

EAM

MARVEL



A medium/small electric sport aircraft with a wide speed range and smooth flying characteristics.

Wing span: 38 in. / 965 mm

Wing area: 356.25 sq. in. / 22.98 dm²

Length: 20.4 in. / 518 mm

Weight: 28 – 36 oz / 790 – 1020 g

Power: 125 – 250 Watts

EAM Marvel kit instructions.

The Marvel kit is a product of
Electro Aero Modeling, USA
<http://www.eam.net/>
e-mail: sales@eam.net

Power package and radio:

Recommended power is an electric motor in the 150 to 250 watt range. We have used Speed 600 brushed motors, Medusa and Lehner brushless motors so far. A Kv range of 1000 to 1400 is good for sport flying, and up to 2000 for speed freaks. The Speed 600 power packages are adequate for good sport flying performance, and are very inexpensive. Still, we suggest even an inexpensive 150 watt brushless motor for better power, lighter weight and better efficiency. For light weight and slow sport flying, you might get away with a good brushless motor as low as 100 watts.

Batteries used so far are Lithium Polymer 3s 2000 mAH to 3s 4000 mAH. Small power systems might go as small as 3s 1200 mAH LiPoly if you are trying to go featherweight.

Flying weights have ranged from:

28 ounces with the Medusa 028-040-1200 motor and 3s 2000 LiPoly battery to

36 ounces with the Lehner brushless motor and 3s 4000 LiPoly battery and

35 ounces with the Speed 600 motor and 3s 2000 LiPoly battery.

You could probably shave another 3 or 4 ounces off of that with a light weight power package if you prefer a more sedate flying style, or flying in smaller spaces.

Recommended servos are the BlueBird BMS-371, BMS-380 and BMS-380 MAX. We have found the BlueBird line of servos to be of excellent quality and a very good value.

Receiver and ESC are up to the builder, as this aircraft will happily fit and carry almost any full size to micro receiver currently on the market. The Hitec Electron 6 is a good choice, as is almost any good quality small dual conversion receiver available these days. There are viable single conversion alternatives too, particularly the Castle Creations/Berg 4 and the Mikrodesigns SPF-5-RXO, both weighing in at about 5 grams! I would avoid almost all other micro single conversion receivers, as most are limited range, designed for parkflyer/slowflyer aircraft only, and have very poor noise rejection and R/F performance to go with their light weight and low price. Spend the extra \$20 or so and get a good quality receiver. You might also consider one of the current crop of loaded antennas to keep from having antenna wire trailing all about the sky.

Some recommended equipment and links to the manufacturer websites:

Medusa brushless motor 028-040-1200 <http://www.medusaproducts.com/motors/motor-main.htm>

Cool Running A-25 brushless ESC <http://www.coolerc.com/>

Castle Creations Phoenix 25 brushless ESC <http://www.castlecreations.com/>

Commonsense RC lithium battery packs <http://www.commonsenserc.com/page.php?page=intro.htm>

Hitec Electron 6 receiver <http://www.hitecrcd.com/>

Mikrodesigns SPF-5-RXO <http://www.mikrodesigns.com/>

BlueBird BMS-371 and BMS-380 servos available through EAM

Tools:

Ruler or other straight edge

Clamps

Knife (hobby knife, razor knife or similar – even a box knife or razor blade in a pinch...)

Screwdrivers - various..

Awl (or bamboo skewer – good as a tool and even reinforcement as necessary)

3/16” drill bit

Window screen bead roller (a cheap plastic one can be had at most hardware stores for about \$2) or

1/4” dowel with one end rounded off.

Rubber bands

Masking tape

Sandpaper

Materials:

Plastic sheeting (poly drop cloth) for use while gluing to keep parts from sticking to whatever you don't want them to stick to.

Reinforced strapping tape. Preferably 2” wide, but 3/4” will work too. Used to reinforce the spar and leading edge of the wing and to hold servos in place.

Covering. Whatever low temperature covering to go over the bare foam wing. We have used packing tape (Zagi tape), Econokote and Ultarcote. Use what you like, as long as it is a low temperature covering suitable for use over foam.

Glue.. Our recommended glues are:

Polyurethane glue(Gorilla glue or similar – hereafter referred to as PU). Very good for Coroplast. Excellent for foam, wood and fiberglass. The advantage and disadvantage of PU is that it foams up as it cures. This is good in that it fills the joints and bonds really well with the styrofoam wing core, but it can (and will) ooze out of the joints and is a pain to clean up. Also its amber color is a bit of a problem unless whatever you use for covering/finishing is really good at covering up the underlying colors.

Goop (Household, Plumbers, Marine, Whatever Goop, Shoe Goo, E-6000 – whichever of these you pick up first). Our recommended glue for most of this project. Goop adheres very well to the Coroplast – much better on Coroplast than is epoxy. It takes a tack and skins over fairly quickly, but takes several days to cure to maximum strength. Once cured it sticks to Coroplast better than any other glue we have tried except Medium CA. The major advantage of Goop over CA is that it will fill and fillet the joint, providing more gluing area and a stronger joint on most edge joints. This glue remains slightly flexible once cured (a bit like silicone) and this helps maintain the integrity of the joint with flexible materials like Coroplast. Goop will melt the styrofoam wing core, so you cannot use it on the wing.

Epoxy – good for everything, but PU, CA and Goop adhere better to the Coroplast. Epoxy is good for the wing assembly.

CA – Medium CA adheres well to Coroplast if the surface is freshly cleaned and/or sanded. Regular CA is plenty good, but the special plastic CA glues are the best that I have tried. The rubber toughened may be at least as good, or possibly even better, as they can do some gap filling and they remain slightly flexible once cured.

Also suggested but not required is a 1 3/4" (45mm) spinner. Pick your favorite color...

OK, so much for the preamble, now to the actual assembly.

Our suggest build order is:

Fuselage followed by the

Tail and then the

Wing.

Final assembly and

Flight setup wrap it up.

