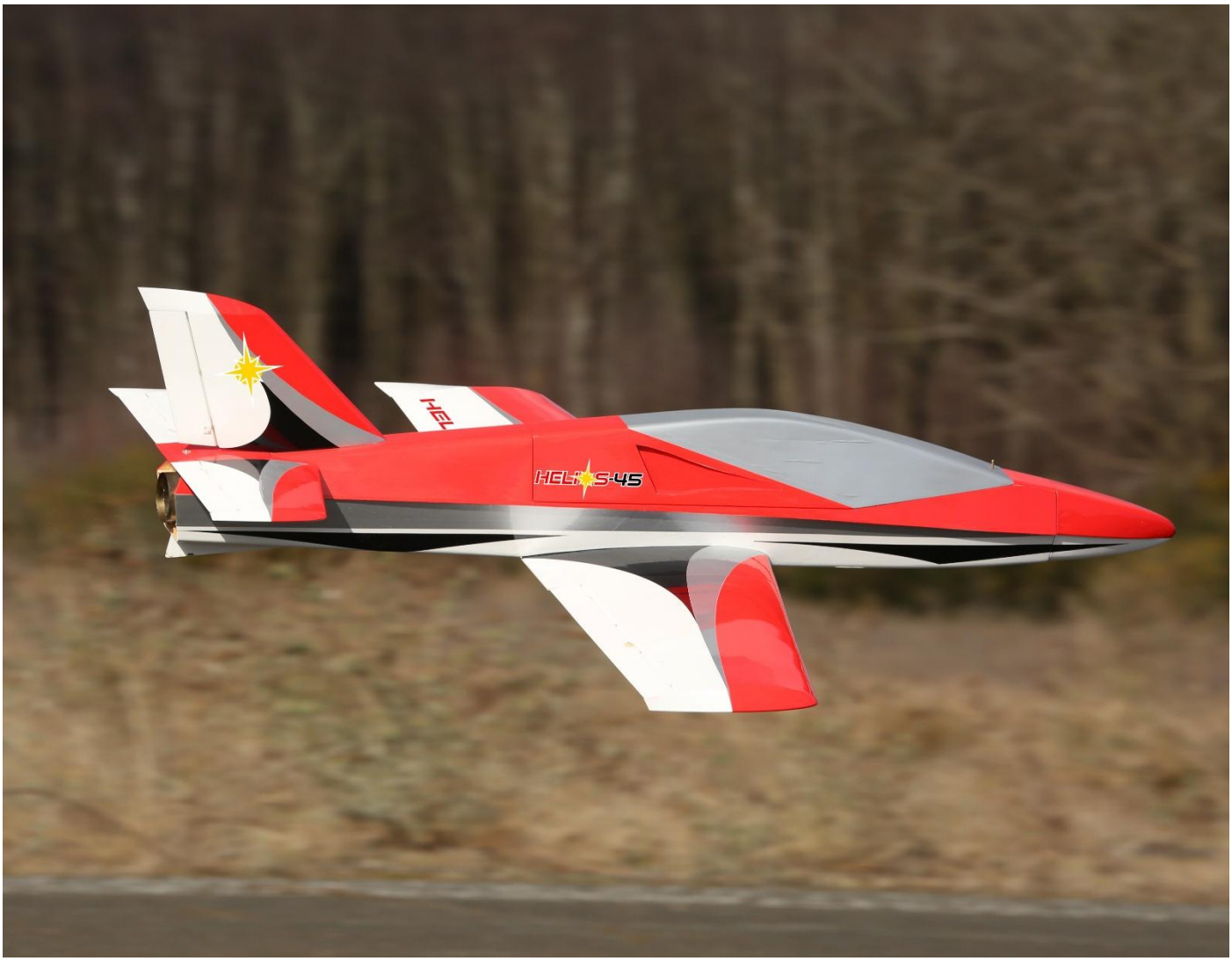
# Auriga Models Helios-45 Assembly Manual




**Helios-45 Specification**

| | |
|---|---|
| Wingspan: | 1430mm |
| Length: | 1530mm |
| Weight: | 4.6kg (with header tank full) |
| Turbine: | 45 Newton Thrust |
| Servos: | 7 Mini/Micro Required |

Thank you for buying our Helios-45 jet, which has been developed to be quick to assemble and a pleasure to own and fly. The Helios, being a jet powered model, has an impressive performance and as such it is vital that great care and attention is taken during assembly to ensure a safe and reliable airframe. You have invested a significant sum in your model, so it is false economy to use any items to complete the aircraft that are not of the quality required; this covers everything from adhesives, through turbine, radio equipment and on-board batteries etc. If at any point during the assembly you are in any doubt about the next step to take please contact your supplier – turbine powered models are not the place for guesswork!

