CARF-Models

Valiant

World Class F3A Pattern Airplane

Build and Setup Instructions
for Glow or Electric Power.

A manual of the Valiant's designer Bryan Hebert.

Bryan has written the CARF Valiant Manual while installing a YS 170.

As an additional contribution to this manual Stuart Chale has written up an installation manual for an outrunner electric installation.

We thank Bryan and Stuart for their hard efforts to create this manual for us and for you!

Dear Customer!

This extensive building and trimming manual was written by nobody less than Bryan Hebert himself, the designer and prototype builder of the Valiant. Thank you, Bryan!

We thought that it would be best to invite the designer to explain the construction details and the building steps. Thus, some of these steps might be very personal opinion and not always intended by CARF. However, CARF decided to print this manual without modifications since it has too many good hints and tricks included. Please keep in mind that with such a highly professional product there are many different installations possible and we trust you, as an experienced modeler and pattern pilot to make your judgement.

For the electric version we thank Stuart Chale for his invaluable contribution.

Here now Bryan's words:

I want to start out by saying congratulations!
If you're reading this you must be open to new ideas. I'm going to try to give the best information I can on the new Comp-Arf models Valiant to help with the building, set up and trimming of this one-of-a-kind F3A Machine.

Please read this entire manual before you start building and flying the Valiant.

First let me say, airplane setup is very important. The setup will make or break your performance at any level of competition. With a properly designed and trimmed model, you will have a distinct advantage over the competition.
The construction, radio and equipment installation is where this begins. The new computer radios can only do a limited amount for you. What we want to do is to set up an airplane such that the radio is relied upon very little for corrective actions. It should be used only for molding the radio to the particular "feel " you are looking for with the model.

I'm going to give you information on how to set this airplane up to fly, with my built-in settings, in just a few flights. Comp Arf has strived very hard to be as accurate as they can to give the modeler an airplane that strictly follows my force arrangements. I will show you how to fly and adjust the model, through a series of maneuvers, for the best results with very little to NO mix.

First some important information

The weight balance of the Valiant was designed to accommodate most motors with, some adjustment of the center of gravity (C/G) being needed on others. If you are flying Glow or Electric, the stabs are cut out for Mini servos, and these servo's can be installed in the stab halves, with little adjusting of C/G required to complete final balance in the radio installation process.

If you intend to use a 2 Stroke, a YS 1.70" NON CDI", or a YS 1.60, the airplane could be tail heavy, if you install the servo's in the stabs; so, be careful and thoughtful with your installation. You may need to run a push rod or pull-pull system on the elevator and make some cover plates for the stabilizer servo cut outs. This will make it easier to adjust the proper C/G. Just be aware of the weight during the building process. Shulman Aviation makes an extension wire for rear servo setup in the stabs that will save you some weight in the rear of the airframe, should you run the elevator servos in the stabs.

The airplane is supplied with two center tank mounts to mount the tank. It is made to be used in range from the Tetra™ 16 Ounce to the 20 Ounce and should be installed centered on the C/G under the wing tube, so there are no trim changes during the flights. If you are running a standard YS1.60 or 1.70, I would recommend a 16 to 20 ounce tank. If you choose to run a YS ignition motor, you can get by with only a 12-ounce tank for any pattern in use today. However, the tank cutouts are standard for the 20 Ounce Tetra Crank Tank, and they will need to be modified if you use a smaller tank. The C/G is on the center of the wing tube, so place the tank in this position for best results.

Engine cooling

This is a big issue for YS Motors, especially the 1.70 YS.
You may have to dam your engine compartment with foam around the engine head to ensure proper airflow around the engine head. YS engine box foam works great for this purpose. Look at the photos in this manual. If using a YS 1.70, you will need to remove the center of the cut out in the front of the chin, for the best cooling on the hottest days. Also, you may choose not to add the side cut out like I recommend on the chin. If you choose not to use this cooling method, make sure you cut a big enough cooling exit for good airflow.

Very Important Information on the center hinge wings and stabs

Comp Arf has manufactured a very nice and precise product, however, some precautions are required by you, the builder. You must install very precise, quality servos in the wings. If there is excessive looseness around center, along with engine vibration, you may encounter aileron flutter, so chose your servos carefully. Do not disregard this step. The same pertains to the elevators; you must use very precise servos for best results

Motor mounts

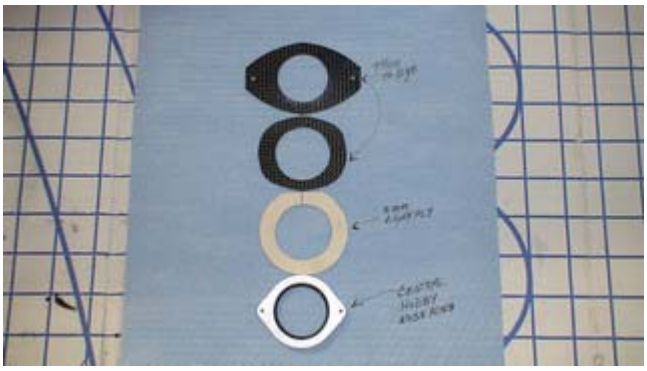
I recommend the LR 85 Hyde mount for this airplane. I worked with Merle Hyde on the application and operation of this mount, having tested all of his mounts on this airframe, and finding the LR 85 to be the best overall for my composite designs. The motor mount is important because of the center hinging of control surfaces. The better the mount the longer the hinges stay tight and free of slack.

Servo's and Linkage

I recommend, for best results, using Futaba™ BLS Brushless servos, or an equivalent. For elevator halves, use the BLS 651, for ailerons use the BLS 551. On rudder, use a 200-inch ounce servo for the most consistent results.
For clevises on the glow models, I recommend the Tetra™, Central Hobbies™ or MK ™ BB clevises where possible, for all surfaces and Central Hobbies™ Carbon/Titanium push rod systems. It is important to have as little linkage slack or looseness as possible, for the best trimming, flying and durable results. Remember, quality servos produce quality results!

Now lets get to the building

These instructions are specific to a glow engine setup. Some of the building will be applicable to electric versions, but this manual is specific to the glow setup. The electric version can be built with a slightly lighter process.
I have replaced the aileron, and rudder clevis arms with a sunken dowel to give the ability to use Tetra BB linkages. This will give the best results for longevity and slack free usage. If you choose to use the rudder arm supplied in the kit, make sure it is installed far enough back so that it does not hit the fin during extreme rudder throws. For the elevator, in this example, we use the supplied arms. I feel this is the best setup.



First we will start on the motor Mount/ fire wall installation

#1 Cut out a 82mm diameter disk 1 to 1.5 mm thick to make a spacer for hanging the engine from the nose ring. Hold the fuselage vertical.
Insert the engine in the fuse, and install the spacer disk /spinner on the engine and hang it centered on the nose of the airframe.