It should be fairly easy to build this model in three days. Day one would be the Fuselage and Tail, and starting the Wing. Day two would be finishing the wing and attaching the tail to the fuselage. Day three would be finishing details like covering and trimming, motor installation, radio installation and final setup.

Marvel kit and build information is available from:

EAM

<http://www.eam.net/>

http://eam.net/EAMRC/Marvel/eam_marvel.htm

and also on RC Groups

<http://www.rcgroups.com/>

<http://www.rcgroups.com/forums/showthread.php?t=524984> (pre-release tickler thread)

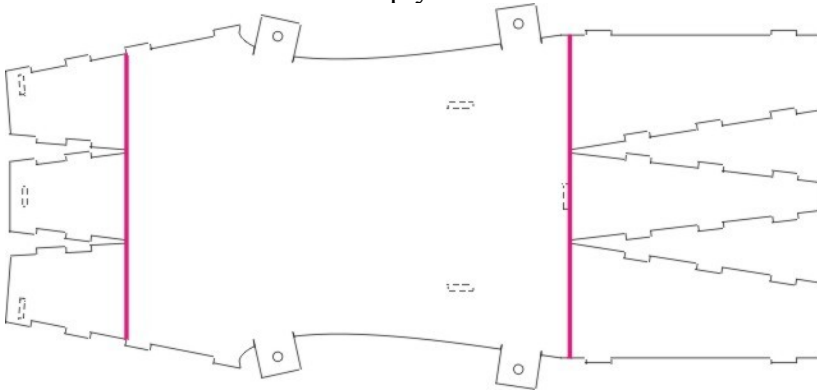
<http://www.rcgroups.com/forums/showthread.php?t=542813> (build thread)

Fuselage:

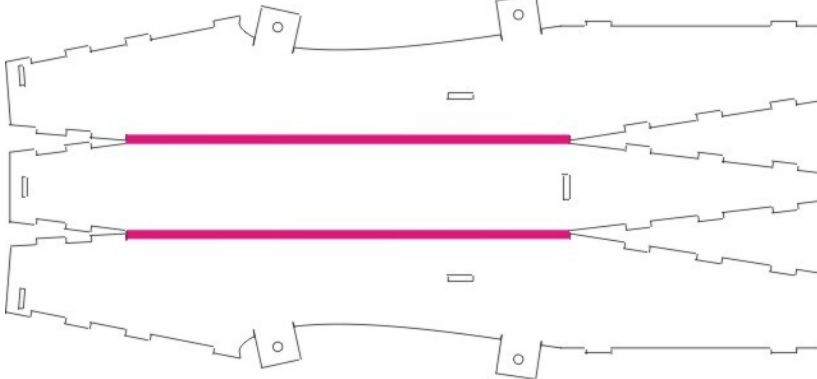
Inspect the edges of Coroplast pieces for scrap, lumps, etc. Clean up the edges if necessary.

Generally, one side of the Coroplast will be smoother than the other. Pick whichever side you prefer for the outside, and lay that side down on the workbench. You will crush the fold lines with a blunt tool, like the end of a dowel – rounded off, or better yet the window screen bead roller. You can even use a ball point pen cap or any other similar object that will not cut or tear the Coroplast when you drag it along the fold line to crush it.

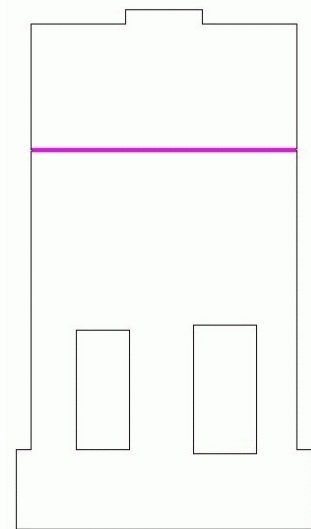
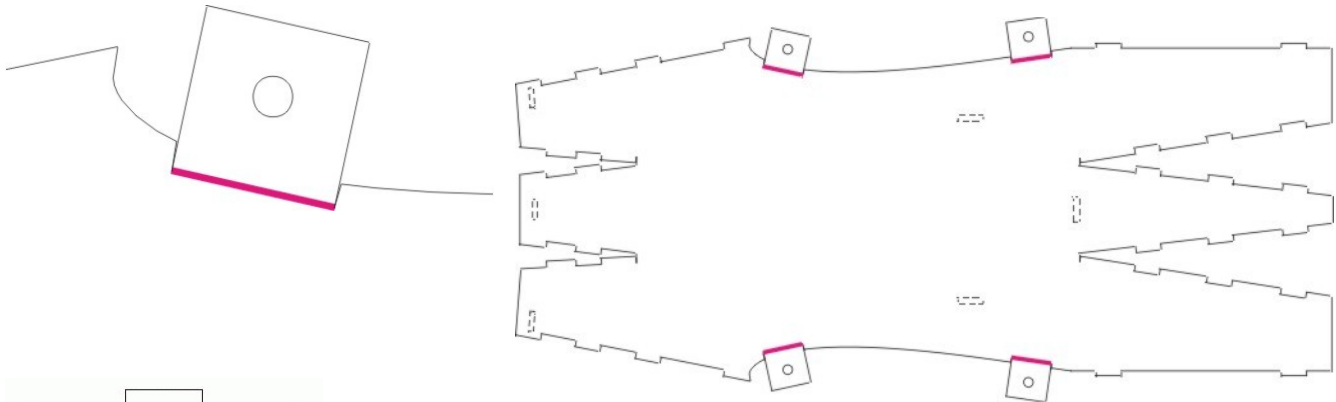
Lay your ruler across the fuselage at the nose fold. Align with the back end of the nose section and using your crushing tool make a single sharp crease across the fuselage. Keep the ruler on the crease and fold the sections back sharply to make a neat crease for the nose fold. Repeat with the tail fold.



Lay your ruler along the fuselage at one side crease. Using your crushing tool, crush the fold line to a width of about 1/4" - about the width of the relief notches. This is best done using several passes, moving the straight edge slightly with each pass. This wide fold crease will help keep the bottom edges a bit more rounded rather than making a sharp fold.



