



DEHAVILLAND BEAVER 120ARF



Assembly and Operations Manual

#VMA-B190CIB First Edition 2001 01 26

**Please Thoroughly Review This Manual
and all other documentation and instructions
Before Assembling or Operating
the
VMAR DeHavilland Beaver 120 ARF**

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Liability Disclaimer

It is important that the following liability disclaimer be **READ BEFORE ASSEMBLING OR USING THIS PRODUCT**

Model airplanes, model engines, model engine fuel, propellers and products such as the VMAR DeHavilland Beaver can be hazardous if improperly used. Be cautious and follow all safety recommendations when using your VMAR DeHavilland Beaver. Keep hands, tools, clothing and all foreign objects well clear of engines when they are operating. Take particular care to safeguard and protect your eyes and fingers and the eyes and fingers of other persons who may be nearby. Use only a good quality propeller that has no cracks or flaws. Stay clear of the propeller and stay clear of the plane of rotation defined by the propeller.

The Manufacturer, Distributor, Retailer and/or other suppliers of this product expressly disclaim any warranties or representations, either expressed or implied, including but not limited to implied warranties of fitness for the purposes of achieving and sustaining remotely controlled flight.

In no event will the Manufacturer, Distributor, Retailer and/or other suppliers of this product have any obligation arising from contract or tort, or for loss of revenue or profit, or for indirect, special, incidental, consequential or other damages arising from the use of this product.

In purchasing and/or using this product, the user accepts all responsibility for its use and accepts all liability associated with such use.

Proceeding with assembly and use of this product indicates Agreement With and Acceptance of the Liability Disclaimer.

CAUTION.

A Remote Control Model Aircraft is not a toy. It is a flying model that functions much like a full size airplane. If you do not assemble and operate this product properly you can cause injury to yourself and others and damage property. DO NOT FLY this model if you are not qualified.

You are ultimately responsible for the mechanical, aeronautical and electrical integrity of this model and it's structure, control surfaces, hinges, linkages, covering, engine, radio, wiring, battery and all other components. Check all components before and after each flight. Don't fly until it's right!

INTRODUCTION.

Thank you for purchasing a VMAR Product. VMAR Manufacturing is committed to delivering superior value to the RC modeller. Your new VMAR DeHavilland Beaver is a market leader in features, value, ease of use and flexibility. Please review these instructions before beginning the simple assembly procedure.

Whenever we've used the directional terms left or right, they are with respect to the model when viewed as you would from sitting in the cockpit... that is when viewed from the back looking forward.

The DeHavilland Beaver from VMAR Manufacturing carries on the VMAR tradition of offering RC Flyers an easy to fly, easy to assemble and top value Almost Ready to Fly RC model. Nothing comes close to the value of a VMAR ARF.

Fantastic quality, outstanding graphic scheme and details, unbeatable value, knock 'em dead looks, more features and a price you just cannot beat!

The VMAR DeHavilland Beaver incorporates some unique features that you normally do not find on ARF's. Check out the rudder, elevator, ailerons and flaps and you will see that all the surfaces have been preinstalled with hinges that have been double pinned on each side of the hinge line. Take a look inside the fuselage and you will notice double metal push rods running to the rudder and to the elevator. The double pushrod system allows you to use lower cost standard servos while maintaining the utmost in strong reliable control.

We've also included two unilaterally adjustable servo trays that will accept most standard servos. Once you see how our servo tray works, you'll be trying to buy 'em as a part!

Check out the parts bags and you will notice that we've included a pair of solid cast aluminum T-beam engine mounts that have been drilled and tapped and come with black allen head machine screws and engine clamp straps. Also included are four Y harnesses for coupling your servos together and pre-installed aileron and flap extensions set within tubes in the wings for easy maintenance!

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INTENDED USER.

This model is not intended for beginners. It is intended for experienced modellers who have previously built and successfully flown RC Model Aircraft.

These assembly and set-up instructions assume that this model will be assembled and flown by an experienced modeller. To successfully and safely assemble and fly this model you must be an experienced builder and flyer of RC model aircraft. You must be familiar with model aircraft terminology, components, parts, methods and pre-flight integrity checks. This is not a trainer and no attempt has been made to introduce basic concepts or terminology in these instructions.

Given the high degree of pre-fabrication, this is not a difficult model to assemble, however you must be experience & you should not attempt to assemble or operate this model unless you are fully qualified to do so.

DAMAGED, MISSING or DEFECTIVE ITEMS.

Please check the "READ THIS FIRST" pamphlet included with your kit for information about Troubleshooting, Contact Procedures, Return Procedures and Conditions.

If upon arrival of your model you noted damaged, missing or defective components DO NOT proceed with assembly.

Damaged, missing or defective components must be reported to your vendor within 30 days of purchase and BEFORE any assembly begins. Please DO NOT START if something is damaged, missing or defective. Your vendor will not be able to provide you with exchanges or replacements of parts that have been assembled.

DO NOT START UNLESS IT'S RIGHT!

MANUAL - ERRORS AND OMISSIONS

This page was last updated 2001 01 26.

Please check the "READ THIS FIRST" pamphlet included with your kit. Review any Errors or Omissions listed there that may describe errors or omissions in this manual that we discovered after the manual was printed but prior to your kit being shipped.

Check our web site at www.richmondrc.com/vmar for the latest information related to this product. Such information may include further tips or corrections to the documentation that we have added since your kit was shipped.

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Errors and Omissions.

Corrections to errors or omissions related to the documentation and discovered after the initial printing may be noted in a separate pamphlet entitled "READ THIS FIRST"

BEFORE PROCEEDING: Please check the READ THIS FIRST pamphlet carefully for any Errors or Omissions and take careful note of any references to corrections or additional instructions.

PHASE 1 - CHECK OUT THE CONTENTS.

PLEASE SAVE YOUR BOXES UNTIL CHECK OUT COMPLETE

You've taken the lid off the box, read over the "READ ME FIRST" pamphlet and you are ready to start with the assembly procedure... you are about 15-20 hours away from being ready to go flying! Now is the time to look over what's in the box. Please go through the contents and make sure nothing has been damaged in shipping. **Damaged, missing or defective components must be reported to your vendor BEFORE any assembly begins. Please DO NOT START if something is damaged, missing or defective. See Page 3 for further information. As you can imagine, once you start the assembly process or install your radio or engine your options for returns are very limited. Your vendor will not be able to provide you with exchanges or replacements of parts that have been assembled. DO NOT START UNLESS IT'S RIGHT!**

STEP 1.1 - UNPACK.

The wing box (15-1/2 x 5-1/2 x 63-3/4 in. / 11 lbs 2 oz) is the smaller of the two boxes. Inside the wing box is the rudder, the horizontal stabilizer and the two wing halves in a bag with spacers separating them.

The fuselage box (15-1/2 x 12 x 63-3/4 in. / 22 lbs 12 oz.) is the larger of the two boxes. Inside the fuselage box is the fuselage, the cowl, landing gear and cowl accessories including the dummy cylinder plate, hardware etc. If the optional cockpit set has been included it will have been packed in the fuselage box. The optional cockpit set consists of two pilots sitting on two chairs and a bag of cloth cabin liners and a strip of Velcro for attaching the liners to the inside of the cockpit. The liners are reversible with a choice of brown or aluminium colors.