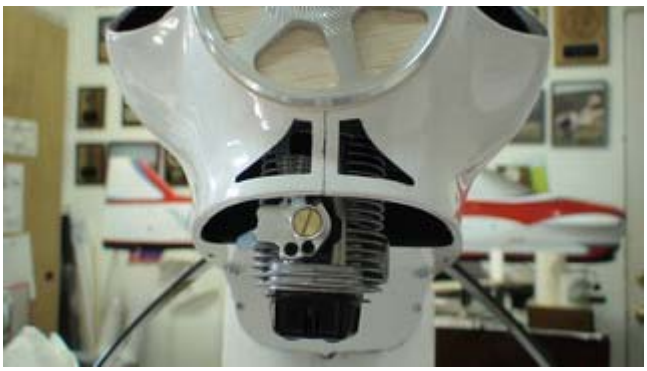
#2 From the rear, insert the motor mount up to the motor and screw it to the motor

#3 Slide the firewall to the motor mount, making sure the alignment of the engine is still true. Realign if required and then tack glue the firewall to the fuse with cyanoacrylate glue (C/A), so it can be handled a little without becoming dis-lodged easily.

#4 VERY IMPORTANT, turn the engine off centered, looking at the nose, 6mm to the left and tack glue the motor mount to the firewall. This will give a little extra room for engine backfires

#5 Remove the motor, but leave the motor mount tack glued to the firewall.

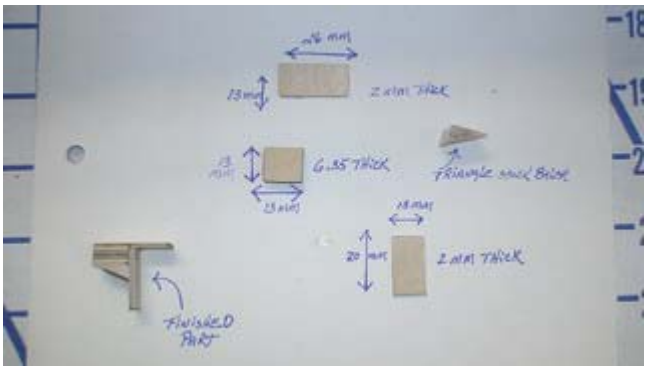
#6 Mix some 2-hour epoxy, along with carbon/graphite powder for a thickening agent. Dam the front side of the motor mount with tape so the epoxy won't seep through. Turn the fuse on its nose and,

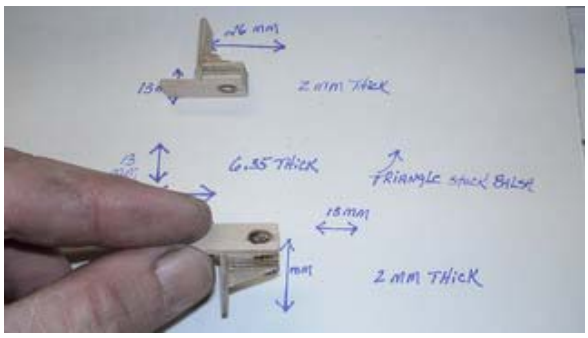


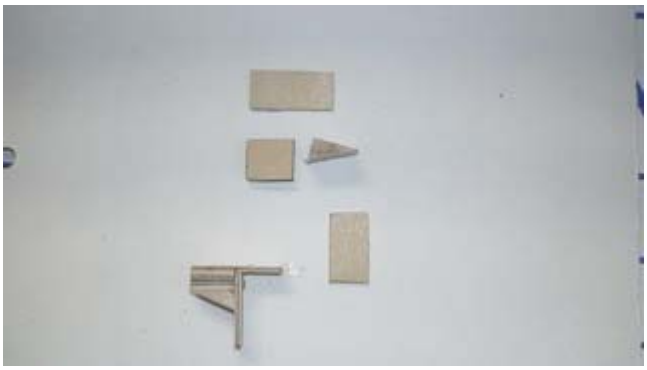
using an applicator or a brush, apply the glue to the firewall.

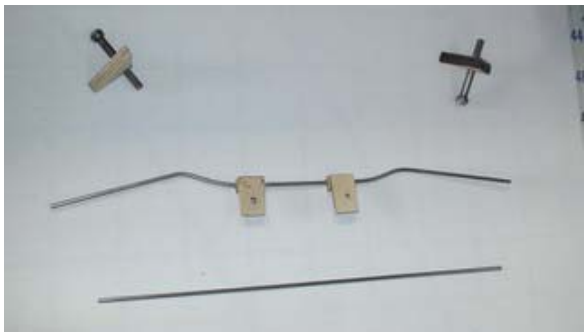
When the firewall glue is completely hardened, drill the holes in the motor mount through the firewall and install the blind nuts. Relieve the flashing on the engine compartment so the motor cannot touch or rub. See the photos. Drill the relief hole for the needle valve and fuel elbow's to complete the installation.

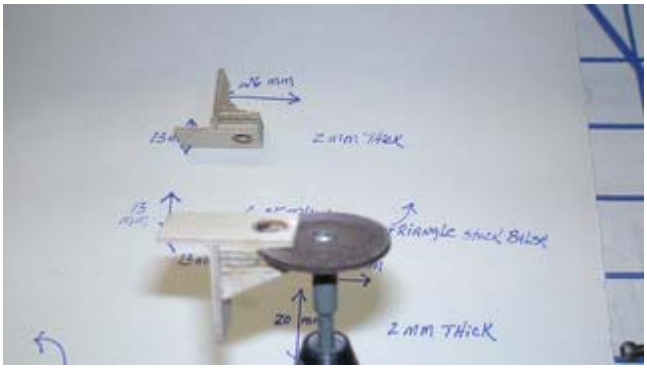
After the motor is installed, install the exhaust system. Add a piece of 2mm plywood across the inside of the fuse where the mounting for the pipe disconnects. Screw in for rigidity and noise reduction.