Using the above techniques make a sharp crease for the wing bolt tabs. This crease should be across the ends of the relief notches - parallel to and about 1/8" (3mm) below the edge of the wing seat. Use a bit of care here, as folding the Coroplast at a shallow angle across the flutes is a bit tricky, and the cleaner the fold is here, the stronger the wing mounting will be. With the fuselage sheet laying flat on the bench, you can lay your ruler along the fold line and bend the tab up against the edge. If you have the manual dexterity, it is better to hold a small piece with a hard straight edge (like the motor mount – use the top edge) on the tab with the edge lined up on the fold line and lift the straight edge and tab up as a unit to make the fold. Probably a better fold, but it is trickier to do.



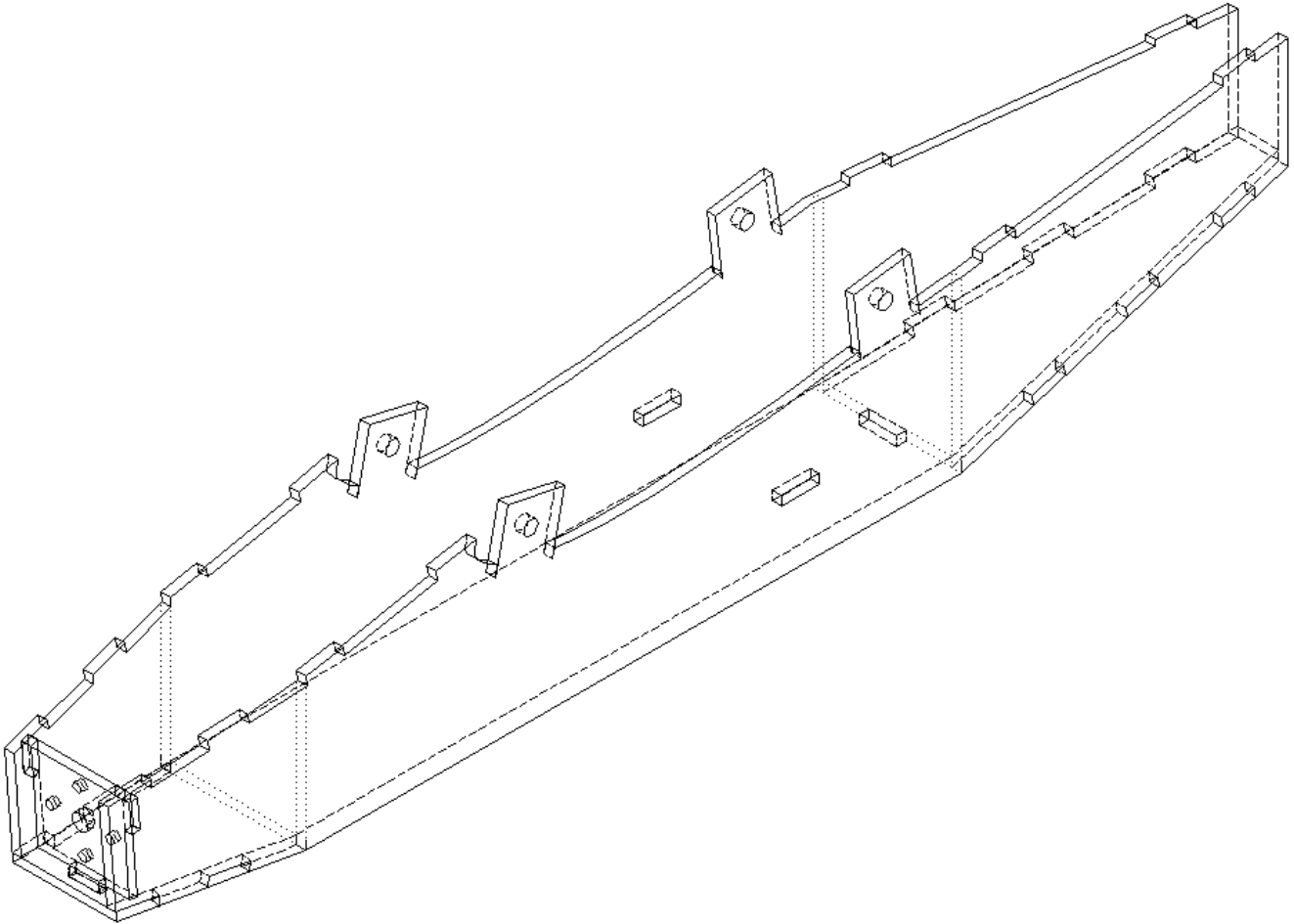
Also using the above techniques make a sharp fold line on the servo tray / aft bulkhead. There are small notches on the edges 1" from the back end of the tray indicating the fold line location. We have found that with most transmitter and servo combinations, mounting the servo on the right side of the fuselage results in correct elevator movement without having to reverse the elevator channel. You should check the fit of your elevator servo in the cutouts and arrange for the one with the best (snug) fit to be on the right side, with the back end of the servo tray bent down. The servo tray has cutouts to match the BMS-371 and BMS-380 servos. You may need to adjust one of the cutouts to match your choice of servo. If you do, try to make sure that the servo is a snug fit in the cutout.

You can sand the surface of the Coroplast in the areas of all of the glue joints. This is most easily done before you start gluing. This step is optional but recommended. While PU and Goop adhere well to Coroplast, every little bit helps. Whether you sand or not, it is a good idea to clean the Coroplast before gluing.

