Viper Jet MKII Composite

Assembly Manual

Specifications

Material:	Composite Fuselage, Balsa Wings
Length:	39.9 in
Wing Span:	40.2 in
Wing Area:	1.91 ft²
All Up Weight:	54 - 65 oz
Wing Loading:	28 - 34 oz/ft²
EDF:	70mm with 5 Blade Fan
Recommended Motor:	2842MB1 @ 3200KV (1100W)
Recommended ESC:	80A+
Recommended Battery:	LiPo, 4s 3300 - 3700 mAh
Radio System:	5 - 6 Channel (optional retracts)

SAPAC AMERICA

The SAPAC Viper Jet MKII Composite is not a toy. It is an advanced remote control aircraft requiring advanced building techniques and advanced piloting techniques. If this is your first remote control aircraft you are encouraged to find an experienced builder and an experienced pilot to help you enjoy your Viper Jet.

We recommend you read through the complete manual before starting your assembly to familiarize yourself with the steps you will be following when putting together your Viper Jet.

Information in this document is subject to change without notice

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September 2009 **P/N SAP13600M** **Rev. A02**

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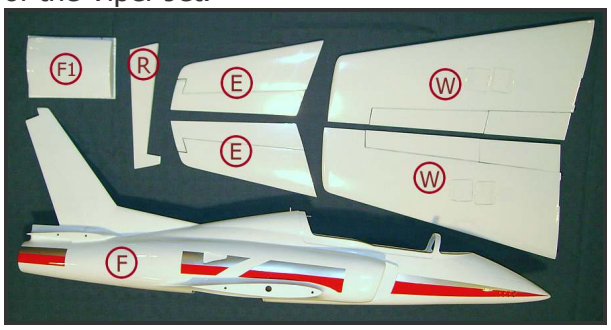
What's in the Box

Airframe Components

- The following are the main airframe components of the Viper Jet.

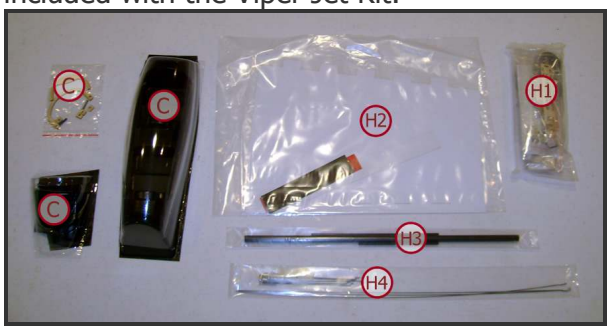


Airframe components

- F – Main Fuselage
- F1 – Fan Access Hatch Cover
- W – Wings
- E – Stabilizers (Elevators)
- R – Rudder

Additional Kit Components

- The following are the additional components included with the Viper Jet Kit.

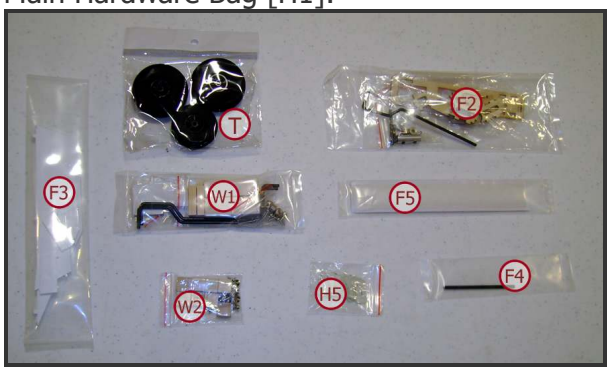


Additional kit components

- H1 – Main Hardware Bag
- H2 – Thrust Duct & Decals
- H3 – Wing Tube & Horizontal Stabilizer Mounting Tubes
- H4 – Control Horns & Control Rods
- C – Cockpit & Canopy

Main Hardware Bag Contents [H1]

- The following are the components packed in the Main Hardware Bag [H1]:

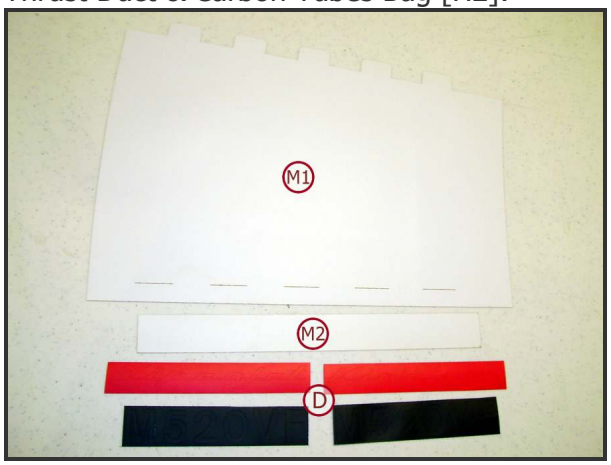


Main hardware

- F2 – Fixed Landing Gear Hardware, Nose
- F3 – Ventral Fins & Winglets
- F4 – Carbon Fiber Pitot Tube
- F5 – Hook & Loop Fastener for Battery
- W1 – Fixed Landing Gear Hardware, Main
- W2 – Wing Servo Hardware
- H5 – Spare Hinges
- T – Wheels & Tires

Thrust Duct and Carbon Tubes Bag Contents [H2]

- The following are the components packed in the Thrust Duct & Carbon Tubes Bag [H2]:

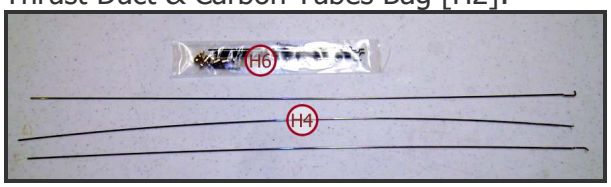


Thrust duct & retract templates

- M – Motor & EDF (Electric Ducted Fan) Unit
- M1 – Thrust Duct
- M2 – EDF Unit Shroud
- D – Decals

Thrust Duct and Carbon Tubes Bag Contents [H2]

- The following are the components packed in the Thrust Duct & Carbon Tubes Bag [H2]:



Thrust duct & retract templates

  - H4 – Main Fuselage Control Rods
  - H6 – Control Horns, Wing Control Rods, Control Rod Clips & Linkage Stoppers

Additional Required Components

- The following is the list of additional components required to complete and fly your Viper Jet:
  - 5 to 6 Channel Computer Radio. Channels are throttle, ailerons, elevator, rudder/nose wheel steering and flaps; retractable landing gear is optional.
  - 6 – 8 Servos (8g – 10g range)
  - Any necessary servo extensions and Y-harnesses.
  - 70mm Fan and Motor.
  - 80A+ Electronic Speed Control (ESC).
  - 4S, 3300mAH – 3700mAH Lithium-Polymer Battery.
  - Lithium-Polymer Battery Charger.
  - Building supplies and tools (as noted in individual assembly steps).
  - Battery Eliminator Circuit (BEC) (optional).
  - Retractable Landing Gear (optional).
  - Control Rod connectors such as Linkage Stoppers or E/Z connectors (optional).

Available Optional Components

- To complete your Viper Jet, the following components are recommended by SAPAC as they are designed to work seamlessly with this model.
- **3200KV MB1 Motor and 70mm Fan Unit**. Designed specifically for models in the size and weight range of the Viper Jet, this EDF unit fits with the inlet duct, motor cradle and thrust tube without any adjustments. It will power your Viper Jet comfortably on a 4S battery and will make it very lively on a 5S battery [P/N SAP30732].

Optional, SAPAC EDF unit with MB1 motor

- **Retractable Landing Gear, SAPAC Rz180**. Designed specifically for models in the size and weight range of the Viper Jet, this gear fits into the provided mounts without any adjustments. [P/N SAP14000].

Optional, SAPAC Rz180 retractable landing gear

- **Scale Struts, SAPAC Sz180-v**. Designed specifically for models in the size and weight range of the Viper Jet these Scale Struts fit the Rz180 Retractable Landing Gear without any modifications. [P/N SAP12601].

Optional, SAPAC Sz180-v scale struts and wheels

- **M-Power Servos, MS-A65 & MS-D65M**. Available as analog and digital with metal gears the M-Power servos are designed specifically for airplanes the size of the Viper Jet and will fit the mounting areas perfectly. With torques and speeds in the highest ranges for their class these are the best option for your SAPAC model. [MS-A65 P/N MPOMSA65] [MS-D65M P/N MPOMSD65M].

Optional, SAPAC M-Power 65 size servos

Wing Control Surfaces

Hinge Wing Control Surfaces

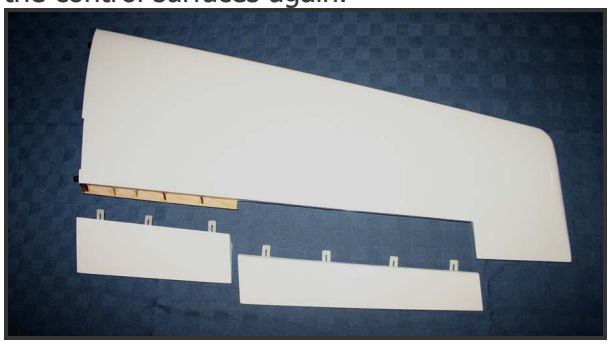
Required Parts

- Wing [W]

Required Tools and Adhesives

- Thin CA (Cyanoacrylate) Adhesive

- We recommended you work on one wing half at a time for all wing related assembly steps; this will ensure left and right components aren't accidentally mixed up.
  Alternately, you can mark one side of the wing with some masking tape for easy identification. Some assembly steps are done from the top side of the wing and some are done from the bottom side so it's easy to get confused.
- Separate the aileron and the flap from the main wing. Ensure the hinges are well seated and centered in their corresponding slots. Replace the control surfaces and flex the hinges back and forth several times to loosen them. Remove the control surfaces again.

