown are an example of a neatly installed and neatly wired charging system typical of what can be done on Zenith CH601/650 and CH750 aircraft.



Starter Solenoid

The starter solenoid can be mounted on the firewall above the stiffener shelf or attached to the shelf itself – either top or bottom side. Make sure you mount it within reach of the starter cable on the engine.

Bolt in place with spare AN3 bolts. Make sure the base of the solenoid is grounded (should be no problem with the all metal Zenith – just make sure firewall is grounded to battery)

Regulator

Mount the regulator on the firewall above the shelf somewhere near the battery.

Bolt to the firewall with spare AN3 hardware

Wiring instructions are in the installation manual on the CD that came with your engine.

The installation manuals are also found in the “MANUALS” section of Jabiru’s website: www.jabiru.net.au

RamAir Cooling Ducts

The RamAir ducts will have to be fitted to the engine. An airdam and additional deflectors are already installed inside the ducts to assure adequate cooling.

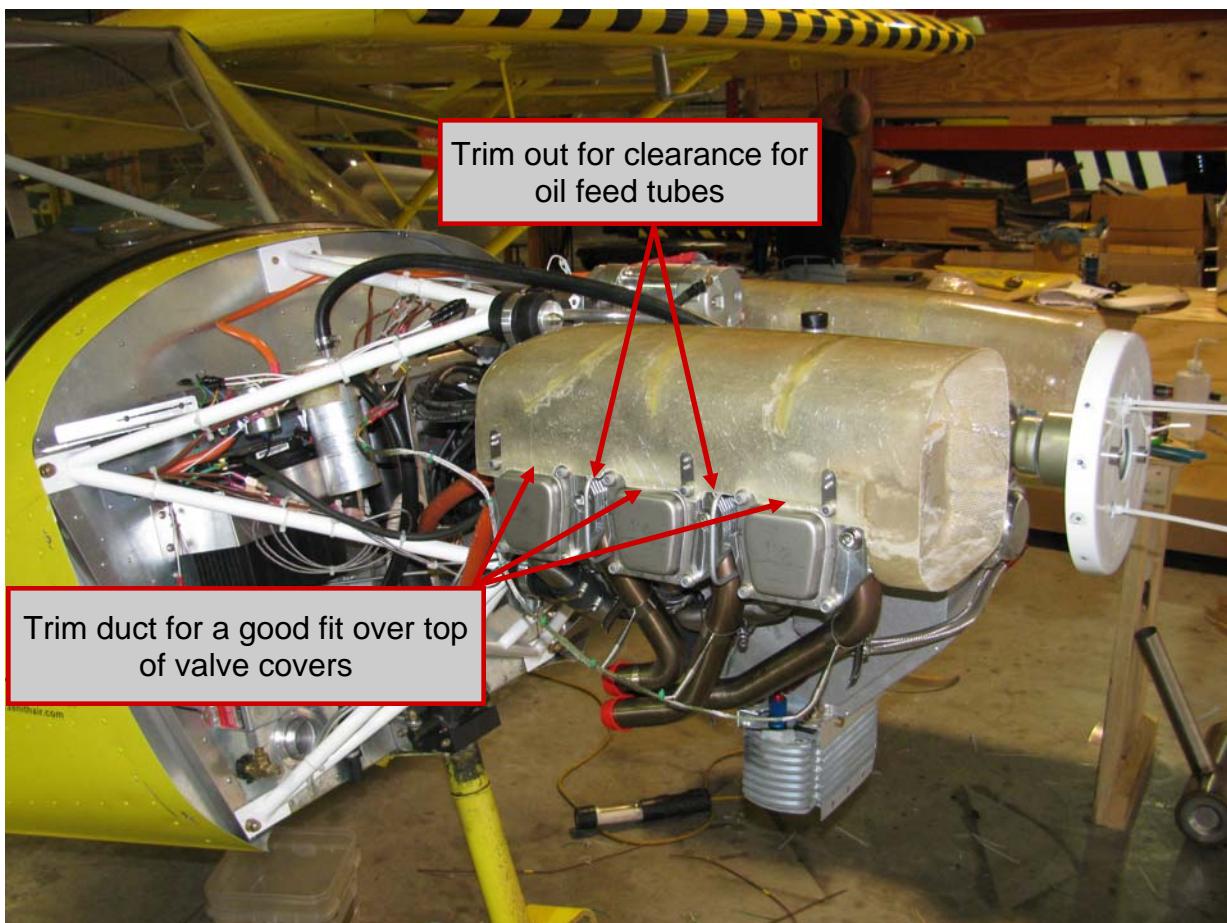
Remove the forward top valve cover cap screw on cylinders 1 and 3. Remove the top rear screw on #5.

Remove the spark plug leads and lay them down out of the way for now.

Place the duct in position over the heads so that the outside edge extends down over the holes where you removed the rocker cover cap screws. You may have to trim the duct a bit around the rocker covers to get it to sit down correctly.

When satisfied that the duct sits down on the rocker covers drill through the duct with a $\frac{1}{4}$ inch drill at the location of the rocker cover cap screws that you removed.

Loosely reinstall the cap screws.



The inside edge of the duct should extend just past the inside edge of the gull wing baffle and nest between fin ?? & ??.

Attach the small angle spring support to the top of the duct.

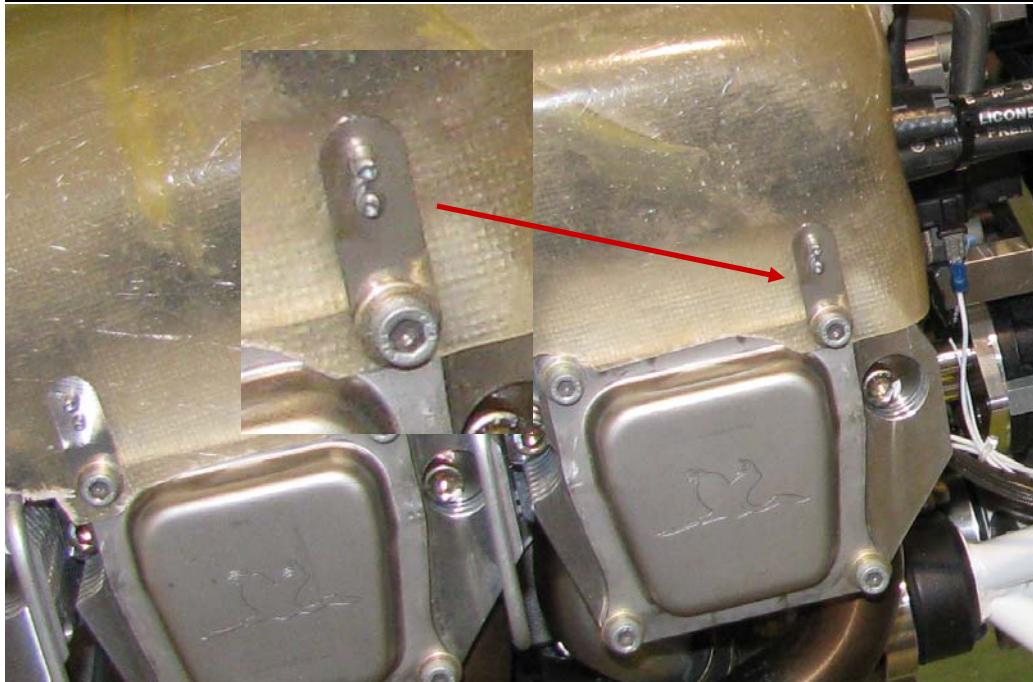
Install the small spring between angle spring support and the loop of safety wire around the middle cylinder. Angles, springs and rivets are in the engine accessory kit that came with the engine).

Small deflectors are installed in the top of the duct over the forward edge of the middle cylinder. This deflector is positioned perpendicular to the air flow and extend vertically down from the top of the duct about 1/2 inch. This deflector may have to be trimmed back during flight testing to achieve even cooling.

Repeat for the other duct.

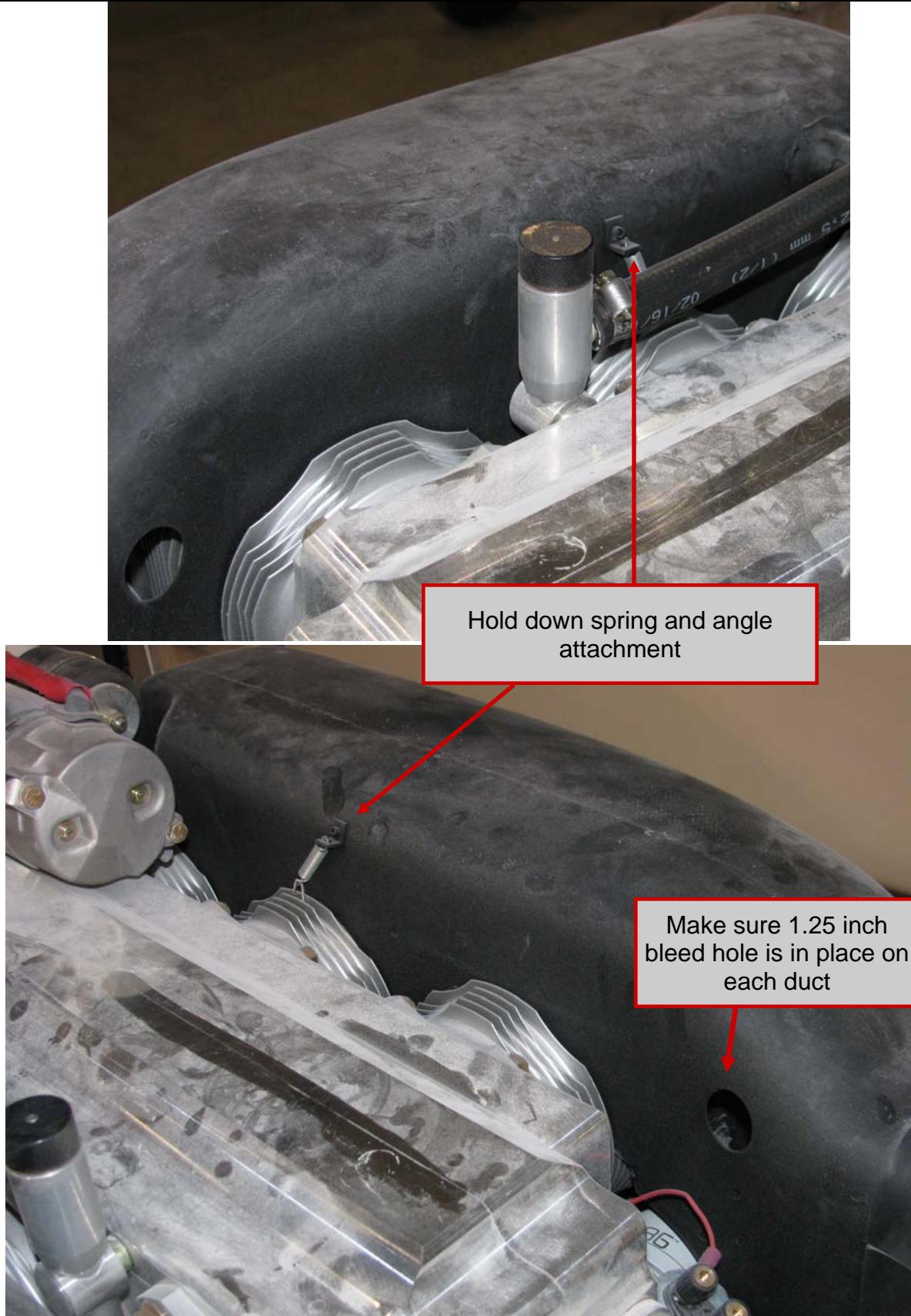
Make sure there is a one inch hole in the inside top of the duct near the front so some air will bleed over the top of the engine and flush away heat build up from the top of the crankcase.

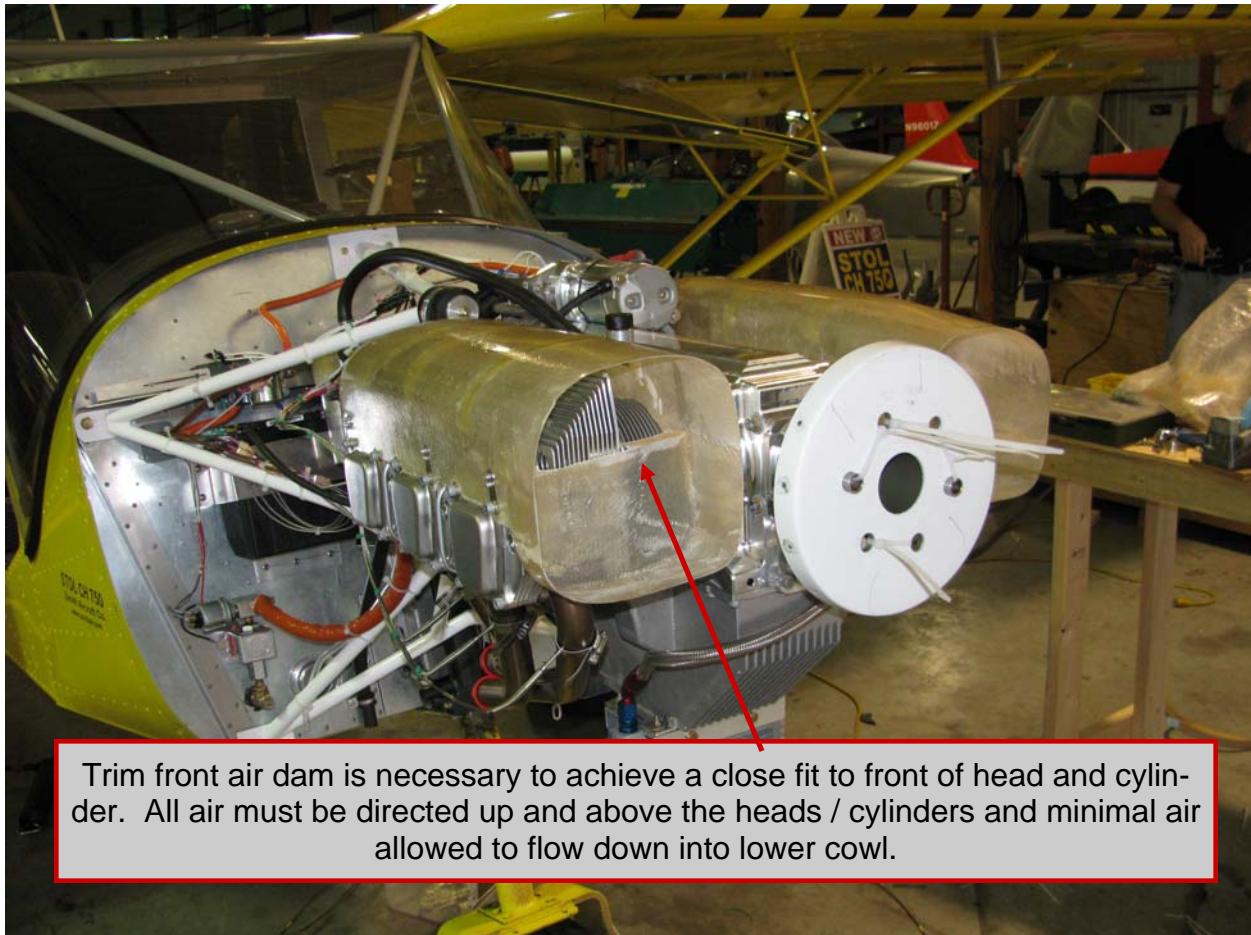




Some builders have fabricated metal reinforcements for the attachment holes in the air ducts. Make these from scrap aluminum from airframe kit trimmings and rivet to the airducts if you want to use them. Over time the fiberglass will degrade from heat and from the process of removing and reinstalling for inspections. The reinforcements will help maintain the integrity of the attachment.