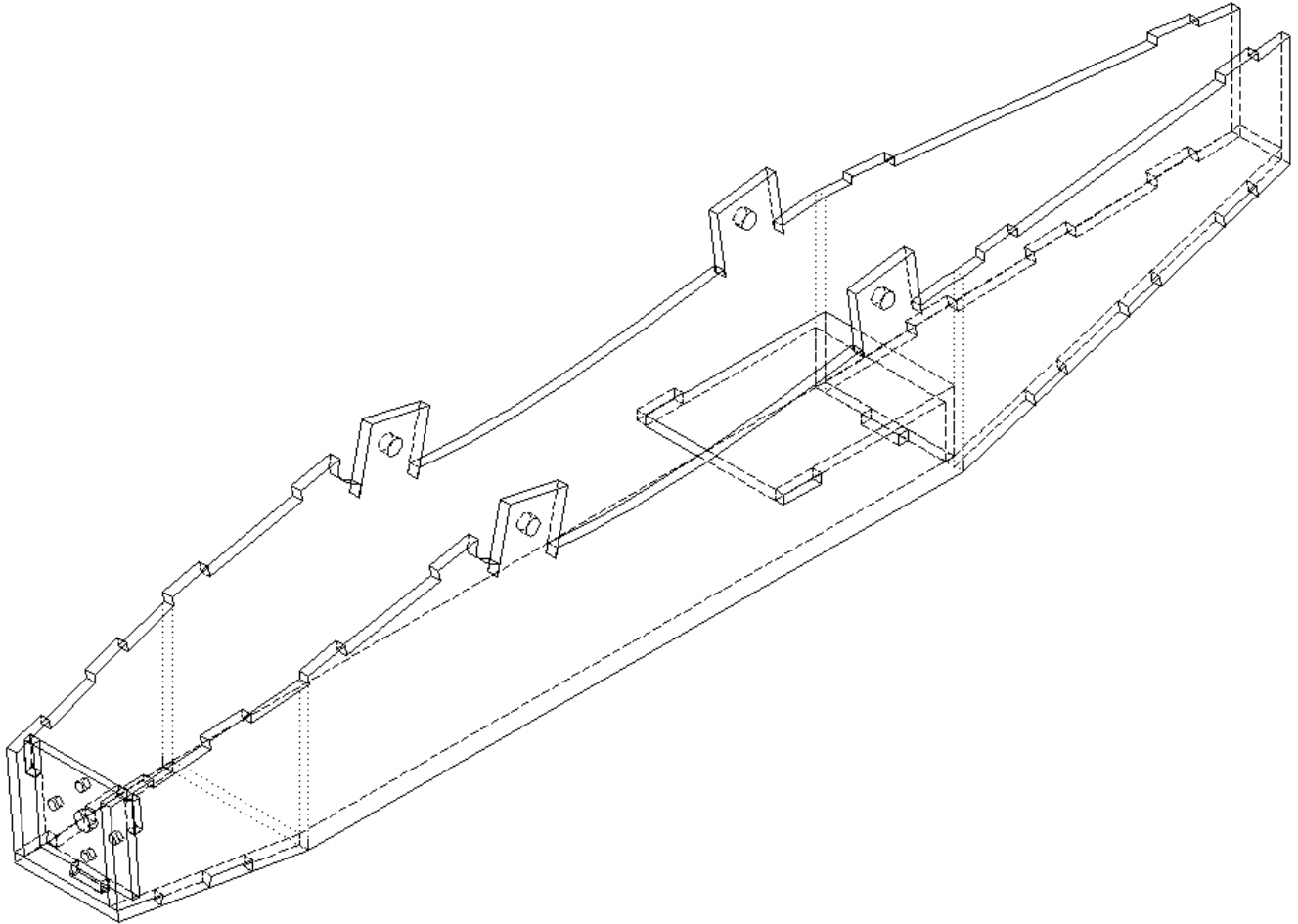
Fold the fuselage sides up and check the fit with the firewall, the top front / hatch, and the servo tray. Check that all tabs and slots fit easily, or at least neatly.

If you work quickly, it is easy to get all of the fuselage glue joints done in one session, and they can all cure at the same time. This makes the major fuselage assembly pretty much a one day process. I find that the following sequence works best.

Put glue along the bottom front joints and the motor mount joint line. Apply glue to the bottom and sides of the motor mount too. Key the motor mount into one of its associated slots. Fold the sides up, bring the sides and bottom together. Make sure that the motor mount keys into all of its slots. Tape the bottom joints together. Also place a strap of tape across the top over the motor mount to hold the motor mount joint for the moment.