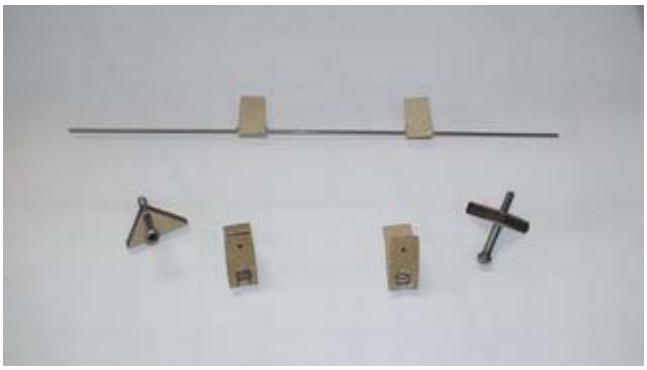


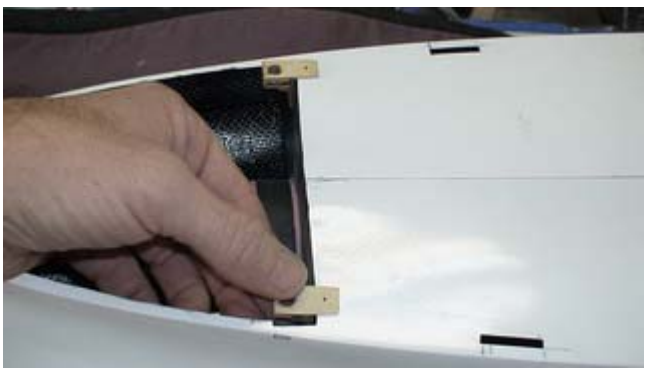










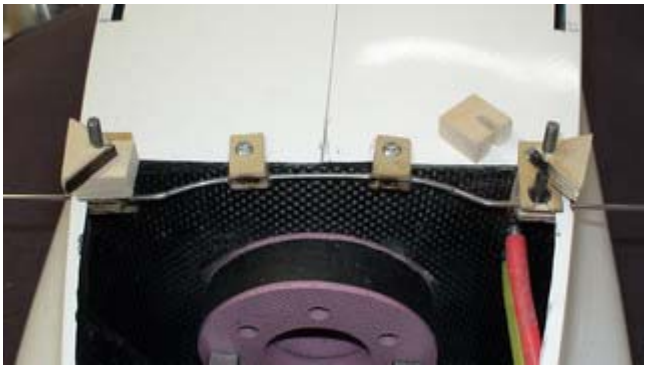


Cowling with Quick disconnect

You can use your own method of installing the cowling for the glow version. The rear pins are already installed at the factory, with a front screw in place. However, the front screw will interfere with the glow engine, so it will have to be removed and another hold down method used.

In this example, I will show you how to make a wood version of the Japanese cowling quick disconnect. The front screw is installed for the electric version but, again, this will interfere with the engine on a YS. So, it will have to be removed and the flashing ground away.

Using the supplied instructional photo's, build a couple of pin latches for the disconnect system. Use a spring steel wire and bend it to the necessary shape. Relieve the fuse sides near the firewall to allow the latches to be installed square to the firewall, and then screw the setup to the firewall. Using 5mm aircraft ply, cut out some triangle stand offs for the pins holders. Using 2.5mm or 6-32 screws, file the heads round so they can move the spring wire as it is



inserted in the latch. Remember to drill the holes in the latch equal to the size of the insert screws.
Cut spacers to insert under the standoffs, keeping them vertical to the cowling on the fuse, and test fit the standoffs to make sure they touch the cowling sides (you may have to adjust the wood cowling alignment inserts installed at the factory in the middle of the cowling, for enough slack to be easily installed) After test fitting, use a thixotropic epoxy glue mix and glue the standoffs to the cowling. You will have to cut out cooling exit holes in the rear of the cowling, see the supplied photos.

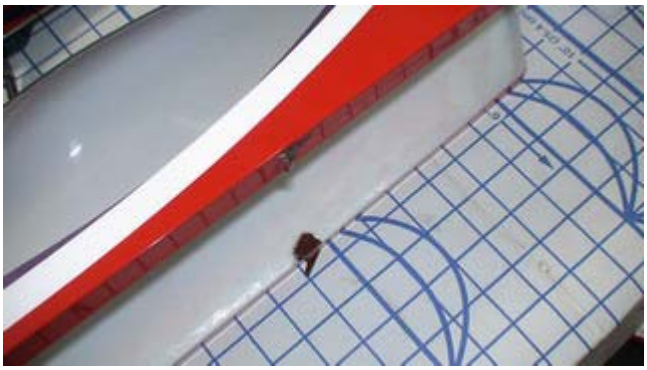
Landing Gear

Assemble the gear using Central Hobbies™ aluminum axles, or equivalent, to keep the weight down. Make sure you use Loc-tite™ or some other thread lock compound on the axle screws to prevent the threads from backing off and losing the wheel and pant in flight.

Relieve the wheel pants wheel area and test fit a 65mm /2.5 inch wheel, making sure there is no rubbing on the sides. Add a piece of 1mm plywood doublers about 30mm square as a hard point to mount the axle against, and a hard point to put an anti-rotation screw to secure the pants to the gear leg. Measure and cut a hole in the fuse side directly above the gear plate for glow (mount it on the bottom of the fuse in the cowling area if you are using an electric setup). Cut it slightly bigger than the gear tongue and insert the gear one at a time in the fuse. Measure them square, being careful not to put in toe-out (both wheels facing out) because it will be difficult to steer on take offs, and cause trimming problems from drag.

Tack glue them to the gear plate when you're satisfied with the measurements on both sides. Drill the gear and the plate through, and then install the blind nuts and screws provided in the kit. Seal the blind nuts with medium thickness CA. You will also need to relieve the cowling flashing around the gear blind nut area.

Note: Since with an electric motor you would use larger props please consider to mount the gear from below, not from top. This will require to cut a notch into each rear corner of the chin cowl to give room for the gear legs. See the electric addendum!

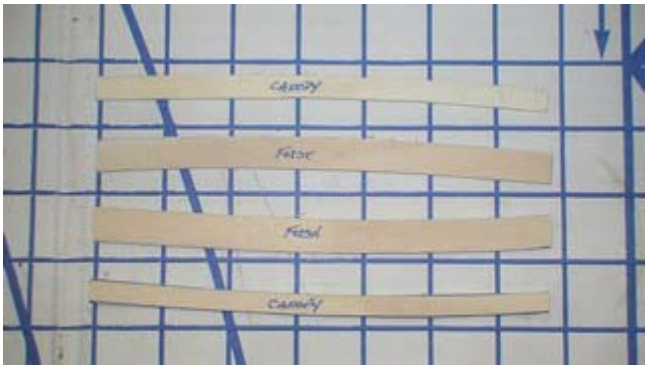


Now let start on the Canopy.