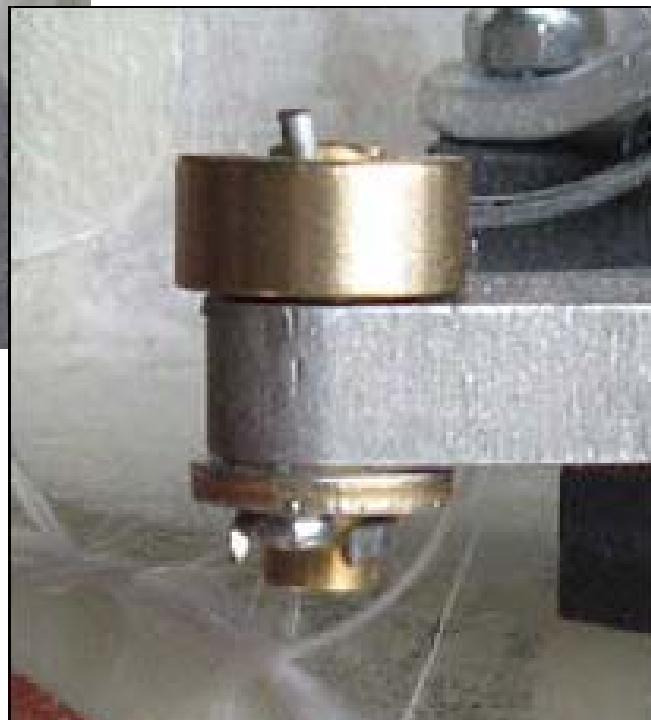
Trim front air dam is necessary to achieve a close fit to front of head and cylinder. All air must be directed up and above the heads / cylinders and minimal air allowed to flow down into lower cowl.

Carb heat

Run the outer cable through the clamp and secure by tightening the clamp, then slip the brass ferrule over the inner cable.

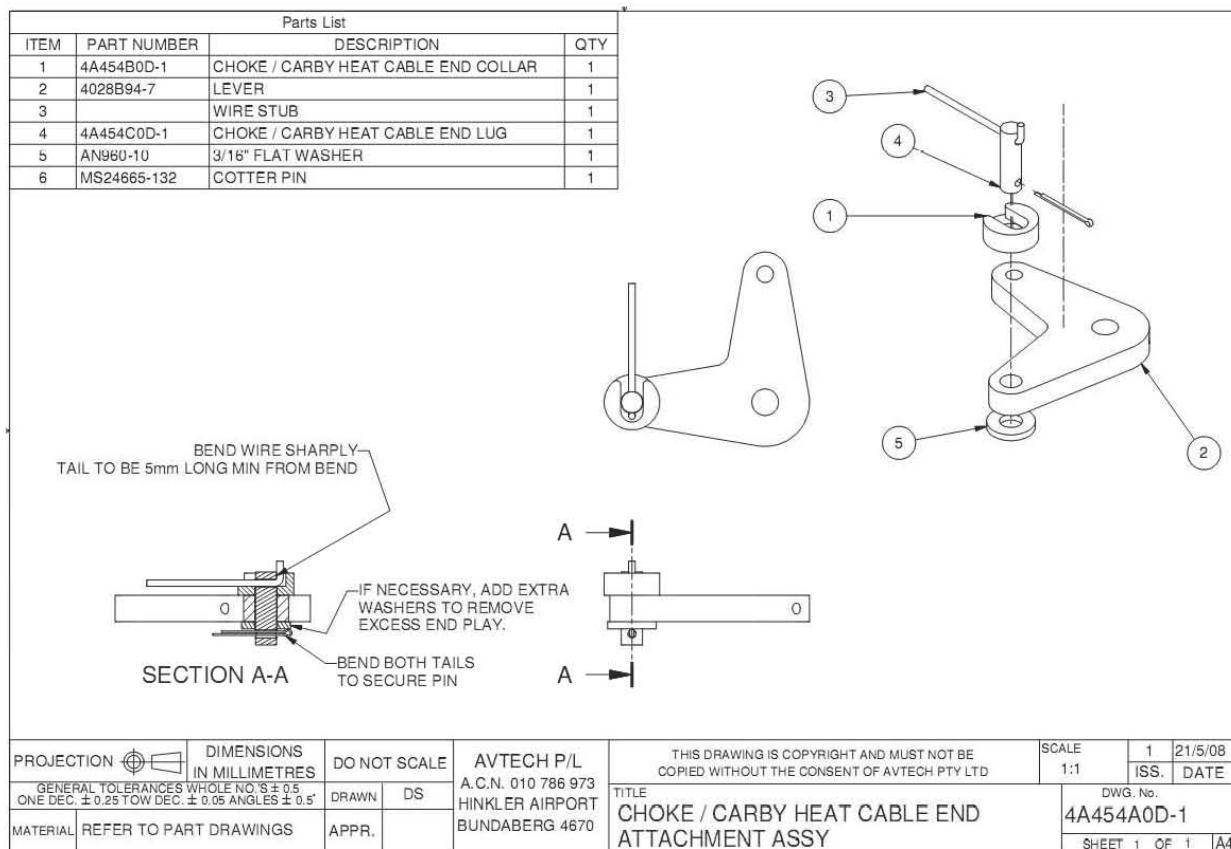
Make sure that the air valve drive arm is fully forward and then fit the ferrule into the hole in the drive arm. Bend the inner cable at right angles in front of the ferrule. Cut the excess inner cable off. Slip the ferrule through the retaining collar and fit to the to the drive arm with a washer and split pin fitted to the brass ferrule on the underside of the drive arm.

Adjust the Carb Heat cable with the clamp until with the Carb Heat "T" handle all the way in the air valve drive arm is fully forward as shown above. Tighten the clamp bolts firmly.



Choke

Choke cable termination is done in the same way using the same components. More details will be in the Choke Control section.



Choke Cable Installation

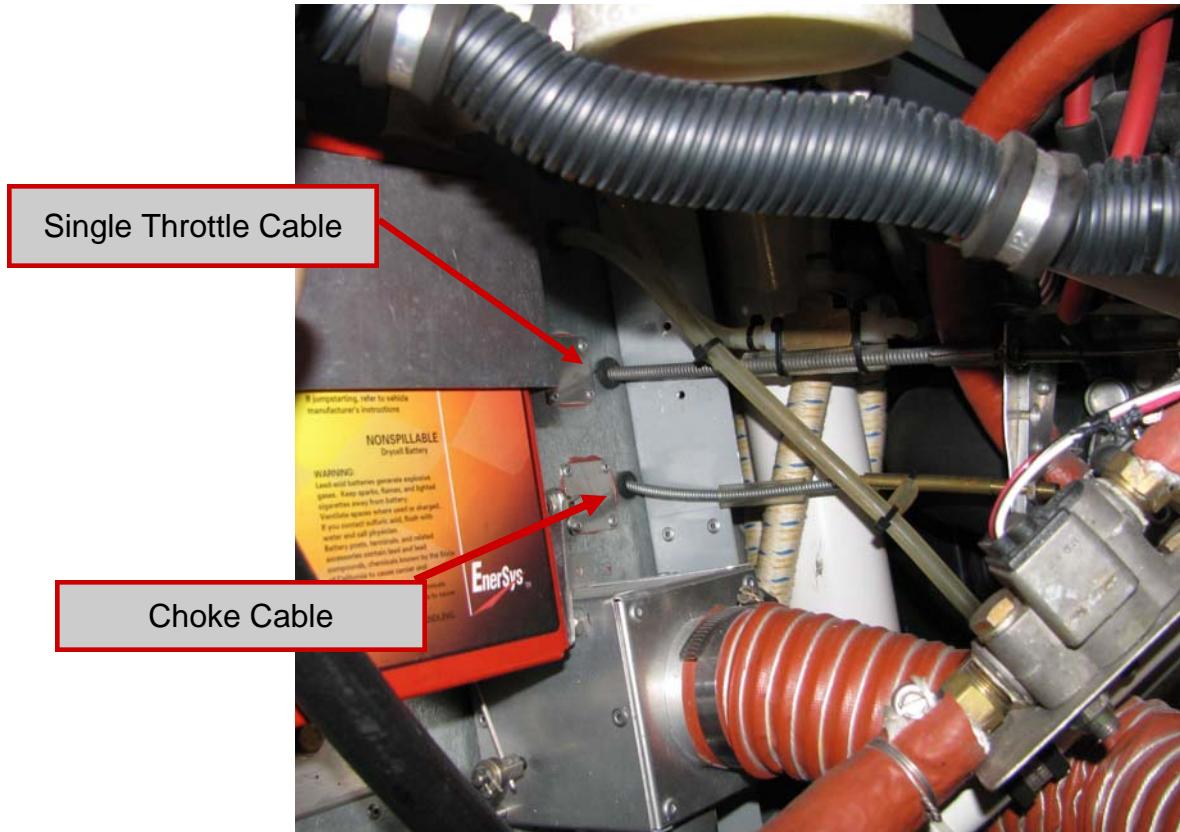
The choke cable must be routed from your panel, through the firewall, and to the carb cable bracket.

Locate a spot for a hole through the firewall that will be directly aft of the lower hole in the carb bracket and very close to the starboard side of the nose leg channel.

Drill 3/8 through the firewall

Insert a 3/8 grommet in the hole

Route choke cable from panel, through grommet, and through the bottom hole in the carb bracket.



Hold the cable end adjuster up to the cable to mark where the cable should be cut off.

Pull wire back through the sheath and cut off spiral sheath.

Clean up the end of the sheath.

Insert cable end adjuster on the end of the sheath

Swage the adjuster on to the end of the sheath

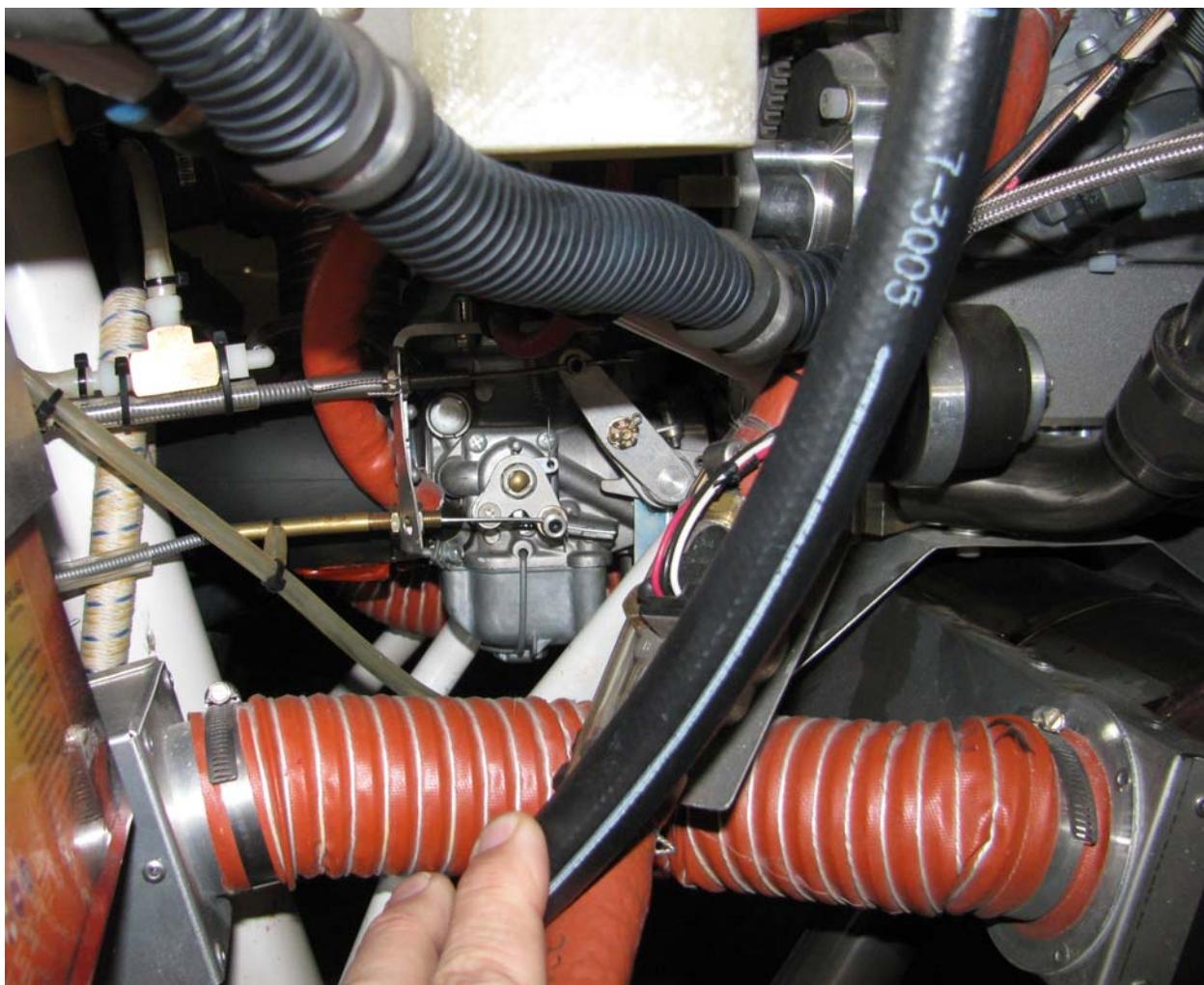
Insert adjuster into bracket and install jam nuts on either side of bracket.