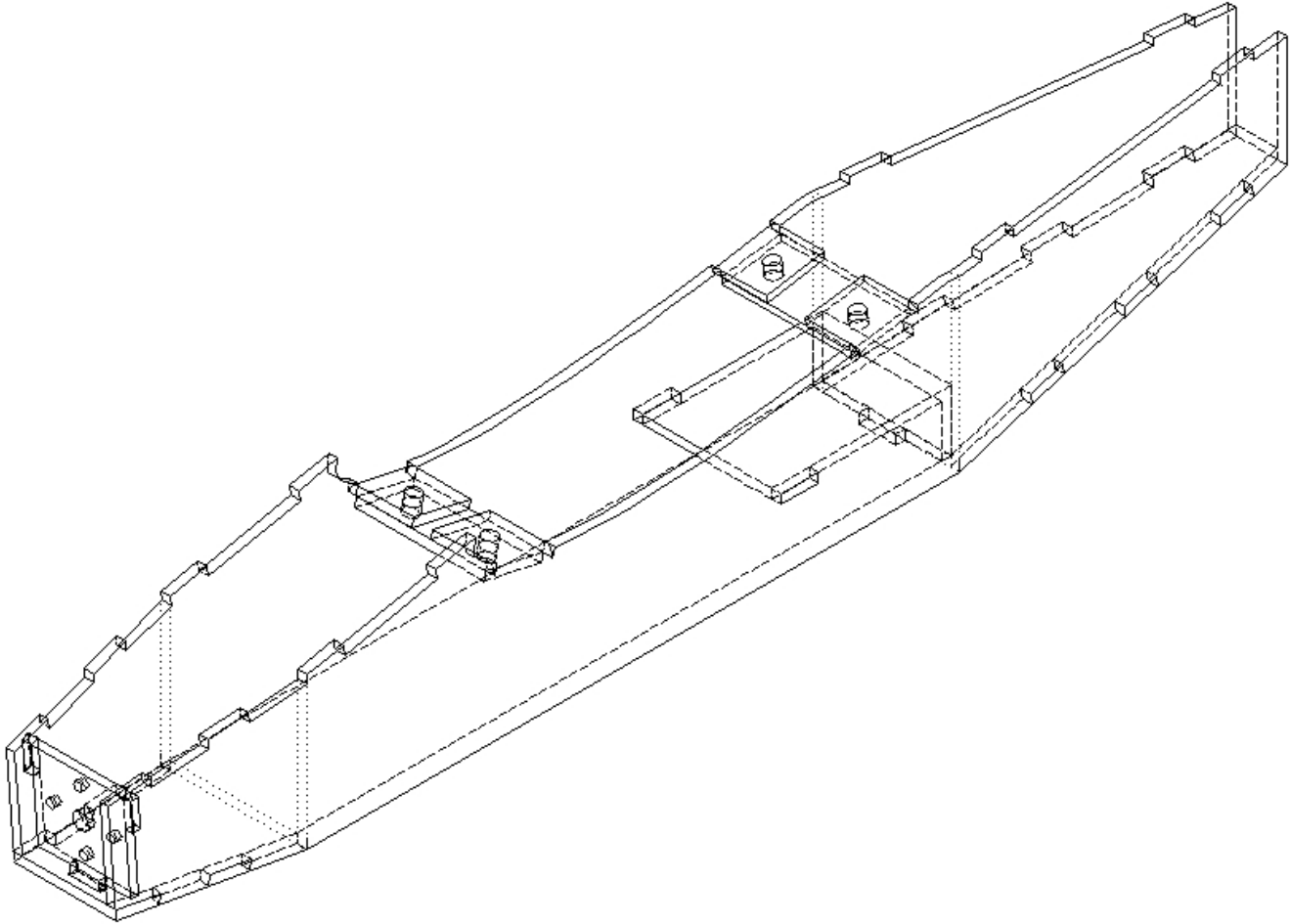


Put glue along the servo tray joint line. Put glue along the sides and back end (bottom) of the servo tray / aft bulkhead. Spread the fuselage sides a bit and put the servo tray in place. Put a strap of tape across the wing saddle toward the front end of the tray to hold it in place. Put a strap of tape across the back end of the wing saddle, above the back end of the servo tray too. You may wish to put a light clamp across each end of the servo tray just to make sure this joint stays tight. The problem with a clamp is that it may get knocked loose during the following steps.



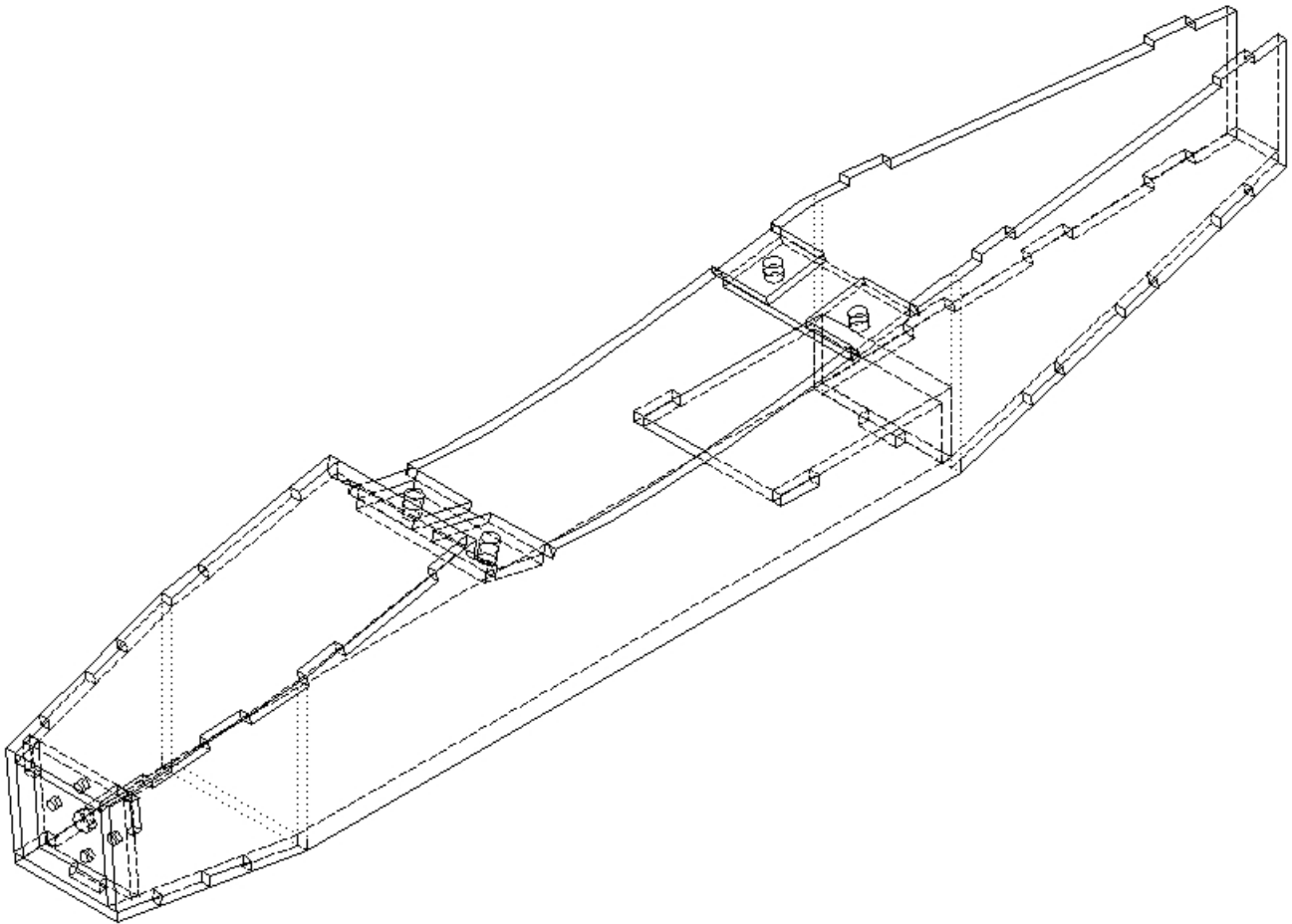
Find the four nylon wing bolts. Cut 1/2" off of two of them to give them a shaft length of 1".