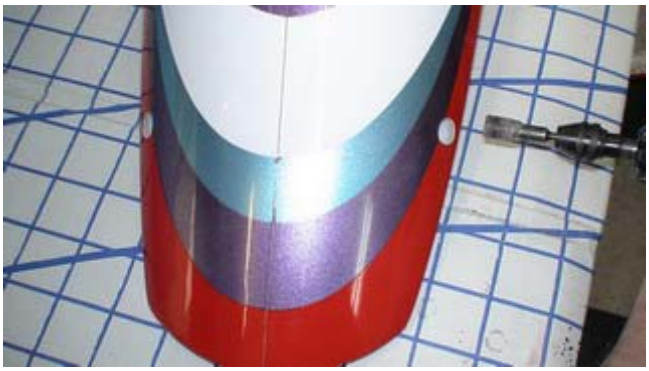
#1 Install the supplied hooks a little beyond the middle of the canopy facing forward, using a thixotropic epoxy mix.

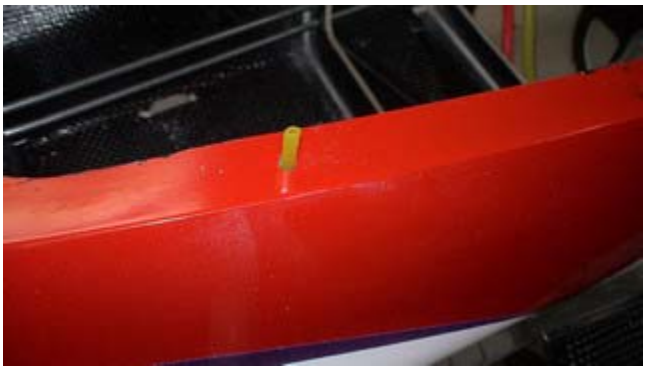
#2 After this is hardened, measure and cut receptacle holes for the hooks in the fuse side canopy flashing. Fit the canopy, adjust, and glue the phenolic U receptacle in place as a catch and alignment socket. They will need to be trimmed to fit close to the fuse sides.

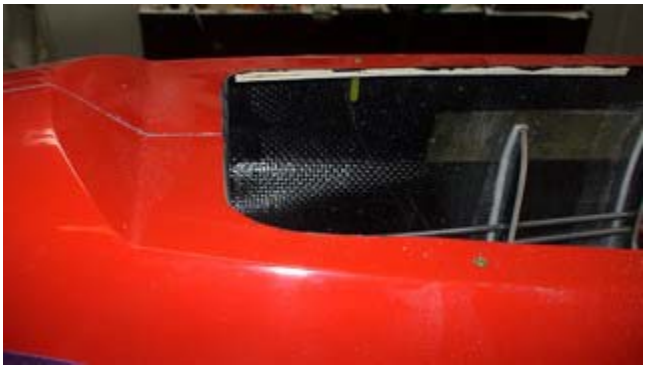
#3 Use a canopy latch like the BVM™ latch and glue it to the inside of the canopy with some thixotropic epoxy. Also, glue a piece of aircraft ply behind the canopy arch former as a hard point for the latch pin. While it is hardening, let's work on the front.



#4 Cut out a couple of light ply rails and glue them to the underside of the canopy flashing on the front of the fuse, and on top of the canopy flashing on the canopy, using 15 minute epoxy. Wait for it to harden. This will help with fuse noise and rigidity.





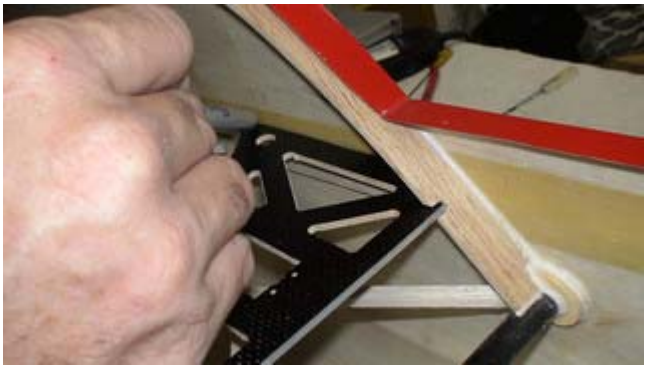


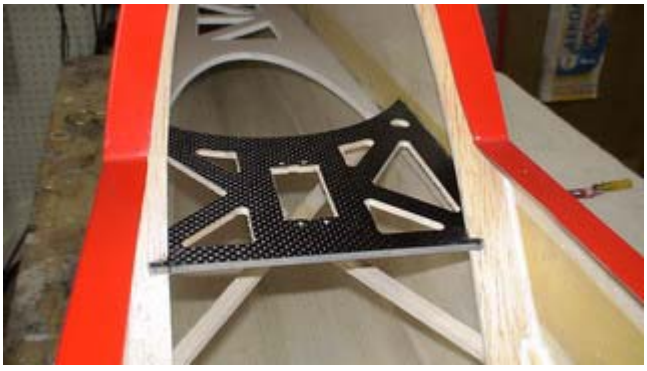
#5 After the rear latch is hardened, install the canopy. Find the rear pin indent and drill the hole for the rear latch pin.

#6 Using a Dremel™ barrel grinder, drill a hole towards the front of the canopy through the top skin. Then, use a 1/16 drill, after aligning the canopy, and precisely drill a pilot hole through the canopy and fuse flashing, going through the light ply rails.

#7 Now, remove the canopy and drill the pilot hole with a 1/8" drill bit. Insert a piece of yellow Ny-rod® and glue it in place with C\A from the bottom side.

#8 Reinstall the canopy and, using a self-tapping screw, screw the canopy down to the fuse for a final fit test.





Now to the rudder tray

#1 Test fit the tray, in the rear edge of the canopy opening. It will need to be cut down slightly to fit the fuse properly (warning do not force fit; it can ruin the outer finish and break the fragile sides) Open the slotted area in the former slightly and trim the tray, to allow for some adjusting. There may be some modification required.

#2 When the tray has a good fit, install it parallel to the angle that the cables will run down the fuse, and exit in the rear. Then, using a pencil, draw a light line on the fuse to mark where the tray will rest.

#3 Next, remove the tray and add balsa strips 3mm below the line marked, and glue them in with CA or quick hardening epoxy.

#4 Reinstall the tray and glue it in on the rails, using CA or half hour epoxy.

Rudder installation

#1 Using the supplied rudder pin, test fit the rudder. Slide the pin in from the bottom and mark how long the rod will need to be, then bend a 90deg bend in the wire and cut to about 30mm long.

#2 Cut a trench, in the forward section of the rudder, deep enough to sink the rudder hinge wire 90deg section.

#3 Cut the wire; leave enough room to add a small servo mounting screw, to screw down on the wire, retaining it in the rudder. There is a hard point installed in the bottom section of the fuse

to mount a tail wheel, so drill through the bottom of the fuse into the hard point installed, to mount the tail wheel. The rudder however does not have a hard point; it will have to be added if you want a tiller arm attachment there.

#4 Move the rudder back and forth; make sure you don't have any binding on the top or bottom. You may have to relieve the top of the fin and the cut out, in the hinge area, to make sure the rudder has full throw.