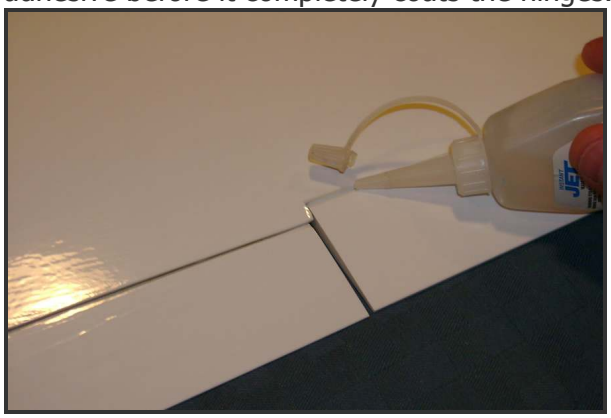


Separate control surfaces and seat hinges properly

- Starting with the aileron (outboard control surface), insert into the wing and align it to the desired position. Ensure there is a small gap between the aileron and outside of the wing and there is no rubbing or binding.

  Tip: the hinges can be held in position with T-pins if they shift when inserting the control surface. Remember to remove the T-pins before bonding the hinges.

- Note: If any hinge slots are missing hinges add them from the supplied spare hinge bag [H5].
- Using thin CA adhesive with a fine applicator place a few drops on each side of the hinges. The use of thin CA ensures the adhesive is wicked up the complete surface of the hinge for a tighter bond. Avoid the use of accelerator in this joint since you don't want to cure the adhesive before it completely coats the hinges.



Bond hinges using thin CA adhesive

- Once the aileron has been hinged repeat the step with the flap (inboard control surface). Ensure there is a small gap between the aileron and the flap and there is no rubbing or binding. Additionally, ensure the flap does not extend past the inner edge of the wing to avoid interference with the fuselage when the wing is mounted.
- Repeat the procedure for the opposite wing. Set the wings aside until the adhesive has dried thoroughly.
- Once the adhesive is dry flex all the control surfaces several times and give them a light tug to make sure they are properly bonded.

Prepare Servo Slots and Servo Covers

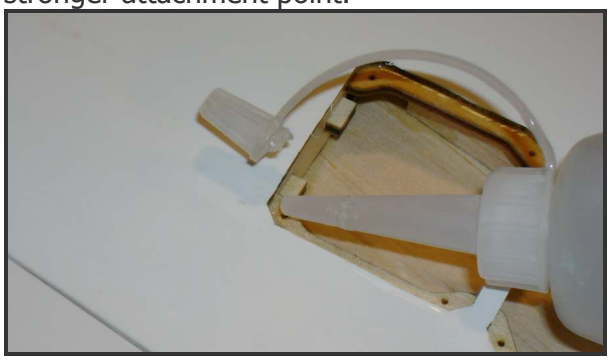
Required Parts

- Wing [W]
- Servo Covers (4) [W]

Required Tools and Adhesives

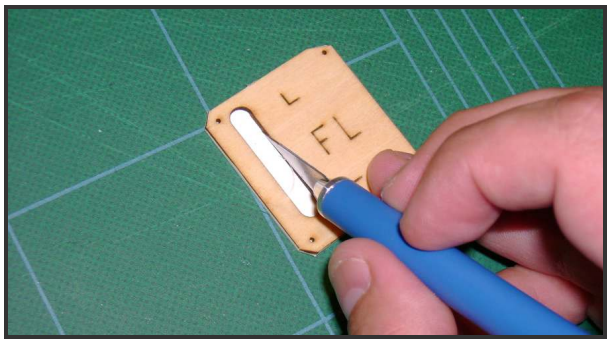
- Hobby Knife
- Thin CA Adhesive
- Hand Drill & Drill Bits

- Locate the servo covers taped to the wings in their corresponding servo mount openings.
- Reinforce the cover mounting holes in the wing with thin CA adhesive. This will add strength to the plywood and provide the cover screws a stronger attachment point.



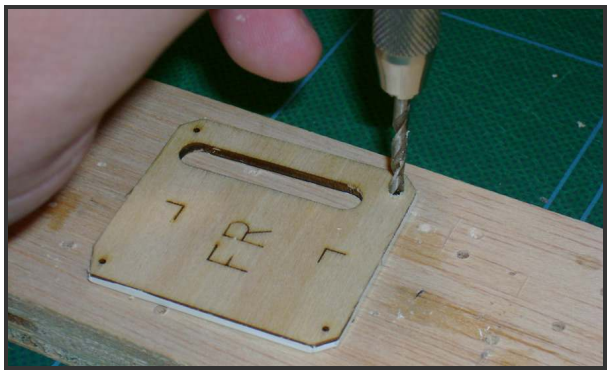
Reinforce screw holes with CA adhesive

- Using a sharp hobby knife, trim the covering from the servo arm slots in the servo covers



Remove covering from servo arm slots

- Using a hand drill with a bit slightly larger in diameter than the mounting screws, drill holes in the corners of all the servo covers (marked by a laser dot).



Drill mounting screw clearance holes

Mount Aileron and Flap Servos to Servo Covers

Required Parts

- Wing [W]
- Servo Covers (4) [W]
- Servo Mounting Posts (8) [W2]
- Flap Servos (2) + Hardware
- Aileron Servos (2) + Hardware

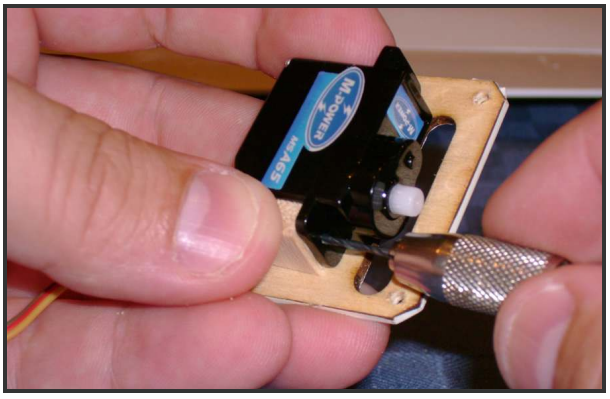
Required Tools and Adhesives

- Thin CA Adhesive
- 12 Minute Epoxy Adhesive
- Hand Drill & Drill Bits
- Screwdriver

- Test fit your servos in the wing to ensure you don't encounter any clearance issues.
- Hold the servo mounting posts against your servos and drill pilot holes in them using the servo mounting holes as guides for their location. Use a hand drill to avoid splitting the wood, and ensure you use a bit slightly smaller in diameter than your servo mounting screws.

  Tip: when drilling the pilot holes for the servos in the mounting posts drill them with the servos flush to the servo covers. This will allow maximum clearance for the servos when mounted inside the thin wing.

  Tip: when drilling the pilot holes orient the end-grain of the servo posts so it will be the side bonded to the servo cover. This will give the strongest bond as well as a stronger grip for the screws.

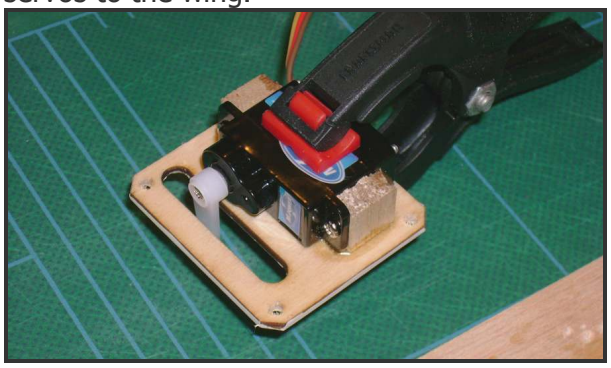


Drill pilot holes in servo mounting posts

- Once the holes have been drilled reinforce them with a few drops of thin CA adhesive.
- Screw the post to the servos using the mounting screws supplied with your servos.

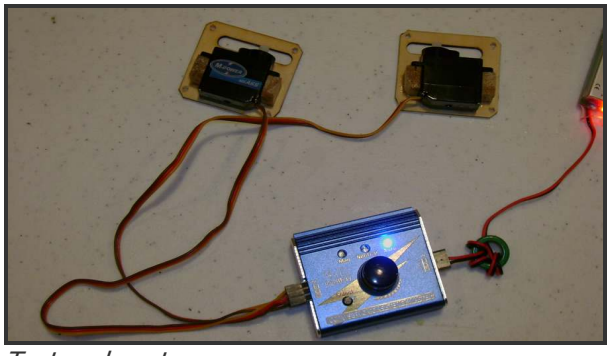
Servo mounting posts screwed to servos

- Use epoxy adhesive to bond the servo mounting posts to the servo covers.
  When bonding the posts, ensure the servo arm is located in the center of the slot and that there will be no clearance issues when mounting the servos to the wing.



Bond servo mounting posts to servo covers with epoxy adhesive

- Test all new servos before using them in any project to ensure there are no production defects; center your servos and attach the control arms.



