

Jabiru USA JU1000-601



Firewall Forward Installation



Zenith CH601 Series Jabiru 3300 Engine Firewall Forward Kit

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1.0 Inventory

- 1.1 Unpack large cardboard box
- 1.2 Locate Packing List taped to box lid.
- 1.3 Check parts and components against packing list
- 1.4 Note any backordered items (note that propeller is shipped directly from Sensenich and will not be with the kit)
- 1.5 Refer to component photos at www.usjabiru.com or the chart below for information on component packaging

<u>Zenith CH601 Series Firewall Forward Components</u>		
<u>Part Number</u>	<u>Component System</u>	<u>Package</u>
JU800-Z	Firewall Side Mount Hardware	Bag
JU800-2	Engine Side Mount Hardware	Bag
JU800-601	Engine Mount	Tied in Box
JU714	9" Spinner Assembly Kit	12x12x12 Box
ZK Bolt Kit	Sensenich ZK Series Prop Bolts	Bag
W64ZK-51	Sensenich Propeller	Ship direct from Sensenich
JU250	Oil Cooler Kit - J Style Mount	Box
JU129	Oil Recovery System	Bag
JU500	Fuel System Firewall Forward	Bag
JU39Z	Carb Heat Filter Box Zenith	Bubble Wrap
JU440J	Carb Heat Components less airbox	Box
466218N	Prop Extension 63mm	Bubble Wrap
JU625	Battery Box Assembly	Bag
JU120-601	Zenith CH601 Cowl System	Bubble Wrap & Bag
JU310-48	Single Throttle System	Box
JU320-48	Dual Friction Throttle (optional)	Box
JU950-1Z	Cabin Heat System Zenith (optional)	Box

2.0 Pre fit Engine Mount

- 2.1 Unwrap mount and hold up to firewall
- 2.2 The two bottom holes on mount must match up exactly to the bolts coming through the firewall.
- 2.3 If your bolt locations are not exactly in line with the engine mount holes it is permissible to "stretch" the holes up to 1/8 inch to get a good fit. If your bolt locations are farther off than the 1/8 inch do not try to spread the mount as this will warp the mount pins and make it impossible to fit mount on the engine. Jabiru USA can supply a mount with the lower holes not drilled for firewalls where the mount bolt locations are not exactly to plan dimensions.

2.4 The upper mount arms are a bit flexible and can be moved a it to fit over the firewall bolts without twisting the mount.

2.5 Once satisfied that the mount fits over the bolts then remove the mount and paint.

3.0 Prep & Paint Mount

3.1 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.

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

3.3 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.

4.0 Throttle Arm Extension

4.1 Before attaching engine to the mount install the throttle arm extension on the carb. It will be much easier to work on the throttle arm before the engine is mounted

4.2 Retrieve the throttle arm extension from the throttle sub kit and follow the directions contained in the package.

5.0 Fit Mount to Engine

5.1 Attach Female Rubbers Engine mount to both engine attach point on the Top Only.

5.2 Attach Male Rubber Mount Cushion to the lower engine mount pins.

5.3 Stand the engine vertically on the prop flange

5.4 Lower the mount down into the mounting holes in the engine back plate. Push the male cushions through the holes to get them seated firmly in the engine back plate.

5.5 Start at the top engine mount pins. Insert an AN4-31A bolt into the engine mount pin from rear to front.

5.6 Slide a male rubber cushion onto the engine pin weldment and through the engine back plate.

5.7 Slide an engine mount washer over the end of the bolt and into the rubber cushion.

5.8 Using a small C clamp squeeze the rubber cushions together until the AN4-31A bolt is visible.

5.9 Fit an AN960-416 washer and a AN363-428 nut on the bolt and tighten up all the way until the mount washer bottoms on the engine mount pin.