Take one of the wing mount spreaders, apply a bit of glue to the tee nuts, fit into the holes in the spreader and press them into place. Put a generous amount of glue on the top face of the spreader where the wing mount tabs will fold over and cover, and on the ends as well. Do not get glue in the threads of the tee nuts! Apply a generous amount of glue to the aft mount tab fold lines. Spread the fuselage sides slightly and put the spreader in place. Fold the tabs down and screw the short wing mount bolts down to hold the tabs and spreader in place. **MAKE SURE THAT THERE IS NO GLUE IN THE THREADS OF THE TEE NUTS OR ON THE BOLTS, OR IT WILL BE VERY DIFFICULT TO GET THE BOLTS OUT AFTER THE GLUE CURES.** Place a strap of tape across the mount too, just to make sure things stay in place while the glue cures.



Repeat the above process for the front wing mount, using the long bolts to hold this end together. It is somewhat easier to do this before the following step is completed, but if you have already done it, no big deal...

Remove the piece of tape across the top of the motor mount. Put glue along the top front joints and the top of the motor mount. Put the top on and tape in place.



Spread the aft sections out a bit and apply glue along the joints. Bring the aft joints together and tape in place.

Check the fuselage for alignment – that all sides are square and that it is not twisted – and set aside for the glue to cure.

Remove the bolts from the wing mount plates once the glue has properly cured.

Tail:

It is easiest to put the elevator control horn in place before doing anything else here, so I suggest that you do it now.. You can do it later if you prefer – your choice. Position the horn at the center of the elevator, with the pushrod holes over the hinge cutout. Punch holes through the elevator for the control horn mounting screws. It is highly suggested that you reinforce the Coroplast in the area under the horn base. You can push a short piece of wood, (1/8” hard balsa stick, dowel, piece of bamboo skewer) in through the flutes, or you can squeeze some epoxy or PU glue in through the holes that you punched for the screws. Screw the control horn in place. Make sure that it is snug against the Coroplast, but that you do not crush the Coroplast.

Check the fit of the vertical fins to the ends of the horizontal stab. When you are happy with the fit, apply glue along the joints and join the parts. **DO NOT PUT GLUE ON THE ENDS OF THE ELEVATOR** – only on the ends of the stab ahead of the elevator hinge line. You can use some scrap Coroplast (or whatever material) pieces to make set squares to make sure that the fins remain square with the stab as the glue cures. Slip them into the elevator hinge line and tape in place. Tape the set squares to both the stab and the fins. Do not glue the set squares in place, and also **MAKE SURE THAT YOU DO NOT GLUE THE ENDS OF THE ELEVATOR TO THE FINs!** I make this last statement twice, because it is all too easy to do...

Set aside for the glue to cure.

Wing:

Clean up wing core. Remove any material from spar cutouts and trailing edge cutout. You may choose to gently block sand the core to smooth out any ripples or imperfections, but this is not necessary.

DO NOT USE GOOP on the wing! The Goop glues will melt the foam wing core. Use epoxy or PU glue on the wing.

Put glue into the spar cutout in the wing core. You can use the spar as a ramrod to push the glue into the hole. Plug both ends of the tube with a tightly wadded piece of paper towel. Any glue inside the spar tube is just a waste and additional weight. When you are pushing the glue into the hole in the wing, use a twisting motion with your ramrod. This makes it a bit easier to push it through, and helps to insure that the glue is distributed all around the inside of the hole. Push glue in from both ends of the hole. Wipe glue down the carbon tube spar to make sure that you get the surface completely covered. Glue the spar into the cutout in the wing. Make sure that the spar is centered in the wing. When you push the spar in, just measure to see that both ends are the same depth from the end of the wing. If you are using PU glue, tape over the spar slot with 2" wide masking tape or several strips of narrow masking tape.

Spread glue into the slot on the trailing edge of the wing core. Wipe glue onto the bonding area of the ailerons. Glue the Coroplast ailerons into slot in the trailing edge of core. The hinge cutout on the ailerons should be on the bottom side of the wing – along with the servo cutouts. Make sure that the ailerons are centered spanwise, and fully seated into the slots. If you are using PU glue, place a wide strip of masking tape on the foam wing core over the aileron glue joint – top and bottom of the wing. Place a strip of tape along the join line across the aileron and wing core to hold the aileron in place while the glue cures.

Glue the wingtips on. Make sure that you glue the aileron piece inside the trailing edge slot. You can use 5 minute epoxy if you want to be fast, otherwise use whatever glue you like. Just make sure that whatever glue you use is foam safe. Tape the tips securely in place.

Place plastic sheeting over wing core, put the wing assembly into the shuck with the spar slot (bottom side) up, place a board over the shuck and weight down on a flat surface while the glue cures. If you are using PU glue, put LOTS of weight on to help make sure that the glue does not expand out of the joints. Do not put more than about 2,000 pounds of weight on the wing, as more than this will start to deform the foam. Yes, that number is real – beaded styrofoam can take up to about 7 pounds per square inch before starting to deform. This core is 288 square inches. That times 7psi is 2016 pounds! Still..... Up to this limit, the more the better, especially when using PU glue! Better yet, if you have a vacuum bagging rig use it, as it can apply this kind of force evenly over the wing.

