Building the RCRCM MiniVec

Congratulations on purchasing an RCRCM MiniVec. Firstly, let's make sure that you have all the right parts with your model.

Check list:

Fuselage, RH wing, LH wing, RH stabiliser, LH stabiliser
Wing joiner, carbon tail joiner, steel tail joiner
Clevis x 7, pushrod x 4, pushrod coupler x 3
Servo covers x 4
Radio tray.

Radio gear that you will need:

Battery – we recommend the 2/3A size in 4.8V for this model.
Wing servos – Hitec HS125MG; Hyperion DS11AMB; Hyperion DS095FMD; or similar. Hyperion DS095FMD recommended.
Fuselage servos – Hitec 65MG; Savox 255MG. Savox 255MG recommended.

Adhesives and tools you will need:

Thick CA
30 minute epoxy
Microballoons
Epoxy thickener (this could be Cabosil, Thixotropic Silica, Milled Glass, or cotton flocks)
Soldering iron
1.6mm drill bit (if using thread L bend wing linkages only)

Fuselage Build

It is necessary to fit the ballast tube to the fuselage even if you do not intend to use fuselage ballast. The ballast tube imparts a lot of strength to the wing root area of the fuselage.

The tube is designed to run down the top spine of the fuselage.

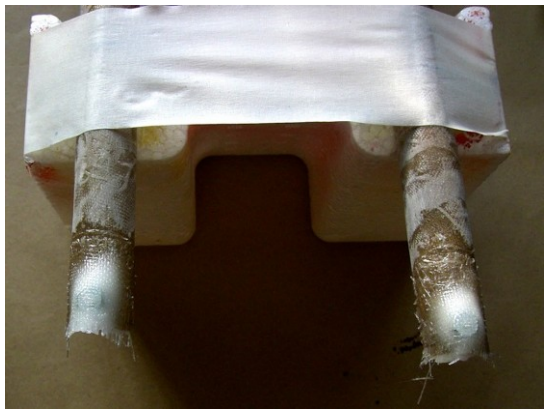
Let's prepare the tube:

First, cut the tube to 195mm long from the inside of the rear stopper.
Shape the front as shown. This fits 5 x 35mm long slugs plus a 20mm retainer.

I use an M5 retainer bolt through the retainer spacer to keep the ballast in place. Use a Dremel with a cut-off wheel to put a few slots into the sides of the nut to give the glue something to grab onto.

Drill a 6mm hole in lower surface of the tube 10mm from the front. Then tack the nut in place with some thick CA. Be careful not to get glue on the threads.

Put some wax or grease onto the M5 bolt and screw it into the nut from the inside of the tube.



Mix up some epoxy and thickener and splooge around the nut from the underside. Cap it off with a layer of 100g glass cloth if you have some as shown. When dry, the bolt will easily unscrew due to the grease/ wax you put on the threads. That's your tube prepared!

Now let’s prepare the fuselage for the ballast tube.

Glue some 80 grit sand paper to some 19mm dowel. If you don’t have any dowel to hand, then you can just wrap some 80 grit paper around the actual ballast tube and secure it at one end with a wrap of masking tape. Use this to lightly sand the inside of the fuselage for the length of the ballast tube. Also, use some loose 80 grit sand paper to prepare the inside of the canopy area for gluing in the servo tray.

We need to create a reference mark on the ballast to make sure that it is glued in the right place. Measure 111mm from the inside of the rear stopper in the ballast tube, and make a mark around the tube. This will align with the **REAR** edge of the wing joiner hole. This will put the tube directly centred on a CG of 80mm. Test fit the tube to the fuselage. Make sure that the tube sits well into the top spine of the fuse and **leaves the wing joiner hole completely clear**.

Tape your elevator and rudder snakes in the nose area so that they run just under the wing joiner hole. This is important - gluing the ballast tube in sets their position to a degree.

Turn the fuse upside down and make a cradle from a card box to hold it in position.