Remove the fuselage carefully from the box and set it on a clean flat surface with cardboard, foam or cloth beneath the bottom of the fuselage to protect the finish from scratches.

Very carefully remove the cowl, slide your hand into the cowl from the back of the fuselage cargo bay, reach right through the cowl to the front and put your fingers on the inside of the cowl front nacelle ring, apply gentle pressure upwards, wiggle the cowl slightly and lift the cowl carefully up and out of the fuselage. Set the cowl carefully aside for use later.

After removing the cowl, you can then remove any of the other material that has been packed into the fuselage. Remove the packing material and if included, extract the optional set of pilots on a seat assembly by rotating the assembly slightly and sliding the assembly back and out of the fuselage. Remove the master hardware bag.

Using a pencil or pen mark the top edge of the forward removable firewall so that you can clearly discern which is the top edge of the forward removable firewall.

Remove the forward removable firewall and fuel tank. Reach inside the fuselage and undo the four nuts and three washers from each of the four bolts. Set the bolts

and nuts aside along with the forward removable firewall for later use.

Now reach into the fuselage and remove any of the stuffing from the back behind the cargo area and remove the wing strut bag that has been stored in the back of the fuselage. The wing struts can be removed by bringing them forward through the fuselage cargo and cabin areas and finally exiting via the front of the fuselage.

Loosely replace the forward removable firewall and fuel tank with the bolts, nuts and washers you removed earlier. This step is just being done to ensure that all the parts are retained for later use. Do not bother to tighten anything down at this stage... just put the forward removable firewall assembly loosely back the way it was.

STEP 1.1 - CHECK OFF MAJOR COMPONENTS INCLUDED.

Now that you have unpacked all of the major components it is time to check them off.

Wing Box with the following items:

- Left Wing Half
- Right Wing Half
- Horizontal Stabilizer with pre-attached elevators
- Vertical Stabilizer with pre-attached rudder

Fuselage Box with the following items:

- Fuselage assembly
- Cowl
- Cowl accessories bag
- Main Landing Gear
- Wing Struts (pair)
- Master Bag of hardware
- Optional Cockpit Set consisting of Pilots, seating etc (if included)



❑ STEP 1.2 - CHECK OFF CONTENTS OF THE MASTER BAG.

The Master Bag of Hardware contains the following items:

- ❑ Wing Parts Bag
- ❑ Main Gear Parts Bag
- ❑ Control Horn Parts Bag
- ❑ Miscellaneous Parts Bag
- ❑ Spare Parts Bag
- ❑ 4 Y-Harnesses with connectors for Airtronics Z, Futaba and JR
- ❑ 2 T-beam Engine Mounts made from cast aluminum with clamping plates, machine screws and plywood spacers
- ❑ 2 Wheels, four inch diameter treaded lightweight
- ❑ 1 Foam Sheet approx 2-3/8" x 9-7/8" x 1/8" thick
- ❑ 2 Spar Joiners made of wood, one approx 3/4" x 10-1/4" with dihedral and one approx 3/4" x 7" with dihedral and half-round notches in the ends.

❑ STEP 1.3 - CHECK OFF CONTENTS OF THE WING PARTS BAG.

- ❑ 2 Wood dowels approx 1/4 x 1-1/4 in.
- ❑ 2 Wing mounting bolts made of white plastic, approx 1-1/2 in. long
- ❑ 2 Butter Fly nut and bolts sets including 2 large flat washers per set
- ❑ 4 Control rod assemblies with clevises at each end, approx 4-1/2 in. long, for use on flaps and ailerons
- ❑ 4 Control horn assemblies for use on the flaps and ailerons, each consisting of metal bolts about 2 in. long, a white plastic beveled washer, a white plastic T-nut, a metal nut and white plastic control horn with a hole in the flange end of the horn.

❑ STEP 1.4 - CHECK OFF CONTENTS OF THE MAIN GEAR PARTS BAG.

- ❑ 2 Axle assemblies each consisting of an axle, two nuts, two washers and two wheel collars with set screws.
- ❑ 4 Screws for mounting the landing gear, approx 1-1/4 in. long.
- ❑ 4 Flat washers for use with the four screws.

❑ STEP 1.5 - CHECK OFF CONTENTS OF THE SPARE PARTS BAG.

A collection of control horn components, bolts, screws etc. These parts are not required but have been supplied in case something is lost during assembly or damaged thereafter.

❑ STEP 1.6 - CHECK OFF CONTENTS OF THE CONTROL HORN PARTS BAG.

- ❑ 2 Control horn assemblies for use on the elevators, each consisting of metal bolts about 2 in. long, a white plastic beveled washer, a white plastic T-nut, a metal nut and white plastic control horn with a hole in the flange end of the horn.
- ❑ 1 Control horn assembly for the rudder, consisting of a long bolt assembly made from two bolts welded together at the head, two white plastic T-nuts, two metal nuts and two white plastic control horns with hole in the flange end of the horns.

❑ STEP 1.7 - CHECK OFF CONTENTS OF THE MISCELLANEOUS PARTS BAG.

- ❑ 1 Throttle control rod, about 6 in. long with a clevis on one end and an EZ connector on the other.
- ❑ 1 Throttle servo tray made of wood with two mounting screws partially inserted into it.
- ❑ 8 Screws, approx 1/2 in. long with flat heads for mounting the wing struts.
- ❑ 8 Flat washers for use with the screws.
- ❑ 10 Screws, approx 1/4 in. long for mounting the wing top plate.

RECOMMENDED PRODUCTS REFERRED TO WITHIN THESE INSTRUCTIONS.

We recommend and use the term "Pacer 30 Minute Zpoxy" when referring to a top quality 30 minute epoxy.

We recommend and use the term "Pacer Z42 Thread Locker" when referring to a top quality anaerobic thread locker for metal bolts and nuts.

We recommend and use the term "Pacer Zap-A-Gap-Goo" when referring to a top quality clear silicone based sealer.

We recommend and use the term "Pacer Zap-A-Gap" when referring to a top quality medium thick super glue.

We recommend and use the term "Pacer Zap CA" when referring to a top quality thin wicking super glue.

We recommend and use the term "Pacer Zpoxy Finishing Resin" when referring to a top quality finishing resin.

We recommend professional grade Pacer ZAP brand products for top quality assembly & finishing of this model.



☐ PHASE 2 - WING ASSEMBLY

☐ STEP 2.1 - TERMS TO REMEMBER.