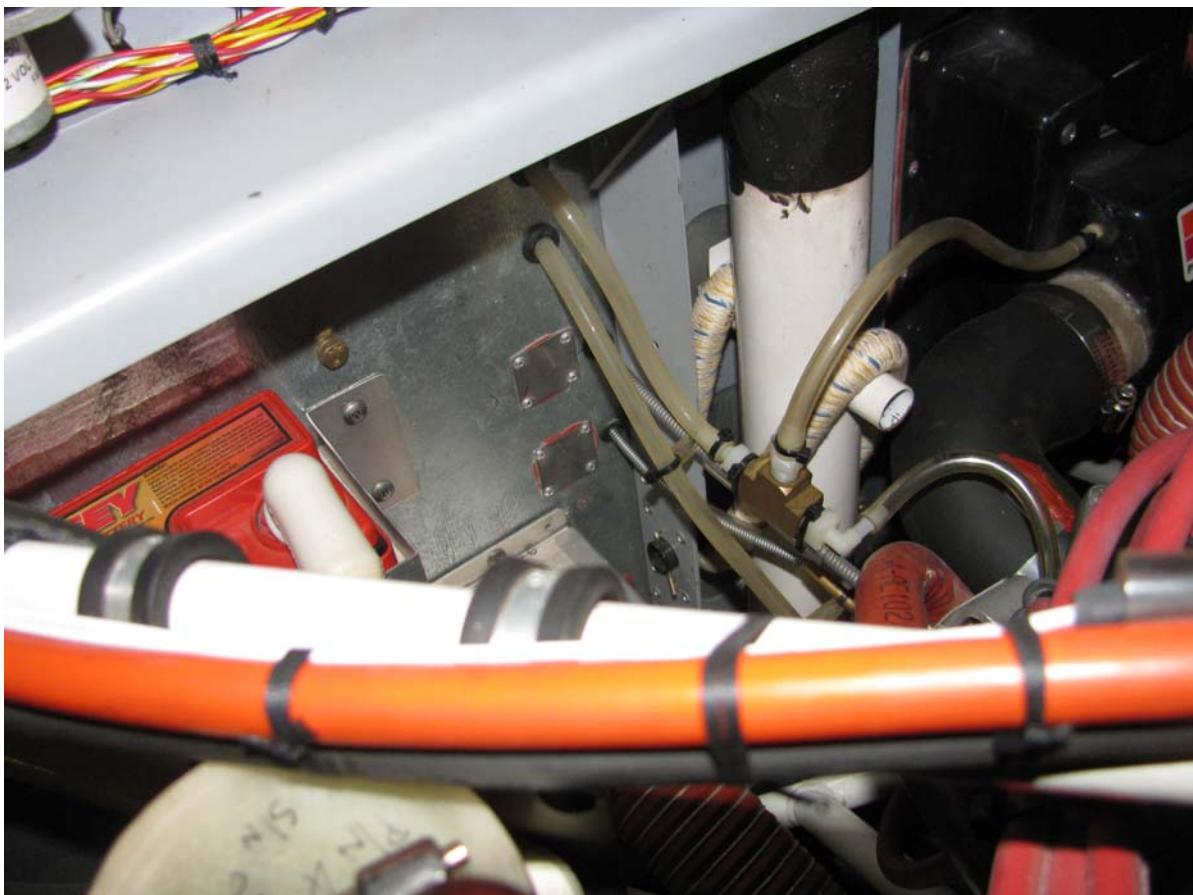
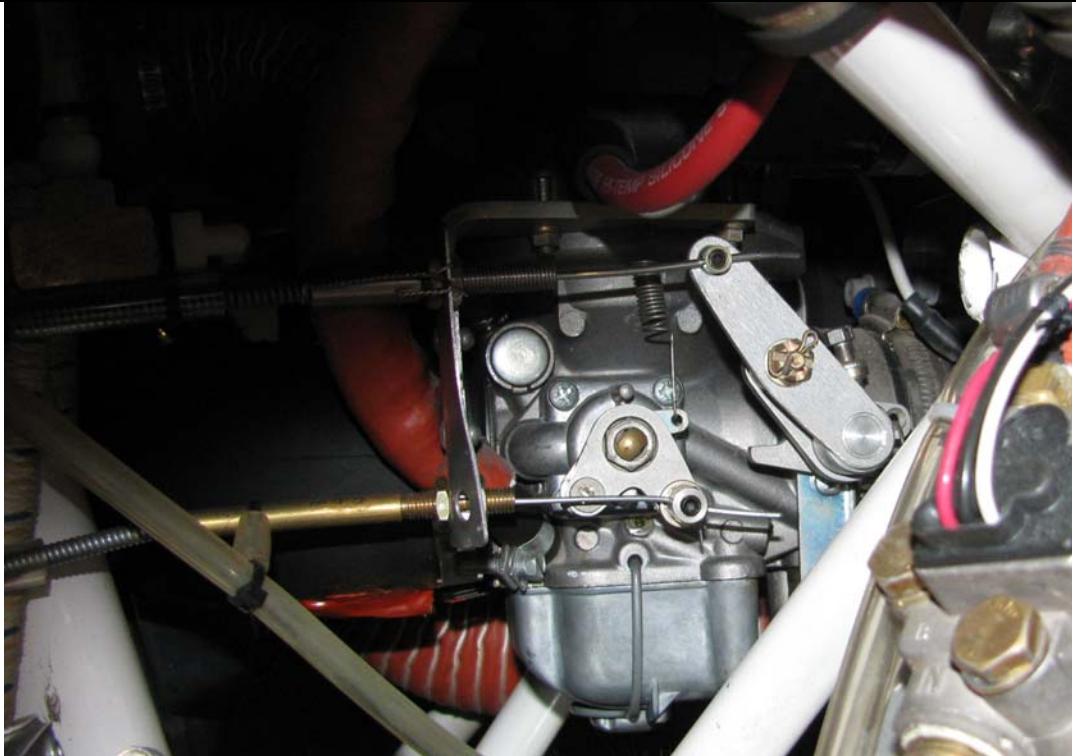
Push the choke wire back through the sheath to the fully closed position.

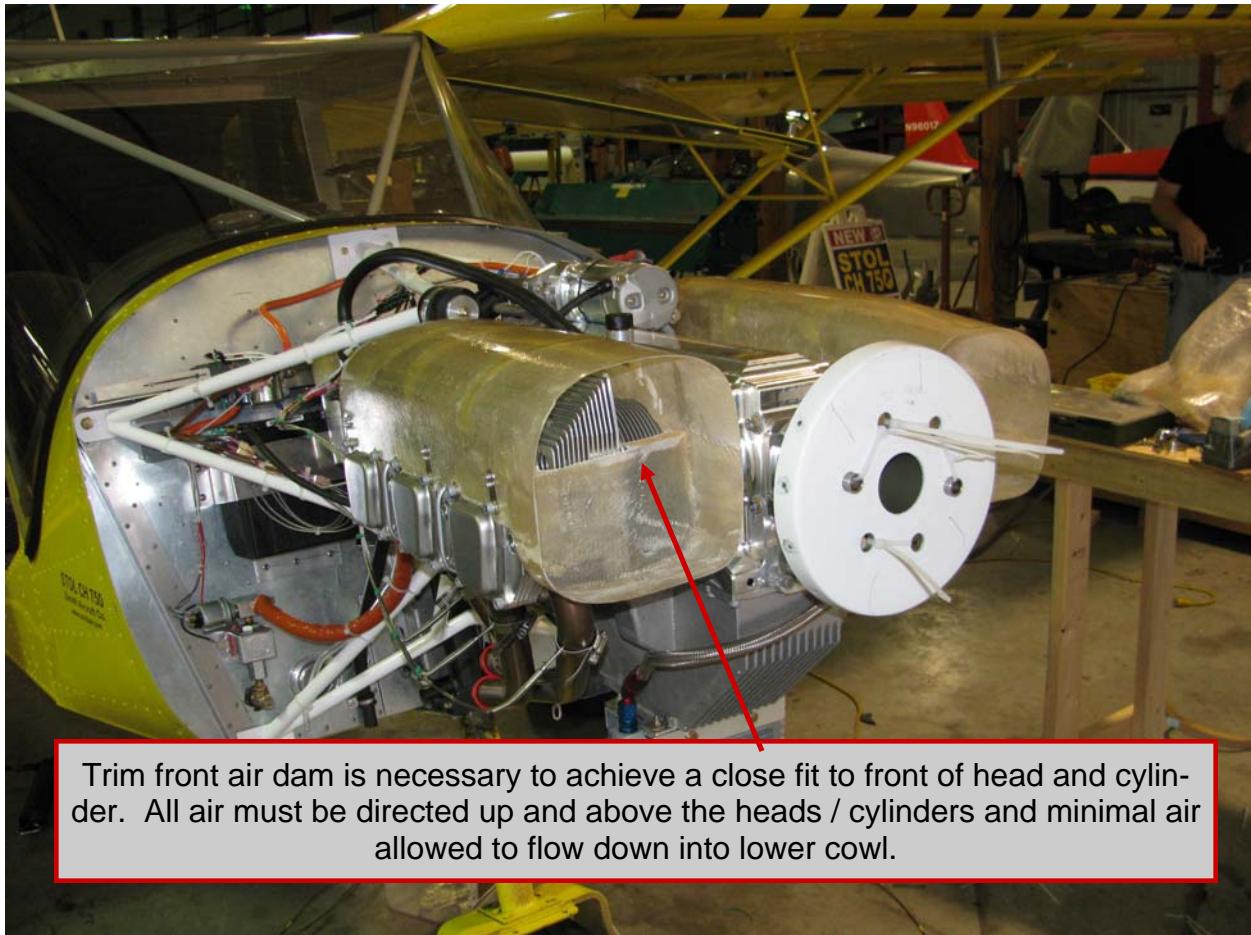
Follow cable termination procedure from Section 11 to attach choke cable wire to carb choke arm

Adjust jam nuts so that the choke knob on the panel is all the way in when the choke is closed.

Check for full travel and rotation of choke arm and adjust if necessary.







Trim front air dam is necessary to achieve a close fit to front of head and cylinder. All air must be directed up and above the heads / cylinders and minimal air allowed to flow down into lower cowl.

Attach throttle arm extension if not already done. (see section 4.0)

Route throttle from panel forward through firewall. The cable should exit the firewall very close to the nose wheel channel directly behind the top hole in the carb bracket. Install a grommet or cable safe (not supplied) in the firewall.

With the throttle cable in place, mark the length needed for the installation. With the cable in place this mark should be $\frac{3}{4}$ inch behind the carb bracket. Do not cut too short!

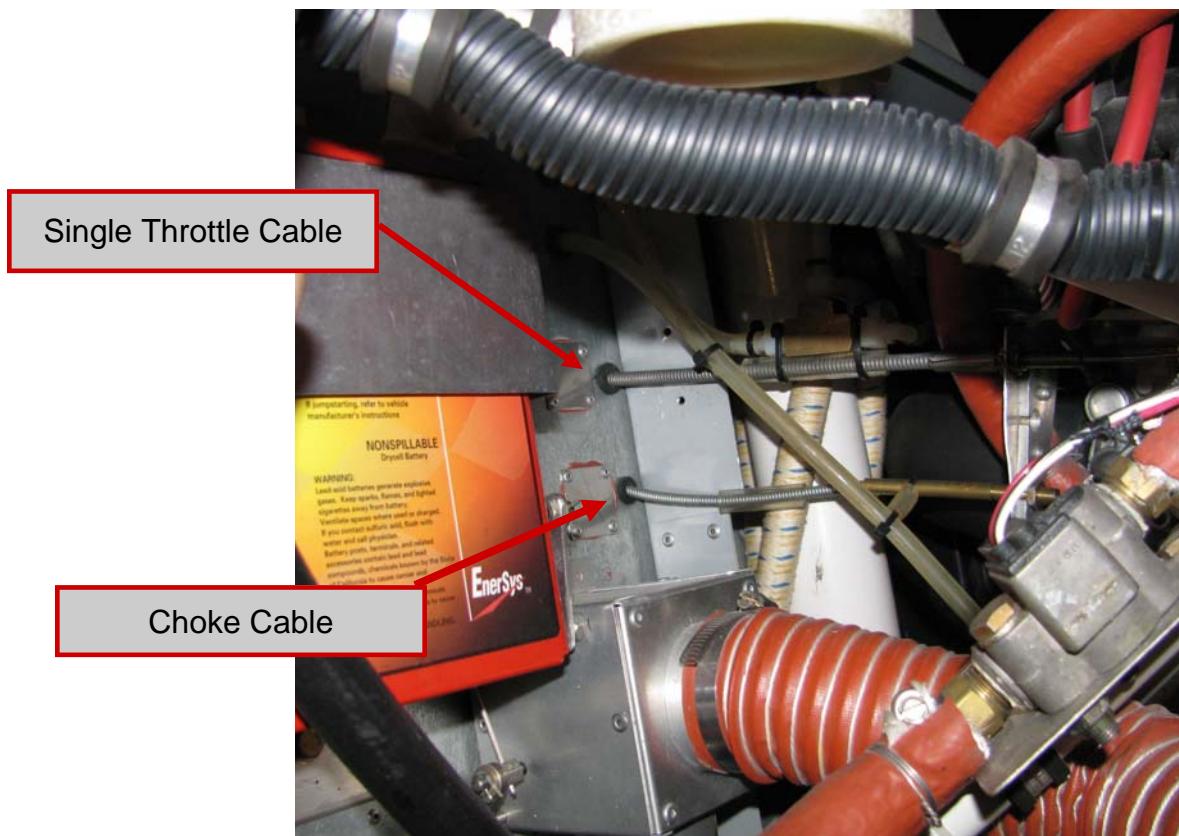
Remove the cable from the panel and firewall. Remove the center wire from the throttle cable sheath. Cut the sheath to length.

Clean up the cut end so that the spiral winding does not interfere with the center wire.

Install the 5/16 cable end adjuster and crimp on to the cable sheath with a swage tool. Swage on two places. Insert the center wire while swaging and crimp until a slight restriction is felt in the center wire. Release swage tool and the restriction should go away. The cable end adjuster needs to be crimped firmly to the sheath but not so tight as to bind the center wire.

Reinstall cable through panel and firewall.

Install one 5/16 jam nut on the cable end adjuster.



Insert adjuster into carb bracket and install the second jam nut.

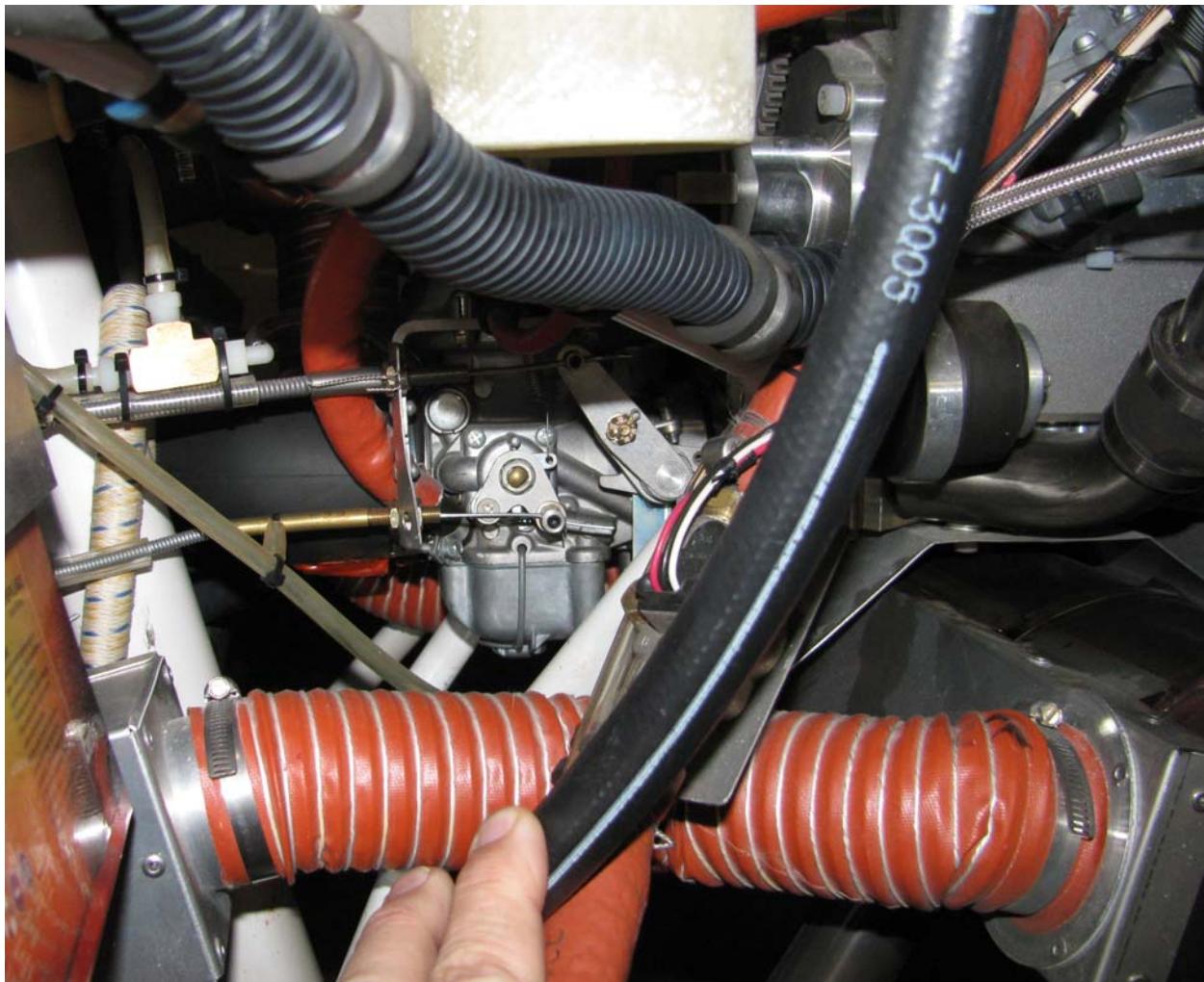
Feed center wire through the sheath.