5.10 Repeat for the other mount cushions.

6.0 Hang Engine (temporary)

6.1 Using an engine crane or other lifting device (a couple strong helpers can do the job) lift the engine and mount into place siding the mount over the bottom bolts first and then over the top bolts.

6.2 Install temporary 3/8-24 nuts to hold the engine on the firewall while the locations of components are marked.

7.0 Locate Firewall Components

7.1 Airbox

- 7.1.1 Place the carb heat airfilter / 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.
- 7.1.2 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.
- 7.1.3 Mark the outline of the airbox with a felt tip marker.

7.2 Cabin Heat Mixer Box (optional)

- 7.2.1 If installing cabin heat locate the mixer box close to the center of the aircraft to the right side of the nose leg channel.
- 7.2.2 Mark the location with your marker

7.3 Battery Support & Clamp

- 7.3.1 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.
- 7.3.2 Mark the outline of the battery

7.4 Oil Recovery Bottle

- 7.4.1 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.
- 7.4.2 The bottle does not have to be vertical but can be slanted to help with the fit.
- 7.4.3 Mark the outline of the bottle.

7.5 Fuel fitting

- 7.5.1 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.
- 7.5.2 Locate the fuel fitting on the firewall where it will not conflict with other firewall mounted items.
- 7.5.3 Mark the location.

7.6 Starter Solenoid

- 7.6.1 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.

7.7 Regulator

- 7.7.1 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.

8.0 Remove Engine

- 8.1 Now that the locations of the firewall mounted components are determined it is time to remove the engine and mount to make it easier to drill, rivet, and install the FWF components.

9.0 Install Components on Firewall

9.1 Airbox

- 9.1.1 Remove the airbox top from the airbox base
- 9.1.2 Position the base per your previous markings on the firewall
- 9.1.3 Drill through the airbox flange and through the firewall with a 1/8 inch drill.
- 9.1.4 Temporarily secure the airbox in place with Cleco's.
- 9.1.5 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.
- 9.1.6 Remove base and coat edge with silicone sealant
- 9.1.7 Reinstall base with 6 x 1/8 dome head rivets.
- 9.1.8 Insert K&N air filter
- 9.1.9 Replace airbox top and screw to base with the #8 screws provided.

9.2 Cabin Heat Mixer Box

- 9.2.1 With a 2" hole saw cut a hole in the firewall per your earlier mark for the cabin heat mixer box
- 9.2.2 Deburr hole
- 9.2.3 Install box with 4 x 1/8 inch rivets

9.3 Battery Support & Clamp

- 9.3.1 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.
- 9.3.2 Install the battery hold down clamp about 1.5 inches down from the top of the battery. Pre-drill two 1/8 inch holes in each side of the battery hold down clamp each hole about 1/2 inch in from the edge.
- 9.3.3 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
- 9.3.4 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.
- 9.3.5 Drill out the holes in the clamp to 3/16
- 9.3.6 Install battery and battery clamp and secure with the four #8 screws provided.
- 9.3.7 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 www.batteries4everything.com as one source.

9.4 Oil Recovery Bottle

- 9.4.1 Pre-drill two 3/16 holes through the oil bottle clamp evenly spaced on the flat part of the clamp.
- 9.4.2 Place the clamp on your mark and drill through the pre-drilled holes and on through the firewall.
- 9.4.3 Using the 3/16 rivets, secure the clamp to the firewall.
- 9.4.4 Slip the bottle into the clamp.

9.5 Firewall Fuel Fitting

- 9.5.1 Drill a 1/4 inch hole at the spot of your mark where the fuel line will come through the firewall.
- 9.5.2 Insert the fuel fitting in the hole from the engine side.
- 9.5.3 Drill through the two holes in the flange of the fitting.
- 9.5.4 Debur and then rivet in place.

9.6 Starter Solenoid

- 9.6.1 The starter solenoid can be mounted on the firewall above the stiffener shelf or attached to the shelf itself – either top or bottom side.
- 9.6.2 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).