We refer to:

- the outboard ends of the wings as the "wing tips",
- the flat wooden face that is at the opposite end from the wing tip as the "wing root". We will be joining the wing halves and the wing roots will end up contacting each other.
- The back edge of the wing as the "trailing edge".
- The front rounded edge of the wing as the "leading edge"
- the flat or flatter side of the wing as the "bottom" of the wing.
- the curviest side of the wing as the "top" of the wing.
- the outboard moveable component along the trailing edge of the wing as an "aileron".
- the inboard moveable component along the trailing edge of the wing as a "flap".
- each of the slightly V shaped pieces of wood that will serve to join the wing halves together as a "wing spar joiner"

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☐ STEP 2.2 DRY ASSEMBLY OF THE WING HALVES.

Carefully open the wing bag that is contained in the smaller of the two boxes. Remove the staples from the end of the bag and carefully remove the wing halves from the bag.

Carefully remove the spacers from the bottoms of both wing halves. These spacers were put in place to separate the wing halves during shipping.

Note that this wing is not intended to be glued and must be used with the wing struts. It is to be assembled prior to flying and then disassembled again for transport. However, if you have a vehicle that accommodates a 10 foot wing, you can glue the wing together using Pacer 30 Minute Zpoxy but you must always use the wing struts when flying.

The wing is joined and mounted using two wooden wing spar joiners, two dowels protruding from the front recessed area of the wing, two wing retaining bolts that go down into the fuselage and two metal bolts with butterfly nuts that serve to pull and retain the wing halves together.

From the wing parts bag locate the two wooden wing dowels. They are approximately 1-1/2 in. long.

Mark the dowels at their mid length with a pencil. Insert the dowels into the hole in the forward recessed face of each wing up to the pencil line. This will ensure that the dowel extends through the cavity. Glue the dowels into place with Pacer 30 Minute Zpoxy.

Locate the wooden wing spar joiner that has a rounded half notch at each end. This wing spar joiner measures approximately 3/4 x 7 in.. Insert one end of this wing spar joiner into the forward spar cavity of the left wing ensuring that you have the dihedral angle correct. Push the wing spar joiner into the cavity until the rounded half notch engages with the dowel inserted earlier. You want a snug fit. If too tight, sand the wing spar joiner lightly only and trial fit it again. Do not overdo the sanding... remember you want a snug fit.

Locate the second larger wing spar joiner. This wing spar joiner measures approximately 3/4 x 10-1/4 in.. Mark the spar joiner at its mid point. Insert one end of this larger wing spar joiner into the second spar cavity of the left wing ensuring that you have the dihedral angle correct. Push the larger wing spar joiner into the second spar cavity up to the mid point mark. You want a snug fit. If too tight, sand the wing spar joiner lightly only and trial fit it again. Do not overdo the sanding... remember you want a snug fit.

□ STEP 2.3 – JOINING THE WINGS.

Now position the right wing and slide it onto the two wing spar joiners that are protruding from the left wing root. Slide the right wing onto the wing spar joiners until the left and right wing roots are touching. If too tight, sand the wing spar joiners lightly only and trial fit it again. Do not overdo the sanding... remember you want a snug fit.

Locate the butterfly nut, bolt and washer assemblies. Remove the nuts and washers from the bolts. Slide one washer back onto a bolt and working from the cavities in the centre of the underside of the wing, insert the bolt through the forward retaining hole in the wing root. The bolt will pass from one wing half to the other wing. Apply a washer and a butterfly nut to the bolt. Tighten the butterfly nut until it is barely tight at this point. Using the second bolt, two washers and the second butterfly nut, install the second bolt into the rear retaining hole in the wing root. Tighten the second butterfly nut until it is barely tight at this point. Now, place the wing on a large flat surface and lay the leading edge down on the surface so that the wing is pointing straight up and down... bottom towards you... leading edge down... trailing edge up. Using the flat surface to align the leading edges, gently wiggle the wing halves and begin tightening the butterfly nuts whilst keeping the wing root faces aligned and the leading edges firmly against the flat surface. Alternate the tightening of the butterfly nuts until they are firmly finger tight and the wing halves are correctly aligned. Do not use pliers on the butterfly nuts. Remember, the bolts and butterfly nuts are to hold the wing halves together. The wing struts that you will install later will actually bear most of the load.

Note that this wing is not intended to be glued and must be used with the wing struts. It is to be assembled prior to flying and then disassembled again for transport. However, if you have a vehicle that accommodates a 10 foot wing, you can glue the wing together using Pacer 30 Minute Zpox but you must always use the wing struts when flying.

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□ STEP 2.4 – INSTALLING THE FLAP SERVOS.

Locate the flap and aileron servo cavities in the underside of each wing. The flap servos go in the inner cavities. The aileron servos go in the outer cavities.

Carefully remove the red cover plates from the flap servo cavities. Ensure you know which cover plate is for the right wing and which is for the left. Remove the red cover plates and retain the mounting screws. Notice that there are wooden servo rails pre-installed into each flap servo cavity.

Locate the wiring harness tubes that are protruding slightly into each flap servo cavity. The tubes can be moved slightly at this point. Check out the other end of each tube for a clean position and then using Pacer Dap-A-Gap-A-Goo secure the wiring harness tubes at the flap servo cavity end.

Install a servo in each flap servo cavity and connect the servo wire to the wiring harness. Use servos having at least 40 oz of torque.

□ STEP 2.5 – INSTALLING THE AILERON SERVOS.

Carefully remove the blue cover plates from the aileron servo cavities. Ensure you know which cover plate is for the right wing and which is for the left. Remove the blue cover plates and retain the mounting screws. Notice that there are wooden servo rails pre-installed into each aileron servo cavity.

Locate the wiring harness tubes that are protruding slightly into each aileron servo cavity. The tubes can be moved slightly at this point. Check out the other end of each tube for a clean position and then using Pacer Dap-A-Gap-A-Goo secure the wiring harness tubes at the aileron servo cavity end.

Install a servo in each aileron servo cavity and connect the servo wire to the wiring harness. Use servos having at least 40 oz of torque.

We recommend professional grade Pacer ZAP brand products for top quality assembly & finishing of this model.



□ STEP 2.6 – ADJUSTING THE WIRING EXTENSIONS.

After the two flap servos and two aileron servos are installed, work from the underside cavities in the center section of each wing and gently pull the wiring harnesses back until you have an loose length of wire in the center section cavities. Be careful... leave an inch or so of loose wire at the servo ends.

□ STEP 2.7 – INSTALLING AILERON CONTROL HORNS AND AILERON CONTROL RODS.

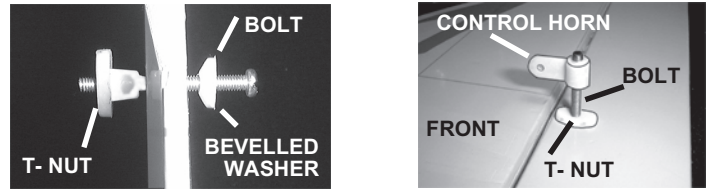
Locate the flap and aileron control horn assemblies in the wing parts bag. There will be four such assemblies. One for each flap and one for each aileron. The control horn assemblies consist of a metal bolt about 2 inches long, a white plastic beveled washer, a white plastic T-nut, a metal nut and a white plastic control horn with a hole in the flange end of the horn.

Remove the four metal bolts from the four control horn assemblies.