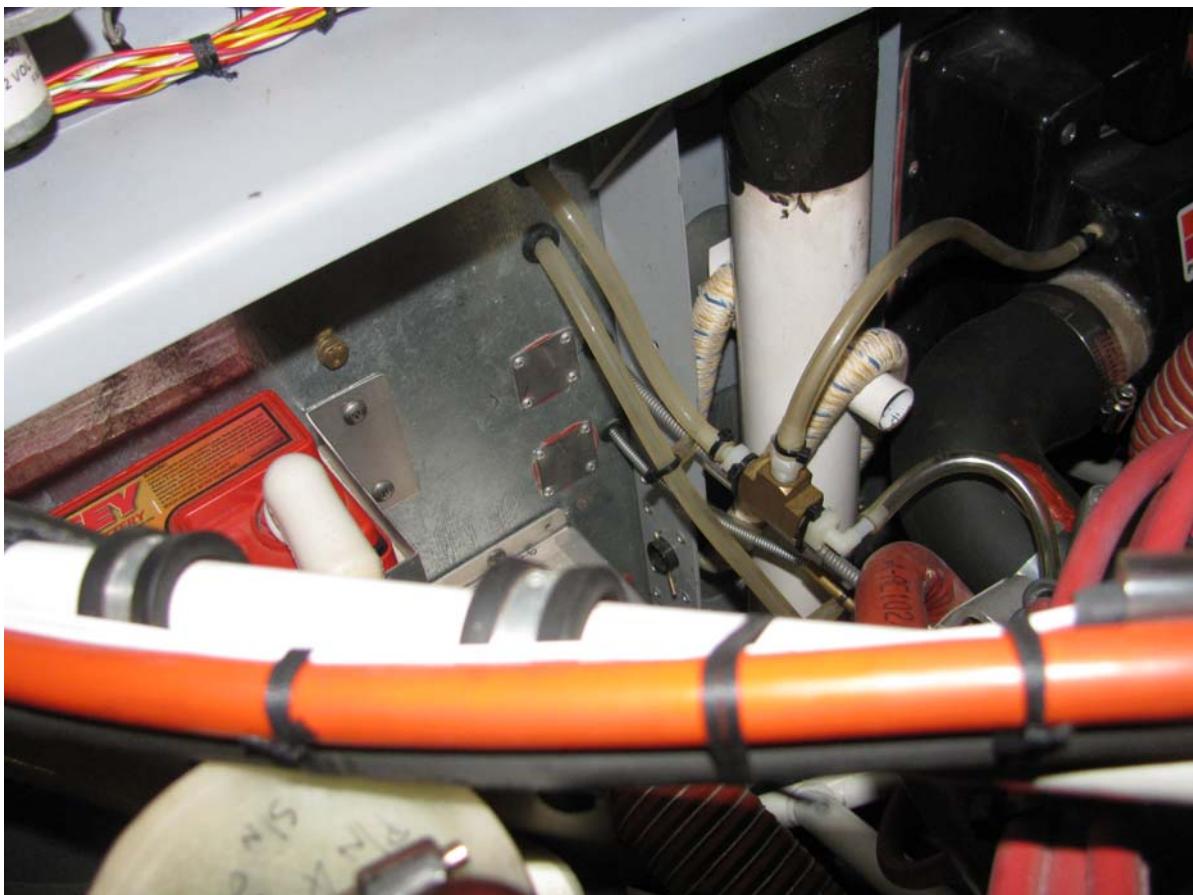
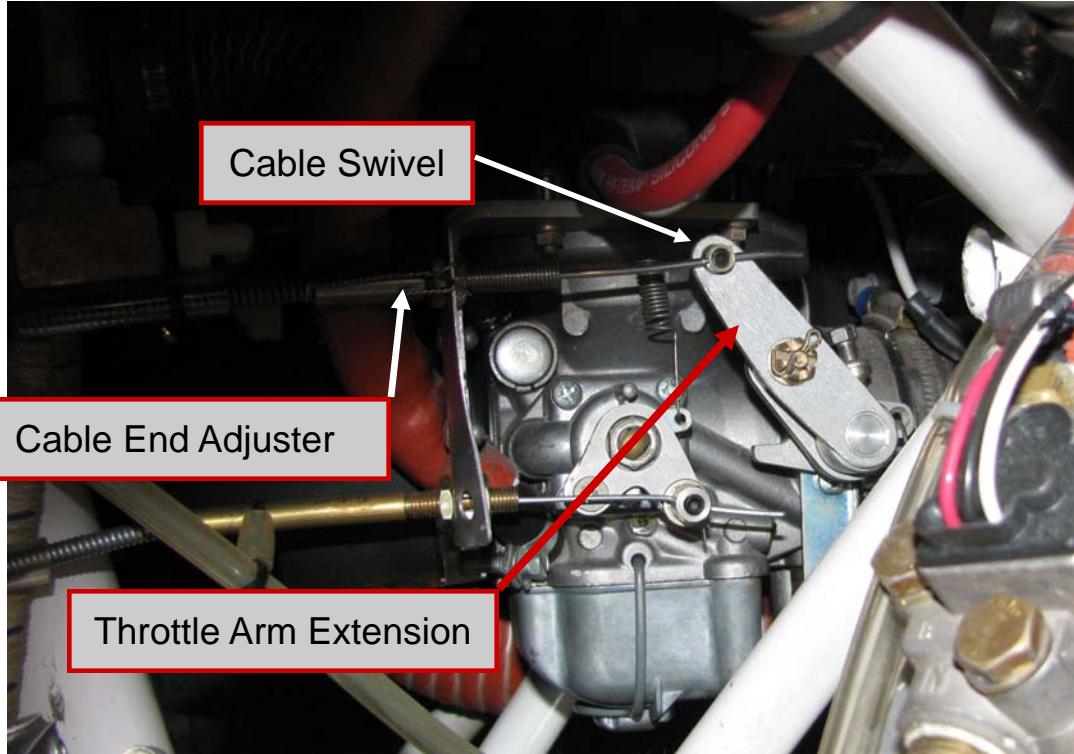
Install the $\frac{1}{4}$ inch cable swivel into the throttle arm.

Feed cable wire through the swivel.

Tighten the allen screws in the swivel from both sides.

Trim off extra throttle wire length.





Photos and description show a Zenith CH701. Procedure is the same for a CH750

Locate Cable End at Firewall

Measure up from the stiffener shelf 2.25 inches and starboard from the center stiffener 1.25 inches. Drill a 3/8 hole.



Split Jam Nut

Place the outer jam nut on the end of the throttle cable with the round ball on it in a vise. With a hack saw or rotary cutter cut a slot in the jam nut so that the jam nut can be removed from the throttle cable end adjuster.



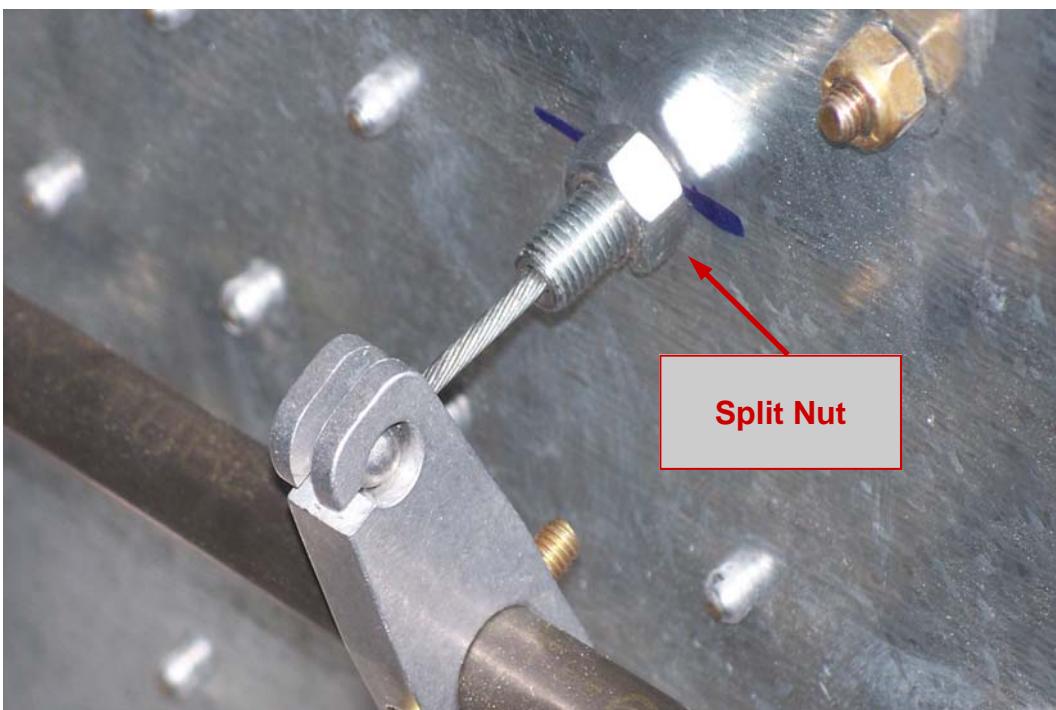
Install Cable End to Firewall

Remove the split jam nut.

Insert the cable end adjuster into the hole you drilled in the firewall.

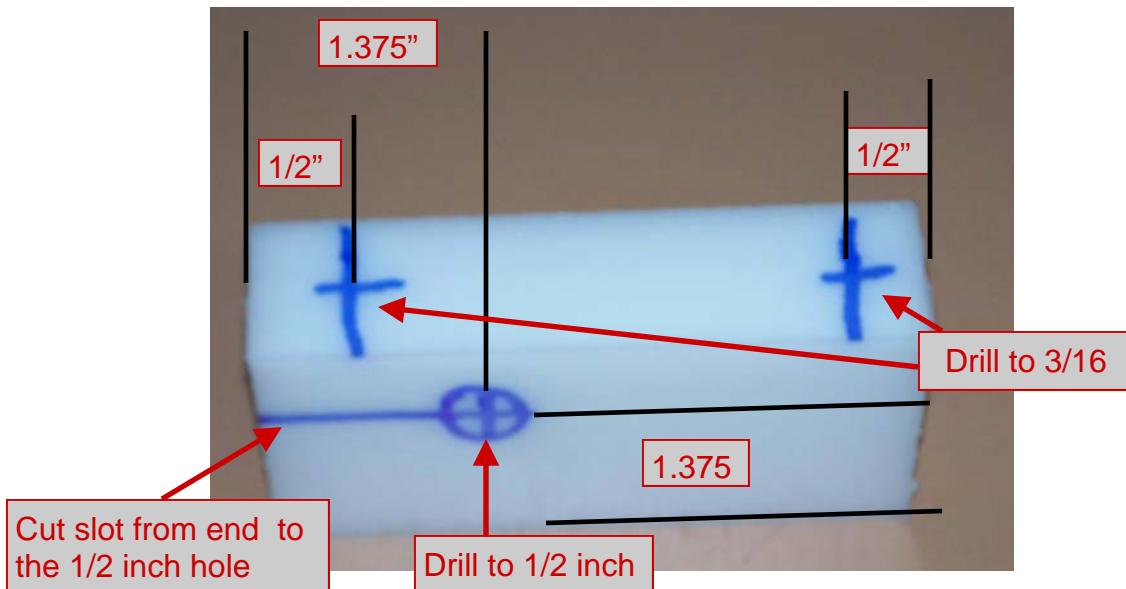
Install the split nut onto the cable end adjuster on the aft side of firewall.

Adjust cable end so 1/2 inch of the adjuster protrudes form the aft firewall.



Prepare Throttle Support Blocks

Locate the 1x2x8" acetal block and cut it into 2 pieces 1x2x4"
Mark and drill per the dimensions in the photos below.



Assemble Throttle Cross Rod

Install the throttle output lever (the short lever) onto the cross rod. The slot will be facing to the rear.

Install the two throttle input levers about 1.5 inches in from each end.

Do not drill at this time.

Install the two support blocks on the ends of the cross rod.

Attach Cross Rod Assembly to Throttle System

Attach the output lever to the throttle cable by inserting the swaged ball into the receiver.

Adjust the position of the output lever on the shaft so that the cross rod is cen-



tered on the firewall.

Position the output lever against the cable end adjuster and drill a 3/16 hole through the output lever and cross rod. Install a AN3-11A bolt to hold the position.

Level the cross rod across the firewall and position the support blocks at the outer ends of the cross rod in a position where they will not interfere with other fittings (angle iron bracket, etc) on the firewall.

Drill through the support blocks and firewall and install the four AN3-23A bolts with the heads forward of the firewall and the nylock nuts and washer on the aft side of firewall. Snug up the bolts.

With the output lever up against the cable end adjuster, position the input levers so that they are snug against the support blocks and the top ends are about 1/2 inch from the firewall. Drill through the input levers and cross rod and install



AN3-11A bolts.

Install rod ends on the outboard sides of the input levers and secure with AN3-11A bolts, washers, and nylock nuts.

Assemble Throttle Push Pull Rods

Insert the 1/4—28 threaded rod and jam nut into aluminum push pull rod
Install throttle knobs on ends of push pull rods.

When panel is in place attach the push pull rods through panel (drill 1/2 inch hole and mount a 1/8 acetal cushion block with 3/8 hole behind panel to support push pull rod)

Attach to the male rod ends on the input levers using a jam nut to hold position.

Attach Cable to Carb

Turn one jam nut off the end of the carb end cable adjuster.