It is highly recommended that you carefully inspect all parts of your Helios before starting assembly, if there appear to be any faulty parts or items missing please contact your supplier for advice/replacement. If you have not assembled a turbine powered model before we suggest that if at all possible you find a local modeller who has and ask them to act as a mentor/second pair of eyes, to ensure the model is assembled to the highest standards.
When the model is ready to fly we strongly suggest finding a site with a reasonably long runway, even if this means travelling some distance. Many models have been destroyed on their first flight due to a take-off or landing incident on a short runway, often due to overshooting on the first landing, when a turbine takes several seconds to accelerate from idle to full power. Having a long runway available eliminates this risk and reduces the stress level on the pilot, allowing him to concentrate more on flying the model. If you have never flown a jet before, please consider the option of getting a pilot that is experienced in this type of model to carry out the first flights – this allows the model to be trimmed correctly before you take control. Please note that some countries have legal restrictions or requirements for model turbine flying, so do ensure you are operating legally at all times.

**Parts listing:**


| | | |
|---|---|---|
| Fuselage with Centre Section | Canopy/Hatch | Nose Cone |
| Right Wing Panel w/Aileron | Left Wing Panel w/Aileron | Tailplane w/Elevators |
| Fin/Rudder | Decals | Control Accessories, hinges, etc |

**Optional Parts:**

| | |
|---|---|
| L-HELI01TANK: | Fuel Tank Set |
| A-HELI01PIPE: | Twin Wall Tailpipe |
| A-HELI01RET: | Electric Retract Set with Oleos, Wheels, Brakes etc |
| P-MJ7758HVSET: | Set of 7 high quality metal cased, metal geared, coreless motor micro servos |
| P-HELI01LEADS: | Extension lead set with the correct lengths for all flying control servos |

**Required to complete:**

**45 Newton Turbine:** Xicoy X45 and KingTech K-45G3/4 turbines were used in the prototype models, and both provided a perfect balance between power and weight.

**Radio:** A 10-channel radio will be required to allow all the functions of the Helios to be fully utilised. Fitting a gyro will be beneficial, particularly when flying in gusty conditions, we used the Futaba GYA573.

**Servos:** The Helios requires a total of 7 high quality metal gear servos for the flying surfaces and nosewheel steering. Prototype models used MJ-7758HV micro servos of 6.3 kg.cm torque at 7.4v for the ailerons (2 req), elevators (2 req), rudder (1 req), flap (1 req) and nosewheel steering (1 req), and one was also flown with Hitec servos: HS-5085MG servos of 4.3 kg.cm torque for the ailerons (2 req), elevator (2 req), rudder (1 req) and flap (1 req) as well as an HS-70MG servo of 3.0kg.cm torque for nosewheel steering.

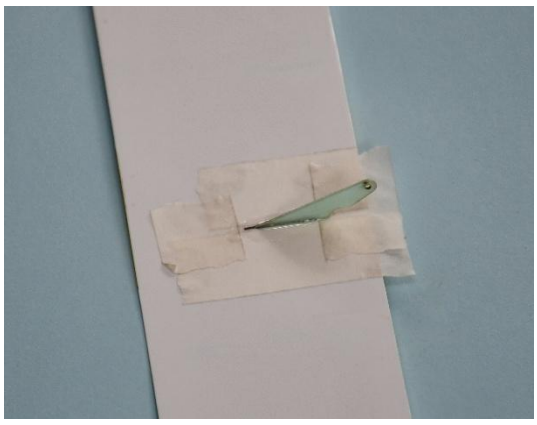
**Batteries:** We used either 1 (1600mAh) or 2 (1000 to 1400mAh) 7.4v Li-Po packs for the on-board radio equipment when using MJ-7758HV servos, (2 packs when using a PowerBox style switch) or a 6.6v 1600mAh Li-Fe battery when using Hitec servos, (a Li-Po battery is of too high a voltage for the Hitec servos we used). A 9.9v 2100mAh Li-Fe battery was used for the KingTech turbine and a 7.4v 2200mAh Li-Po pack for the Xicoy X45.