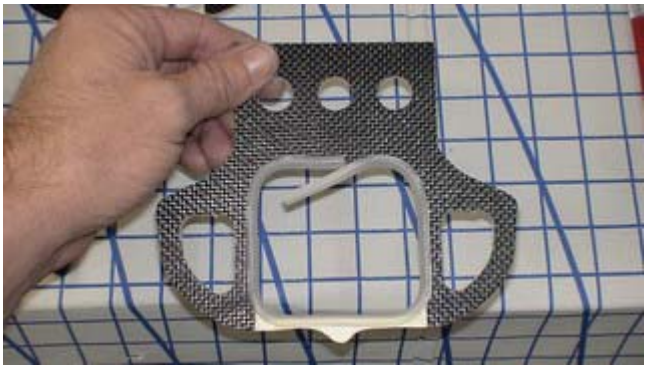
Test the throw with the stabilizer installed. The rudder needs to throw to within 4mm from the elevator halves, adjust accordingly

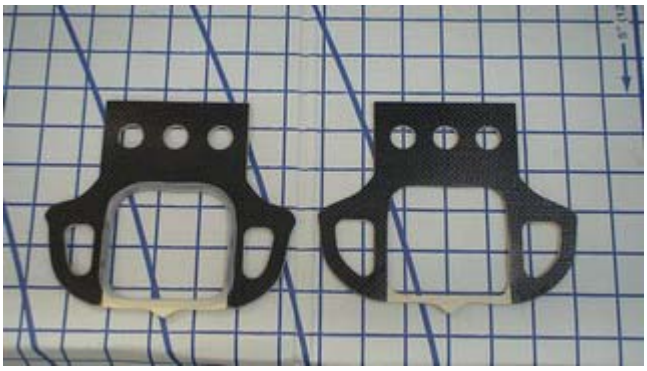
#5 Triangulate the area on the rudder where you will need to install a control arm clevis; mark it on the rudder. You will need to decide what system you will use; either the supplied control arm, or a shaft style. I used an IM Models™ rudder control arm because I could get more throw out of the rudder. If you decide to do this, drill a hole in the rudder hard point where you have it marked; sink a 12mm dowel center, drilled for the threaded rod, and epoxy this in place with thickened epoxy.

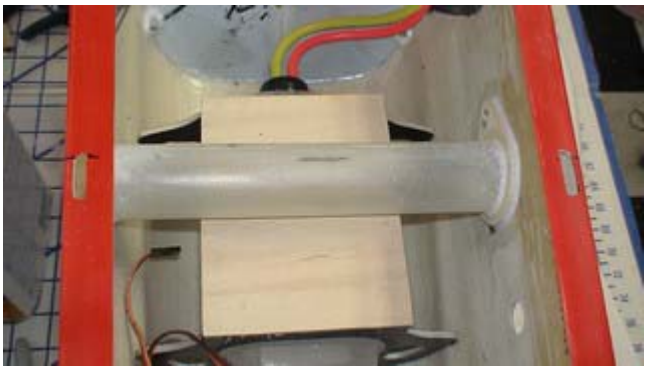
#6 Install the rudder servo and arm, to get a measurement for the cable exits in the rear fuse. You will have to drill small exit holes in the rear fuse formers, for the cable to exit the fuse clean without rubbing.

#7 Using masking tape, cover the area on the fuse to be cut, for the cable exits. Take two Dremel™ cut off wheels and stack them together, for the right width of the exit cuts, and cut through the tape on the fuse, to keep the edges sharp and clean.

String your cable, test fit and adjust the exit hole accordingly.







Fuel Tank formers and rear former

These formers are installed for two reasons; fuselage rigidity, and as a trouble free tank mount.
Once installed, they cannot be removed; so, install them such that the tank is centered on the wing tube.
Depending on the size tank you use, they will need to be modified slightly. It is best suited for the Tetra™ Crank Tank, 16-20 ounce. You will need to get the tank off of the floor. You can use some soft foam, or:

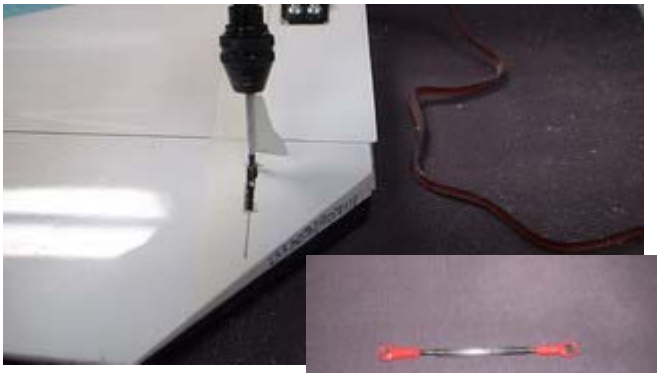
#1 Make a couple pieces of 2mm light ply bridges, to close the gap on the formers and get the tank off the floor.

#2 Cut some medium fuel tubing length-ways as a cushion; wrap it around the formers and test fit the tank, making sure it is tight enough such that the tank does not easily move.

#3 At this point, you can decide if you want to leave the tank formers high as is; to build a receiver tray on top or, cut the formers such that the tray top goes under the wing tube. Do whichever is more convenient to your radio set up; 2.4GHz or 72 MHz.
What ever you decide, over or under, glue the tray to the tube where it intersects; it is an integral part of the structure of the center fuse.

#4 After you are satisfied with the tank fit, install the tank with the front former attached and in place, then slip the rear one in place and adjust the fit. Glue it to the fuse using C\A or 15-minute epoxy, making sure the formers fit precisely, or it can leave a bulge in the skin on the undersurface.

#5 Trim and adjust the rear phenolic U former in the rear, under the rear wing pin, using 15 min epoxy, with micro balloons or carbon powder



Installing the elevator control arms and elevator halves

I recommend using the control horn provided in the kit for elevators, because we will use a MK ™ BB adjuster end on the elevator half, and on the servo side.

#1 Mark a 90deg line from the servo arm attachment point on tape, and measure the hole for the phenolic control horn.

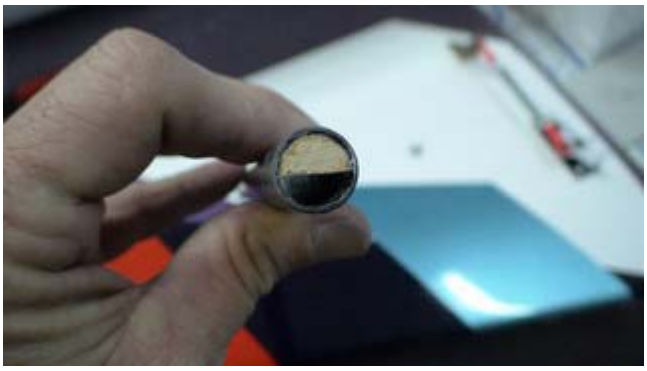
#2 Use a Dremel™ tool with a router attachment, and a drill a 2.5 mm wide trench for the horn in the elevator, deep enough for the horn to fit flush to the surface.