Insert the cable through the slot on the upper hole in the carb bracket

Insert the drive pin from the throttle cable into the throttle arm on the carb. You may have to sand away any excess solder that is on the cable drive arm to get it into the carb throttle arm.

Place a 5/8 washer over the cable drive arm behind the carb throttle arm and secure with a cotter pin.

Reinstall the jam nut and adjust cable length so that when throttles are pushed all the way in that the throttle arm on the carb reached the stop on the carb.

Zenith Firewall Forward Oil Cooler Installation

1 – Oil Cooler
8 – AN363-1032 Nut
8 – AN970-3 Washer
4 – AN3-7A Bolt
4 – AN3-5A Bolt
2 – AN4-42A Bolt
2 – AN363-428 Nut
2 – Aluminum Tubing 3-½" long ¼" ID
2 – Aluminum Angle 1"x1"x1/8"x4"
2 – Aluminum Angle 1"x1"x1/8"x6-1/2"
4 – Grommet 9/16" OD
1 – Braided Oil Line 2' long
3 – 050-FCM-1012 AN6 Straight Hose Fitting
1 – 050-FCM-4022 AN6 45 Degree Hose Fitting
2 – 050 FCM-2003 1/8 NPT – AN6 Adapter
2 – 050 FCM-???? 3/8 NPT – 45 Degree AN6 Adapter

Step 1. On the two 6 ½" aluminum angles mark two holes one inch in from each edge. When marking these holes make sure that you take into account the OD of the aluminum tubing spacers. If you make the holes too far on the bottom edge of the angle then the spacers will hit the top of the oil cooler. Drill these holes out to 1/8".

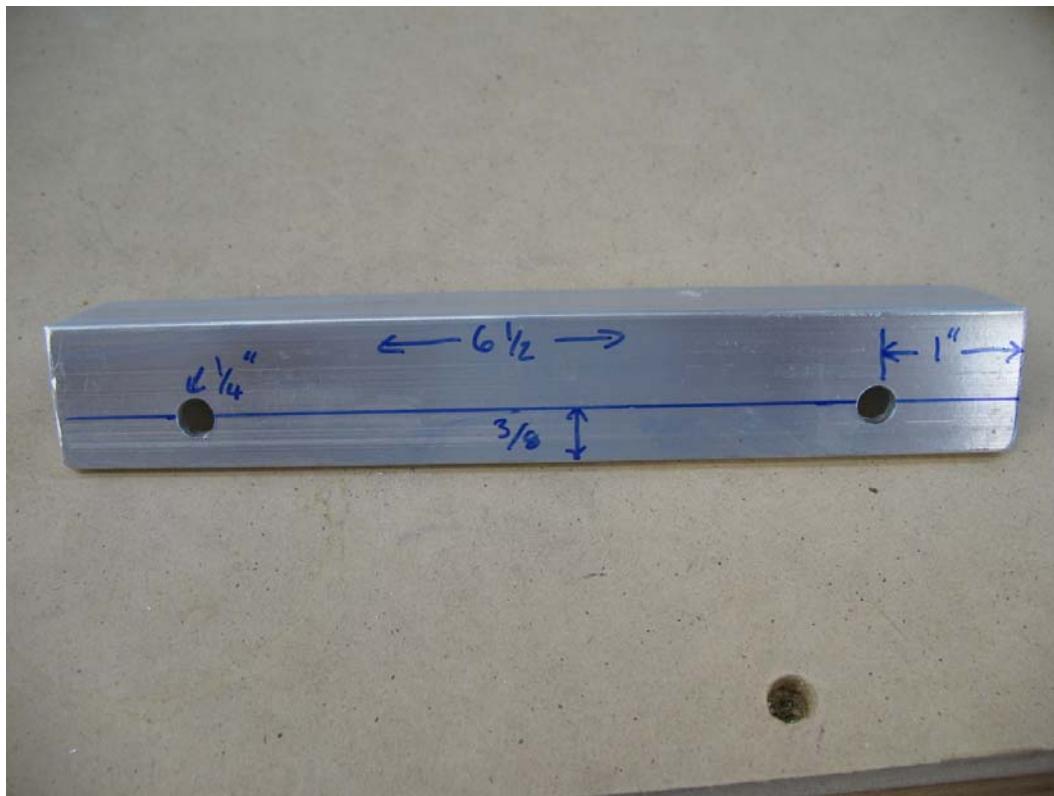


Figure 1

Step 2. Center the 6-1/2" aluminum angle on the top flange of the oil cooler with the bottom of the angle flush with the bottom of the oil cooler flange. The top of the angle goes towards the center of the oil cooler. Back drill through the angle into the oil cooler flange. Drill out to $\frac{1}{4}$ ". Repeat for the other angle



Figure 2



Figure 3

Step 3. Trim the $\frac{1}{4}$ " ID aluminum tubing spacers as needed to fit between the oil cooler flanges



Figure 4

Step 4. On the 4" aluminum angle:

1. On one face of the angle trim off 3/8" of material leaving 5/8"



Figure 5

2. On the other face of the angle make a cutout 1 1/2" wide by 5/8" deep to clear the oil cooler fittings



Figure 6

3. On the cutout side of the angle drill two 1/8" pilot holes 5/8" in from each side and centered on the angle

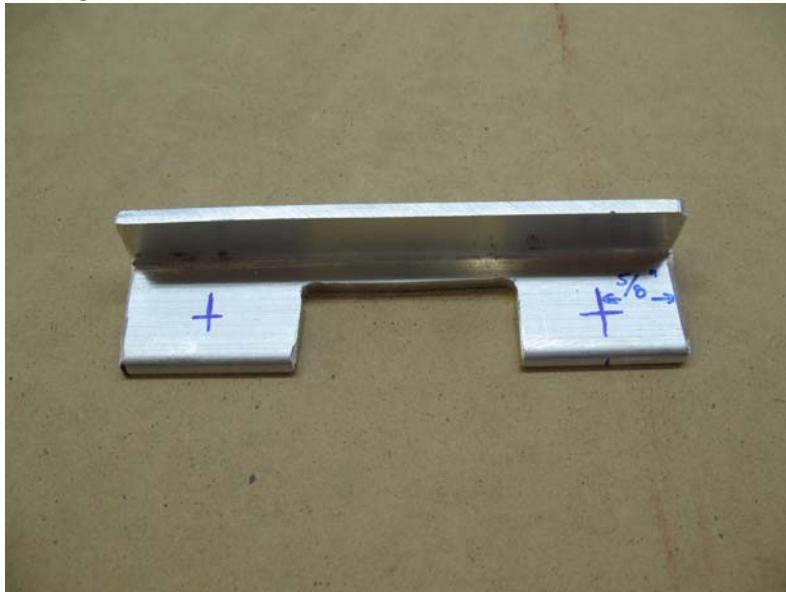


Figure 7

Step 4. Measure the distance between outer most oil pan fins. This measurement should be approximately 4-3/8". Transfer this measurement onto the 6-1/2" oil cooler brackets.



Figure 8



Figure 9

Step 5. Clamp the 4" angles to the oil cooler angles with the cutout clearing the cooler inlets and the inboard edge against the measurements you just made. Back drill through the pilot holes into the oil cooler angles. Before back drilling the second bracket clamp it in place and check the fit against the oil pan fins. Drill all holes out to 3/16" for the AN3-7A bolts.

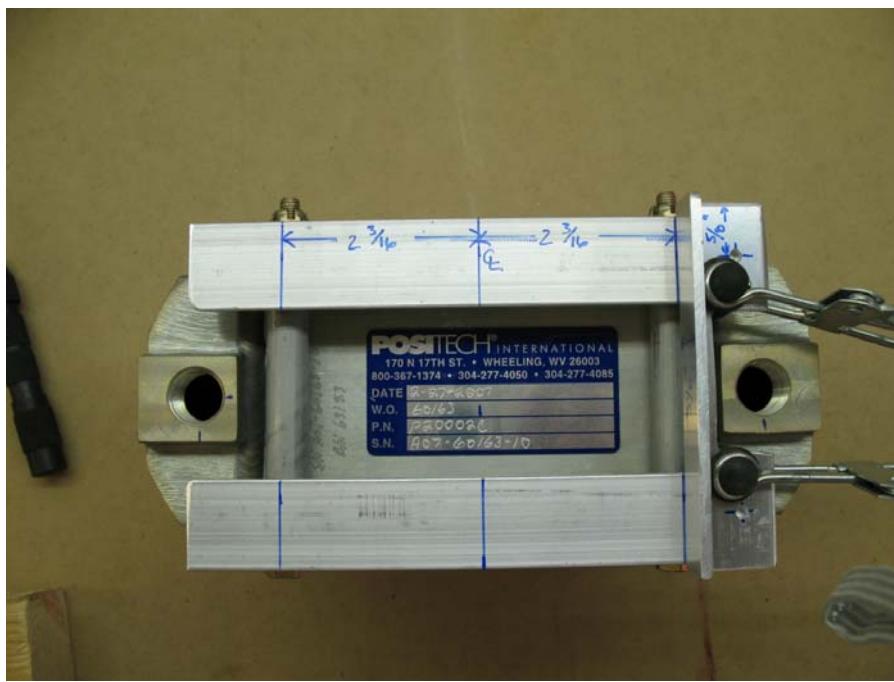


Figure 10

Step 6. Mark two 1/8" holes on the 5/8" face of the 4" angles (see figure 11 next page). Mark these holes 1/2" in on each end of the angle. Carefully measure the height of the oil pan fins and take into account that you will be using a nut between the fins. If you drill too high on the fin then the nut will end up hitting the bottom of the oil pan and you will not be able to get a bolt through it.



Figure 11

Step 7. Place 4" bracket on the side of the oil pan. Line up the bottom front edge of the angle to the front edge of the oil pan. Back drill through 4" angles into oil pan fins. You will have to drill through two fins to make room for the correct length bolt.

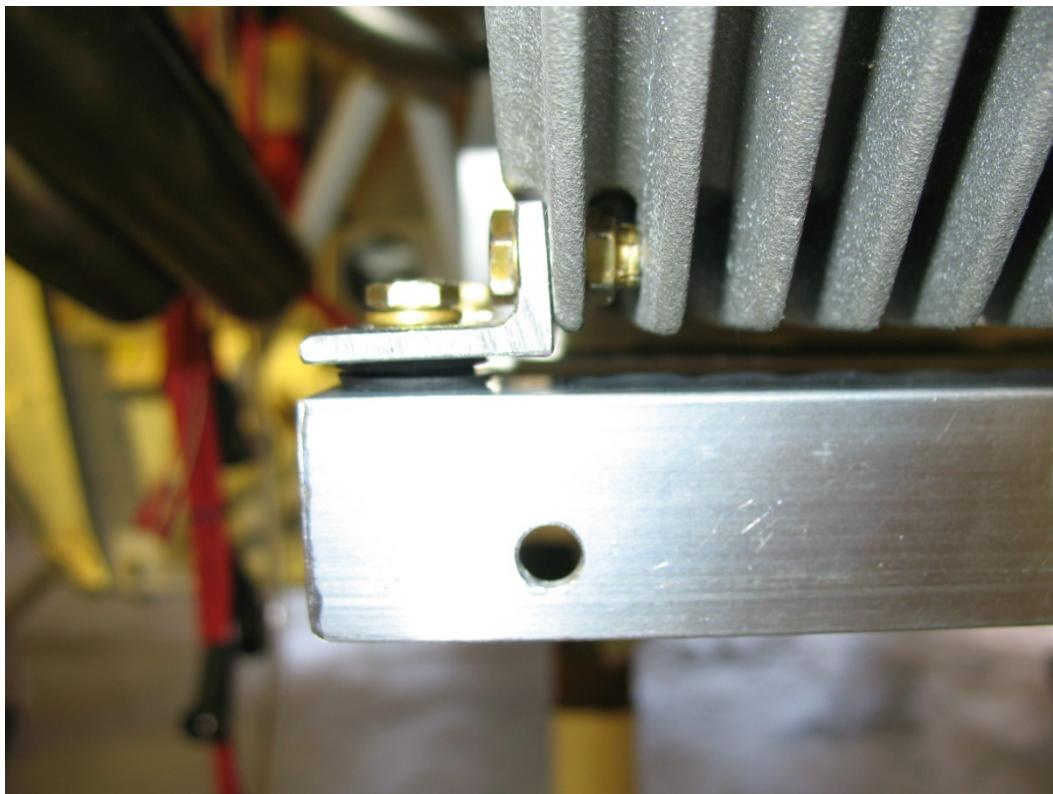


Figure 12

Assembly

Step 1. Make sure all holes are de-burred and all sharp edges removed from the brackets.

Step 2. Assemble oil pan brackets to oil pan using AN3-5A bolts and metal locknuts.

Step 3. Assemble oil cooler brackets to oil pan brackets using AN3-7A bolts, nuts and washers. Place grommet between oil pan bracket and oil cooler bracket. Finish with metal locknuts.

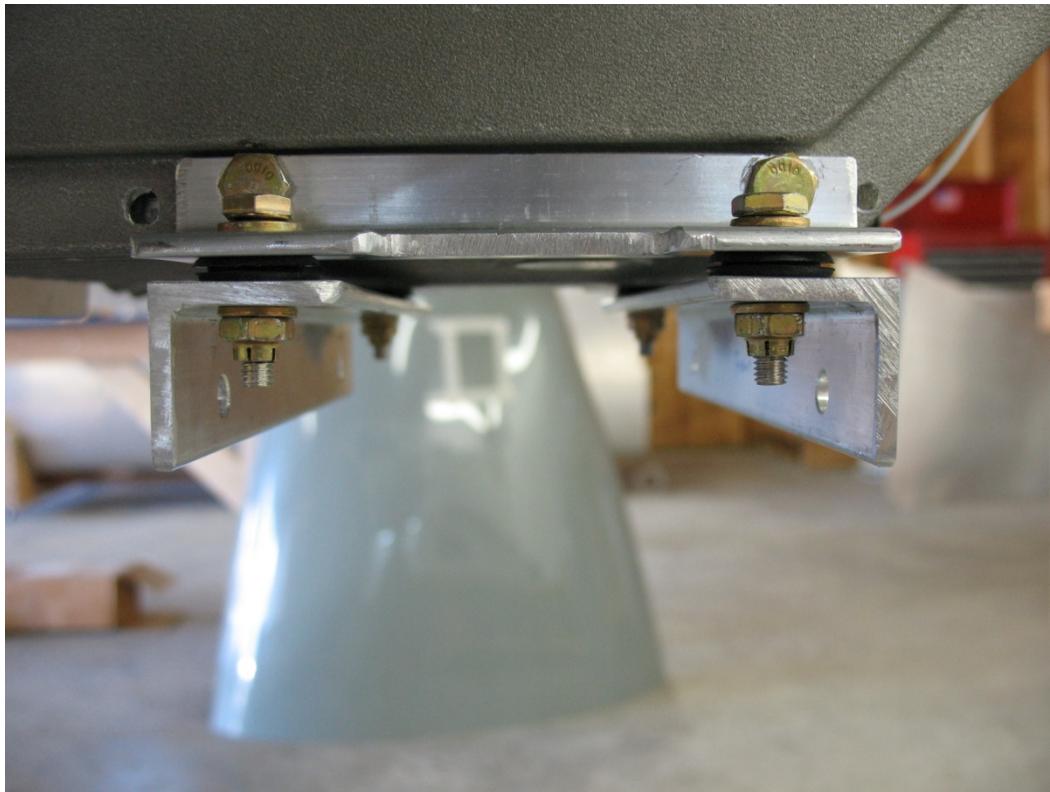


Figure 13

Step 4. Screw 3/8 NPT – 45 Degree AN6 Adapter fittings into oil cooler. Don't forget to use a thread sealant such as Permatex 2B.