9.7 Regulator

- 9.7.1 Mount the regulator on the firewall above the shelf somewhere near the battery. Take care to leave room for the dual throttle cross rod that mounts at the rear of the shelf and extends up for about 1.5 inches. (dual throttle option only).
- 9.7.2 Bolt to the firewall with spare AN3 hardware.

10.0 Final Engine Installation

- 10.1 Hoist the engine and mount back into place and secure with a AN960-616 washer and AN363-624 metal locking nut. Tighten the nut to 30 ft lbs.

11.0 RamAir Cooling Ducts

- 11.1 The RamAir ducts will have to be fitted to the engine and an airdam and additional deflectors installed inside the ducts to assure adequate cooling.
- 11.2 Remove the forward top valve cover cap screw on cylinders 1 and 3. Remove the top rear screw on #5.
- 11.3 Remove the spark plug leads and lay them down out of the way for now.
- 11.4 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.
- 11.5 When satisfied that the duct sits down on the rocker covers drill through the duct with a 1/4 inch drill at the location of the rocker cover cap screws that you removed.
- 11.6 Loosely reinstall the cap screws.

- 11.7 The inside edge of the duct should extend just past the inside edge of the gull wing baffle and nest between fin ?? & ??.
- 11.8 Attach the small angle spring support to the top of the duct.
- 11.9 Install the small spring between angle spring support and the loop of safety wire around the middle cylinder.
- 11.10 Clamp the bottom front of the duct together taking care not to distort the front of the duct.
- 11.11 An air dam must be constructed for the front of the duct opening. The purpose of the dam is to prevent air from entering and going below the head. We must force the incoming air stream up and over the head so that the cool air will be drawn down through the heads. The dam should be vertical and be located just forward of the front edge of the head. Gap between head & air dam should be minimal. The dam should come up to just above the mid line of the head. Some fiberglass plate is provided for the dam construction or it can be made of aluminum if the builder prefers.
- 11.12 A small deflector must be installed in the top of the duct over the forward edge of the middle cylinder. This deflector must be positioned perpendicular to the air flow and extend vertically down from the top of the duct about 1/4 inch. This deflector may have to be trimmed back during flight testing to achieve even cooling so don't make it too short. Again, you may use fiberglass or scrap aluminum.
- 11.13 Repeat for the other duct.
- 11.14 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.

12.0 Engine Controls

12.1 Choke

- 12.1.1 The choke cable must be routed from your panel, through the firewall, and to the carb cable bracket.
- 12.1.2 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.
- 12.1.3 Drill 3/8 through the firewall
- 12.1.4 Insert a 3/8 grommet in the hole
- 12.1.5 Route choke cable from panel, through grommet, and through the bottom hole in the carb bracket.
- 12.1.6 Hold the cable end adjuster up to the cable to mark where the cable should be cut off.
- 12.1.7 Pull wire back through the sheath and cut off spiral sheath.
- 12.1.8 Clean up the end of the sheath.
- 12.1.9 Insert cable end adjuster on the end of the sheath
- 12.1.10 Swage the adjuster on to the end of the sheath
- 12.1.11 Insert adjuster into bracket and install jam nuts on either side of bracket.
- 12.1.12 Push the choke wire back through the sheath to the fully closed position.
- 12.1.13 Cut off excess wire.