Place a white plastic beveled washer on the bolt so that the flat side of the beveled washer is against the head of the bolt. Insert the first bolt into the predrilled hole in the left aileron working from the top surface of the aileron. From the underside of the aileron apply a white plastic T-nut to the bolt such that the shaft of the T-nut is towards the head of the bolt. Tighten the T-nut so that the shaft of the T-nut goes into the hole in the aileron. Use a small crescent wrench to hold the T-nut and a screw driver to turn the head of the bolt and tighten until the T-nut just begins to seat into the covering and so that the bevel portion of the beveled washer has sunk nicely and snugly down into the hole in the top surface. Ensure that the bolt will now securely move the aileron with no slack. Now apply the metal nut to the bolt and tighten the nut down and just into the white plastic of the T-nut. Apply Pacer Z-42 Thread locker to the metal nut. Install the white plastic control horn on to the bolt.

Locate the control rods with a clevis on each end in the wing parts bag. They are approximately 4-1/2 inches long. Working with your left aileron servo at a neutral center position and the servo arm, take one of the control rods and connect it between the left aileron servo arm and the left aileron control horn. Adjust the servo arm, clevises and left aileron control horn to perfect a secure connection between the servo and the left aileron. Test the movement and throw.

Repeat this procedure for the right aileron



Metal retaining nuts not shown.

□ STEP 2.8 – INSTALLING FLAP CONTROL HORNS AND FLAP CONTROL RODS.

Place a white plastic beveled washer on the bolt so that the flat side of the beveled washer is against the head of the bolt. Insert the first bolt into the predrilled hole in the left flap working from the top surface of the flap. From the underside of the flap apply a white plastic T-nut to the bolt such that the shaft of the T-nut is towards the head of the bolt. Tighten the T-nut so that the shaft of the T-nut goes into the hole in the flap. Use a small crescent wrench to hold the T-nut and a screw driver to turn the head of the bolt and tighten until the T-nut just begins to seat into the covering and so that the bevel portion of the beveled washer has sunk nicely and snugly down into the hole in the top surface. Ensure that the bolt will now securely move the flap with no slack. Now apply the metal nut to the bolt and tighten the nut down and just into the white plastic of the T-nut. Apply Pacer Z-42 thread locker to the metal nut. Install the white plastic control horn on to the bolt.

Locate the control rods with a clevis on each end. They are approximately 4-1/2 inches long. Working with your left flap servo at a neutral center position and the servo arm, take one of the control rods and connect it between the left flap servo arm and the left flap control horn. Adjust the servo arm, clevises and left flap control horn to perfect a secure connection between the servo and the left flap. Test the movement and throw.

Repeat this procedure for the right flap.

□ STEP 2.9 – INSTALLING THE FOAM SHEET.

Locate the white foam sheet that was included in the master parts bag.

The foam is used to fill the gap between the fuselage and the exposed portions of the forward wing roots. Cut the foam in half and trial fit the pieces to the exposed wing roots. Mark and cut the foam to fit. Attach the foam sheets to the exposed wing roots using Pacer Dap-A-Gap-A-Goo or clear silicone.

Set the completed wing assembly aside for now.

❑ PHASE 3 – INSTALLING THE ENGINE.

GMS We recommend at least a 1.20 size 2 stroke engine such as the GMS 120 for this model. This will work well for wheel based operations from land. For use with floats or for usage as a glider tower or cradle carrier you will need a larger engine such as the Enya 155 four stroke. Gas engines up to 60 cc can be used.

ENYA

❑ STEP 3.1 BECOME FAMILIAR WITH THE POWER MODULE ASSEMBLY.

Work with the fuselage resting upright on a padded surface of cardboard, cloth or foam sheets. The padding will serve to protect the bottom surface of the Fuselage from becoming scratched.

Examine the power module assembly. The advantage to the power module system is that it allows you to easily install and maintain your engine and fuel system initially and at any time later on. Undo a few nuts and the throttle actuating rod and the entire engine and fuel tank system comes off in one piece! More importantly however, the power module system allows you to separate the aspects of engine placement from those of engine thrust angles. Most modelers have a great deal of difficulty correctly positioning the engine on the firewall while simultaneously setting the thrust angles. With the power module system you are able to set the position first without regards to thrust angle and then later once you've set the position correctly you can adjust the thrust angles properly. Again, you set the engine placement and then you can set the engine thrust angles and vary the thrust angles at any time thereafter. This model comes with a set of T-beam engine mounts that are suitable for most engine installations. In cases where custom mounts are used with a particular engine, the principle of the power module system still applies... first you position the engine correctly then you set the thrust angles. This principle remains the same for all engines, all engine orientations and all engine mounts used in conjunction with the power module system.

The power module consists of a forward removable firewall bolted to second fixed firewall slightly aft that has been permanently attached to and becomes the forward face of the fuselage. We refer to the two firewalls as the "forward removable firewall" and the "aft fixed firewall". Note the four firewall mounting bolts securing the forward removable firewall to the aft fixed firewall. For shipping purposes these bolts have been reversed and installed with the bolt heads forward.

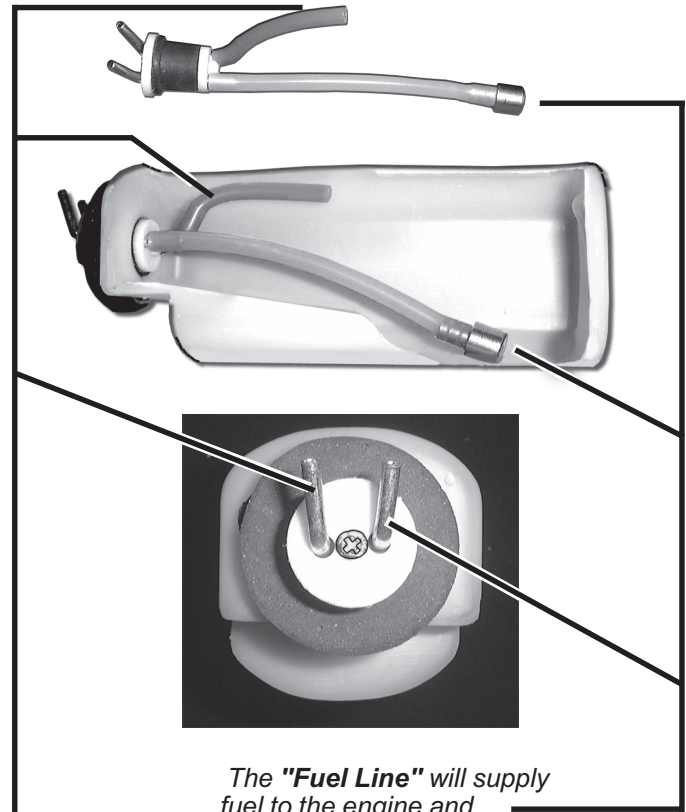
Mark the top edge of the forward removable firewall so that you can later re-install it with the top edge upwards.