Test and center your servos

Attach Control Horns

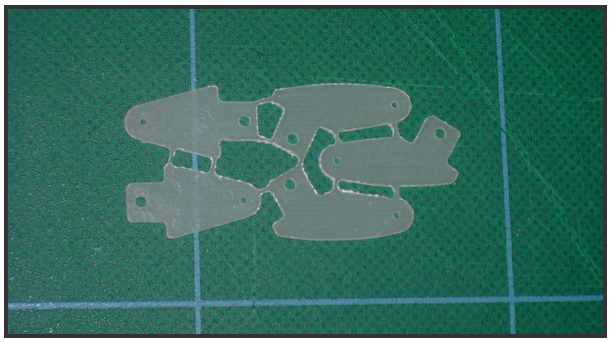
Required Parts

- Wing [W]
- Aileron Control Horns (2) [H6]
- Flap Control Horns (2) [H6]

Required Tools and Adhesives

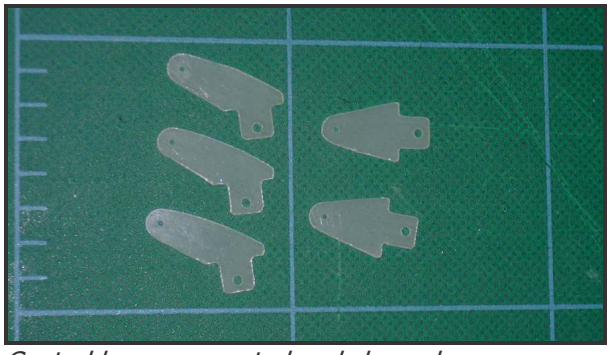
- Hobby Knife
- Sandpaper
- 12 Minute Epoxy Adhesive

- There are two types of control horns provided, the straight control horns are for the flaps and the angled control horns are for the ailerons, rudder and elevators.



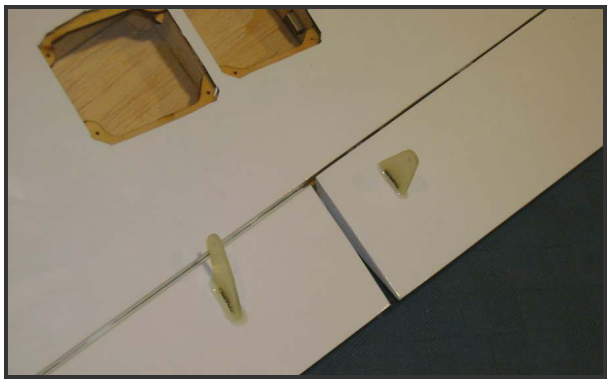
Fiberglass control horns

- Separate the control horns from each other with a hobby knife. Clean up the edges using some sand paper or a small file. Set aside 3 control horns for the rudder and the elevators, these will be used later.



Control horns separated and cleaned up

- Find the control horn mounting slots in the control surfaces and remove the covering using a sharp hobby knife. Dry fit the control horns
- Once you have a good fit bond the control horns to the control surfaces using epoxy adhesive.



Mount control horns with epoxy adhesive

Make Control Rods and Mount Servos

Required Parts

- Wing [W]
- Control Rods (4) [H6]
- Servo Cover Mounting Screws (16) [W2]

Required Tools and Adhesives

- Ruler
- Needle Nose Pliers
- Z-Bend Pliers (optional)
- Screwdriver

- Start with the ailerons. Place the servo and servo cover in position without the mounting screws. Use a ruler to measure the length of the control rod.

Dry fit servo and measure control rod

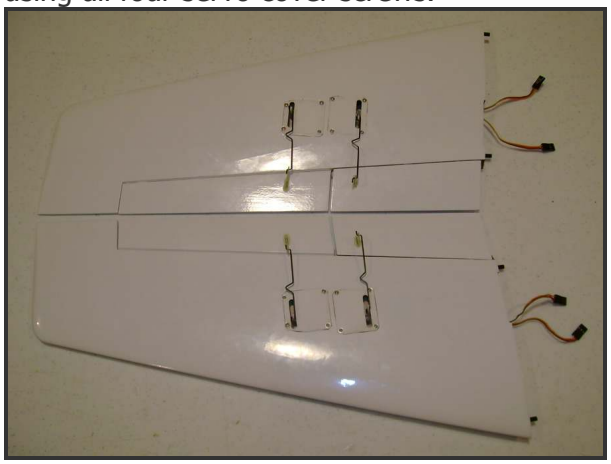
- Bend a V into the control rod halfway between the two attachment points. Make a Z-bend at the opposite end of the control rod ensuring the length matches the measured distance. The V will allow for minor adjustments of the control rod length.

  Tip: for greater ease of adjustability a control rod adjustment mechanism such as threaded clevises or linkage stoppers can be used.

- Remove the aileron servo cover, thread the control rod through the control horn and the servo arm and re-mount the flap servo cover with all four screws. Feed the servo wire through the channel provided in the wing.

Completed aileron control rod

- Connect the flap servos to your radio and set them to the fully retracted position (regular flight mode). Place the flaps in the fully retracted position (0° of flaps).
- Create the flap control rods in the same manner the aileron control rods were created. Insert the flap control rods and mount the flap servos using all four servo cover screws.



Completed control rod assemblies

Main Gear, Fixed (Optional)

Build Gear Mounts

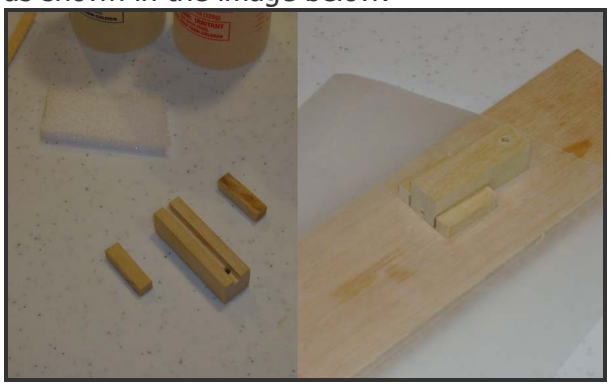
Required Parts

- Main Gear Central Mounts (2) [W1]
- Main Gear Side Components (4) [W1]

Required Tools and Adhesives

- 12 Minute Epoxy Adhesive

- Assemble the two main gear mounts by bonding the two side components to the central mount as shown in the image below.



Main gear mount assembly

- Use epoxy adhesive to bond these components as these bonds will transfer a large amount of the load from the gear to the wing structure.
- Set aside and make sure the adhesive is thoroughly dry before proceeding with the mounting of the gear.

Cut Slots in Wing for Gear Mounts

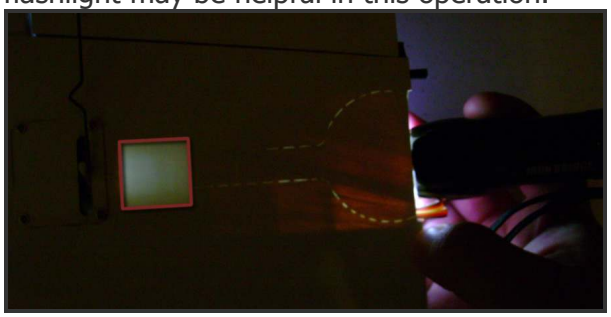
Required Parts

- Wing [W]
- Main Gear Cover [W1] (for measuring)

Required Tools and Adhesives

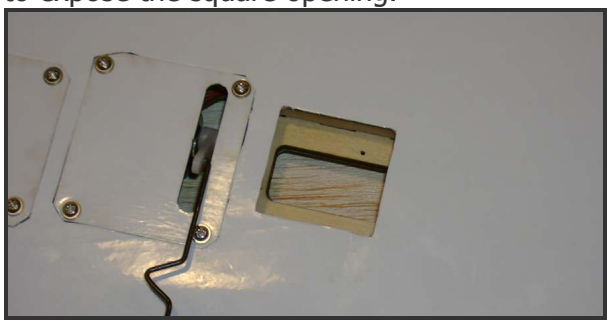
- Hobby Knife
- Flashlight
- Pen

- Locate the opening for the main gear on the bottom of the wings (close to the flap servos). Notice the balsa wood sheathing has been partially removed over the gear mounts. A flashlight may be helpful in this operation.



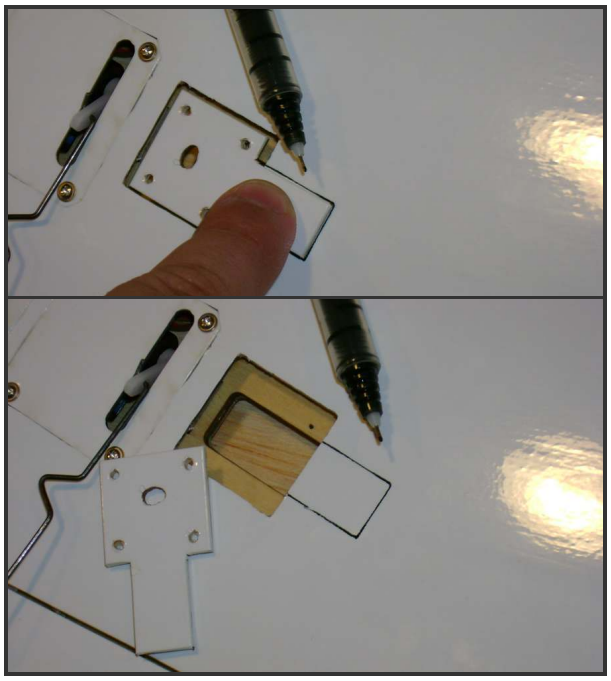
Main gear location hole

- Using a sharp hobby knife cut away the covering to expose the square opening.