## Assembly Instructions:

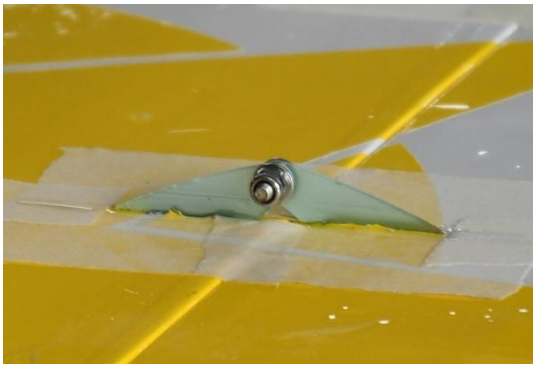
**Control Surface Hinging:**

Glue the supplied pin hinges into the control surfaces (elevator shown here), either epoxy or a dedicated hinge glue can be used for this, but it is recommended that the hinge pin is oiled before applying glue to avoid the hinge being glued solid! Do ensure all the pins are aligned and clean off any excess glue before it dries. Next glue the exposed parts of the pin hinges into the flying surfaces, wiping away any excess glue immediately – a solvent such as cellulose thinners can be used here. Carry this out for both elevators, both ailerons and the rudder.

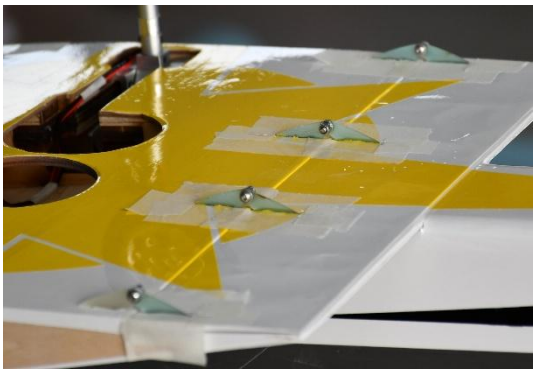
Check the fit of the flap horn in the flap, then roughen the tab at the bottom of the horn with coarse sandpaper. Apply masking tape around 2mm outside of the slot in the flap, finally using epoxy to glue the horn into place in the flap. Remove any excess epoxy with tissue, then carefully remove the masking tape before the epoxy cures, without disturbing the horn.



Assemble the flap hinges with the M2 screws, washers and nuts supplied. Roughen the tabs on the hinges that slot into the underside of the wing and flap, offer the flap into position, then apply masking tape as shown around 2mm outside the slots in the fuselage and flap.

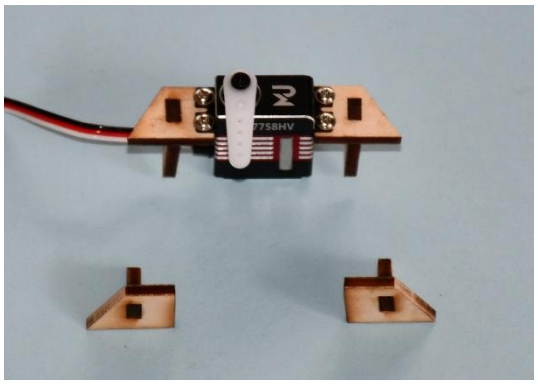


Dry fit all of the hinges, noting that the hinges with the deeper tabs go into the fuselage and those with the narrower tabs go into the flap, and then use masking tape to hold the flap in position, finally using epoxy to glue the hinges into place in the wing and flap. Remove any excess epoxy with tissue, then remove the masking tape before the epoxy cures.