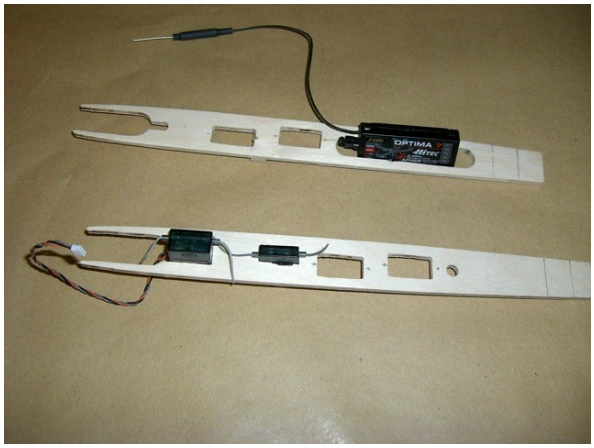
Mix up some epoxy and thickener. Put a large dollop onto the end of the ballast tube and run a thick bead of thickened epoxy down each side of the tube. Carefully insert the ballast tube into the fuselage and drop into place so that the epoxy fillets well between the sides of the tube and the fuse interior.

Ensure the mark on the tube lines up perfectly with the rear of the joiner hole as noted above. Picture below shows the final ballast tube position.

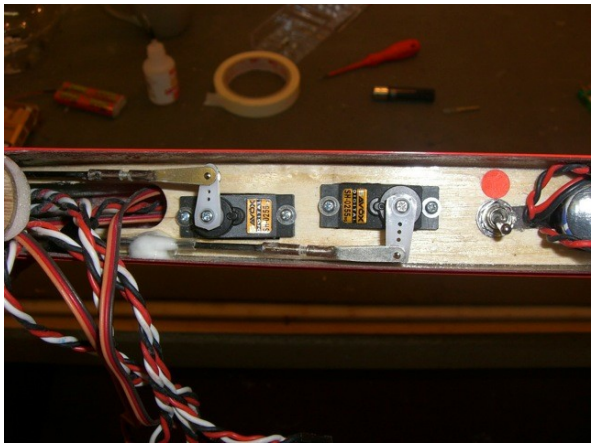
NOTE: ensure that the tube does not obscure the joiner hole!!! If necessary, grease/ wax the wing joiner and insert it to ensure that the ballast tube does not move out of place.

Now let’s get the tray glued in.

Here are a couple of trays prepared for different receivers.



Note the marks at the rear of the tray. They show the position of the wing joiner. The tray runs underneath the wing joiner with enough clearance for the snakes to also go under the joiner. It is wise to put your fuselage wiring loom in place prior to gluing the tray in as this saves having to try to thread it through after the tray is in position!



As per the lower fuselage in the first picture, thread some drinking straws over your pushrods to protect them from glue. Put your tray in place. Angle it such that the pushrod run will allow them to easily come up to the height of the servo head. Make sure that the marks line up with the joiner hole. Tack your tray in position with some thin CA in a couple of small places. Then, once you are happy with the placement, mix up some epoxy with thickener and make a fillet between the tray and the fuse to bond it in place. If you want to be a real pro, then you can lay some carbon tow into the fillet as shown!

Using a mixing stick, get some epoxy under the tray as well where accessible to create a filler underneath in as many place as you can. Now the nose of your MiniVec is very strong indeed! In the second picture, note the support blob of thickened epoxy used on the end of the pushrod outer for the elevator.

Now for the pushrods. Install your fuselage servos as shown.

I use a 13mm arm on the elevator servo and a 9mm arm on the rudder servo.

Cut your carbon pushrods to length and clean the ends with acetone.

Lightly sand the ends with 210 grit ready for gluing.

Install your clevises to the pushrod extenders, and screw them half way down the threads to that you have adjustment if required.

Ensure that the inside of your pushrod extenders are clean, and rough them up a little with a small file.

Centre your fuselage servos.

Tape your rudder up in the central position.
Ensure that the bellcrank is positioned centrally in the tailplane fillets on the fuselage.

Using epoxy, or thick CA, glue your pushrod extenders onto the ends of the carbon pushrods. Clip the clevis onto the servo horn before the glue dries so that you are sure to have everything centralised.

Once dry, stabilise the ends of the pushrod outers with a small blob of thickened epoxy to the fuse side as shown.

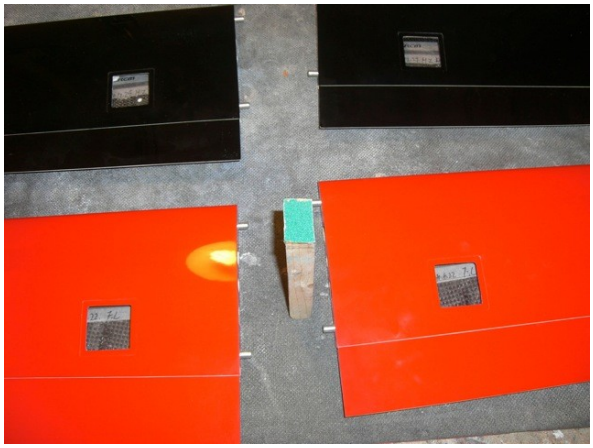
NOTE: Check that servos and surfaces are centred when gluing.