Cut away covering

- Use one of the main gear covers to mark the additional area on the wing you will need to trim for a proper fit.



Trace final outline of opening

- Trim the additional covering and balsa sheathing to create the necessary access to mount the gear.

  Ensure you don't trim any of the internal structure as it must remain in place to properly bond the gear mounts.

Main gear slot cut into wing

- Dry fit the gear mount in the slot you just cut; it may have to enter slightly angled. Make any necessary adjustments to the opening.
- Remove the gear mounts; you will drill them for mounting screws in the next step.

Prepare Gear Mount Covers

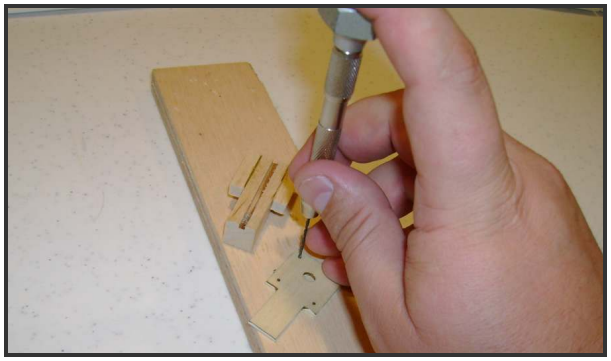
Required Parts

- Wing [W]
- Main Gear Struts (2) [W1]
- Main Gear Mount Assemblies (2) [W1]
- Main Gear Covers (2) [W1]

Required Tools and Adhesives

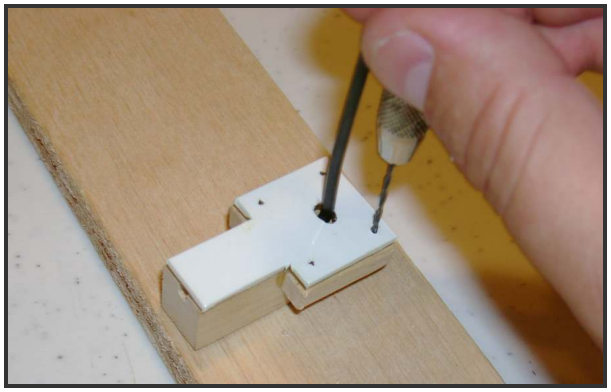
- Hobby Knife
- Thin CA Adhesive
- Hand Drill & Drill Bits
- Screwdriver

- Using a hand drill with a bit sized to drill pilot holes for the main gear cover screws, drill four holes in each cover at the marked locations



Drill pilot holes in gear cover

- Use a sharp hobby knife to remove the covering from the strut hole in the Main Gear Covers.
- Temporarily assemble the gear struts and the gear cover to the gear mount. Use the holes you just drilled to drill pilot holes into the main gear mount assemblies.

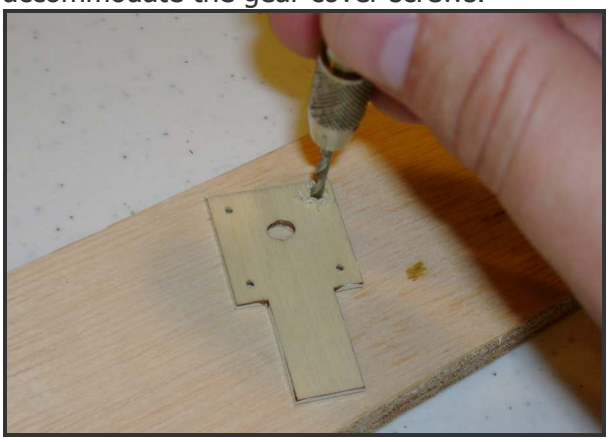


Drill pilot holes through gear cover into gear mount

- Remove the covers and gear struts. Reinforce the pilot holes with thin CA adhesive.

Reinforce holes with thin CA adhesive

- Enlarge the holes in the gear covers to accommodate the gear cover screws.



Drill clearance holes in gear covers

- Reassemble and dry fit in the wing, check for and fix any clearance issues.

Bond Main Gear

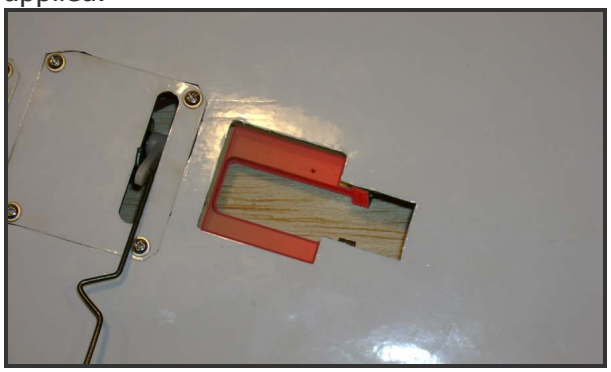
Required Parts

- Wing [W]
- Main Gear Mount Assemblies (2) [W1]

Required Tools and Adhesives

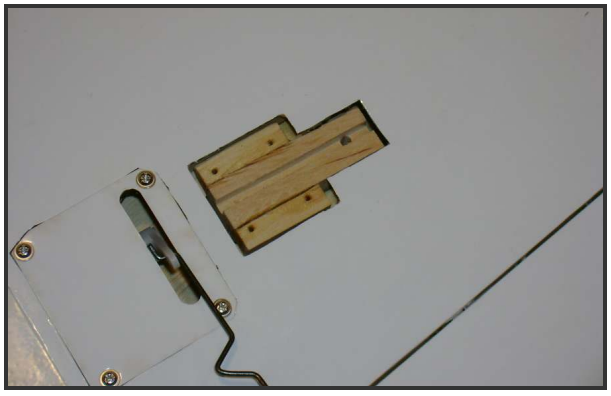
- 12 Minute Epoxy Adhesive

- Disassemble the gear mount assemblies, you will bond the gear mounts into the wing on their own.
- Bond the completed main gear mounts using epoxy adhesive. The following image shows the places where epoxy adhesive needs to be applied.



Epoxy adhesive location for main gear mounts

- You may need to temporarily insert the main gear strut to guide the mount into its final location.



Gear mount bonded in position

- Before the epoxy dries test fit the main gear covers to ensure there are no clearance issues; if necessary make adjustments.

Main Gear Final Assembly

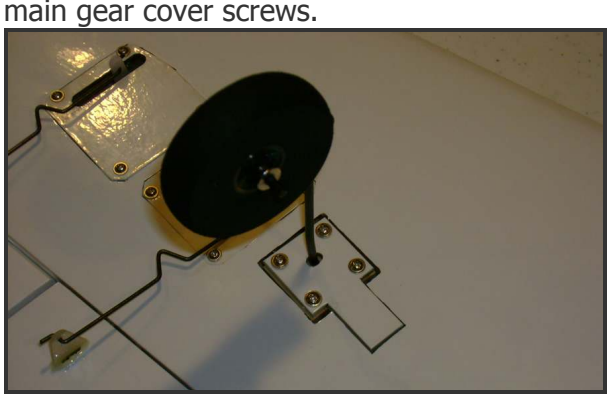
Required Parts

- Wing [W]
- Main Gear Struts (2) [W1]
- Main Gear Covers (2) [W1]
- Main Gear Cover Screws(8) [W1]
- Main Gear Tires (2) [T]
- Main Gear Collets (2) [W1]

Required Tools and Adhesives

- Screwdriver
- Hex Wrench
- Thread Locking Compound

- Mount the main gear struts to the main gear mounts using the main gear covers and the main gear cover screws.



Completed main gear assembly

- Mount the tires to the main gear struts using the supplied collets. Use thread locking compound on the set screws in the wheel collets.

Main Gear, Retractable (Optional)

Cut Openings in Wing for Retract Units and Gear

Required Parts

- Wing [W]

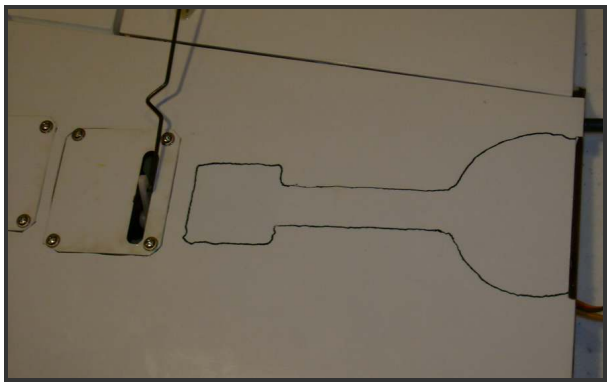
Required Tools and Adhesives

- Hobby Knife
- Flashlight
- Pen

- The retractable gear opening is laser etched into the balsa wood wing sheathing. The easiest way to locate it is to shine a flashlight from the root rib into the wing; this will easily highlight the outline.

Locate the cutout for the retractable landing gear

- Use an erasable pen to trace around the template defining the location of your cutout.



Mark the location of the retract cutout

- Cut out the location for the landing gear using a hobby knife.
- Channels are provided to secure the loose servo wires to avoid interference with the operation of the retractable landing gear.