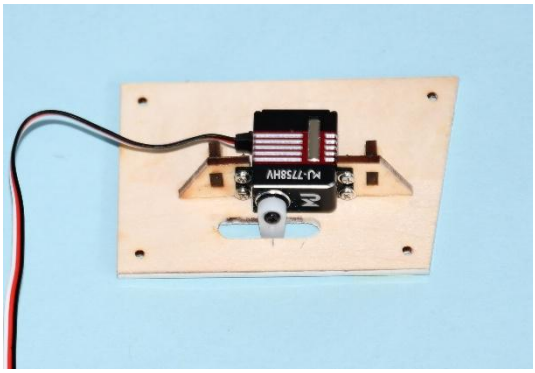


**Servo Installation:**

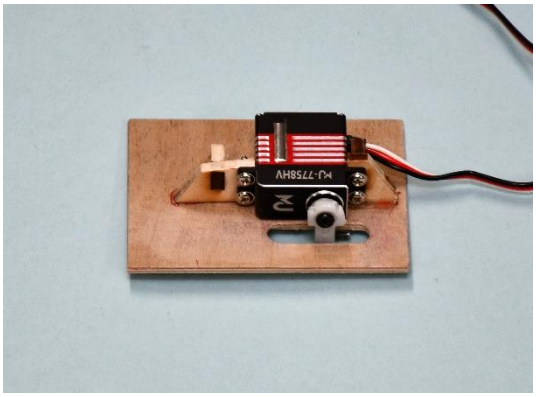
Take the laser cut ply parts supplied for servo mounting and glue these together as shown, using Cyanoacrylate glue – ensure that matching pairs are made! The servos to be used can then be fitted to the mounts as shown using the screws supplied with the servos, note that it is normal with jets not to use the supplied ferrules and grommets, due to the lack of vibration. Do use a washer under the head of the screw to ensure the screw does not pull through the hole in the servo lug.



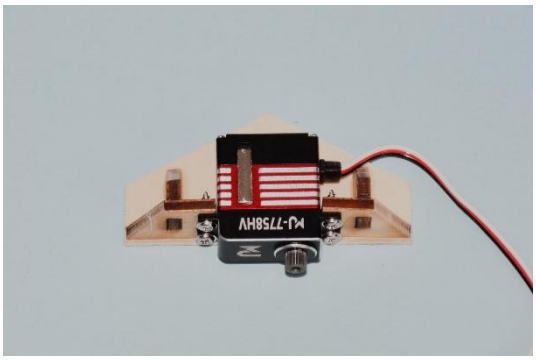
Glue the servo mounts to the servo hatches as shown (aileron servo in this case), carefully positioning the servo arm in the centre of the slot in the hatch. Do take great care to avoid the servo being glued to the hatch itself!



The servo mounts for the elevator servos have to be modified as shown – the one at the front of the hatch has to be cut down in width and that at the rear has to be sanded down to allow it to fit into the tailplane.

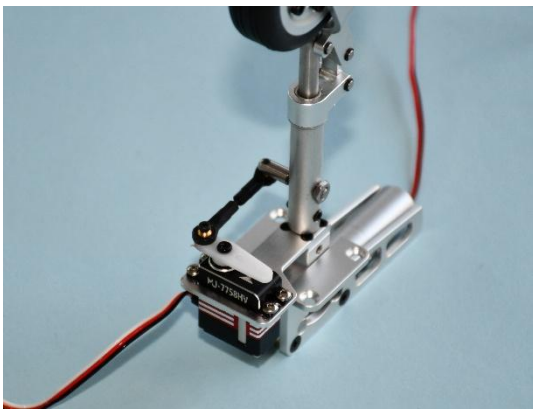


The flap servo mount can be glued into the fuselage, but this does make later removal of the servo difficult, so the alternative is to cut a piece of 3mm (1/8”) ply as shown and then glue the servo mounts to this. This piece can then be secured to the fuselage with screws to allow easy removal.



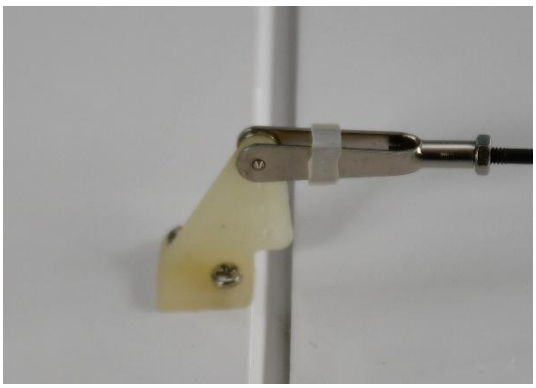
**Nose Retract:**

Fit the nosewheel steering servo into the mounting as shown – use threadlock on the screws to ensure they cannot come loose. Screw the steering arm into the noseleg and secure with the locknut, note that the arm has to be kept short to allow the leg to retract correctly. Fit the steering linkage, with the servo centred.