#3 Using micro balloons or carbon powder, mix some 30-minute epoxy and glue the horn in place.

#4 Install the servo, using a Dremel™ tool to adjust the servo mount size, if needed, and measure the distance needed for a push rod with the ends. I recommend Central Hobbies™ titanium / carbon push rod sets for the 2.5 mm bb clevis ends.

Stabilizers

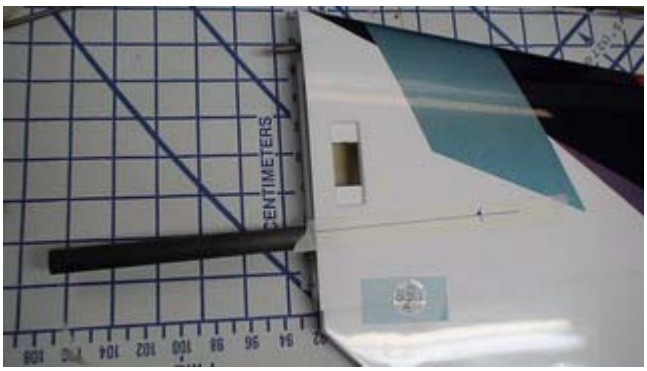
First, because the stabs will be fluttering from the glow engine vibration, we need to add a root rib, out of 2-3 mm balsa, for a larger contact area with the fuse. We will need to add a foam cushion also, for noise and vibration dampening. This will give you longevity and very little to no wear, in the stab tube setup. You will have to use a Dremel™ tool, to cut a hole in the fuse side, for the servo wires to be inserted through the fuse. I recommend, for durability, that you wrap the servo wires with foam insulation where they enter the fuse sides, to keep them from chafing.



#1 Trace the outer stab root, on some 2-3 mm light balsa wood and, after you trim it to fit inside the stab flange flashing, cut some lightening holes, for servo wire access. Use some 5-minute epoxy and glue it in place. Use a razor to cut it flush with the stab root flashing, and to prepare it for the foam tape.

#2 Add some thin foam cushion to the root rib, Sonic Tronic™ or any light foam wing saddle tape.

#3 Glue a hard point, inside each end of the carbon stab tube, for the mount screw and install the stab tube in one stab half. Measure how far the tube inserts into the socket. Then, transfer the measurement to the stab, centered on the tube socket area. Mark the hole to be drilled 8 mm from the end of the tube, or centered on the hard point.



#4 Drill a 8mm hole, centered on the measured mark, through the surface of the skin only, to sink a hard point (like a wood dowel) and glue it flush, resting on the stab tube socket, using 5 minute epoxy.

#5 With the tube inserted in the stab, hard point up, drill a 1mm hole through the stab hard point and through the stab tube hard point. Next, screw a self-tapping servo mount screw, or equivalent, to secure the stabilizer to the stab tube.

#6 Install the second stab half and repeat the procedure.

Wing Installation.

The following is the suggestion of Bryan Hebert. CARF recommends to use the included control horns, just like in the elevators. If you want to follow Bryan's method, it is described here:

For longevity we will use a wood dowel sunk into the hard points in the ailerons, with a 3mm or 6-32 standard stud tapped into the hard points. This will give you more options on the BB clevises manufactured by MK™ and Central Hobbies™. A slack free linkage, with little to no wear, is a must for precision and longevity. This will completely prevent flutter and unwanted movement during flying. So, for this reason, I recommend you do not use the clevis arm provided in the kit for aileron linkage, unless you're building an electric version.

A large 4-stroke engine can be very abusive to the surfaces. The tighter you can keep the play in the linkage, the better the wear and precision in flying. And again, to prevent wear, we need to add a 4mm-4mm rib insert, around the inside of the wing root flashing, so we can add wing saddle tape to prevent noise and wear.

#1 Cut some 4mm-4mm light stick balsa, the length on the root opening, next. Using CA or epoxy, carefully fit and glue the inserts into the root rib flashing, using small clamps/cloths pins; when dried, shave it flush to the outer surface edge. Test fit the wing to the fuse, and adjust the root rib flashing to fit the fuse correctly; when satisfied, add the saddle tape.

2 Glue a square piece of wood, drilled in the center, over the wing mount bolts flush to the root rib saddle tape edge; this will be a stop gauge to prevent over tightning of the wing mounting thumb nut, when tightening the wing to the fuse side.

#3 Install the aileron servo in the wing and measure a ninety-degree angle from the servo arm. Mark the line on tape, to the aileron clevis mounting area.

#4 Find the hard point and measure for the center, and drill a 4mm hole in the hard point and glue a dowel in place, using 15 minute epoxy, thickened with micro balloons or carbon / graphite powder. You may prefer to center drill the dowel on a press, before installing it in the aileron. Be careful to mount it level to the surface, and 90 degrees to the wing center.

#5 After the hard point hardens into place, install the stud and linkage clevises, repeating the procedure on the other wing.

Assemble the airplane and temporarily install the radio gear (battery, switch, receiver ECT.) to get the balance point advised in the beginning of this manual; "center of the wing tube", when satisfied with the C\G install them in the fuse permanently.

Flight Trimming the Valiant

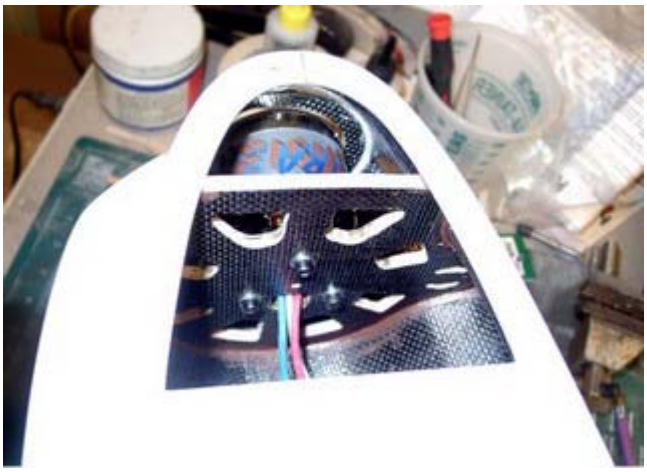
Start by putting the C\G on the wing tube and test fly. Make sure the airplane is trimmed for hands off level flying. Pull to vertical flight, making sure it goes straight up. Then, fly a left rudder knife-edge. If the model goes to the belly, move the c/g forward a small amount at a time until it goes straight with no pitch. Repeat the same test on the right rudder knife-edge; it should be the same. If the motor thrust is aligned to the nose ring the airplane will go straight up with no need for further adjustment. For the down lines, you may need to mix 2-3 % down elevator to keep it from pulling to the canopy.