Step 5. Temporarily bolt the oil cooler to the brackets using the AN4-42A bolts and spacers. Put the lower cowl in place and note the offset of the oil cooler in the cowl inlet. Remove cowl and oil cooler.



Figure 14

Step 6. Fabricate a mounting flange for the baffle material out of scrap L angle and aluminum from the Zenith kit.



Figure 15



Figure 16

Note: Flange is offset to the left. This was done to center the baffle on the inlet in the cowl.



Figure 17

Sandwich the baffle material between the flange and pieces of scrap aluminum.



Figure 18

Step 7. Bolt oil cooler in place using AN4-42A bolts, spacers and metal locknuts.

Step 8. Locate oil cooler by-pass plate and oil filter extension fitting sent with the Jabiru engine. Remove the barb fitting from the by-pass plate and replace them with the 1/8 NPT – AN6 Adapter fittings.



Figure 19

Step 9. Remove the oil filter. Screw on the oil filter extension fitting and snug down.

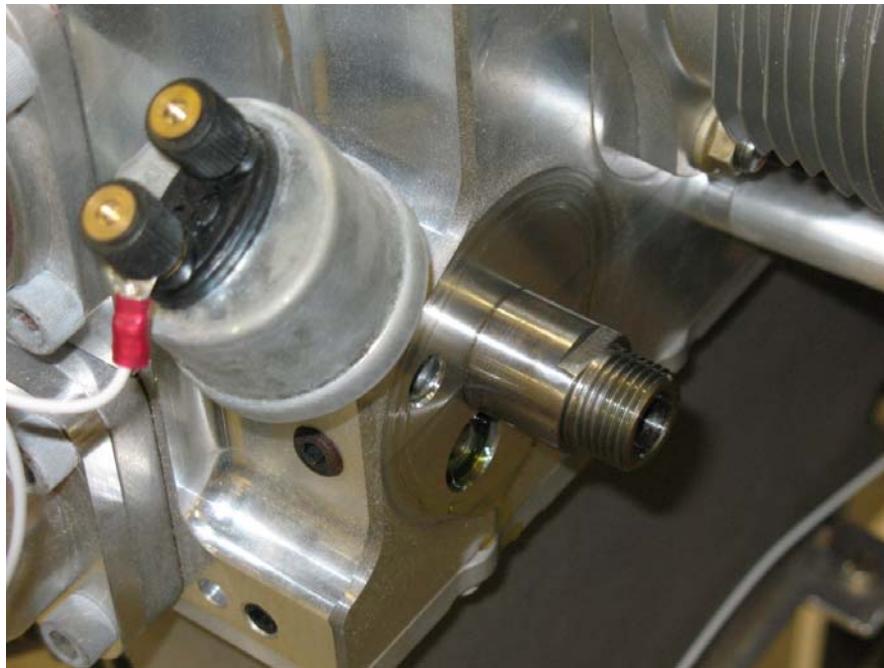


Figure 20

Step 10. Lightly lubricate the oil ring on the oil cooler by-pass with engine oil. Slide the by-pass over the fitting and orient the plate so that the rear AN-6 fitting is pointing down. Re-install the oil filter.

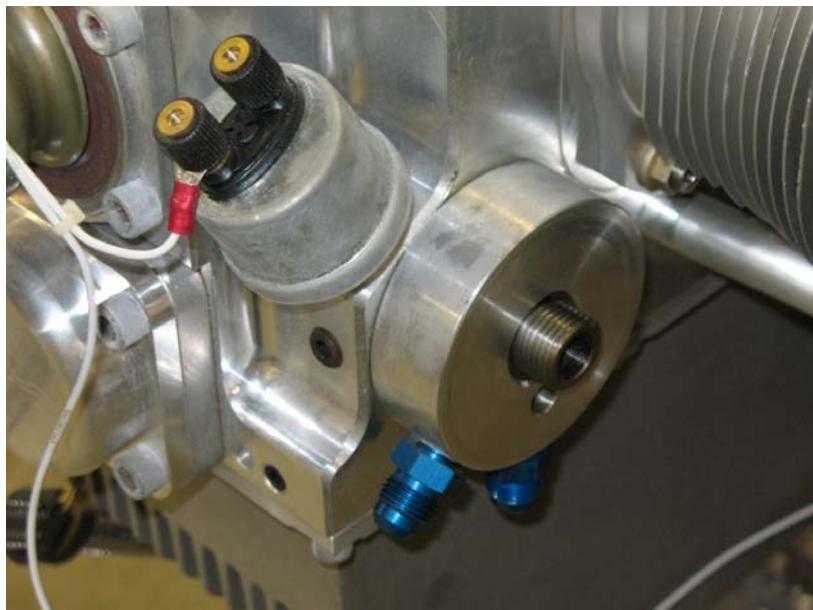


Figure 21

Step 11. Carefully measure and fabricate the oil lines. For instructions on fabricating the oil lines please visit <http://www.usjabiru.com/zenithch601installation-instructions.html> and download the “Stainless oil cooler line assembly” instructions. The oil line running straight down to the left (pilots) side of the oil cooler uses two straight fittings. The oil line that runs to the right side uses a 45-degree fitting at the oil filter and a straight fitting at the cooler.



Figure 22

Secure the oil line as needed to minimize vibration.

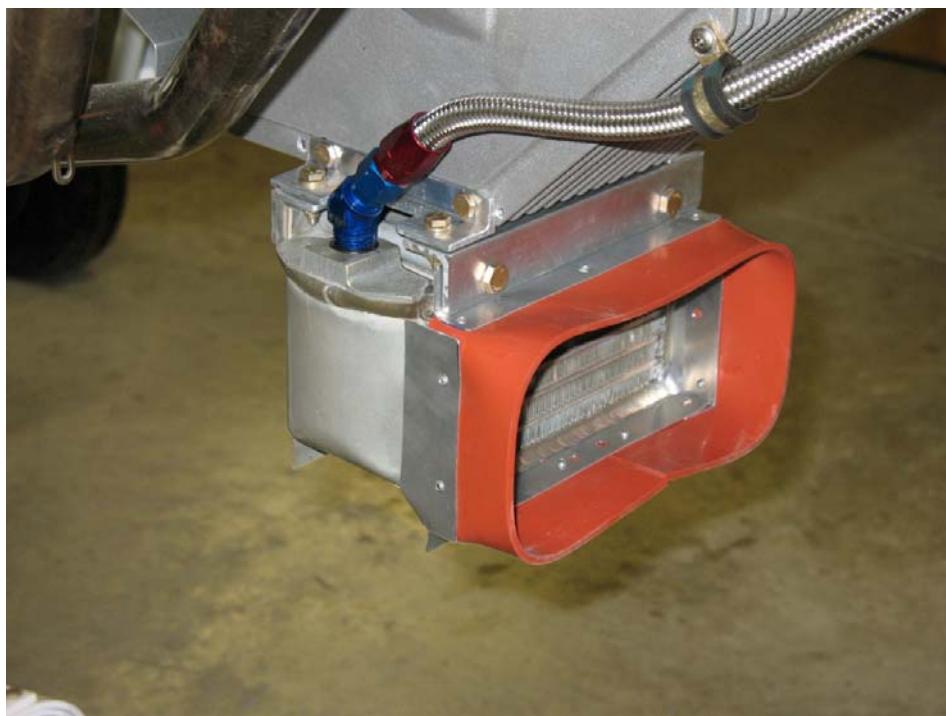


Figure 23

Pre-Paint>Fuselage>Firewall forward>Fit propeller flange extension**Objectives of this task:**

To remove the universal propeller flange that is shipped with the engine and fit the model-specific propeller flange extension to the crankshaft. While this is a straightforward mechanical task it is most definitely a **critical** task and care must be taken.

The universal propeller flange is lock wired in place, however the depth of the propeller flange extension makes the use of lock wire almost impossible and so we use a strong Loctite to keep the flange securely fitted. This means that the cleanliness of all threads is critical.

This task will require 2 people: 1 to stop the crankshaft from moving and 1 to loosen and later tighten the cap screws. This task is intended to be performed by the kit builder with the engine mounted to the aircraft. In the factory we do this task while the engine is fitted to a mobile engine stand so some of the photos will be slightly different to what the kit builder could expect to see.

Materials and equipment required:

Loctite 620 and lockwire

Thread cleaner – Loctite 7471 or Acetone

5/16" Hex drive socket, or alternately a 5/16" Allen key cut straight and fitted to a 5/16" socket

Torque wrench, set to 30 ft/lbs or 40 Nm

Remove the universal flange

The universal flange is held in place by 6 x 3/8" UNF Allen head cap screws, all of which will be reused.

Cut and remove the lock wire from the 6 cap screws, then heat the cap screws with a heat gun in order to loosen the Loctite.

Lock the engine from turning by holding a large blade screwdriver in the ring gear teeth between the starter motor and the adjacent alloy block (circled in the photo above right).

Crack each cap screw in turn to break the Loctite seal and remove each cap screw and the related washer.

Set the cap screws and washers aside for later use.

Remove the flange and discard.

Clean and prepare the screws and hub



Clean the cap screw threads with a wire brush – make sure that there is no residual Loctite in the threads. Clean all threads with cleaning solvent (Loctite 7471 cleaner or Acetone) and dry.

Run a 3/8" UNF flat bottomed tap all the way into each bolt hole in the hub, apply a cleaning solvent (Loctite cleaner or Acetone) into each hole and then blow dry with compressed air.

Check that each thread is absolutely clean and dry before proceeding.

Fit the propeller flange extension

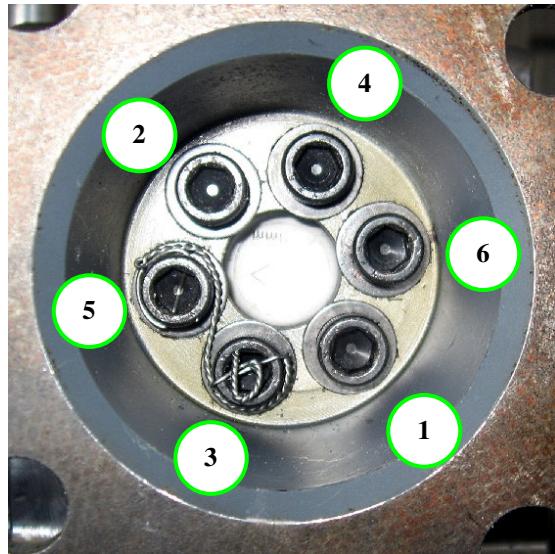
Set your torque wrench to 30 ft/lbs or 40 Nm and place it on top of the engine.



Apply a few drops of Loctite 620 to each screw hole, place the propeller flange extension on the hub and fit the 6 cap screws and washers.

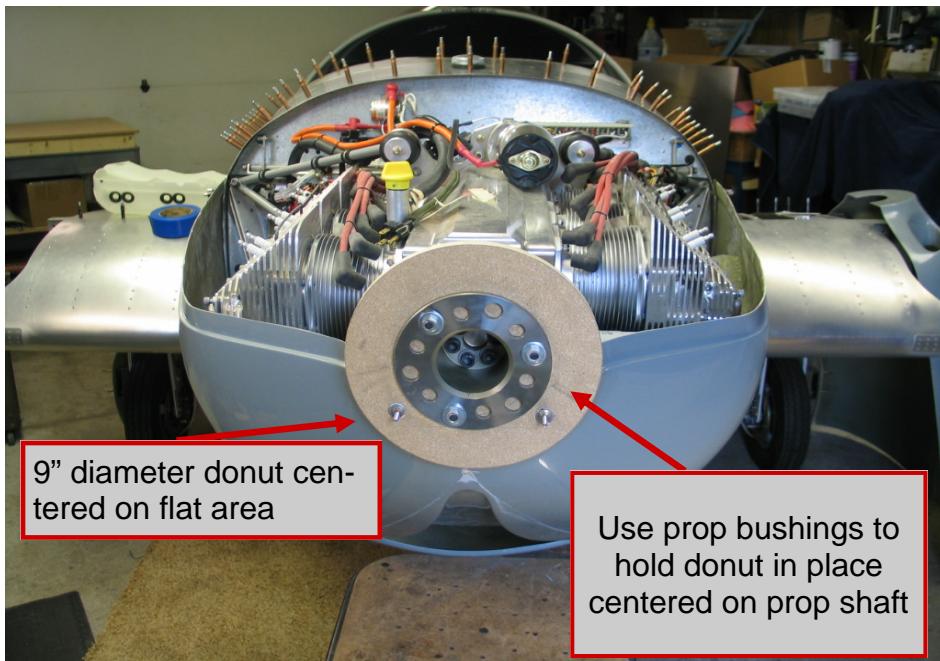
Have your helper lock the engine from turning and tighten all the cap screws firmly then torque each cap screw to 30 ft/lbs or 40 Nm, working in a criss-cross pattern as shown at right. Re-check each cap screw, applying steady pressure on the torque wrench until the torque value is reached.

Re-check the torque values again and then lockwire each pair of cap screws together. Lockwiring cap screws in extended propeller flanges is very difficult. Jabiru only lockwire cap screws in standard propeller flanges.

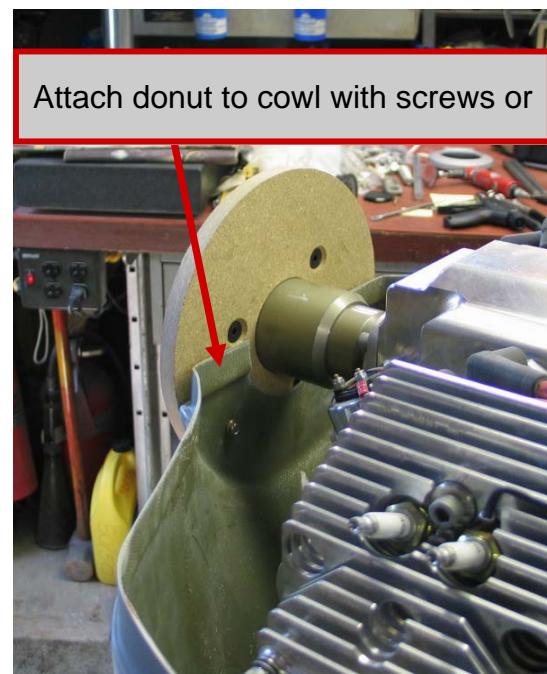


This completes the **Pre-Paint>Fuselage >Firewall forward>Fit propeller flange extension** task.

- 1.1 In simple terms, the cowls are installed by fitting the bottom cowl to the fuselage and attaching with screws to the fuselage and then fitting the top cowl and attaching it to the fuselage and bottom cowl with Camlocs.
- 1.2 One positioning jig will make installation much easier. Fabricate a “donut” from 3/4 inch thick chipboard or plywood. Cut the inside hole of the donut to 2.75 inches in diameter and make the donut 9 inches in diameter on the outside to match the spinner size.
- 1.3 Place the original prop hub that you removed from the crankshaft on the donut. Center the hub and with a 5/8 hole saw drill through three of the prop hub holes so you can insert the engine prop bushings later on.