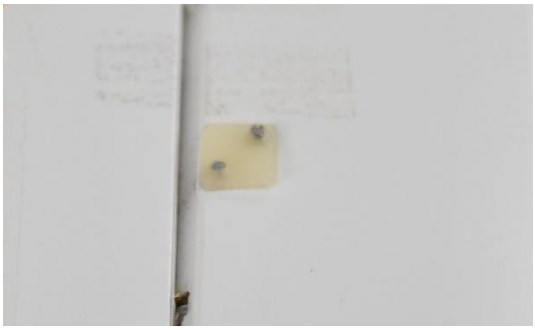


**Linkages:**

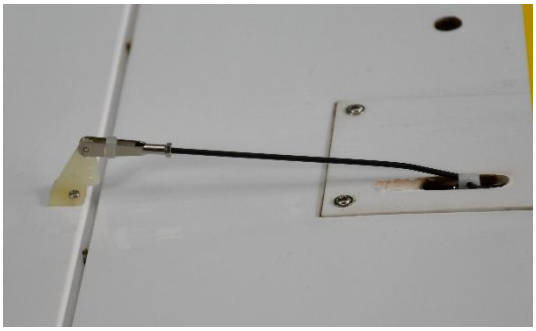
Install the control horn as shown, drilling 2mm diameter clearance holes in the control surface for the securing M2 screws.



Screw the M2 screws into the horn plate and carefully tighten, but do not overtighten and crush the wood of the control surface. Cut off the excess thread and file or grind smooth.

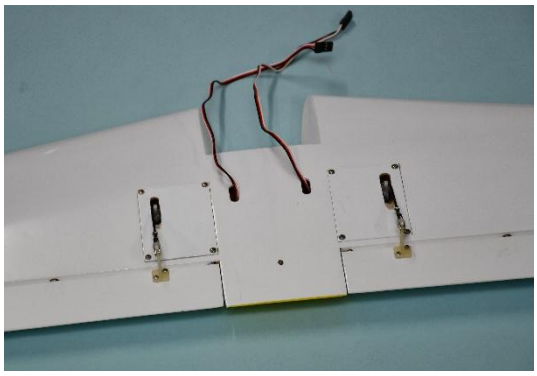


Centre the servo and fit the pushrod as shown, with the “Z” bend fitted into the servo horn, and the clevis clipped to the control horn. Adjust the length of the pushrod by screwing the clevis in or out, and then clamp with the M2 nut. Fit a clevis keeper as shown, cut from fuel tubing. Note the slight bend in the aileron pushrod to allow clearance at full deflection.
Carry this process out for both ailerons and elevators.



The rudder linkage is similar to the other control linkages apart from the use of a balljoint, which allows for the swept back hinge line.

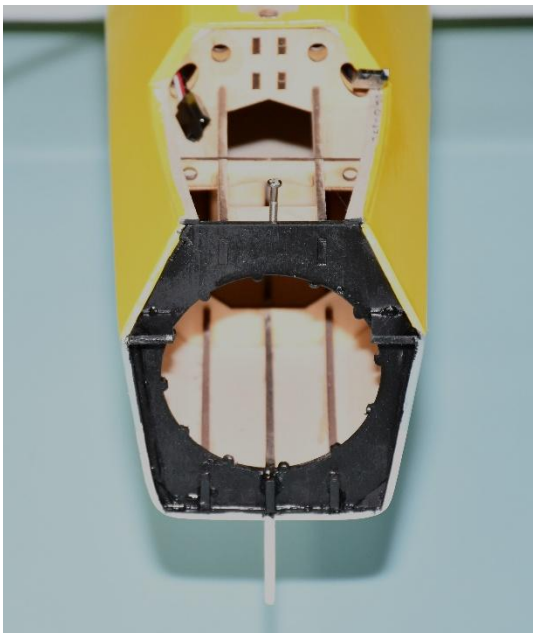
When the elevator servos are installed their leads must emerge from the slots in the underside of the tailplane as shown here.



**Fuselage:**

It is worth giving the inside of the fuselage a coat of paint or clear lacquer to protect the wood from any fuel leaks. We masked the outside of the fuselage and gave the interior a sprayed coat of grey primer, then applied a thin coat of stone effect paint, finishing off with a clearcoat to seal.

We also painted the rear former black, both to protect the wood and improve the appearance.