Remove the four bolts from their shipping positions. To do this, reach inside the fuselage and unscrew the four nuts and remove the three washers from each bolt. Pull the forward removable firewall forward and away from the fuselage. Remove the four firewall mounting bolts and retain the bolts, nuts and washers for later use.

❑ STEP 3.2 – ASSEMBLE THE FUEL TANK.

Remove the fuel tank and the fuel tank mounting dowels from the rear face of the forward removable firewall.

Install a clunk and fuel tubing in the tank. Ensure that the tubing is compatible with your intended fuel. Install and secure the neck stopper in the tank. Leak test the tank by blowing in one line while sealing the other. No air should leak out of the tank when pressurizing it. Do not over tighten the stopper screw... if the tank appears to be leaking... back off the screw slightly... rotate the stopper to and fro through about 20 degrees and then re-tighten the screw and re-test.



The "Fuel Line" will supply fuel to the engine and allow you to fill the tank up

The "Pressure Line" is connected to the muffler of your engine and serves to bring engine pressure into the tank to help force fuel out the fuel line into the engine. It also serves as a fuel overflow vent when topping the tank up with fuel.

□ **STEP 3.3 – MOUNTING YOUR ENGINE ON THE ENGINE MOUNTS.**

Locate the two cast aluminum T-beam engine mounts. There are four black machine screws shipped installed in each T-beam mount and a plywood spacer applied to the firewall side of each mount.

Locate the horizontal thrust line that was factory positioned on the front face of the forward removable firewall. Draw a vertical thrust line up and down so that it is centered left and right and intersects the factory positioned horizontal thrust line at a 90 degree angle. You will have a large plus sign or cross hair like set of two lines when you are done.

Install your engine on the T-beam mounts. Generally this is done using the clamp plates and positioning the engine mounting lugs between the clamp plates and the T-beams. Some modelers prefer to tap and drill exact mounting holes in the T-beams to accommodate their particular engine.

Trial fit the T-beams and engine to the front face of the forward removable firewall. Regardless of engine orientation, upright, inverted, 90 degrees or any other intermediate angle, the T-beams must be mounted to the forward removable firewall so that that an imaginary line centered through the length of the crankshaft would pass at a perpendicular angle through the forward removable firewall at the intersection of the horizontal and vertical thrust lines. Please review the previous statements carefully before doing any drilling or mounting of the T-beams to the forward removable firewall. In summary... the engine crankshaft must be centered on the forward removable firewall with no left or right or up or down displacement. Do not worry about thrust angles at this point... just the location.

Carefully mark the location of the firewall to T-beam mounting bolts. Drill four holes in the firewall to accommodate the bolts. Secure the T-beam mounts to the forward removable firewall. The plywood spacers are supplied to offset the engine from the forward removable firewall when necessary for carburetor clearances (some four strokes), fuel line passages etc. In some cases the plywood spacers may not be necessary and then do not have to be used. Check the alignment again to ensure that the center of the crankshaft lies directly in line with the intersection of the horizontal and vertical thrust lines. Adjust the engine in the clamps to get the intersection right or re-drill the firewall holes if badly out of line. Again, do not worry about thrust angles at this point... just the location. You will work on thrust angles a bit later.

Re-install the fuel tank mounting dowels so they protrude from the back face of the forward removable firewall. Glue them in place with Pacer Zap-A-Gap or Pacer 30 Minute Zpoxy. Seal the back side and all edges of the forward removable firewall with Pacer Zpoxy Finishing Resin or other fuel proof sealant. Let the adhesive and finishing resin cure thoroughly.

□ **STEP 3.4 – MOUNTING THE FUEL TANK.**

Temporarily join the metal tank tubes with a length of tubing to prevent contaminants from entering the tank. Install the fuel tank on the dowels. To do this, apply a bead of Pacer Dap-A-Gap-A-Goo to both sides of the black sealing donut around the neck of the tank. Apply a bead of Pacer Dap-A-Gap-A-Goo to the top faces of each dowel. Position the tank firmly against the firewall such that the tubes protrude through the hole in the firewall. Push the tank firmly forward and down onto the dowels to seat the sealant. Wrap and secure the tank to the dowels with duct tape and then with two or three tie wraps.

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□ STEP 3.5 – INSTALLING POWER MODULE, ENGINE AND TANK.

Working from inside the fuselage... install the four firewall mounting bolts as follows. Take a bolt, apply a washer beneath the head of the bolt and press the bolt through the mounting hole in the aft fixed firewall from inside the fuselage. Apply a second washer and then a nut to the bolt. Tighten the nut securely and lock it down with Pacer Z42 Thread Locker. Apply a second nut and thread it onto the bolt until it is about ¼" from the forward face of the first nut. Do not thread lock the second nut at this time. Do this for all four bolts.

Now install a third washer to each bolt and place the removable forward firewall onto the bolts such that the top edge points up and the engine points forward.

Apply a fourth washer and then a third nut and tighten the nut until the forward removable firewall is secure on the bolts. Now check the engine thrust. The factory recommended engine thrust is 0 degrees horizontal and 0 degrees vertical. Some modelers prefer a degree or two of right thrust to assist with tail dragger handling. The amount of right thrust may vary with individual preferences and engine size. Vertical thrust can be varied if performance dictates but start off with 0 degrees and only vary from 0 degrees vertical thrust if conditions require such. The simplest way to get approximately 0 degrees of thrust in both the vertical and horizontal is to ensure that the space between the first and second nuts. This distance was originally ¼ inch... it does not have to be ¼" exactly but the distance should be same on all four bolts.

Once you have the engine thrust the way you want it, tighten the nuts evenly and securely and apply the final fourth nut to lock everything in place. Lock all nuts with Pacer Z42 Thread Locker after the first couple of test flights and any adjusts to vertical or horizontal thrust have been completed.

□ STEP 3.6 – INSTALLING THE THROTTLE SERVO, TRAY AND CONTROL ROD.

Locate the throttle control rod in the miscellaneous parts bag. The throttle control rod is about 6 inches long with a clevis on one end and an EZ connector on the other.

Locate the throttle servo tray in the miscellaneous parts bag. The throttle servo tray is made of wood and has two mounting screws partially inserted into it.

Plan the location of the throttle servo to allow smooth movement of the throttle servo, the throttle servo control rod and the engine throttle arm. Try to position the throttle arm servo tray on the inside of the fuselage forward of where the pilots and pilot chairs are normally located. Remember to leave enough room for the pilots and chairs which may be installed later. Drill a hole in the firewall(s) to allow the control rod to connect from the servo to the engine throttle arm and to operate smoothly.

Score the back of the wooden servo tray with rough sandpaper and a cutting knife. Glue the servo tray into place inside the fuselage using Pacer 30 Minute Zpoxy. Once the Zpoxy has cured, install a servo having at least 40 ounces of torque. Connect the throttle servo control rod between the engine throttle arm and the throttle servo arm. Ensure smooth operation and correct throw of the servo to open and close the carburetor through the full range required for correct operation of your engine.

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❑ PHASE 4 – INSTALLING THE RUDDER & ELEVATOR SERVOS.

❑ STEP 4.1 – GETTING ORIENTED.