This design has no roll coupling or pitch coupling at knife-edge. If yours has these tendencies, check all surfaces, making sure that they are perfectly straight at neutral. Snap settings; set the for all snaps, positive or negative up line, and down line; set the throws on the ailerons to 23 deg. up and down. Elevator, set at 14 deg. up and 18 deg down.
Rudder, set the low rate rudder at 20 degrees and adjust it for exiting the snap cleanly, without continued spinning. If you continually overshoot the snap, do not reduce the ailerons. Reduce the rudder throw a small amount at a time, until you can consistently exit them without further rotation. Increase the rudder if you consistently under snap.

For 1.5 snaps, the only change that you will need is an increase in rudder throw of 10 degrees. (A mid rate rudder). Again, adjust the rudder if you can’t cleanly exit (over rotate, reduce rudder and vice versa.

The rudder is very powerful and the Valiant can do a knife-edge loop easily on low rate rudder. However, the fin and rudder were designed for a perfect snapping balance, and you will have best stall turn results on high rate in windy or calm conditions.

The counterbalances were utilized on this design for a soft feel around neutral, but it will also give you low speed power for low speed snaps and spins with very good control through the speed envelope. There is no change in the aileron feel no matter what speed you are flying the maneuvers.



Electric motor installation:

There are two basic types of electric motor installations. Firewall mounted for outrunner motors like Axi and Plettenberg, and nose ring mounted with a rear support for inrunner motors like Hacker and Neu motors both with reduction gearing.

Firewall mount:
For a firewall mounted motor setup you will use the smaller of the two firewalls, the one with the cooling holes precut. It will mount further forward than the glow firewall.

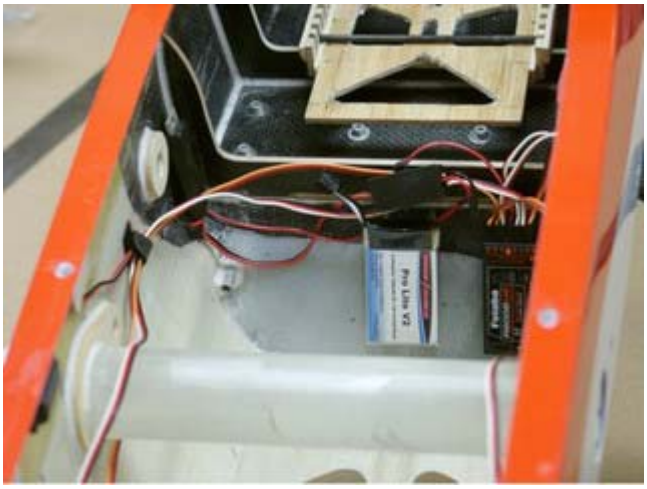
Once the firewall is installed the only way to install and remove the motor will be through the opening in the nose ring. So the first step is to open the nose ring opening enough to slide your motor through it.

Before opening
After opening

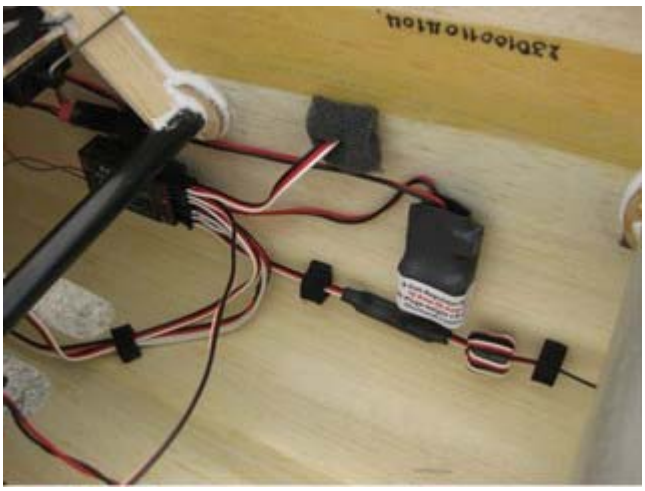
Motor clearance
There is a hole drilled near the center of the firewall but offset slightly. This is the center of the motor axis when the firewall is inserted with the hole offset to the plane's left which makes up for the built in right thrust. Unless your motor is significantly different in size from the standard outrunners it should be used to center your motor mount.

Firewall with motor mount:
The motor or mount should have threaded attachment points so that it can be screwed in from the back of the firewall. Attach your motor mount and motor to the firewall and slide the whole unit in from the rear. You will find that the motor will fall short of its final position. The Plettenberg Evo shown in the pictures was about several mm from where it needed to be. Use your spinner back plate to keep the motor centered and sand away the edges of the firewall that are contacting the fuselage. Keep fitting the firewall. It should slip in a little further each

time. Do your final fitting with your choice of spacer between the fuse and spinner. A plywood ring just smaller than the front of the fuselage works best. The front of the fuse has the proper right and downthrust molded into it. A 1/16" space is all that is needed with an electric motor. Once you are satisfied that the firewall is properly fitted and not causing any bulging to the fuse sides you can glue it in with 30 min epoxy mixed with micro balloons. Tape the spinner to the fuse to hold the firewall in alignment while the glue sets. After it hardens remove the motor and fill in any gaps between the fuse and the firewall and add small epoxy - micro balloon fillets.

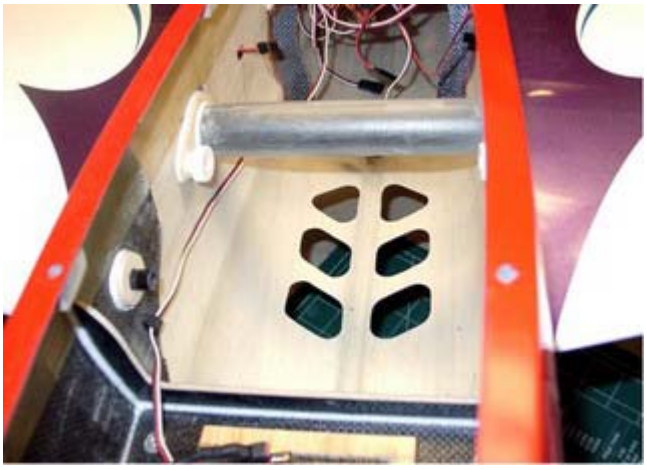


The precut openings in the firewall can be opened a little bit further to reduce weight without sacrificing strength. The firewall started at 41 gms and finished at 34 gms ready to install.