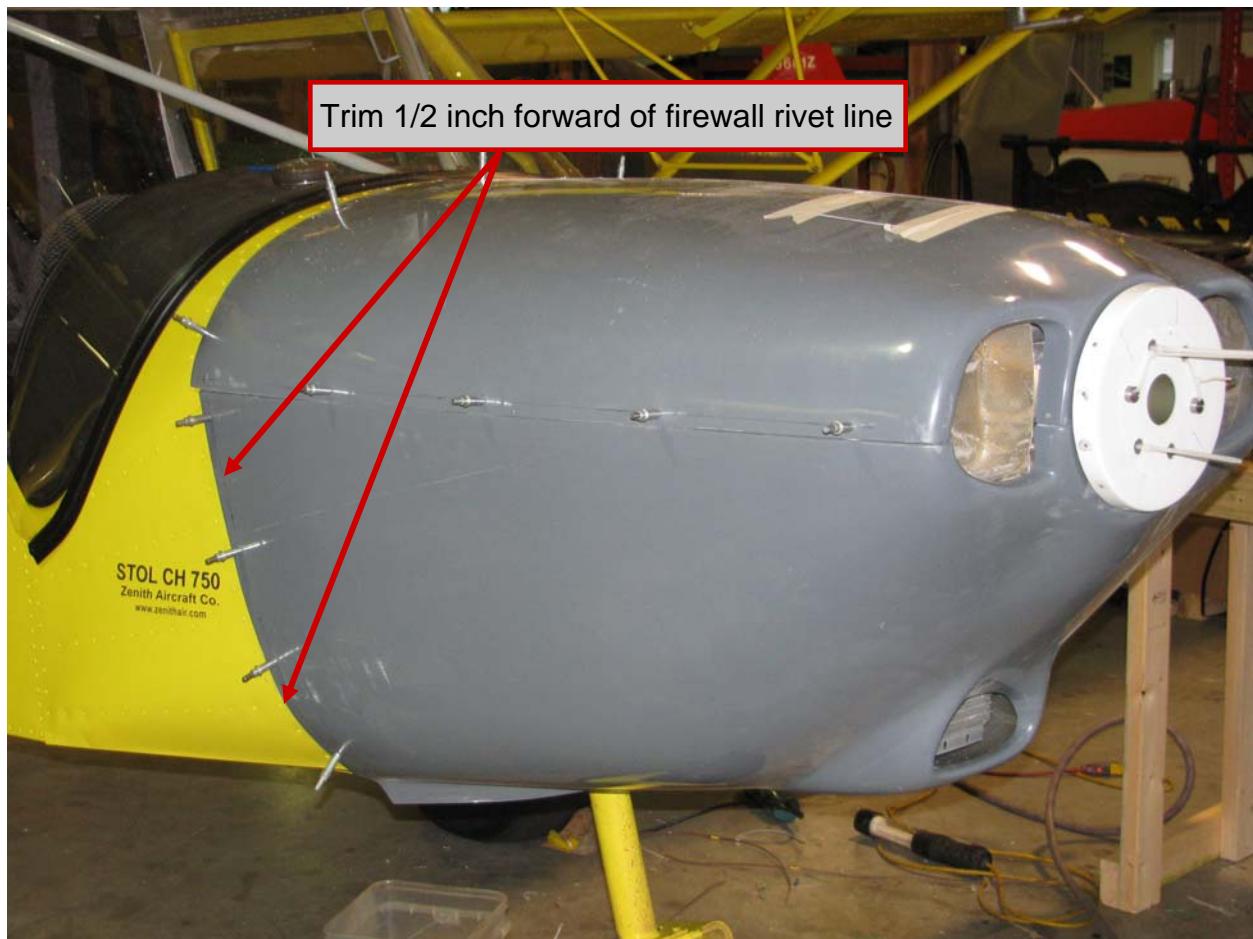


- 1.4 Cut the donut in half (don't cut through the holes in the hub area.. Position one half against the upper cowl spinner flange (the flat area that falls just behind the spinner) and temporarily attach it to the upper cowl with a few self tapping screws inserted from the inside of the cowl into the wood block.
- 1.5 Attach the lower cowl to the other half of the donut in the same manner.

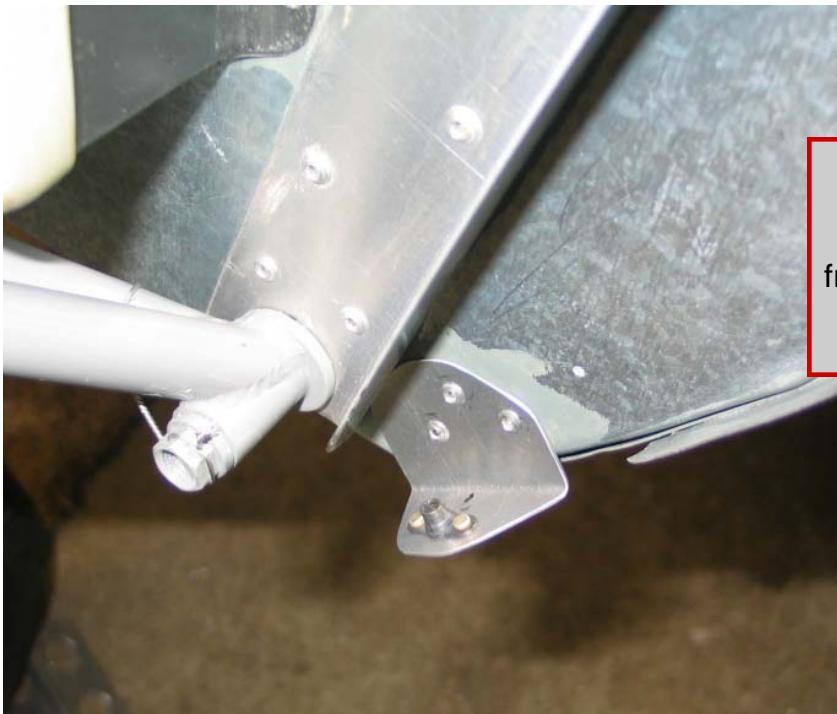


1.6 Bottom Cowl

- 1.6.1 Lift the lower cowl into place and secure the rear end in approximately the right place on the fuselage with tape. Position the front with the donut just behind the prop hub (on the prop hub extension) and secure with the prop bushings from the engine accessory pack and some temporary bolts or screws.
- 1.6.2 The inside radius of the donut should fit around the shaft of the prop hub extension and hold the front of the lower cowl in place.
- 1.6.3 Continue with the fitting of the rear of the cowl against the fuselage. Adjust the bottom cowl so that it is even on each side.
- 1.6.4 The rear of the cowl is made a bit long so that a builder can trim it to his liking. We would suggest trimming to about a half inch forward of the firewall rivet line.
- 1.6.5 Once the cowl is trimmed, drill three holes for temporary attachment of the cowl to the fuselage. Drill to 1/8 inch and cleco the cowl in place.



1.6.6 Fabricate a bottom attach bracket from some .032 aluminum scrap from the Zenith kit and attach to the firewall per the photo at left. Position the bracket so that the bent tab is in contact with the cowl. When happy with the fit, rivet to the firewall and then drill the final bottom cowl attach holes and cleco cowl in place.

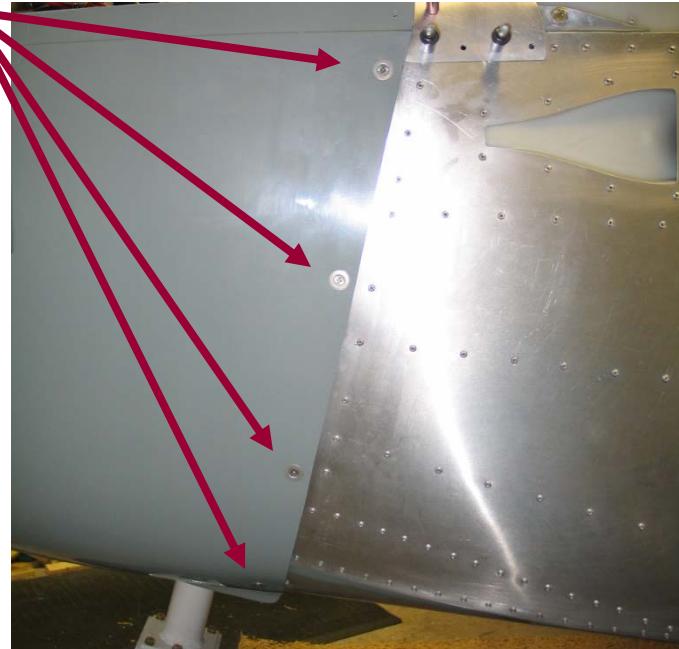


Optional bottom cowl attach bracket fabricated from spare or scrap aluminum sheet stock.

1.6.7 To complete attachment of the bottom cowl, remove the cowl and drill the holes in the sides of the fuselage out to 5/32 inch and install the MK1000-8 nutplaces behind the holes. Be sure to countersink or dimple the holes for the 3/32 flush rivets that attach the nutplates. Before final riveting of the nutplates, drill the hole out to 3/16 to give a bit more clearance to the #8 machine screw that will hold the cowl.

1.6.8 Using a stop countersink bit, countersink the holes that you drilled in the sides of the lower cowl so that the Tinnerman washer will fit flush with the surface.

Countersink cowls so that Tinnerman washers are flush with surface



1.6.9 Reinstall the lower cowl using the donut in the front and the #8 taper head screws and Tinnerman washers in the rear.

1.6.10 Once the nutplates are in place, trim the side skin of the fuselage to suit using the photo as a guide.

1.7 Top Cowl

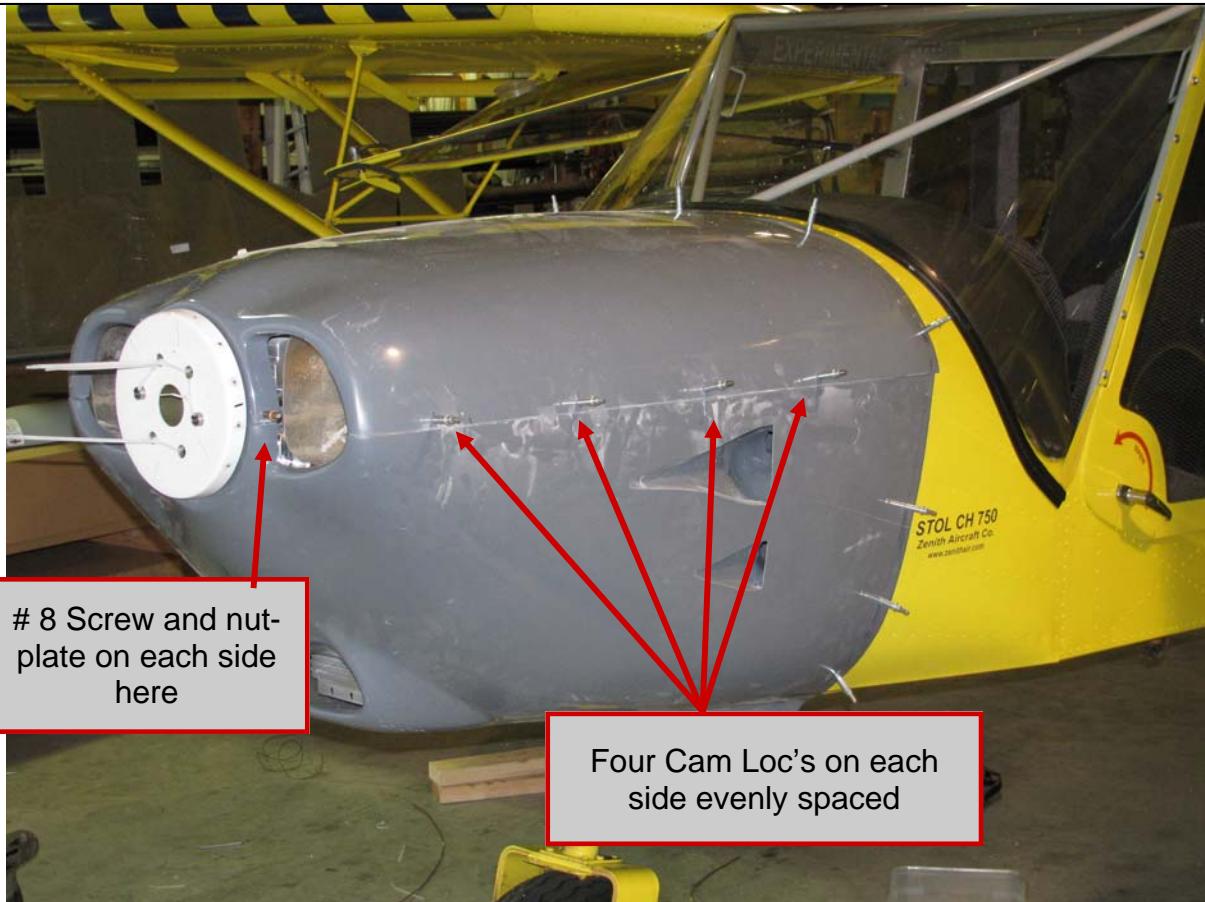
1.7.1 **Hint: One of the keys to good cowl fit is to pull the upper cowl tightly down around the fuselage at the rear of the upper cowl. Trimming need to be finished before the cowls can be pulled tightly together. Some gaps may appear at the rear of the top cowl if not pulled tightly down.**

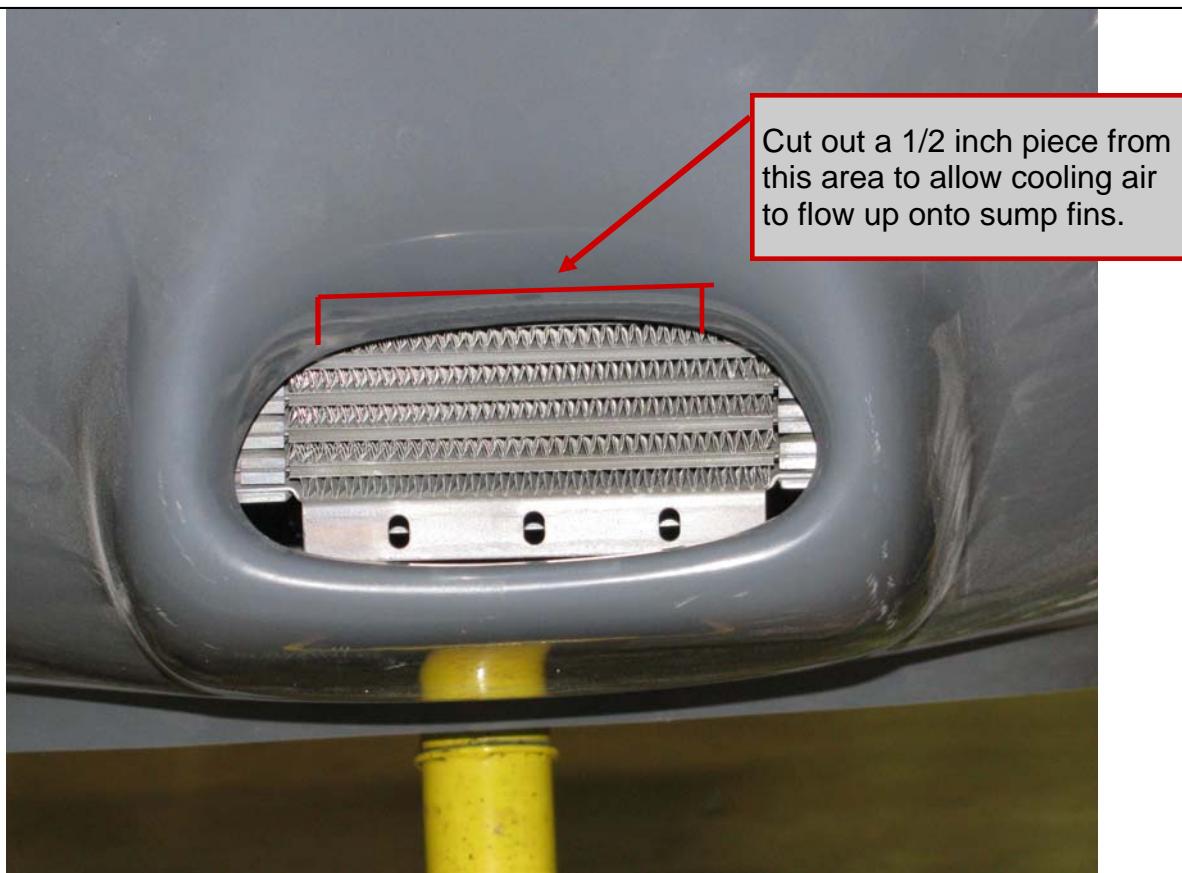
1.7.2 If not already done attach the remaining half to the donut to the front of the top cowl in the same manner as the lower cowl. Place the upper cowl on the airframe and secure in the front at the donut and prop hub.