Position the fuselage upright in front of you with the front of the fuselage to your right and the tail to your left.

Look into the “cargo bay” area from above and you will note two servo trays and four control rod assemblies. The control rod assemblies run from the rear of the fuselage forward into the cargo bay area. Note that the left most control rod furthest from you consists of two control rods that are merged into one by a coupler.

The left most control rod assembly connects to the right side of the rudder and to the tail wheel assembly.

The control rod that lies just left of center in the cargo bay connects to the right elevator.

The control rod that lies just to the right of center connects to the left elevator

The right most control rod that lies closest to you connects to the left side of the rudder.

❑ STEP 4.2 – SET UP SERVO TRAYS.

For shipping purposes, two universal servo trays were tacked into place within the cargo bay. Remove the universal servo trays and then remove the plastic bags and hardware from the universal servo trays.

Apply the black plastic slider plates to the universal servo trays using the small screws. Leave the sliders slightly loose for now.

Re-install the universal servo trays.

❑ STEP 4.3 – CONNECT THE RUDDER AND ELEVATOR SERVOS

Install two elevator servos and two rudder servos in the universal servo trays. Use servos having at least 40 ounces of torque. Orient the servos such that they align correctly with the appropriate rudder and elevator rods. Center the servos and connect the rods to the servo arms.

Join the leads of the two rudder servos together using one of the Y-Harnesses.

Join the leads of the two elevator servos together using one of the Y-Harnesses.

❑ PHASE 5 – INSTALLING THE WING STRUTS.

The wing struts must be used when flying this model. The wing will break if you attempt to fly this model without the wing struts.

❑ STEP 5.1 - BECOME FAMILIAR WITH THE WING STRUTS..

Locate the two wing struts that were removed from the fuselage earlier. The struts have pre-installed white plastic mounting brackets on each end. One bracket is angled at about 60 degrees and the second bracket is angled at about 30 degrees.

The 60 degree bracket attaches to the fuselage, the 30 degree bracket attaches to the underside of the wing. Locate the pre-drilled mounting holes on the fuselage sides outboard from the large internal landing gear blocks. Locate the pre-drilled mounting holes on the bottom of the wing

❑ STEP 5.2 – TRIAL FIT THE SCREWS INTO THE PRE-DRILLED HOLES.

Locate 8 flat head sheet metal screws (about 1/2” long) and 8 flat washers in the miscellaneous parts bag. These screws and washers are used to attach the struts to the fuselage and the wing.

Trial tap the strut mounting screws into the pre-drilled holes in the fuselage sides and the bottom of the wing and then back the screws out and set them aside.

❑ STEP 5.3 – MOUNT THE WING STRUTS.

Mount the wing on the fuselage and bolt it down using the two white plastic wing bolts from the wing parts bag.

Back off the two main wing mounting bolts a turn or two so that a playing or business card can be inserted between the trailing edge of the wing and the rear of the wing saddle.

Mount the wing struts using the wing strut mounting screws.

Now re-tighten the two main wing mounting bolts.

Check that the wing is correctly positioned and that both sides of the wing have similar dihedral as you move outboard from the center of the wing towards the tips. The two wing halves should look the same when examined from the front, rear, top and bottom. The purpose of the wing struts is to make the wing very strong, not to warp or twist the wing. Ensure that there are no warps or twists induced by the struts. Ensure that the wing tips are equidistant from a common point near the tip of the tail of the fuselage.

□ PHASE 6 – INSTALLING THE HORIZONTAL AND VERTICAL STABILIZERS.

□ STEP 6.1 – MOUNT THE HORIZONTAL STABILIZER.

Locate the horizontal stabilizer assembly in the wing box. The horizontal stabilizer assembly consists of the one piece horizontal stabilizer to which the elevators have been pre-mounted with hinges that have been double pinned on the under side. Note carefully that the bottom of the horizontal stabilizer is the side where the hinge pin heads can be seen.

Remove any shipping spacers from the fuselage slots.

Ensuring that the horizontal stabilizer assembly is top side up, slide the horizontal stabilizer assembly into the horizontal stabilizer slot in the fuselage. Carefully insert the horizontal stabilizer assembly all the way into the slot and center it left to right.

Ensure that the wing is mounted on the fuselage and that the wing mounting bolts are snug. Ensure that the wing struts are installed and that the struts are not inducing any warps or twists in the wing.

Position the horizontal stabilizer assembly so that it is straight and the tips of the horizontal stabilizer are equidistant from the wing tips.

Carefully position masking tape on the top of the horizontal stabilizer assembly so that the edge of the masking tape marks where the fuselage meets the horizontal stabilizer on both sides of the stabilizer.

Carefully remove the horizontal stabilizer assembly from the slot in the fuselage.

Using a pen, draw a line parallel to and about ¼ in. inboard from the inboard edges of the masking tape.

Using a sharp knife, carefully cut along the drawn lines and across the stab so that you can peel up the covering material and bare the wood in the top center area of the stab that will be covered by the fuselage tail section. Do not score the wood. Seal any score lines with Pacer ZAP CA before proceeding further. If you cut into the wood and do not subsequently re-glue any score lines, your horizontal stabilizer may fail in flight at any time.

Do not glue the horizontal stabilizer assembly into place in the fuselage slot at this time.

Locate the two elevator control horn assemblies. The

elevator control horn assemblies each consists of a metal bolt about 2 in. long, a white plastic beveled washer, a white plastic T-nut, a metal nut and a white plastic control horn with a hole in the flange end of the horn. Remove the parts from the two bolts.

Place a white plastic beveled washer on the bolt so that the flat side of the beveled washer is against the head of the bolt. Insert the first bolt into the predrilled hole in the left elevator working from the top surface of the elevator. From the underside of the elevator apply a white plastic T-nut to the bolt such that the shaft of the T-nut is towards the head of the bolt. Tighten the T-nut so that the shaft of the T-nut goes into the hole in the elevator. Use a small crescent wrench to hold the T-nut and a screw driver to turn the head of the bolt and tighten until the T-nut just begins to seat into the covering and so that the bevel portion of the beveled washer has sunk nicely and snugly down into the hole in the top surface. Ensure that the bolt will now securely move the left elevator with no slack. Now apply the metal nut to the bolt and tighten the nut down and just into the white plastic of the T-nut. Apply Pacer Z-42 thread locker to the metal nut. Install the white plastic control horn on to the bolt.

Repeat this procedure for the right elevator.

Slide the horizontal stabilizer assembly into the horizontal stabilizer slot in the fuselage. Carefully insert the horizontal stabilizer assembly all the way into the slot and center it left to right using the masking tape as a guide.

Tape the elevators into their neutral positions.

Using the wing as a reference, and looking back along the fuselage from the front, ensure that the horizontal stabilizer assembly is level with respect to the wing. If adjustment is required, sand the horizontal stabilizer slot in the fuselage. Sand carefully and check frequently for progress. Do any sanding in small incremental steps, checking the alignment with respect to the wing frequently.