Mount Gear and Connect Air Lines

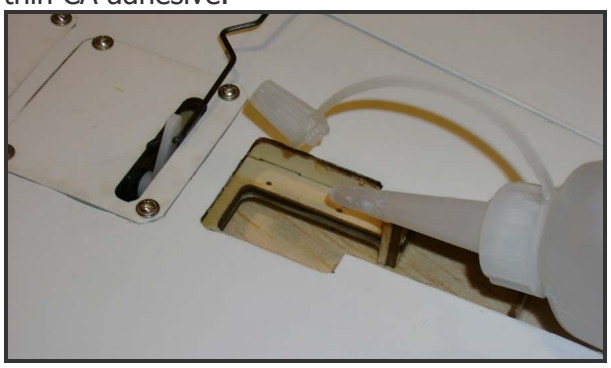
Required Parts

- Wing [W]
- Main Retractable Landing Gear Units (2)
- Retract Unit Mounting Screws (8)
- Retract Unit PVC Covers (2) [W1]
- Air Line

Required Tools and Adhesives

- Thin CA Adhesive
- Screwdriver
- Air Line Cutting Tool

- Refer to the manual included with the Rz180 retracts for details on the correct installation and plumbing of the retract units. Although a good overview of the process is provided here more details can be found in that manual.
- Laser etched pilot holes are provided on the plywood retract unit mounts. Reinforce these holes and the mounts using a couple of drops of thin CA adhesive.



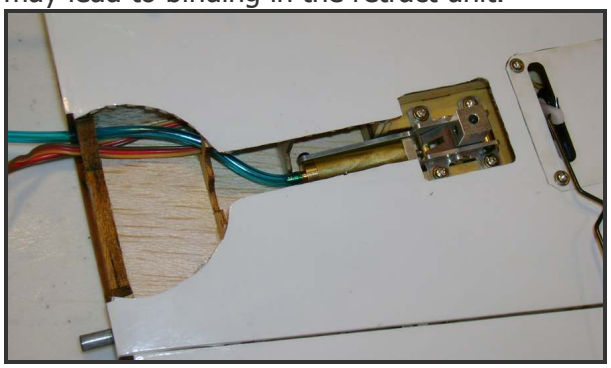
Reinforce retract mounting holes

- Ensure you use screws long enough to go through the entire gear mount but not so long they go through the wing's top balsa sheathing; 10mm - 12mm are recommended. Don't be tempted to use the screws provided to affix the fixed gear covers since they are not long enough to go through the entire mount and could result in the retract units breaking loose during takeoff or landing.
- Cut two air lines to sit inside the wing and into the fuselage. Attach them to the retract units.

Tip: cut the internal air lines a little long; you can always trim them when you are ready to attach them to the T-Fitting in the fuselage.

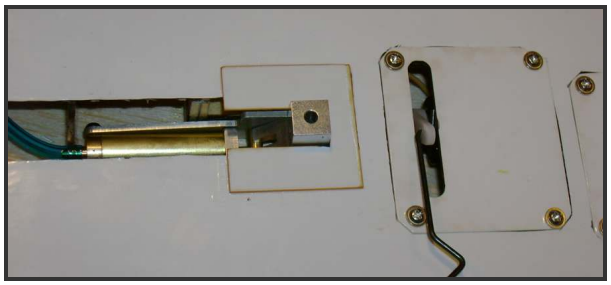
Attach air lines to retract unit

- Mount the retract units to the plywood hard points. Don't over-tighten the screws as this may lead to binding in the retract unit.



Retractable landing gear unit mounted in final position

- Route the two air lines through the wing through the supplied channels to keep them out of the way of the retracted gear.
- Bond the PVC covers to the wing over the retract units using CA adhesive. This will reduce the size of the opening and provide a smoother and neater installation.



PVC retract unit covers

- This is a good time to test the retract units; you can do this by temporarily attaching your retract pump to the retract unit airline.

Retractable Landing Gear Final Assembly

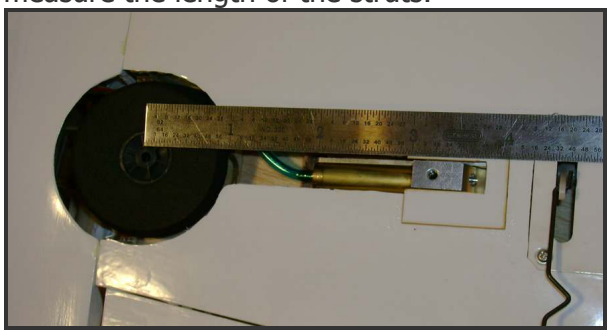
Required Parts

- Wing [W]
- Main Gear Wheels & Tires [T]
- Wheel Collets [W1]
- Landing Gear Struts (2)

Required Tools and Adhesives

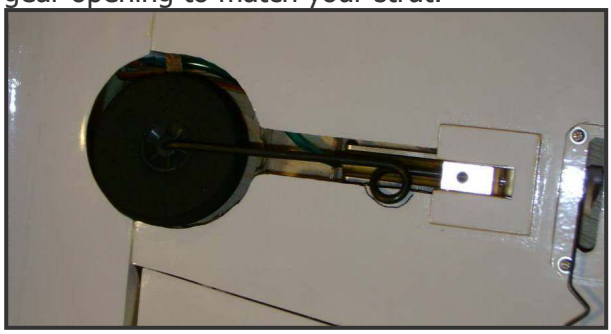
- Pliers
- Hex Wrench
- Hack Saw or Rotary Cutter
- Thread Locking Compound

- Note: you will complete these steps after the wing has been joined to the fuselage. This will allow you to correctly position the wheels and bend the struts.
- Place the wheel in its final retracted location and measure the length of the struts.



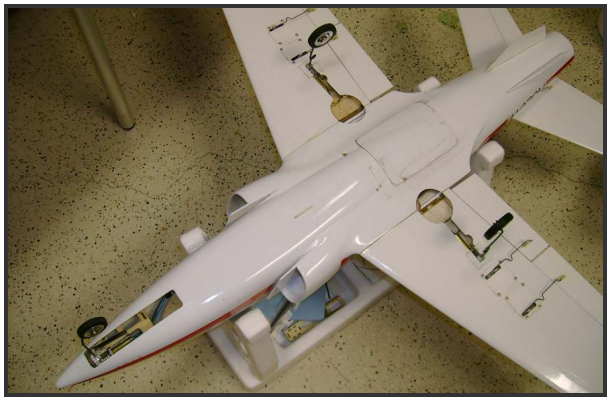
Measure the length of the struts

- Using the struts provided with the retract units, bend and trim the landing gear struts to the desired shape. Test the retract motion and make any adjustments to ensure smooth operation. You may have to trim the landing gear opening to match your strut.

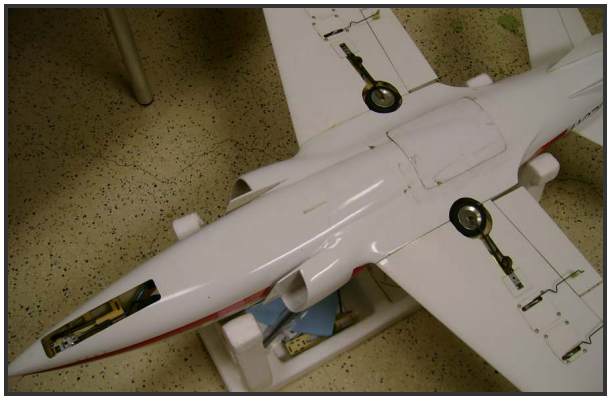


Bend and test the struts and trim the opening

- Once you are happy with the landing gear shape and operation assemble the landing gear strut and wheel to the retract unit. Use thread locking compound on the set screws in the retract unit and the set screw in the collet.



Completed landing gear – deployed



Completed landing gear – retracted

Nose Gear, Fixed (Optional)

Assemble Nose Gear Mount

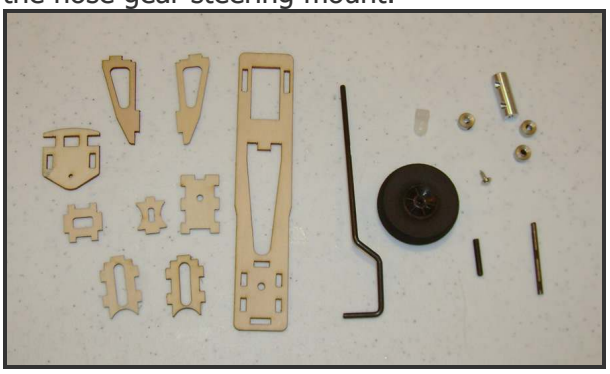
Required Parts

- Fixed Nose Gear Mount [F2]

Required Tools and Adhesives

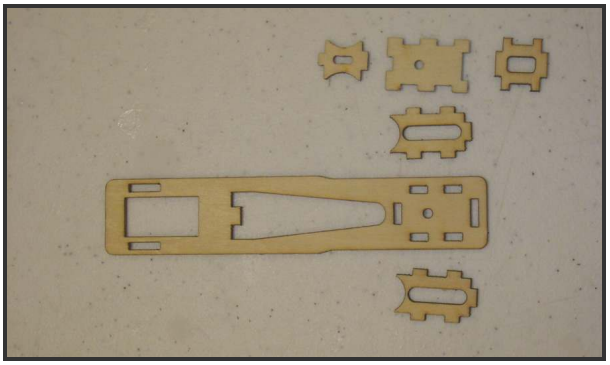
- 5 Minute Epoxy Adhesive

- The nose wheel steering servo will be seeing a very large amount of vibration and load during take-off and landing due to the contact with the ground through the nose gear. For this reason we highly recommend the use of a metal gear servo for nose wheel steering.
- The following image shows the components of the nose gear steering mount.