- 12.1.14 Clean end of wire with steel wool
- 12.1.15 Apply flux and solder the ferrel to the choke wire
- 12.1.16 Insert ferrel into choke arm with a washer on each side and secure with a cotter pin.
- 12.1.17 Adjust jam nuts so that the choke knob on the panel is all the way in when the choke is closed.
- 12.2 **Single Throttle**
 - 12.2.1 Attach throttle arm extension if not already done. (see section 4.0)
 - 12.2.2 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.
 - 12.2.3 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!
 - 12.2.4 Remove the cable from the panel and firewall. Remove the center wire from the throttle cable sheath. Cut the sheath to length.
 - 12.2.5 Clean up the cut end so that the spiral winding does not interfere with the center wire.
 - 12.2.6 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.
 - 12.2.7 Reinstall cable through panel and firewall.
 - 12.2.8 Install one 5/16 jam nut on the cable end adjuster.
 - 12.2.9 Insert adjuster into carb bracket and install the second jam nut.
 - 12.2.10 Feed center wire through the sheath.
 - 12.2.11 Install the $\frac{1}{4}$ inch cable swivel into the throttle arm.
 - 12.2.12 Feed cable wire through the swivel.
 - 12.2.13 Tighten the allen screws in the swivel from both sides.
 - 12.2.14 Trim off extra throttle wire length.
- 12.3 **Dual Throttle**
 - 12.3.1 Mount throttle cross rod on firewall stiffener shelf
 - 12.3.1.1 Place one nylon block on each end of the throttle cross rod.
 - 12.3.1.2 Place rod on firewall shelf positioning the cross rod as far forward as possible but still allowing clearance for the nose leg top. Center the rod on the shelf.
 - 12.3.1.3 Drill a 3/16 hole through the blocks and the firewall shelf. Install AN3-13A bolts with nuts & washers.
 - 12.3.2 Install Dual Throttle Cables

- 12.3.2.1 Tilt the input arms of the cross rod rearward until they touch the firewall. Mark the firewall where the throttle cables will attach to the input arms. It works well to hold one of the 5/16 cable end adjusters against the input arms and mark for a ¼" hole around the adjuster.
- 12.3.2.2 Drill the firewall at the point where the adjuster will mount.
- 12.3.2.3 Install the 36 inch cables in the panel and extend through the firewall. Mark for length and trim the sheath to 1" aft of the firewall.
- 12.3.2.4 Remove cables and install cable end adjusters per section 12.2.6
- 12.3.2.5 Place a 5/16 jam nut on each cable end adjuster and install throttle cables in the panel and through the firewall. Adjust the cables for length by adjusting the jam nuts so that the cable is as straight as possible.
- 12.3.2.6 Once cable sheath length is set, install a jam nut on forward side of firewall and cut off the cable end adjusters close to flush with the jam nut on the forward side of firewall.
- 12.3.2.7 Install cable center wire through the installed cable sheaths and on through the firewall and through a ¼ cable swivel installed in the input arms of the cross rod.
- 12.3.3 Fabricate Center Cable Support
 - 12.3.3.1 Using the length of 1/8 x 1" aluminum Drill a ¼ inch hole 5/8 inch from one end of the piece.
 - 12.3.3.2 Temporarily install a ¼ inch cable end adjuster in this hole. The aft end of the center cable will attach here.
 - 12.3.3.3 Position the piece on the firewall shelf so that the cable end adjuster lines up with the output arm of the cross rod. You should bend the end of the aluminum piece just a bit so that the cable will aim right at the output arm.
 - 12.3.3.4 Drill three 1/8 holes through the aluminum piece and the firewall shelf. Debur and then rivet the aluminum piece to the shelf.
 - 12.3.3.5 Install a ¼ inch cable end adjuster in the carb bracket upper hole.
 - 12.3.3.6 Measure the cable sheath from the 1/16 aircraft cable to length between the cable end adjusters trying to make a gentle bend between the adjusters.
 - 12.3.3.7 Cut the sheath to length, clean up the cut ends.