Once the glue has cured (overnight), remove any tape holding parts in place and carefully sand down any lumps and bumps that will probably have appeared in the spar, wingtip and aileron joint areas. If more than the lightest sanding is necessary, it is advisable to place a strip of masking tape on the core next to the area requiring sanding. This will help keep from sanding a divot into the core while trying to smooth down any bumps. It may be necessary to sand the ends of the ailerons a fraction of an inch to get them flush with the ends of the wing cores. We just leave the wingtips square on the ends, but you can shape the wingtips as desired with knife and careful strokes of coarse sandpaper. The blue foam will sand nicely, but will chunk out if not sanded gently, preferably in one direction.

The wings are already routed out for BlueBird BMS-371 servos. In our experience these are excellent micro servos and perfectly adequate to the task for this plane. Carefully enlarge the pockets as necessary if you are using some other servo. It is best for the pockets to be a bit tight so that the servos must be pressed into place. This helps hold them in place and keeps them from moving and wallowing out the pockets over the life of the plane.

Make sure that the aileron servos are properly centered using your radio. Place the output arms on the servos pointing straight out to the side. Cut the output arms so that there is just the one arm that will be sticking up out of the wing. Make sure that you set up the servos/arms one left and one right. Also make sure that you put the retaining screw in the servo output arms. Place the aileron servos in cutouts and route wires through the slot to wing center. You will need to make pockets for the connectors of the servo extension cables. Just hold the connectors in place and poke a knife into the foam around the connectors. Be careful not to cut any wires! Use the point of the knife to pick the foam out of the cutout. Place strips of reinforced packing tape over the servos to fix them in place. I also like to hold the inboard end of the extension cable in place with a few strips of packing tape.

Place a wrap of strapping tape around the wing, spanwise. Start on the bottom at one wingtip, run the tape along the bottom of the wing, over the spar slot, pulling it smooth but not tight. Wrap it around the wingtip up over the top and across the top of the wing, again pulling the tape smooth but not tight. Wrap it around the wingtip to the bottom and all the way across the bottom of the wing over the first layer of tape on the bottom. There will be two layers of strapping tape on the bottom of the wing. If you wish to save perhaps half an ounce of weight, you can just overlap the tape about eight inches at the center of the wing rather than having two layers going the full span on the bottom. You could leave the strapping tape off altogether ONLY IF you are planning on building very light, with perhaps less than a 150 watt power system for flying in small spaces.

If you wish to reinforce the leading edge against dings from weeds, hangar rash and whatever, place a strip of reinforced packing tape along the entire leading edge. Pull it snug and smooth. Tight is good, but it does not have to be REALLY tight.. After all, it is only sticking to styrofoam. It would be good to make the ends 3/4" or so long and slit and wrap them around the ends of the wingtips.

Cover the wing with your favorite foam safe covering material. Examples we have used are packing tape (zagi tape), Econokote and Ultracoat. You may wish to give the cores a light dusting of spray adhesive in order to maximize covering adhesion to the foam surface. It is advised to not cover over the Coroplast parts, but if you must, be VERY CAREFUL with the heat. Coroplast will wrinkle and warp with anything much more than the minimum heat usable over foam. Also observed is that the hinges are much stiffer if covered than if left as bare Coroplast. This can be too much for some small servos.

Apply a trim scheme to the wing as desired.

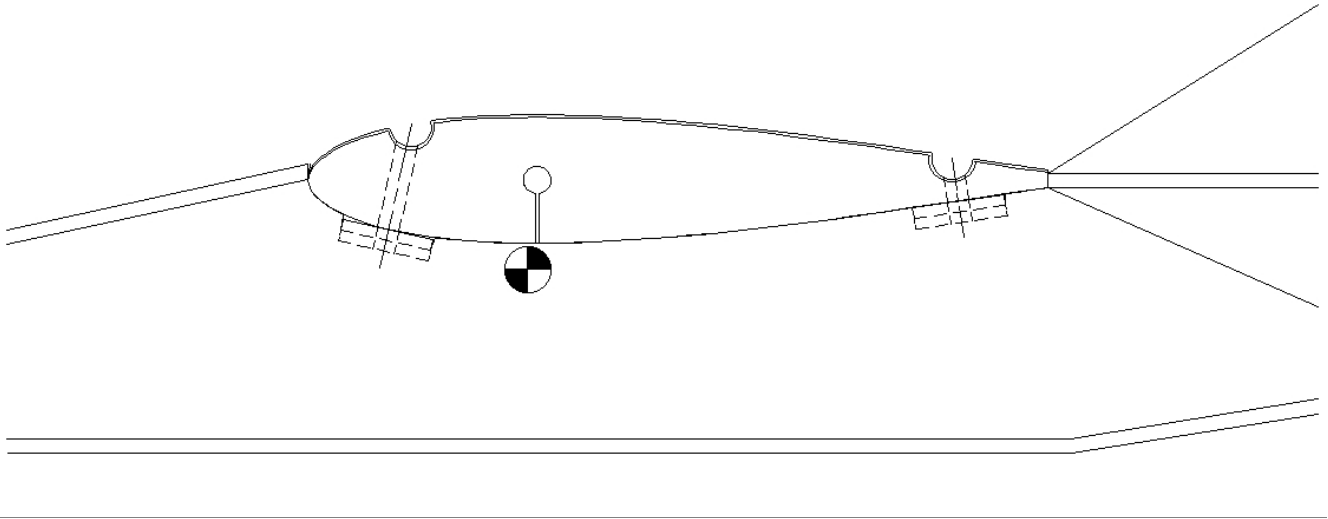
Mount the aileron control horns to the ailerons directly behind the servo arms. Follow the instructions in the tail assembly section for mounting the control horns to the ailerons. Make and install the aileron pushrods, making sure that the servos are centered (arms should be sticking straight out from the wing) and adjust until the ailerons are properly neutral (not up or down) and aligned with each other. Aileron movement should be about 1/4" each way, up and down.

*** Early production note ***

The early production kits have a flat piece of Lexan for the wing center reinforcement. The hole locations are marked with pilot holes. The pieces with the molded dimples will be in later kits. Other than that, the procedure is the same as follows.