Wing Build

NOTE: The flap build presumes the use of a flap offset function in your transmitter programming.

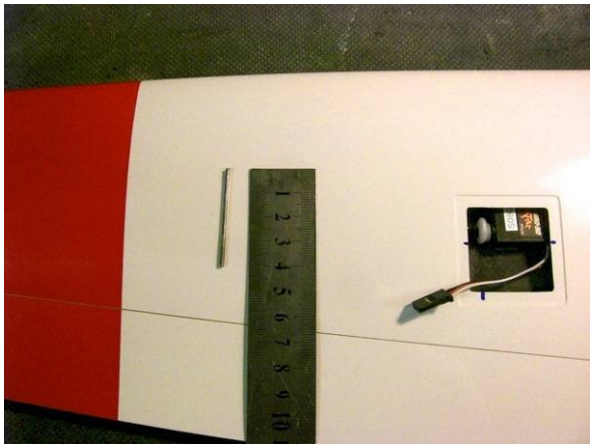
Make sure that all your hinges move freely and that your flap wipers **do not bind** when re-entering the wing trailing edge. To free up the hinge, carefully run the edge of a tightly folded piece of 210grit sandpaper along the underside of the hinge line to remove any excess epoxy still in the hingeline. **DO NOT OVERDO THIS OTHERWISE YOU MAY PART THE HINGE.**

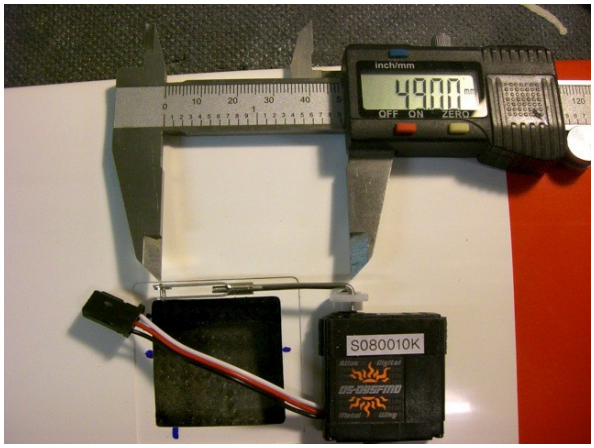
NOTE: If you do not want to use the threaded L bend linkage system as shown here, clevis – clevis is fine as well but harder to achieve the ideal servo arm length of 6mm without the clevis binding. An arm length of 7mm makes a clevis – clevis installation easier, but you may still need to relieve the flap clevis slightly to clear the servo hub.



CA a piece of 80 grit sandpaper to a block as shown as use it to sand the inside of the servo bays lightly to prepare them for glue.

Remove the lugs from the servos as shown as lightly sand the edges of their casings to provide a key for the glue.

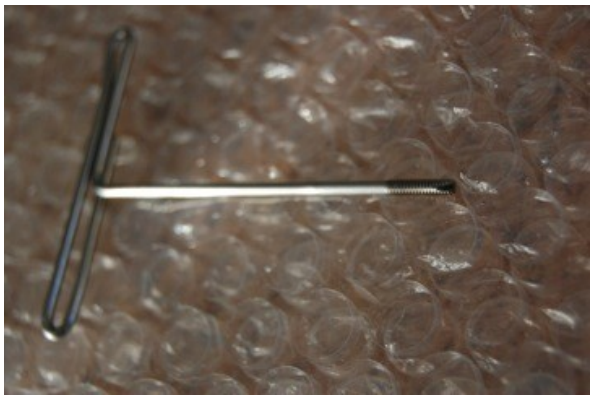




Cut the supplied pushrod to the length shown. Heat it up with a lighter or similar in a vice and slowly bend the threaded end as shown so that the length of the portion which goes through the servo arm is 7mm including the thickness of the pushrod. This is so that it will clear the servo casing when the servo is at full rotation.

Lightly dress the other end of the pushrod with a Dremel so that you can thread the clevis onto it. It is not necessary to use a die as once the pushrod is slightly roughed up and thinned at the end, the clevis will form its own threads when you screw it on. Set the length as shown, to 49mm from clevis pin to the threaded L bend. If you are using clevis – clevis, then the dimension is the same – 49mm from clevis pin to clevis pin.