- 12.3.3.8 Install the cable end adjusters on each end of the sheath per section 12.2.6.
- 12.3.3.9 Install the completed center cable assembly between the firewall shelf and carb bracket.
- 12.3.3.10 Feed a length of 1/16 aircraft cable from the top through to the carb. Install a ¼ cable swivel in the throttle arm of the carb and feed the cable through the swivel. Tighten the allen screws on each side of the cable.
- 12.3.3.11 Cut cable to length and install a cable swivel in the output arm of the cross rod. Feed cable through the swivel and tighten the allen screws on each side of the cable.
- 12.3.4 Cross Rod Center Support
 - 12.3.4.1 Split the remaining nylon block in half creating a top half and a bottom half.
 - 12.3.4.2 Install around the cross rod near the center output arm. Drill through the block as in section 12.3.1.3
 - 12.3.4.3 Install AN3-13A bolt, nut, and washer.
- 12.3.5 Adjust throttle for full travel by adjusting cable end adjusters on center cable.

13.0 Scat Duct Airbox to Carb

- 13.1 The routing of the SCAT duct from the airbox to the carb is critically important in getting good performance from the automatic altitude adjusting system. There must be a smooth air flow entering the carb. Tight bends in the SCAT duct near the carb will create a turbulent airflow from the ridges and wire on the inside of the SCAT.
- 13.2 Attach one end of a length of 2.25 inch SCAT to the carb.
- 13.3 Route the SCAT outward toward the airbox making as gentle a bend as possible near the carb.
- 13.4 The nose leg channel limits the extend that you can route the SCAT toward the rear but try to come as close as possible to the nose leg as you put the duct in place.
- 13.5 Secure to the airbox with one of the clamps provided. It may be necessary to remove the wire from the duct to fit over the airbox flange.

14.0 Fuel System FWF

- 14.1 Locate the FWF fuel system from the kit.
- 14.2 Install the firewall fuel pass through fitting in a convenient spot on the firewall. It makes sense to locate it on the right side of center as the fuel will need to flow to the pump on the right rear of the engine.
- 14.3 Drill a 5/16 hole in the firewall at the desires location.
- 14.4 Insert the firewall fitting in the hole.
- 14.5 Drill the 1/8 mounting flange holes on through the firewall.
- 14.6 Debur and rivet the fitting in place.
- 14.7 Route the ¼ inch neoprene fuel hose from firewall fitting to fuel pump. Cut to length.

- 14.8 Cut a piece of firesleeve to the same length as the fuel hose.
- 14.9 Install firesleeve over the fuel hose.
- 14.10 Install fuel hose to firewall fitting and to fuel pump with clamps provided
- 14.11 Use safety wire to secure ends of firesleeve to hose keeping the firesleeve as close to the fittings as possible.

15.0 Oil Cooler

16.0 Wiring – Basic Supply & Magnetos

16.1 **Magneto Wiring (Ignition Module)**

- 16.1.1 The magnetos do not require electricity to operate. The coils in the modules are excited by magnets on the flywheel to produce a spark.
- 16.1.2 The magnetos are turned off by grounding the output. This is done by running a wire from the ¼ inch male terminal on the module to ground through either a toggle switch or a five position ignition switch (Aircraft Spruce part A-510-2). We would suggest using shielded wire for this purpose and grounding the shield only at the engine end.

16.2 **Basic Electrical Supply**

- 16.2.1 There are many different ways to wire an aircraft and its instruments. Here we will only provide instructions on how to route power from the alternator to the regulator and from regulator to battery.
- 16.2.2 The alternator on the Jabiru is a permanent magnet type with an output of 20 amps continuous at 2500 rpm or greater. As such it is not susceptible to the “runaway alternator” problems associated with a variable field alternator. Consequently, Jabiru does not recommend an alternator master switch or any switch in the alternator circuit.
- 16.2.3 Alternator to Regulator
 - 16.2.3.1 Cut off the terminals on the end of the two alternator wires coming from the center of the flywheel.
 - 16.2.3.2 Extend the alternator wires to the firewall where the regulator / rectifier is mounted. Use #16 wire. Use a good quality butt splice to connect the extensions or solder the connections to the alternator wires and insulate this connection **VERY** well. We use three layers of shrink tube and some electrical tape. When there is a strong demand for power output – example: just after starting when the battery is being recharged – there is a great deal of current flowing through these wires. This current will seize any opportunity to go to ground. Since these wires are frequently routed along an engine mount member which is a good ground we

have seen many times where the current will arc through a single layer of insulation and arc to the engine mount member. Sometimes this has burned out the connection to the extension wires and results in no alternator output to the battery. Other times the builder notices a burned spot on the engine mount member and brittle insulation where it has become very warm.