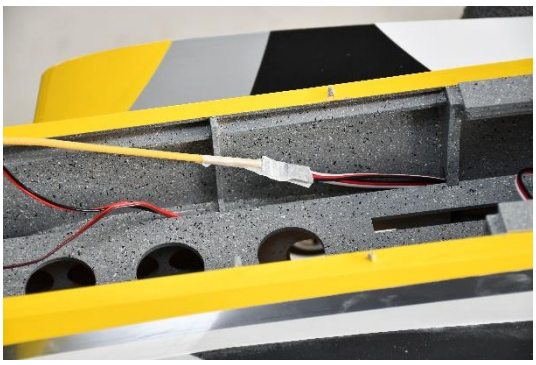
**Landing Gear Installation**

Offer up the main landing gear units and check their fit in the fuselage. Once happy, use the supplied screws to install the landing gear units. Use tape to secure the brake leads to the oleo leg, making sure that they are kept well clear of the wheel/tyre. We wrap a couple of turns of masking tape around the leads to allow these to be glued to the airframe, again making sure that the leads are kept away from the moving/rotating parts of the landing gear. Finally, pass the leads through the access holes into the fuselage and run them forward towards the nose.

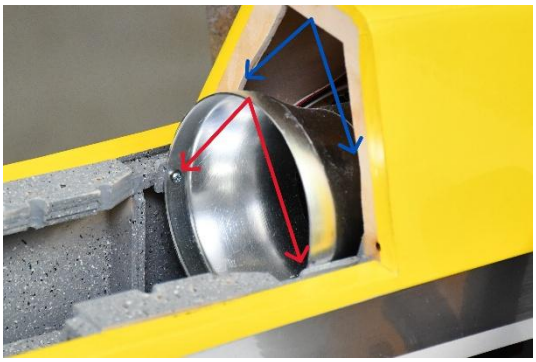
The nose retract unit is installed using the supplied M3 screws into the captive nuts. Make sure that the lead from the unit is held well clear of the noseleg as it retracts and extends.

**Equipment Installation:**

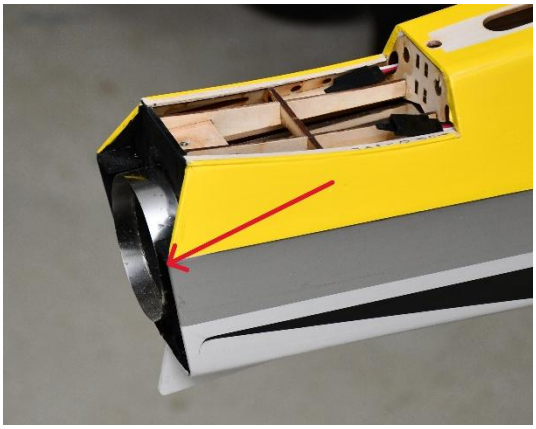
We use a length of flexible pushrod to pull extension leads through the pre-cut holes in the fuselage as shown, temporarily attaching the leads to the pushrod with masking tape. There are a variety of holes in the structure so the most suitable of these should be used to give a neat layout of servo and extension leads for the main retract units. Note that the extension leads for the elevator and rudder servo can be attached to the fuselage sides as well as being run through the holes in the formers. We use a couple of turns of masking tape over the leads, and then use cyano to glue the masking tape to the fuselage. Do ensure that all of these leads are secured so that they cannot make contact with the tailpipe.



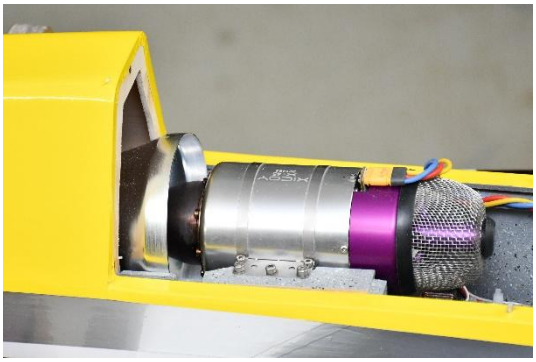
Slide the tailpipe into place – it may prove necessary to sand away a little of the former at the front of the rear fuselage, roughly where the blue arrows point. Sit the turbine being used on the mounts and then align the front of the tailpipe with the exhaust cone of the turbine, looking from the rear of the model. See the photo below for the correct positioning of the rear of the tailpipe, and once happy, drill through the mounting holes in the tailpipe intake cone for the mounting screws – be careful not to drill right though the fuselage sides! Use self-tapping screws to secure the tailpipe in place.



The red arrow shows the very rear of the fuselage – the end of the tailpipe should be in line with this.