1.7.3 Center the top cowl on the fuselage and hold in place with tape at the rear upper end. Mark the rear of the upper cowl for trimming (it will be a bit long especially at the sides) and trim to suit. We would suggest matching the length at the sides with the lower cowl and then keeping a consistent distance from the firewall rivet line over the top.

1.7.4 The upper cowl will attach with 5 Camlocs on each side and two Camlocs over the top rear. The top cowl was molded just a bit oversize to allow for some variation in the size of the airframe that might occur in some cases and most likely may need some trimming along each side to fit snuggly in the joggle joint.

- 1.7.5 When satisfied with the rear trim, again fasten the rear in place with tape. Try to center the upper cowl on the fuselage before taping. Using some more tape, pull the sides of the top cowl down over the lower cowl and mark for trimming for a good fit in the joggle joint. Trim with a long sanding block with 80 grit paper or a Permagrit abrasive block.
- 1.7.6 When cowl is trimmed to fit, installation of the Camlocs can begin. Use a 1/8 drill to initially drill the Camloc locations and clecos to fasten the top and bottom together. Start at the front and locate a Camloc about midway in the front flange. For the sake of symmetry, drill each side in the same location. Insert clecos to hold the cowls together.
- 1.7.7 Mark the sides of the cowl to evenly space 4 Camlocs on each side. Plan on locating the most forward Camloc about six to eight inches behind the bend at the front and the rear Camlocs about 5/8 inch forward of the trailing edge of the upper cowl. Locate the holes so that they are slightly below the center line of the joggle joint. Again, make each side the same. Drill to 1/8 inch and install clecos to hold the cowls together.
- 1.7.8 Finally, evenly space the two Camlocs on the top rear of the upper cowl. Drill to 1/8 and install clecos to hold the cowls in place.
- 1.7.9 Installation of the Camloc receptacles is next. Camloc receptacles are installed similar to nutplates. Drill the 1/8 holes in the lower cowl hole out to 5/16. Insert a 5/16 bolt into the hole and into a Camloc receptacle (the bolt keeps the Camloc centered in the hole) and use a 3/32 drill to backdrill the Camloc attach holes. Counter sink the Camloc attach holes so the 3/32 rivets will be flush and rivet the camloc body in place.
- 1.7.10 Drill a 1/4 inch hole in the upper cowl for the Camloc insert. Make a small notch in one side of the hole to allow the pin to fit through. On the sides of the cowl the Camloc receptacles are installed on the back side of the joggle joint and #6 Camloc inserts are used. At the top rear the bodies are riveted to the under side of the fuselage skin and #2 Camloc inserts are used.
- 1.7.11 When all camlocs are in place, reinstall the bottom cowl without the donut. Lower the top cowl in place and secure with the Camlocs.





Please note—if using the round position jig but are planning on using the Aluminum spinner option - the thickness of the jig will have to increase by about 3/16 inch. This can be accomplished with spacer washers between aft side of prop flange and the cowl positioning jig.



Sensenich Wood Propeller

The Sensenich wood prop uses AN6 attachment bolts. Drill out the propeller drive bushings (supplied with the engine accessory kit) to 3/8 inch. Mount the bushings in a vice cushioned with wood (paint stir sticks work well), cloth or cardboard. These bushes are easy to drill – just keep drill straight

Drill Prop Crush Plate to 3/8 inch. Drill only the six holes on the 4.375 inch diameter hole pattern.

Install an AN6-45A bolt in each prop drive bushing

Insert bushings and bolts into prop hub from rear.

Slide spinner back plate over bolts & bushings (spinner will have to be completed first)

Slide prop over bolts and bushings

Install crush plate over bolts

Install a AN960-616 washer over prop bolt

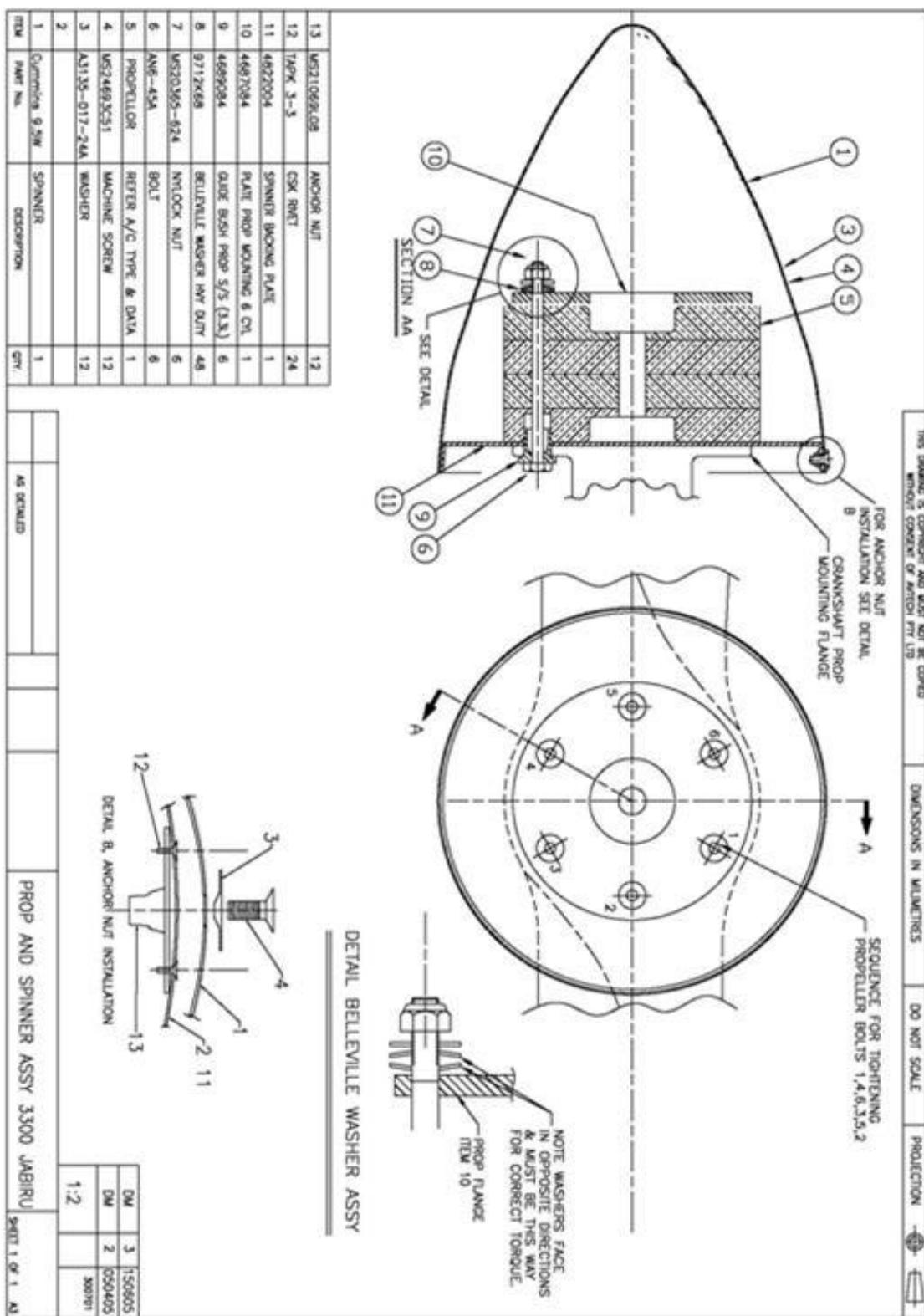
Install two Belleville washers over each prop bolt. The washers go concave face to concave face.

Install AN360-624 nylock nuts

Tighten to 18 ft lbs in a diagonal pattern – first torquing to 12 ft lbs and then to 18 ft lbs.

Refer to prop installation drawing next page

For additional reference and propeller maintenance guides visit Sensenich Wood Propeller at www.sensenichprop.com

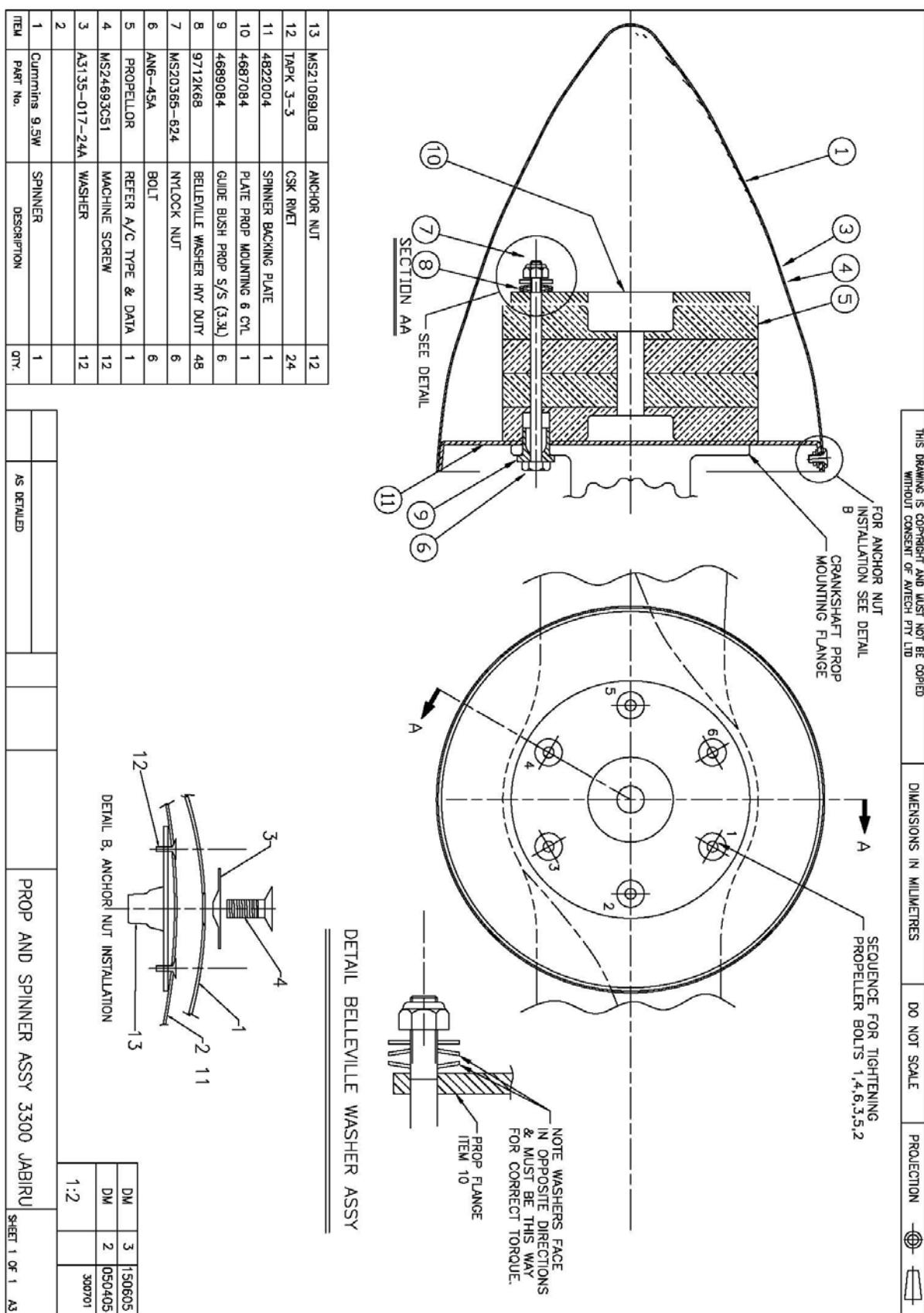


Prop & Spinner

Prop spinner (fiberglass spinner only)

1. Expand holes in spinner back plate to 5/8 inch
2. Set back plate on workbench , install prop bushings and bolts from bottom
3. Position prop over bushings and bolts
4. Cover prop blades with masking tape to avoid scratching prop when fitting spinner cone
5. With a piece of poster board make a template of the prop opening in the spinner
6. Transfer template to spinner cone and cut out
7. Cut small at first and then expand until the rim of the spinner sits flat on the work bench and the prop has 1/8 inch clearance (minimum) from spinner cone.
8. Mark five evenly spaced locations for attachment screws around base of spinner—four holes between the blades on each side
9. Drill to 1/8 and secure with clecos
10. Mount nutplates on inside of spinner back plate (see drawing for details)
11. Expand holes in spinner back plate to 5/32
12. Expand holes in spinner cone to 5/32 and bevel to accept Tinnerman washers (see drawing for details)
13. Place indexing marks on spinner & back plate so prop & cone will be in the same position when installed on the aircraft.
14. Install spinner back plate first on prop hub
15. Then install prop making sure prop is properly aligned on spinner plate.
16. Torque prop to 18 ft lbs (Sensenich Wood Prop - if using another manufacturer prop torque to prop maker's instructions)
17. Install Spinner cone keeping alignment marks in proper alignment.





Cummins Polished Aluminum Spinner

The optional Cummins Polished aluminum spinner requires no trimming and no nut plate installation. It is ready to install right out of the box!

The advantage is that the spinner takes several hours less work and it is perfectly balanced and runs exactly true without adjustment. We think it looks better as well.

The disadvantage is that it costs a few hundred dollars more. We think it is worth it!