- 16.2.3.3 At the alternator we would suggest cutting off the connector and making individual connections. Pay special attention to insulating the two wires from the alternator for the same reasons as in 16.2.3.2.
 - 16.2.3.4 Connect the alternator wires to the light blue wires from the regulator. It does not matter in which order.
 - 16.2.3.5 Connect the black wire from the regulator to a good ground using #14 wire or larger. Keep in mind that with a permanent magnet alternator current is produced all the time at a constant rate. There is no reduction in current from the alternator by weakening the field as you can do in a conventional alternator. With that in mind, the regulator keeps the alternator from over charging by sending excess production to ground. Hence the need for a good ground wire. Inadequate ground wires may result in voltage spikes.
 - 16.2.3.6 Connect the red wire from the alternator directly to the battery. Some builders run this wire through a 30 amp fuse but Jabiru does not on their own aircraft. Use #14 or larger wire.
 - 16.2.3.7 Connect the yellow wire to the 12 volt system. We run it to the battery as well. This wire senses the current in the system and tells the regulator circuitry to send the power output to the battery or to dump it to ground. Use #16 wire.
 - 16.2.3.8 The green wire from the regulator is not used. This is an on / off switch that would light a caution light on the dash of a Kubota tractor when the alternator is not charging. If you want a warning light feel free to use that green wire.
- 16.2.4 Battery to Panel
- 16.2.4.1 This wiring is at your option. In Jabiru airplanes that we produce we use a #10 wire from battery to a master switch / breaker (Spruce part W31X2M1G30). From that master switch we power a master buss and an instrument buss.
 - 16.2.4.2 We also use a #10 wire from a ground buss back to the negative terminal of the battery.

17.0 Propeller Hub Extension

17.1 Use procedure from the "[Fit Propeller Flange Extension](#)" section of the Zenith 601 Instructions

Note: Studs can be torqued (Diagonally) straight to 30 Ft LB as the Loctite will harden within minutes when studs are screwed in.

18.0 Fit Cowls

18.1 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.

18.2 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.

18.3 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.

18.4 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.

18.5 Attach the lower cowl to the other half of the donut in the same manner.

18.6 Bottom Cowl

18.6.1 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.

18.6.2 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.

18.6.3 Continue with the fitting of the rear of the cowl against the fuselage. The break between top and bottom cowl is designed to line up with the longeron coming from the canopy opening. Adjust the bottom cowl so that it is even on each side and the bottom of the joggle is lined up with the longeron.

18.6.4 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.

18.6.5 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.

- 18.6.6 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.
- 18.6.7 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 nutplates 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.
- 18.6.8 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.
- 18.6.9 Reinstall the lower cowl using the donut in the front and the #8 taper head screws and Tinnerman washers in the rear.
- 18.6.10 Once the nutplates are in place, trim the side skin of the fuselage to suit using the photo as a guide.
- 18.7 **Top Cowl**
- 18.7.1 **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.**
- 18.7.2 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.
- 18.7.3 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.
- 18.7.4 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 snugly in the joggle joint.
- 18.7.5 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.
- 18.7.6 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.
- 18.7.7 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.
- 18.7.8 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.
- 18.7.9 Installation of the Camloc receptacles is next. Camloc receptacles are installed similar to nutplates. Drill the 1/8 holes in the loawe 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.
- 18.7.10 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 Camolc inserts are used.
- 18.7.11 When all camlocs are in place, reinstall the bottom cowl without the donut. Lower the top cowl in place and secure with the Camlocs.
- 18.8 **Install SCAT – Cowl to Airbox**
- 18.8.1 Route the 2.25 inch SCAT from cowl NACA inlet to airbox in as straight a line as possible.
- 18.8.2 Trim to length
- 18.8.3 Install clamps provided to attache SCAT.
- 18.9 **Install SCAT – Cowl to Cabin Heat**
- 18.9.1 Route 2.25 inch SCAT from smaller cowl NACA inlet to the cabin heat muff on muffler.
- 18.9.2 Trim to length
- 18.9.3 Secure with clamps provided in Cabin Heat Kit