Set this position by soldering the clevis to the pushrod. Ensure that the clevis pin and the threaded L bend are perfectly in line.

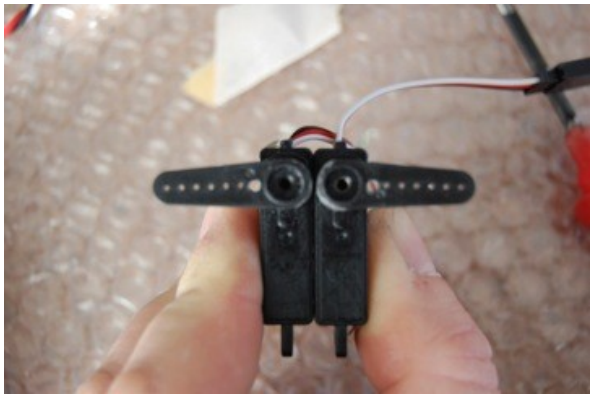
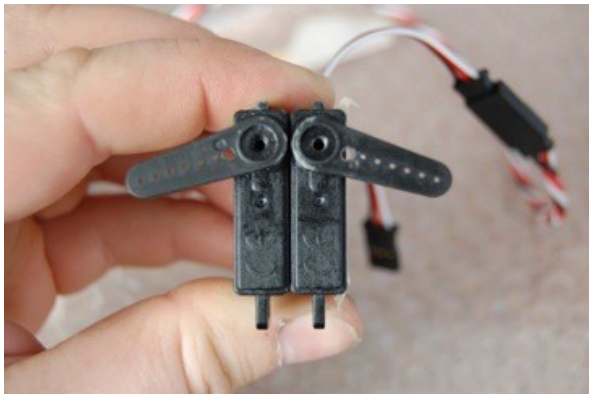


To thread it into the servo arm, drill a 1.6mm hole 6mm from the centre of the hub.

Then using an M2 pushrod, make a tap by bending it as shown, and putting a slot into the end using a thin Dremel cut-off wheel. Use this tap to put the M2 threads into the 1.6mm hole in the servo arm.

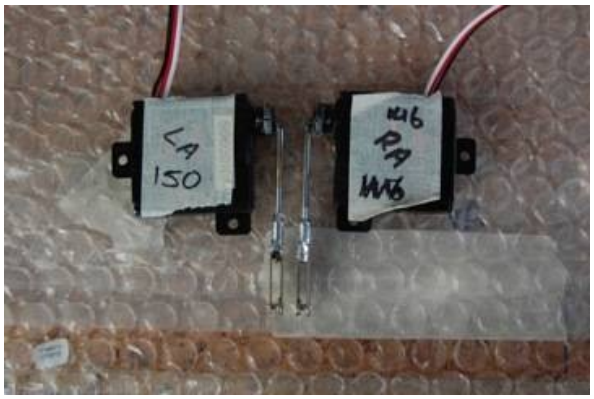
Here's an example of a threaded L bend linkage installed to a servo arm. This one has not yet been soldered. The bearing in the servo arm for the linkage are the threads themselves.

Now we need to set up the servo arms.

Once you have the holes in the arms, centre up your servos as shown. Ideally, do this with a servo tester. Note the subtrim numbers for each servo. Doing it with the arms untrimmed and left long makes it easy to get them symmetrically placed by eye.

Once centred, remove the arms and move them round by one tooth as shown in the second picture. Put threadlock onto the servo screw and install the servo screw.

Then trim the servo arms as shown and install the linkages as shown above.

Aileron servo install:
Centre the servo as shown above. Tape the tip of your aileron flush with the tip of the wing in the neutral position. Once your linkage is connected and the servo in place in the wing, centre the servo once more to be sure. Then proceed to glueing the servo in as shown overleaf. Ensure that the linkage runs perpendicular to the hingeline. Your servo will now be fixed in at neutral, with the surface also at neutral.

Flap servo install:
Offer the wing up to the fuse. Find the neutral position. Then move the flap UP by 7.5mm. This is your maximum up movement. Tape the flap up so that it cannot move from this precise position. Then, using your servo tester, drive your flap servo to its endpoint so that the arm is as far towards the spar as possible. This is your max UP servo position. Connect up the flap linkage, and install the servo. Ensure the linkage runs perpendicular to the hingeline. Ensure that your flap is still in the correct position as decribed above, and the servo drive to its fully up endpoint.