Install the turbine, following the turbine manufacturers' recommendations on the gap between the rear of the turbine tail cone and the front of the parallel section of the tailpipe. Note that it may be necessary to cut away small sections of the ply turbine mounts to give clearance for the nuts and bolts that clamp the alloy turbine mounts together. Take great care to ensure that the centreline of the turbine is perfectly aligned with the centreline of the tailpipe, both vertically and horizontally, so that the turbine exhausts exactly down the centre of the tailpipe.



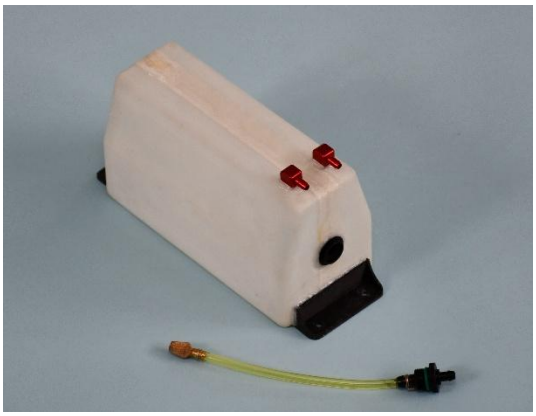
**Fin Mounting:**

It is easiest to install the fin/rudder after the tailplane has been fitted, although it is of course possible to remove the tailplane as and when required. We used 20-minute epoxy on the carbon fin tube where it slides into the fuselage and white glue (PVA), on the front peg and fin to fuselage joint, as it is easier to remove any excess glue before it dries. Check the alignment of the fin from the front of the fuselage, with the wings fitted to ensure all is square – hold the fin in place with strips of masking tape from the top of the fin to the tailplane tips until all the glue has dried. Do ensure that the rudder extension lead is fed through into the fin as shown.


**Fuel System:**

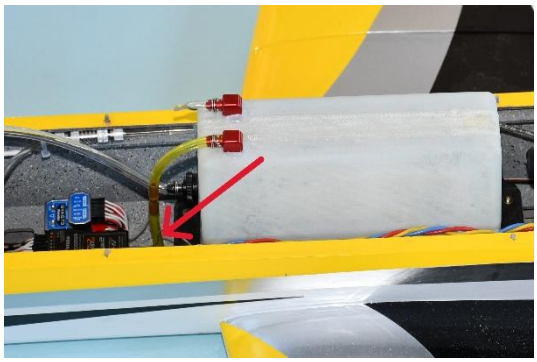
To enable easy mounting of the Xicoy X45 fuel pump we cut a small ply mount, drilled small holes for the countersunk securing screws, and attached the pump to the plate as shown. Two small holes are drilled though the plate to allow a couple of screws to be used to attach the mount to the main equipment plate.


Insert the sintered clunk and line into the fuel tank, and tighten the fuel tank cap finger tight. It is worth blocking off all of the fuel connections with short lengths of tube and then plunging the tank into hot water (wear gloves). The heat will increase the internal pressure in the tank, and any small leaks will be shown by a stream of bubbles.
If any leaks are found, the tank should be completely dried and either thin cyano or epoxy used to seal the leaks before retesting. Once happy flush the inside of the tank with a little fuel, empty this out and then refit the clunk/fuel cap assembly, tightening the cap by hand as far as possible.

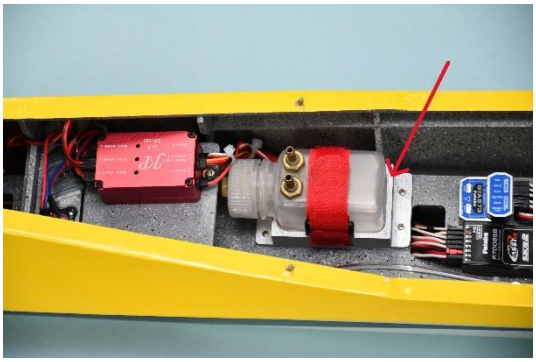


The fuel tube and turbine lead are run along the sides of the fuselage as shown, being held in place with small cable ties through holes drilled in the ply side strips
The fuel tank is secured in place with 4 small screws, then fill and overflow tubing fitted, note the use of safety wiring, and that the second vent is sealed shut when using a fuel system with a header tank. (which we recommend). If a header tank is not being used the second vent is required to allow filling.