- 18.9.4 If cabin heat is not installed block off the opening of the smaller NACA inlet to avoid pressurizing the lower cowl. Too high a pressure in the lower cowl will reduce cooling flow through the heads.

19.0 Install Propeller

19.1 Sensenich Wood Propeller

- 19.1.1 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 cloth or cardboard. These bushes are easy to drill – just keep drill straight
- 19.1.2 Drill Prop Crush Plate to 3/8 inch. Drill only the six holes on the 4.375 inch diameter hole pattern.
- 19.1.3 Install an AN6-45A bolt in each prop drive bushing
- 19.1.4 Insert bushings and bolts into prop hub from rear.
- 19.1.5 Slide spinner back late over bolts & bushings (spinner will have to be completed first)
- 19.1.6 Slide prop over bolts and bushings
- 19.1.7 Install crush plate over bolts
- 19.1.8 Install a AN960-616 washer over prop bolt
- 19.1.9 Install two Belleville washers over each prop bolt. The washers go concave face to concave face.
- 19.1.10 Install AN360-624 nylock nuts
- 19.1.11 Tighten to 18 ft lbs in a diagonal pattern – first torquing to 12 ft lbs and then to 18 ft lbs.

19.2 Sensenich Carbon Ground Adjustable Prop

- 19.2.1 This prop comes with its own bolts and mounting hardware. Follow directions that come with the prop.
- 19.2.2 Initial setting – we would suggest a setting of 2.75 – making the first mark on the left (as you look at prop hub) #1 and the middle mark as #3. Adjust from there to get 2700 rpm on the takeoff roll at full throttle.

20.0 Install Spinner

20.1 Standard Spinner

- 20.1.1 Installing the spinner is a time consuming job but patience and precision will pay off in smooth operation.
- 20.1.2 Lay spinner back plate on a flat surface with flange down.
- 20.1.3 Insert bolts and bushings (temporary bolts may work better here with a temp nut to draw the back plate up to the prop and hold in position.
- 20.1.4 Use a piece of poster board to create a template for the cutout in the spinner cone for the prop blades. Don't worry about making it too precise at this moment – just don't make it too big. We can always enlarge the cut outs but it is tough to fill them in if they are too large.
- 20.1.5 Trace the templates onto the spinner cone and cut out the spinner cone

- 20.1.6 Before trying the spinner over the prop – cover the prop blades with masking tape to prevent the spinner cone from scratching the prop blade.
 - 20.1.7 Fit the cone over the blades and check for fit. Mark where additional trimming has to be done and trim to fit.
 - 20.1.8 Once trimmed so that the cone sits flat on the surface without contacting the prop blade, proceed to install the nut plates.
 - 20.1.9 Evenly space three nut plates on each side of the prop. Install one of the three centered between blade openings and the other two about one inch from the blade opening.
 - 20.1.10 Rivet the nut plates to the spinner back plate.
 - 20.1.11 For final installation – the openings in the spinner cone **MUST** allow at least 1/8 inch clearance between spinner and prop. Any less than that allows the possibility of the spinner flexing and damaging the prop.
- 20.2 **Cummins Aluminum Spinner**
- 20.2.1 Fit back plate to hub before prop
 - 20.2.2 Install spinner cone with screws provided