With the elevators taped into their neutral positions and the horizontal stabilizer assembly fully inserted into the horizontal stabilizer slot in the fuselage adjust the clevises on the elevator control rods to connect to the elevator control horns.

Mix up about 2 ounces of Pacer 30 Minute Zpox and thoroughly apply the mixed Zpox to the bare wood area on the top of the horizontal stabilizer assembly. Apply the mixed Zpox to the top surface of the horizontal stabilizer slot in the fuselage. Carefully slide the horizontal stabilizer into the slot and push the horizontal stabilizer all the way into the slot and center it left to right using the masking tape as a guide. Using the wing as a reference, and looking back along the fuselage from the front, ensure that the horizontal stabilizer assembly is level with respect to the wing. Wipe away any excess adhesive immediately. Pin the assembly into place to hold it securely until the Zpox cures. Allow at least 2 hours for curing and do not fly the model for at least 24 hours. Remove the masking tape applied earlier.

□ STEP 6.2 – MOUNT THE VERTICAL STABILIZER ASSEMBLY.

Locate the rudder control horn assembly in the control horn parts bag. The rudder control horn assembly consists of a long bolt assembly consisting of two bolts welded together at the head, two white plastic T-nuts, two metal nuts and two white plastic control horns with a hole in the flange end of the horns.

Remove all parts from the long welded double ended bolt. Position the bolt through the pre-drilled hole in the rudder so that the bolt is centered with an equal length protruding from either side of the rudder. Apply a white plastic T-nut to each side of the bolt such that the shafts of the T-nuts are pointing inwards towards each other. Tight the T-nuts so that the shafts of the T-nuts go into the hole in the rudder. Use a small crescent wrench to rotate the T-nuts and tighten the T-nuts until they just begin to seat into the covering. Ensure that the bolt will now securely move the rudder with no slack. Now apply the metal nuts to the bolts and tighten the nuts down and just into the white plastic of the T-nuts. Apply Pacer Z-42 thread locker to the metal nut. Install the white plastic control horns to the either ends of the bolts.

Slide the vertical stabilizer assembly into the vertical stabilizer slot in the fuselage. Carefully insert the vertical stabilizer all the way into the slot.

Carefully position masking tape on the vertical stabilizer assembly so that the bottom edge of the masking tape marks where the fuselage meets the vertical stabilizer on both sides of the stabilizer.

Carefully remove the vertical stabilizer assembly from the slot in the fuselage.

Using a pen, draw a line parallel to and about ¼ inch beneath the lower edges of the masking tape on both sides of the vertical stabilizer assembly..

Using a sharp knife, carefully cut along the drawn lines so that you can peel off the covering material and bare the wood on either side of the vertical stabilizer assembly that will be covered by the fuselage tail section. Do not score the wood. Seal any score lines with Pacer ZAP CA before proceeding further. If you cut into the wood and do not subsequently re-glue any score lines, your vertical stabilizer assembly may fail in flight at any time.

Do not glue the vertical stabilizer assembly into place in the fuselage slot at this time.

Slide the vertical stabilizer assembly into the vertical stabilizer slot in the fuselage. Carefully insert the vertical stabilizer assembly all the way into the slot using the masking tape edges as a guide.

Tape the rudder into the neutral position.

Using the wing as a reference, and looking back along the fuselage from the front, ensure that the vertical stabilizer assembly is at right angles with respect to the wing. If adjustment is required, sand the vertical stabilizer assembly where it engages into the slot in the fuselage. Sand carefully and check frequently for progress. Do any sanding in small incremental steps, checking the alignment with respect to the wing frequently.

With the rudder taped into the neutral position and the vertical stabilizer assembly fully inserted into the vertical stabilizer slot in the top of the fuselage, adjust the clevises on the rudder control rods to connect to the rudder control horns.

Mix up about 2 ounces of Pacer 30 Minute Zpoxxy and thoroughly apply the mixed Zpoxxy to the bare wood area of the vertical stabilizer assembly. Apply the mixed Zpoxxy into the vertical stabilizer slot in the fuselage. Carefully slide the vertical stabilizer into the slot and push the vertical stabilizer all the into the slot. Using the wing as a reference, and looking back along the fuselage from the front, ensure that the vertical stabilizer assembly is at right angles with respect to the wing. Wipe away any excess adhesive immediately. Pin the assembly into place to hold it securely until the Zpoxxy cures. Allow at least 2 hours for curing and do not fly the model for at least 24 hours. Remove the masking tape applied earlier.

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☐ PHASE 7 – INSTALLING THE MAIN LANDING GEAR.

☐ STEP 7.1 – MOUNT THE AXLES AND WHEELS.

Locate two axle assemblies in the main gear parts bag.

Locate the two main wheels.

Locate the main landing gear that was shipped in the fuselage bag.

Install the axles on the main landing gear using a washer and nut on each side of the main landing gear. Lock the nuts with Pacer Z42 Thread Locker.

Install a wheel collar, then a wheel and then another wheel collar to each axle. Lock the wheel collar set screws with Pacer Z42 Thread Locker.

☐ STEP 7.2 – MOUNT THE LANDING GEAR.

Remove the wing assembly from the fuselage.

Be very careful of the horizontal and vertical stabilizer when handling the fuselage from this point on.

Turn the fuselage over and trial fit the main landing gear assembly into the slot in the bottom of the fuselage. Check that the mounting holes align with the pre-drilled holes in the fuselage.

Locate the four landing gear screws (about 1-1/4 inch long) and four flat washers in the main gear parts bag.

Install the main landing gear assembly using the screws and washers.

☐ STEP 7.3 – MOUNT THE FAIRINGS.

Locate the blister like fairings in the parts bag that included the black dummy cylinder plate etc. The fairings are the same color as the fuselage, elliptical in shape and measure approximately 6-3/4 in. long.

Fit the fairings where the fuselage meets the main landing gear. Trial fit and mark their locations. Then install the fairings using Pacer Dap-A-Gap-A-Goo.

☐ PHASE 8 – INSTALLING THE WING TOP PLATE.

☐ STEP 8.1 – PREPARE THE WING TOP PLATE..

Locate the wing top plate in the parts bag that included the black dummy cylinder plate, air intakes and fairings. The plastic top plate is the same color as the wing and measures about 10 in. by 10 in.

The wing top plate is used to cover the top of the center section of the wing.

Trial fit the wing top plate to the top of the center section of the wing. The wing top plate is to be mounted such that the widest portion of its raised section is forward and narrows towards the back.

☐ STEP 8.2 – MOUNT THE WING TOP PLATE.

Locate the 10 small screws (about 1/4 in. long) in the miscellaneous parts bag.

Use a suitable number of the screws to retain the wing top plate to the top of the center section of the wing.

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❑ PHASE 9 – INSTALLING THE COWL AND DUMMY CYLINDERS.

The cowl has been pre-painted and pre-trimmed.

The cowl should be oriented such that the pre-applied trim aligns with the graphics on the fuselage.

❑ STEP 9.1 – MOUNT THE DUMMY CYLINDER PLATE.