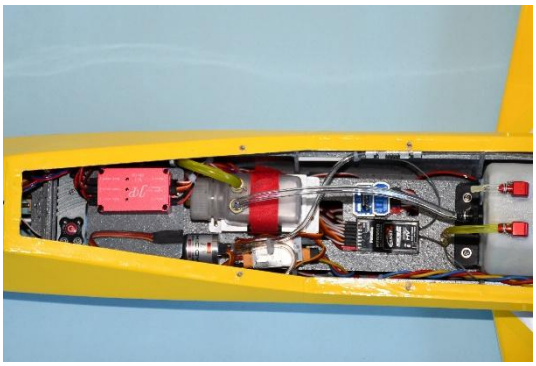
The overflow tube (red arrow) is run down through a hole drilled in the equipment plate and then to a short length of brass tubing that should be glued through the bottom of the fuselage with epoxy. This should only extend beyond the underside of the fuselage by around 4mm and ideally have the front angled towards the direction of flight.



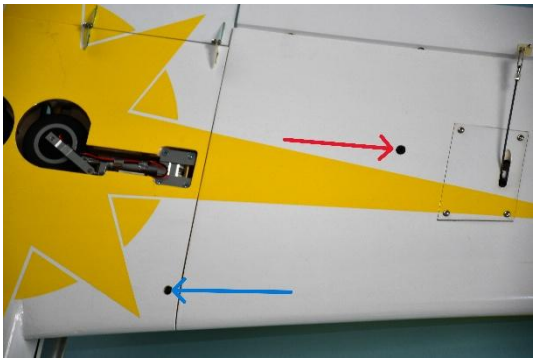
The header tank, if used, can be mounted as shown, Optionally using the 3D printed mount we offer (red arrow). Note also the fitment of the JP retract controller, receiver and gyro.



This photo is of a typical layout, and shows the fuel pump, PowerBox SensorSwitch and Xicoy turbine hub plus other on-board electronics.



The wing panels are attached to the fuselage centre section with a pair of clamps, the rear one (red arrow) tightens on the wing tube and the front one (blue arrow) on the anti-rotation peg



**Balance Point and Movements**

- **Balance Point:** The balance point should be 110mm back from the leading edge of the wing at the joint between the centre section and wing panels. Depending on the equipment used, the installation and the batteries selected, it may be necessary to add a little noseweight, which should be positioned as far forward as possible. Note that all balancing should be carried out with the header tank (if used) full of fuel.

- **Movements:**

| | |
|---|---|
| Aileron: | 10mm each way with 30% exponential |
| Elevator: | 7mm each way with 20% exponential |
| Rudder: | 20mm each way with 20% exponential |
| Flap: | 25mm for take-off, 80mm for landing |

If your radio has conditions, we suggest that this function is used, and activated by the flap switch, separating the elevator trim so that this can be different in each condition, normal flight, take-off and landing. If your radio does not offer conditions or equivalent, we recommend mixing in around 4% of down elevator trim (Not 4% of servo travel!) with take-off flap and 12% of down elevator trim with full flap, these amounts can then be adjusted after test flying. Note that these amounts can also be a good starting point when using conditions, so can be preset before test flying.

The Helios-45 is a pleasure to fly, being exceptionally stable and smooth and with no nasty characteristics we have been able to detect. With the balance point and movements as recommended the model is responsive without being twitchy, has very docile handling indeed at low flying speeds and an almost non-existent stall if pushed. Having said this, it is a jet, and is capable of reasonably high maximum speed, so safe flying procedures should always be followed.

For first flights do find a flying site with a long clear runway – carry out a thorough pre-flight checkout and then make a couple of high-speed taxi runs to confirm that the model is running straight, that the brakes are effective and that no air bubbles are appearing in the header tank. With a suitable turbine the full fuel load should give around 6 to 7 minutes safe flying time depending on the amount of time the turbine is at full throttle, but it is suggested that the first flight be kept much shorter than this. Allow the model to reach full speed on the ground before gently rotating and climbing away – carry out any required trimming then use the remainder of the first flight to get comfortable with the flying characteristics and the slow speed handling, trying out the effects of flap deployment. Keep a reasonable speed during the landing approach for safety and allow the model to land long if the speed/height are excessive, although if things really go badly wrong go to full power and once the turbine has spooled up pull up and fly another approach.

All normal aerobatics are possible with the Helios-45, loops, standard, slow and point rolls, inverted etc; etc can all be easily performed.

We are sure that you will enjoy many very enjoyable flights with your new Helios-45!

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