Reference material: http://www.rcrcm.com/pdf/RCRCM-Airframes-ail-flap.pdf


Then install the servo to the wing as shown. Ensure that the wiring loom is loose installed to the servos prior to gluing. Route the loom in FRONT of the servos to ensure that it does not interfere with the linkage. Put some heatshrink over the connectors to ensure that they remain secure. Bring the green mpx connector out through the hole provided in the wing root.

NOTE: To glue the servo in use 30 minute epoxy with a very large amount of microballoons mixed in. Only use a SMALL amount of glue on the perimeter of the underside of the servo.

To create a very secure slop free linkage it is essential to tie the servo in to the lower skin as well as the top skin. To do this you can use 1mm ply or 1mm G10 epoxy board as shown below. Again, use glue sparingly to secure the bridge to the front and rear of the aperture, and then also to secure the servo to the centre of the bridge.

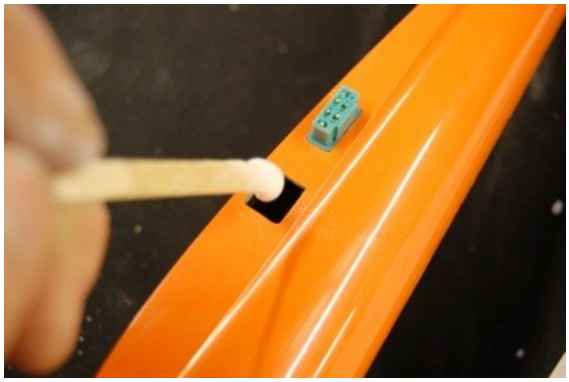

To remove, Dremel the bridge free and remove it, and then pop the servo free of the upper skin by twisting it.

NOTE: Do not over prepare your servos with lots of scuffing with sandpaper. This will make them very difficult to remove in the event of failure. Only put minimal scuffing around the edges, and only put a <2mm bead of glue around the perimeter of the base of the servo when gluing in. Use a LOT of microballoons in the mix to prevent the epoxy being too strong.

Wiring Loom

The loom route in the fuselage is under the rear of the tray, and then up where your receiver is. Prepare the ports on the fuselage as shown below by removing all the paint from the mating surface in the aperture. Then glue the mpx connectors in place using thick CA (photos show the Typhoon fuselage but the install procedure for these parts is the same).

Then, through the wing joiner hole, put some thickened epoxy onto the back of the connectors to secure them really well.



Securing the wing-side can be done as an automating connection, but the simplest way to do it is to simply leave the wing side loose and plug it on manually when sliding the wing on.

It is wise to reinforce the solder connections on the wing side by gluing a small piece of ply under the connections to the back of the mpx connector and then putting some thickened epoxy onto the ply piece to cover all the connections and therefore secure them.

Balancing and Set-up

I prefer to balance models using lead shot and epoxy rather than making a moulded lead piece for the nose.

Tape a small plastic bag to the nose of the model leaving it open at the top.

Put the model on a balancer and pour lead shot into the bag until the model balances. For now, balance it at 85mm from the leading edge.

Remove the bag from the nose and put to one side. Remove the battery from the nose of the model. Now mix up enough 30min epoxy to pot the lead shot into the nose and remove some of the lead shot to allow for the weight of the epoxy. Mix up the shot and epoxy and pour the mixture into the nose of the model. I like to place a bit of greased cellophane around the battery and replace it into the nose of the model so make sure that the nose weight doesn't get in the way of the battery. You should find that there is just enough room.

Once dry, remove the battery and the cellophane.

Now rebalance the model and add removable nose weights either side of the battery to give you a CG of 77mm. This will be your CG for the maiden flight. Most pilots end up flying the MiniVec around 80mm.

Suggested set-up:

Elevator: measured at trailing edge root: 12mm each way high; 9mm each way low.

Rudder: measured at base: 26mm each way high; 21mm each way low.

Aileron: measured at tip: 9mm each way high; 7mm each way low.

Flap as aileron measured at root: 6mm each way high; 4mm each way low.

Snapflap: measured at flap root: 7.5mm each way, worked out along the aileron to maintain a straight trailing edge; my snapflap throw stays the same for high or low rate elevator btw.

Camber: measured at flap root; 4mm each way, worked out along aileron to keep trailing edge in line; elevator compensation 0.75mm each way.

Crow: Flaps at root 47mm down; ailerons at tip 4mm up; elevator 9mm down.

Enjoy!

Zim @ www.sloperacer.co.uk