Depending on your engine, install the black dummy cylinder plate. Cut out the air passages between the dummy cylinders. Mount the cylinder plate to the inside of the cowl using Pacer Dap-A-Gap-A-Goo.

❑ STEP 9.2 – MOUNT THE COWL.

Position the cowl over your engine and the fuselage. Align the pre-applied cowl trim with the graphics on the fuselage.

Parts are not included for mounting the cowl... experienced modelers have a large number of personal preferences for mounting cowls. One method is as follows... Install scrap plywood or hardwood mounting blocks to the forward removable firewall to accept mounting screws to hold the cowl in place. Use at least three mounting locations around the circumference of the cowl. Drill holes in the cowl that align with the mounting blocks. Line the holes with rubber grommets to prevent the mounting screws chaffing the fiberglass cowl.

❑ STEP 9.3 – MOUNT THE DUMMY AIR INTAKES.

Attach the dummy air intakes using Pacer Dap-A-Gap-A-Goo. The larger of the air intakes measures approximately 2-1/2 x 4-7/8 in and is usually mounted on the bottom of the fuselage just aft of the cowl. The smaller of the air intakes measures approximately 1 x 1-1/2 in. and is usually mounted on the left side of the fuselage just aft of the cowl

❑ STEP 9.4 – MOUNT PROP AND SPINNER NUT

Depending on your engine, install a suitable propeller and spinner nut. Given the large frontal area of this model and the large size of the cowl, you will need a prop with a larger diameter and smaller pitch than you might otherwise use.

❑ PHASE 10 – INSTALLING THE COCKPIT SET (when optionally supplied.)

❑ STEP 10.1 MOUNT THE COCKPIT LINERS.

Trial fit the cockpit liners. You can choose to have the aluminum side visible or the colored side visible.

Use the supplied Velcro strip to mount the liners. Use a touch of Pacer Dap-A-Gap-A-Goo to further secure the liners where necessary.

Straighten up the pilots and their shoulder harnesses. A touch of Pacer Dap-A-Gap-A-Goo may be used on the underside of the shoulder harnesses to hold them in place if loose.

❑ STEP 10.2 - PREPARE THE PILOTS.

Position the pilots arms and legs. Pull the hands back slightly and cut the wire protruding from the hands after the arms have been positioned where you want them.

If you want to color the hands brown to simulate gloves or the feet black to simulate boots, use latex paint or magic marker. Test the fabric first in an area that is not noticeable

❑ STEP 10.3 - MOUNT THE PILOTS.

Trial fit the pilots seat assembly on the rails in the forward cabin. Insert the pilot seat assembly from the cargo bay area... insert lengthwise and then rotate as you move the seat assembly forward.

To allow for possible removal of the pilot seat assembly for maintenance at a later date, use screws to mount the pilot seat assembly or attach with a bit of Pacer Dap-A-Gap-A-Goo.

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☐ PHASE 11 – INSTALLING RADIO EQUIPMENT.

☐ STEP 11.1 - MOUNT THE RECEIVER, BATTERY PACK AND SWITCH

Wrap the receiver and battery pack in RC Foam.

Install your receiver, switch harness, antenna and battery pack into the cargo bay area.

☐ STEP 11.2 - TEST RADIO EQUIPMENT.

Test that all servos are working correctly and that the servos are centered.

Turn off the radio equipment.

☐ PHASE 12 – SET UP AND CHECK OUT.

☐ STEP 12.1 - BALANCE THE AIRCRAFT.

All components including engine, prop, cowl, radio etc should be installed when checking the Center of Gravity (CG) and the tank should be dry with no fuel.

The center of gravity is often referred to as the “CG” and is the point at which an aircraft is balanced with as much weight aft of the point as it has weight forward of the point.

The CG for this model is located at the forward edge of the recessed section of the wing. The recessed section of the wing has two wooden dowels protruding from its front and lies immediately behind the second fuselage former when the wing is installed on the fuselage.

Check that the CG is correct. If it is not, move your radio receiver and battery pack first and recheck. If weight is needed, apply the weight as far aft or as far forward as possible to reduce overall weight required to get the CG correctly positioned.

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☐ STEP 12.2 - ADJUST CONTROL SURFACE THROW LIMITS.

Note that throws are measured at the widest part of the elevators and rudder.

Always confirm that the horns and clevises are securely engaged with the control rods and servo arms after any adjustment. .

Adjust the throw limits for the control surfaces to match the following guidelines.

Elevators: Up $\frac{3}{4}$ in and down $\frac{3}{4}$ in.. Total movement 1-1/2 in. Make sure the elevators are aligned and move in the same plane throughout the range of movement.

Rudder: Left 1 in. and right 1 in.. Total movement 2 in.

Ailerons: Up $\frac{2}{3}$ in and down $\frac{2}{3}$ in.. Total movement 1-1/3 in.

Flaps: Down 30 degrees maximum.

Nose gear: As set at factory.

Incidence on Wing and Horizontal Stab: Factory set

Engine Thrust: 0 degrees up/down, 0 degrees right/left. Some modelers may find that 1-3 degrees of right thrust will assist with ground handling

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□ STEP 12.3 - CONFIRM FUNCTIONAL INTEGRITY.

Once you have confirmed that the CG is correct and that all throws have been set up properly, you should do a thorough review of the entire model BEFORE YOUR FIRST FLIGHT. **Check everything twice! Every hook up, every coupling, everything! Do the "TUG TEST"! Tug on all control surfaces, hinges, clevises and rods! Do it twice! DO IT BEFORE YOUR FIRST FLIGHT!**

BEFORE YOUR FIRST FLIGHT have an experienced remote control model aircraft flyer review your work. Don't fly this model until it has been checked out by an experienced second party who knows how to fly a remote control model aircraft and how to set up and handle a model of this size.

Once you have completed your first flight, get in the habit of checking all components of your model over **BEFORE AND AFTER EACH FLIGHT! Do the "TUG TEST"! Tug on all control surfaces, hinges, clevises and rods!** Don't fly without checking and don't fly if you find something that is not right!

CAUTION

You are ultimately responsible for the mechanical, aeronautical and electrical integrity of this model and it's structure, control surfaces, hinges, linkages, covering, engine, radio, wiring, battery and all other components. Check all components before and after each flight. Don't fly until it's right!

REPLACEMENT PARTS

If you have damaged or lost something or had what we call an "uncontrolled flight" into terrain and pranged your model, don't panic! We can probably help! Visit our web site at www.richmondrc.com and check out the VMAR On-Line store for a full listing of replacement parts or contact us by email at sales@richmondrc.com. All parts in stock.

MORE INFORMATION

Please visit our web site at www.richmondrc.com/vmar for more information about this model related to:

- Troubleshooting and Tips
- Spare and Replacement Parts
- Accessories and Support Equipment
- Discussion Groups

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MANUAL - CHANGE LOG

First Edition: 2001 01 26

The entire Assembly and Operations Manual was last updated 2001 01 26

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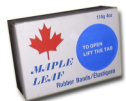
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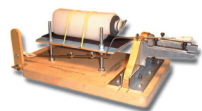
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