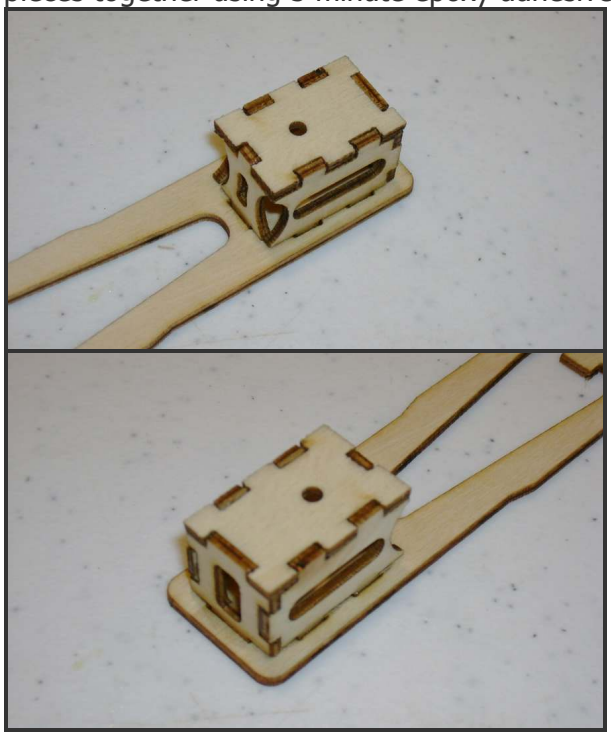
Nose gear steering mount components

- The first step in setting up the nose gear is to assemble the mount. First assemble the strut side of the mount, the required components are shown in the next image. *Note: the components are shown in their assembly orientation; the curved corners face the servo side of the mount.*



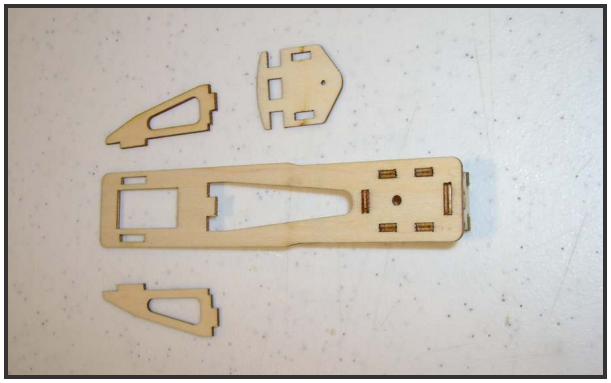
Strut mount components

- The assembled strut side of the nose gear mount is shown in the images below. Bond the pieces together using 5 minute epoxy adhesive.

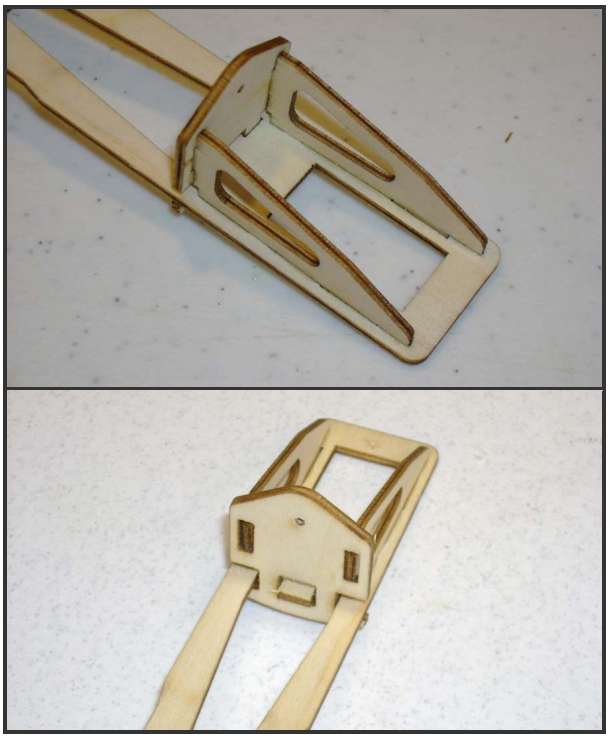


Strut mount assembled

- When the adhesive is dry, assemble the servo side if the mount. As with the strut side of the mount the following sequence of images shows the components laid out and assembled. Again, bond this side of the assembly using 5 minute epoxy adhesive.
  Note: The servo mount goes on the opposite side of the strut mount.



Servo mount components



Servo mount assembled

Mount Servo and Steering Arm

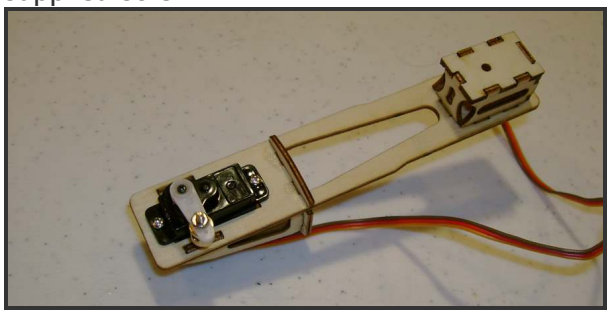
Required Parts

- Fixed Nose Gear Mount [F2]
- Nose Gear Servo + Hardware
- Control Rod [W6]
- Linkage Stopper [H6]

Required Tools and Adhesives

- Hand Drill & Drill Bits
- Thin CA Adhesive
- Thick CA Adhesive
- Hex Wrench
- Screwdriver
- Thread Locking Compound

- The steering assembly is put together outside of the fuselage and then inserted into place when done.
- Mounting the steering servo is done in the same fashion as all other servo. Start by placing the servo in position and drilling pilot holes for the mounting screws. Remove the servo and reinforce the wood with some thin CA adhesive. Mount the servo to the steering mount using the screws supplied with the servo.
- Once the servo is mounted install a linkage stopper on the servo arm so it faces the bottom of the servo. Put a drop of thick CA adhesive on the nut to ensure it doesn't come loose; take care not to bond the linkage stopper to the servo arm. Center the servo using your radio and install the servo arm on the servo using the supplied screw.



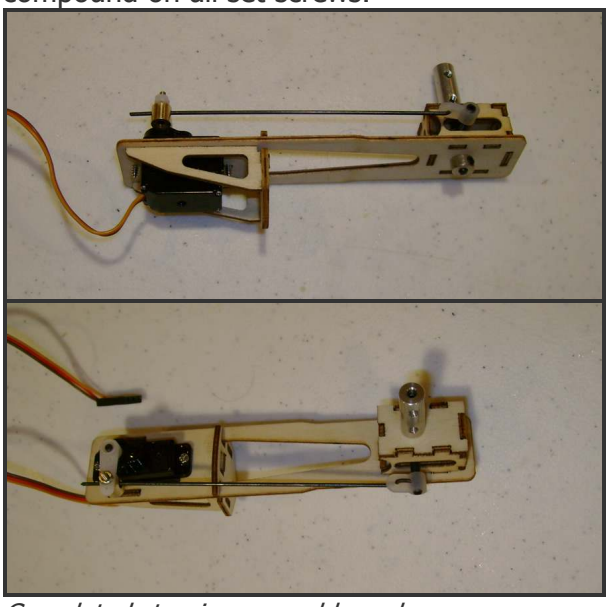
Steering servo mounted in position

- It will be easier to assemble the steering arm before it is installed in the steering arm box. Slip a collet over the short strut element.

Screw the long set screw into the collet until it is tight and in position.
Screw the nylon steering arm attachment to the end of the set screw.
The assembled steering arm should look like this:

Completed steering arm assembly

- Remove the collet from the short strut and insert the collet and the short strut into the steering arm box. Tighten the steering arm. Set a second collet on the bottom of the steering arm box and tighten. Finally, install a pushrod between the steering arm and the linkage stopper on the servo.
We recommend you use thread locking compound on all set screws.



Completed steering assembly and nose gear mount. Note: long collet shown for illustrative purposes only, it needs to be removed before inserting the steering assembly into the fuselage

- Test the assembly before installation to ensure there are no problems with the steering motion.

Installation of Nose Gear Mount and Nose Gear

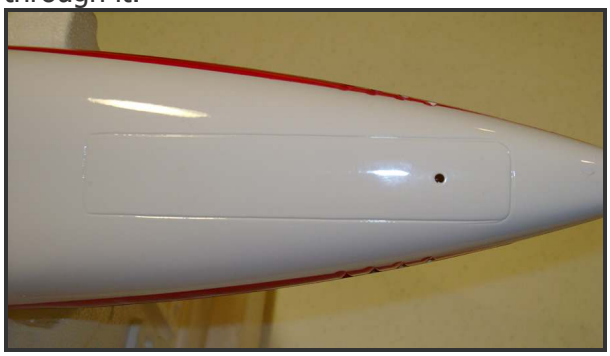
Required Parts

- Fuselage [F]
- Fixed Nose Gear Mount [F2]
- Nose Gear Mount attachment Screw [F2]
- Nose Gear Strut [F2]
- Nose Wheel [T]
- Wheel Collet [F2]

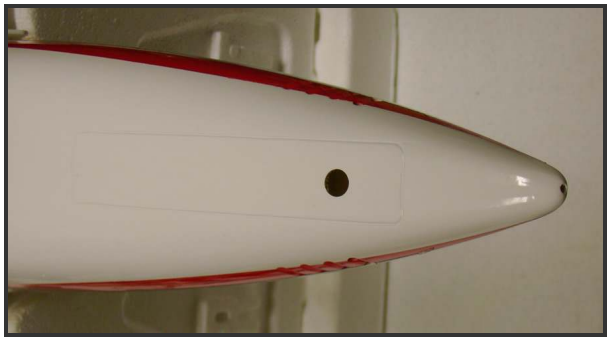
Required Tools and Adhesives

- Hole Reamer
- Screwdriver
- Hex Wrench
- Thread Locking Compound

- Before installing the nose gear mount into the fuselage ream out the nose gear strut hole so the long collet (with two set screws) will fit through it.