*** Early production note ***

Mount the wing center reinforcement. At the leading and trailing edges, mark the exact spanwise center of the wing. Mark the exact center on the ends of the Lexan wing center reinforcement. Align the back end of the Lexan reinforcement at the trailing edge of the wing and align the center marks. Tape the back end down. Align the center marks at leading edge end and tape down. As you lay the Lexan reinforcement down, you will have to press the dimples into the foam wing. You may wish to use the eraser end of a pencil or a 1/4" or so dowel to help with this. Punch or drill bolt holes through the dimples and through the wing, perpendicular to the BOTTOM of the wing – Not the top. The dimples in the Lexan reinforcement allow the heads of the bolts to sit flat and square to the bolt shaft, as well as get them down out of the air stream. If you are unsure, properly position the wing on the fuselage and check the location of the mount tabs. Also, I find it easier on the mind if I first poke a thin tool (awl, bamboo skewer, 1/16" wire...) through the wing and feel that it goes through the hole / tee-nut in the mounting plate. Use the resulting angle as a guide and drill the hole in the wing out to 3/16" for the bolts.



Finishing up...

If you wish, you can sand the corners of the fuselage to take the edge off. Coroplast sands OK, but will end up with a very fine fuzzy surface. You can reduce this a bit by quickly running a hot covering iron over the corners. If you are really picky about finish and appearance, you could find some clear or color matching vinyl tape to put over the corners. This might make it look a bit better, and would also clean it up a bit aerodynamically speaking as well. Less turbulence, less drag, more speed....

Mount the air scoops to the sides of the nose. Pick a location that you like. Generally I like them about 1/2" back from the motor mount. Mark the location on the fuselage and cut holes a bit smaller than the footprint of the scoop against the side of the plane. Put a small bead of Goop around the edge of the scoop that will mate with the fuselage. The bead of glue should be a bit toward the inside of the scoop rather than around the outside. You only need a narrow bead of glue too – more here is not that much better. Carefully place the scoop and put a piece of tape over it to hold it in place while the glue cures. These pieces are small enough, and the glue line is narrow enough that they should be safely secured and handleable after 30-45 minutes.

Mount the wing on the fuselage. Place the tail in position – the tabs should line it up. Make sure that the wing and tail are in alignment. The horizontal stab should exactly meet the trailing edge of the wing and the vertical fins should fit exactly between the ailerons. You may need to trim the inboard ends of the ailerons slightly to not bind against the fins, but the fit should be as close as possible – even a little rub is acceptable. If the horizontal stab is not level and even with the trailing edge of the wing, trim the stab seat as necessary to make it so. Coroplast can be sanded, so use your sanding block to do so. Once everything lines up correctly, you can glue the tail onto the fuselage. Apply glue to the joint line and tape or clamp the tail in place until the glue is cured.

Mount the elevator servo. Put a dab of Goop or a small piece of servo mounting tape on the bottom of the servo mounting tabs. Push the servo down through the hole in the servo mounting plate. The fit should be snug – the glue or mounting tape is really just there to make sure that the servo does not work up out of place in the hole. Put a clevis on the end of a piece of pushrod wire and make a Z bend to go through the servo output arm. Take the output arm off of the servo, put the pushrod wire in one of the inner holes of the output arm and put the output arm back on the servo. Make sure that the servo is properly centered and the output arm is sticking straight out. Make sure that you put the screw in the output arm. Put the clevis on the outer hole of the elevator control horn. This should be a good setting for the first flights. Elevator movement should be about 1/8" each way, up and down.

We like to put a strip of velcro on the bottom of the radio/battery compartment, from the back of the motor to the front of the elevator servo. Place the mating strips of velcro on the receiver and one side of the battery pack. These strips of velcro attach the receiver and battery to the bottom of the plane.

Bolt the motor to the motor mount plate. Attach propeller and spinner using your favorite adapter. Check the fit of the prop and spinner with the front end of the fuselage. If necessary, trim back the front end of the fuselage for clearance.

It is suggested that you mount the ESC to the side of the fuselage, and tape the receiver lead down into the corner of the fuselage to keep it out of the way when inserting the battery.

Flying:

The suggested balance range is from the center of the spar to 3/8" forward, depending on how sensitive or stable you like your elevator control. Do NOT allow the balance to go behind the spar, as this will be a tail heavy condition and flying WILL BE VERY HAIRY!! Been there, done that, and I hope that You learn from my mistake! If balanced at the front edge of the spar slot, there will be almost no elevator correction required for level inverted flight, and will continue whatever dive angle with little if any self pullup. This is pretty much the minimum static stability recommended for most pilots.

As usual, it is best to have somebody else launch the plane – especially for the first flights so that the pilot can have his hands on the controls from the moment the plane becomes airborne. This plane launches well with a nice overhand shove and the nose pointed a bit high, perhaps 15 degrees. This plane is a bit pitch sensitive on launch, and the nose tends to drop on launch, even with the balance at the maximum aft location, so be prepared to give a gentle touch of up on launch. I tend to put a bit of up trim in before launch and dial it back out once airborne. This plane can have a pretty quick roll rate with the ailerons on high rate, but is not particularly sensitive at that. If the elevator throw is too high, the nose will bob in a tight loop or turn, but the plane is otherwise well behaved. Even with this excess of elevator throw, the elevator is not overly sensitive. Yes, it is sensitive, but not OVERLY so... We have not observed any tendency for this plane to snap or stall unless deliberately pushed to that point. While we will not claim that it is not possible, we have yet to experience flutter with the Marvel. This includes some very high speed dives with the Lehner 2100 Kv motor spinning an APC 6x4 prop.

Warning!

Although the **MARVEL** is a very well behaved aircraft, it is not a trainer or first airplane. It has a wide speed range, and can cause serious personal injury and property damage. Please use common sense in the operation of this aircraft.

Fly in a suitable area for a high speed aircraft, such as an AMA approved field.

Electric Aero Modeling USA assumes no liability for the operation or performance of this product. It is the responsibility of the operator to use this product in a safe and responsible manner.