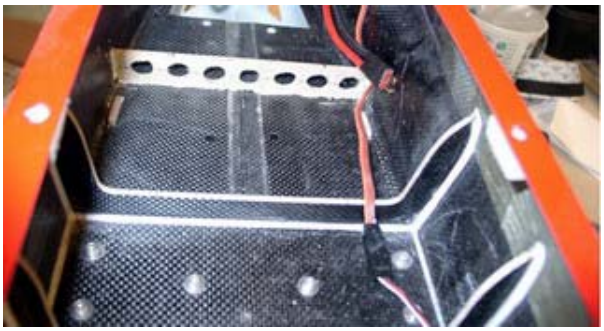


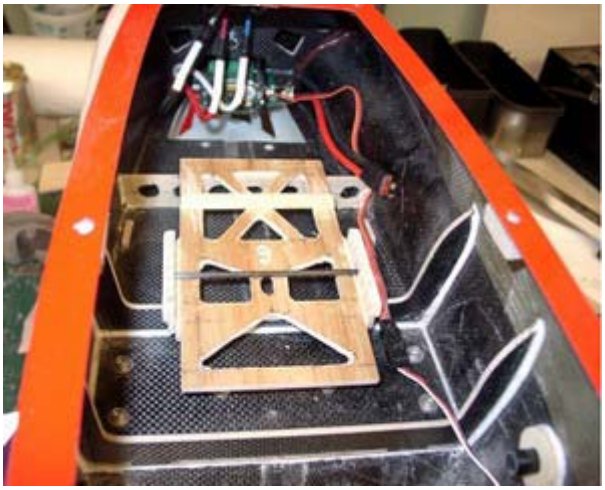
Electronics installation:
The speed controller can be mounted to the side of the front of the fuse, the floor in front of the battery packs or the back of the firewall if you need the weight moved as far forward as possible. Just make sure that it stays cool enough on your first flights. Reposition for better airflow over it if needed.

Additional electronics, your receiver, battery pack and regulator can be mounted to the sides of the fuse with Velcro. A small 2 cell lithium poly battery pack and regulator weigh less than a standard 4 or 5 cell air-borne pack. They can also be mounted just behind the gear supports on the panel that makes up the rear wall of the chin cowl cutout.
(One of Jason's Pics)



Air outlet:
There is no air outlet from the fuse so ex-haust holes have to be cut. Any design or pattern will do as long as they are large enough. The Valiant has a nice ridge molded in the bottom of the fuse that adds additional





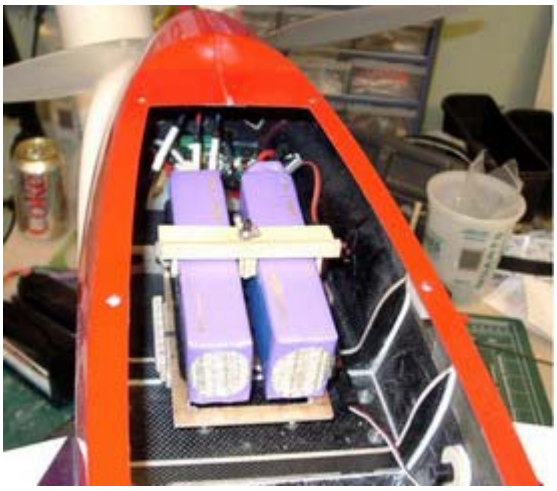
strength compared to a simple rounded bottom. I would recommend not cutting into this ridge for that reason. Keep your cooling hole pattern symmetric to either side of the ridge.

Battery tray:
The battery tray can be made from the included piece of balsa laminated with fiberglass. It should be one of the last building steps as battery position will be used to adjust the CG. Main battery position will likely fall somewhere between being centered over the gear plates to being centered a couple of inches in front of the gear plate. Positioning will depend on the weight of the motor used and amount of weight added to the tail during the build. If the main battery falls in front of the gear supports then an additional battery tray support will need to be added to the front of the fuse. Keep it light and glue in place with an epoxy micro balloon mixture.

Cut the battery tray from the balsa fiberglass laminate and glue to the gear supports or to the front gear support and added tray support depending on desired position of the tray. Judicious use of lightening cutouts can be used to keep the weight down. Added pieces of _" balsa stick can also be glued to the bottom of the tray to increase gluing area to the supports.

Whatever method you choose to attach the batteries to the tray, the position must be reproducible. Once your plane is trimmed out, a change in battery position will change the CG, which will affect your trim. The method shown allows repeatability and adjustments. The position of a piece of 1/8" carbon fiber rod controls the battery position. It is adjusted by placing it across one of several sets of slots on each side of the tray. The slotted pieces are made from some scrap balsa and ply.

The batteries have a slot to fit over the carbon rod created on them by gluing a couple of pieces of 1/8" wood to the bottom



of the packs. Pieces of 1/8” end grain balsa fiberglass laminates were used in the setup in the picture to save weight. Each pack of the same size has the pieces glued to the same spot. Different size packs will have the pieces attached in the right position for those packs to balance the plane at the same position as the other packs.

The battery hold down used is shown. It screws into a blind nut in the battery tray. The second carbon fiber rod acts as a spacer so that the hold down can be tightened without deforming and breaking it. Different sized hold downs can be made for different brands of batteries. Simple Velcro straps can of course be used as well.

The Strake

Here are the installation instructions and photos for the Strake

The strake was designed for enhancing the stability of the Valiant and providing increased rudder power while also providing a softer neutral feel for precision of input. You will notice a better exit from snaps, easier stall turns and a more locked on feel in the wind.

I recommend flying the Valiant for a while before installing the Strake to feel how well it actually works. You will be amazed at how well this simple devise works.

#1 Clean the top seam on the fuse with some MEK or Prep Solve cleaner to remove any mold wax. Then using a #11 exacto blade lightly scrape the seam to remove any flash and to level the seam.

#2 Set the strake on the fuse and make sure you have a good fit.Using tape, Mark on the fuse where the strake begins to find where to start applying the glue. Using Thick C/A apply a small bead of glue from the front mark to the front of the fin do not use thin or med. C/A or there is a chance that you will have a run.

#3 Carefully place the strake on the glue line, hold it in place and let it set ,after the glue sets on the base, glue the upper portion to the fin.

#4 Set the fuselage on a stand. Using an incidence meter set the fuse to zero measuring from the canopy base. Next insert the horizonal separator in the slot on the strake and set the separator to 2 degrees negative. Tack it in place. Then turn the fuse over and glue the seperator in place using thick C/A.

I you decide to fly the airplane before you install the Strake there is no need to worry about trim changes, there will not be any!