Nose gear strut hole



Hole reamed to size to fit the long collet

- Install the nose gear mount. The nose gear mount assembly slides into the fuselage flat against the front bulkhead in a track designed specifically to receive it.
If there is any space between the nose gear

mount and the flat bulkhead then the nose gear mount did not engage correctly; remove it and start again.
When correctly installed, the nose gear mount will be engaged with the fuselage bulkhead at three locations; the front of the assembly, the track you slid it through in the middle and at the rear of the assembly.

- Once the nose gear mount is in position it is attached with a single screw above the bottom of the servo. Use some thin CA adhesive to reinforce the hole the screw will fit in.

Nose gear mount in position and attached

- With the fuselage upside-down insert the long collet through the hole for the nose gear, it should engage with the short shaft and seat up against the nose gear mount. Tighten the set screw on the inside of the fuselage using a hex wrench through the hole in the side of the fuselage.

Tighten the inside set screw of the long collet

- Complete the assembly by attaching the long section of the strut to the long collet and attaching the nose wheel to the strut using the last collet. Use thread locking compound to ensure the collets does not come loose.

Completed fixed nose gear

- If you find that the airplane sits nose high on its wheels trim the nose wheel lower strut shorter to make the airplane sit level.

Nose Gear, Retractable (Optional)

Cut Opening in Fuselage for Retractable Nose Gear

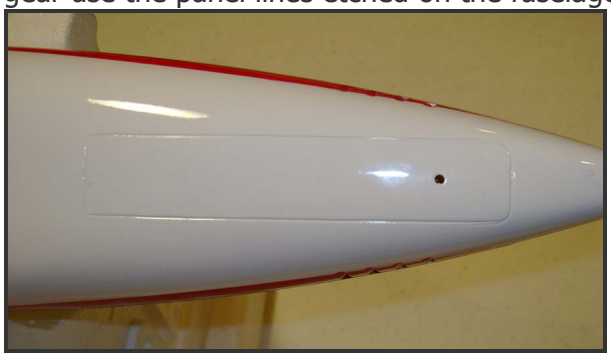
Required Parts

- Fuselage [F]

Required Tools and Adhesives

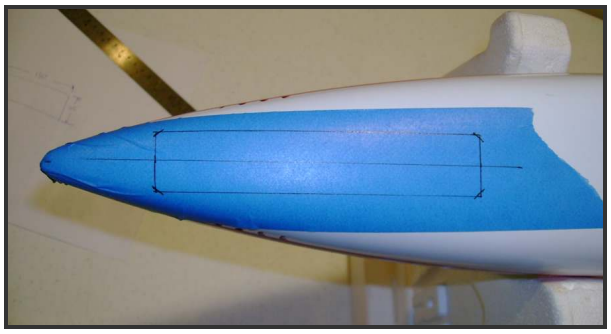
- Removable Tape
- Pen
- Sharp Hobby Knife, Hobby Saw or Small Rotary Cutter
- Needle Files

- Refer to the manual included with the Rz180 retracts for details on the correct installation and plumbing of the retract units. Although a good overview of the process is provided here more details can be found in that manual.
- To locate the cutout for the retractable nose gear use the panel lines etched on the fuselage.



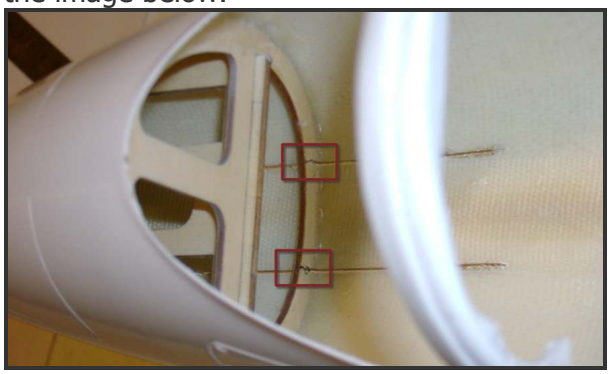
Panel lines showing location of nose wheel cutout

- Place some removable tape on the fuselage over the location of the nose gear cutout; this will protect the paint when cutting. Using the panel lines as a guide, use a pen to mark the location of the cutout on the tape. This will make the lines more visible and the cut easier.

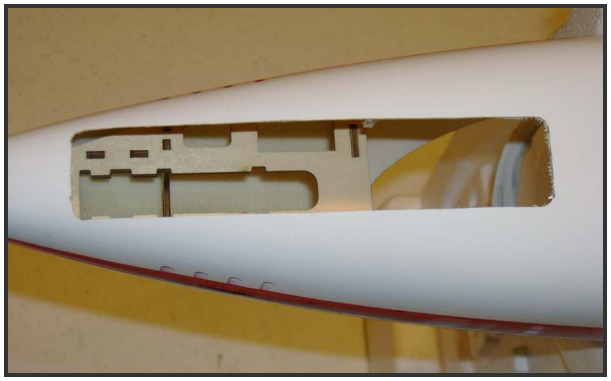


Trace the location of nose wheel cutout onto tape

- Using a sharp hobby knife, hobby saw or small rotary cutting tool cut the opening for the retractable nose wheel. Ensure you cut completely through the bulkhead as shown in the image below.



Cut through the interior bulkhead



Nose wheel cutout complete

- Once the opening has been cut clean up any edges and corners using needle files.

Mount Servo and Nose Gear Retract Unit

Required Parts

- Fuselage [F]
- Nose Wheel Servo + Hardware
- Nose Wheel Retractable Landing Gear Unit
- Retract Unit Mounting Screws (4)
- Air Line

Required Tools and Adhesives

- Hand Drill
- Thin CA Adhesive
- Air Line Cutting Tool
- Screwdriver

- The nose wheel steering servo will be seeing a very large amount of vibration and load during take-off and landing due to the contact with the ground through the nose gear. For this reason we highly recommend the use of a metal gear servo for nose wheel steering.
- The servo can be mounted in either location, to the left or to the right of the center channel.
- Temporarily fit the servo in the desired location and drill pilot holes for the servo mounting screws.
- Remove the servo and reinforce the pilot holes with thin CA adhesive.
- Mount the servo in the final location using the screws supplied with the servo.

Servo and retract unit mounted and air line connected

- Dry fit the nose wheel retractable landing gear unit in the location provided (as shown in the image below). The unit will fit with the assembly bolts clearing the plywood at the notches.
- Once the unit is in place use a hand drill to drill pilot holes through the plywood at the location of the mounting tabs. Remove the unit and reinforce the pilot holes with thin CA adhesive.
- Before permanently installing the retractable landing gear unit attach the air line. Temporarily leave the air line longer than it needs to be; you will trim it when you complete the installation of the retract actuator valve.
- Place the retractable landing gear unit in location and attach it using the mounting screws. Ensure you use screws long enough to go through both layers of plywood. Don't over-tighten the screws as this may lead to binding in the retract unit.

Mount Strut and Test Retract Motion

Required Parts

- Fuselage [F]
- Nose Wheel [T]
- Nose Gear Strut

Required Tools and Adhesives

- Pliers
- Hex Wrench
- Hack Saw or Rotary Cutter
- Thread Locking Compound

- As with the main retracts, the nose gear retract unit can be installed with either the fixed gear strut or by bending the strut provided with the retract unit to shape. The images demonstrate the installation using the strut provided with the fixed gear.
- Trim and bend the nose gear strut to the desired geometry. When cutting the strut, make the nose wheel as tall as possible; this will create a level attitude on the ground and will help the plane rotate during takeoff.
- Mount the nose wheel to the strut using thread locking compound on the set screw in the collet.
- Test the retract motion until you achieve the desired geometry. Don't permanently attach the strut to the retract unit, as you will need to remove the strut and the steering arm to set up the steering linkage.

Assemble Pull-Pull Steering

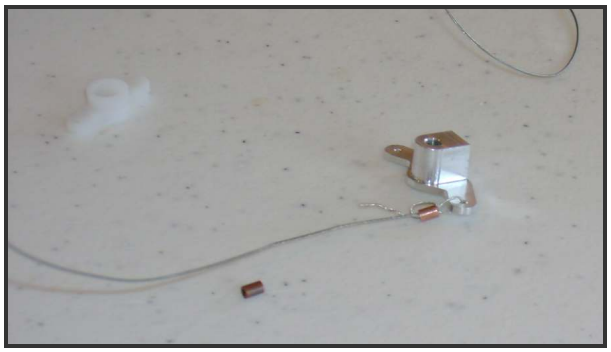
Required Parts

- Fuselage [F]
- Pull-Pull System Cables and Crimps

Required Tools and Adhesives

- Ruler
- Needle Nose Pliers
- Crimping Pliers
- Thin CA Adhesive
- Screwdriver
- Hex Wrench
- Thread Locking Compound

- Before installing the pull-pull steering test the direction the servo will steer the nose gear. If you find that the nose gear steers in the correct direction use straight steering cables. If you find that the nose gear steers opposite of the rudder then you can cross your steering wires to overcome this situation.
- Use a short ruler to measure the distance between the nose wheel steering arm and the servo arm. All you need is a rough estimate at this time; you will adjust the cable length later.
- Cut two lengths of steering cable two to three inches longer than the measured distance.
- Remove the steering arm and the servo arm and assemble the pull-pull setup on your workbench.
- At each node you will want use the following procedure:
  1.- Feed the cable through the crimp.
  2.- Feed the cable through the arm.
  3.- Feed the cable back through the crimp.
  4.- Loop the cable around and feed it back through the crimp sleeve in the same direction (see image for detail).



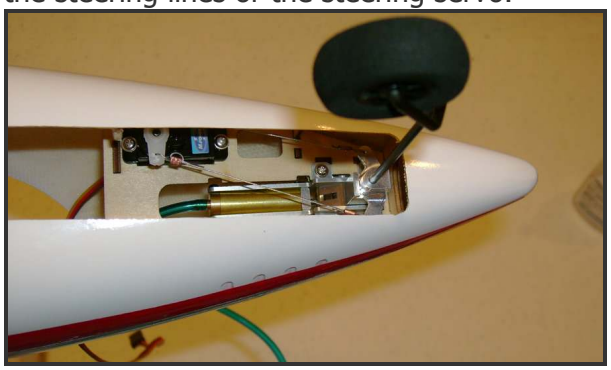
Pull-pull steering cable attachment detail

- At this time crimp only one end of the assembled wire, you will need the other end loose to make any adjustments to the wire tension.

  Tip: once you have crimped a joint you may want to add a drop of CA adhesive to it for extra insurance.

Completed pull-pull steering assembly

- Place the steering arm and servo arm in position and temporarily slip the nose gear strut into the retract mechanism.
- Ensure the pull-pull steering wires are snug and even, if they are not remove the assembly and make any necessary adjustments.
- Once you have the necessary tension and geometry crimp the remaining two crimp sleeves. Re-install the steering assembly and attach the servo arm to the servo with the supplied screw.
- Adjustments can be made to the tracking of the plane by loosening the set screw in the nose wheel retract unit and rotating the nose wheel strut slightly. When you are happy with the position of the nose wheel attach the set screw with thread locking compound to ensure it doesn't vibrate loose.
- Test the operation of the nose gear retract unit to ensure there are no fouling conditions with the steering lines or the steering servo.



Nose gear retract in extended position

Nose gear retract in retracted position

Air Retract Mechanism (Optional)

Mount Retract Servo

Required Parts

- Fuselage [F]
- Retract Servo + Hardware

Required Tools and Adhesives

- Hand Drill & Drill Bits
- Thin CA Adhesive
- Screwdriver

- Refer to the manual included with the Rz180 retracts for details on the correct installation and plumbing of the retract units. Although a good overview of the process is provided here more details can be found in that manual.
- The retract actuator valve and servo are installed in the fan compartment (see image on next page for exact servo location).
- Using the servo for reference, drill pilot holes into the mounting bulkhead using a hand drill with a properly sized drill bit.
- Reinforce the pilot holes with thin CA adhesive.
- Mount the servo to the bulkhead using the screws supplied with the servo.

Mount Actuator Valve and Linkage

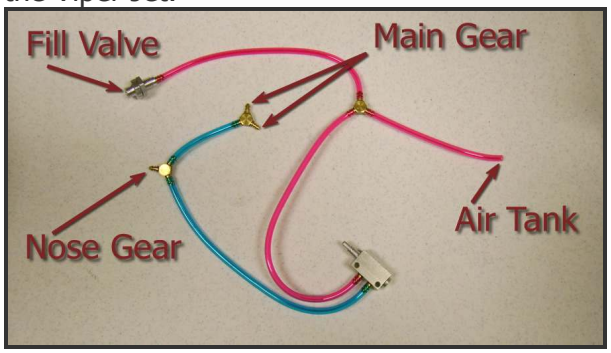
Required Parts

- Fuselage [F]
- Retractable Gear Actuator Valve
- Main Gear Quick Connect Valve
- Retractable Gear Fill Valve
- Retractable Gear Air Line
- Retractable Gear T-Fittings (2)
- Actuator Valve Mounting Screws (2)
- Control Rod [W1]

Required Tools and Adhesives

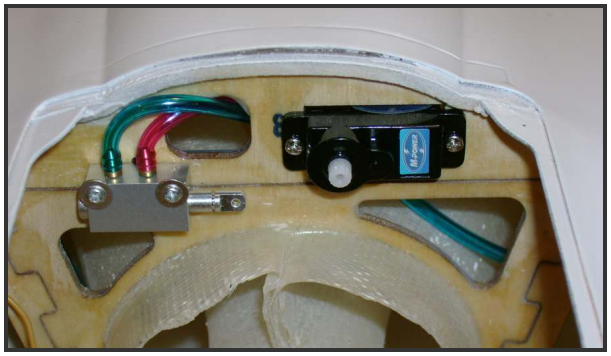
- Hand Drill & Drill Bits
- Thin CA Adhesive
- Ruler
- Needle Nose Pliers
- Z-Bend Pliers (optional)
- Screwdriver
- Air Line Cutting Tool

- Due to space constraints, you may find it easier to assemble most of the air line connections before installing the retract system into the fuselage.
- Plan your air line runs to determine what length you want to make your segments.
- The following image shows an example of the air line connections for a retract installation in the Viper Jet.



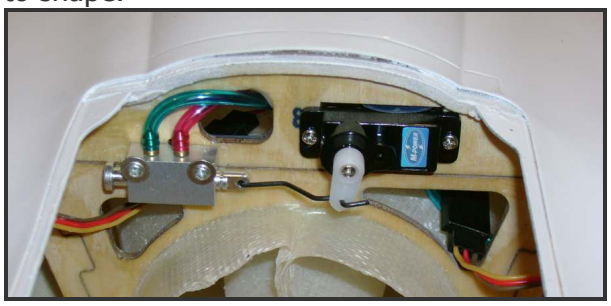
Actuator valve with air lines; blue for gear and red for tank and fill valve

- Reinforce the pilot holes for mounting the actuator valve (pre-drilled in the bulkhead) with some thin CA adhesive.
- Mount the actuator valve assembly to the bulkhead using appropriately-sized mounting screws. Make sure the screws you use are long enough to reach completely through the bulkhead to ensure a firm attachment.



Actuator valve mounted to bulkhead

- Temporarily place the servo arm on the servo and test the motion using your radio retract switch, this will give you an idea of the best servo arm geometry and length.
- Measure the distance between the actuator valve and the servo arm and bend a control rod to shape.



Retract control rod linkage installed

- Install the control rod and servo arm and test the motion of the actuator valve with your radio. Make any necessary adjustments to the control rod length and servo arm position. Once you are happy with the operation attach the servo arm to the servo using the screw supplied with the servo.

Mount Air Tank

Required Parts

- Fuselage [F]
- Retractable Gear Air Tank

Required Tools and Adhesives

- Hot Glue

- Place the air tank between the ducts and bond it in place using hot glue or double sided tape; this will allow you to remove it for maintenance.
- Connect the air line to the air tank.

Air tank mounted in location

Tip: the air tank for the retracts can be mounted in other locations of the fuselage. Locations such as farther up in the cockpit or to one side of the thrust tube can be used. If you would like to do this just plan your air line runs accordingly.

Connect Remaining Air Lines and Test Retract Operation

Required Parts

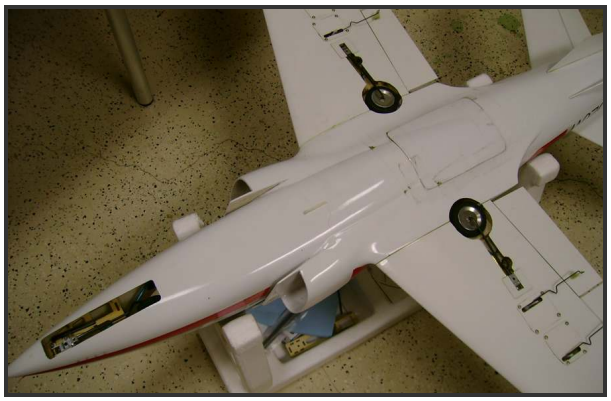
- Fuselage [F]

Required Tools and Adhesives

- Hex Wrench
- Air Line Cutting Tool

- Note: you will complete these steps after the wing has been joined to the fuselage. This will allow you to connect the air lines for the main gear and test the retract motion.
- Trim the nose wheel air line to length and attach it to the t-fitting feeding the retractable gear units. This is the air line closest to the edge of the actuator valve (on the side opposite the servo, using blue air line in the images).
- After attaching the wings connect the main gear air lines to the remaining connections on the t-fitting feeding the retractable gear units.
- Test the operation of the retractable landing gear. You should be able to get 12-20 full actuations from a full tank. You should also be able to get at least 2 hours of holding time from a full tank. If you don't get both, check the system for leaks.
  Check for leaks using smoke in a bottle or dry powder. Do not use water or soap on the valves as they have oil in them and their operation will be compromised.

Retractable gear test, extended



Retractable gear test, retracted

- In case of air system failure the SAPAC retractable landing gear will automatically deploy as they are the air-up and spring-down type.

Rudder and Elevators

Attach Control Horns

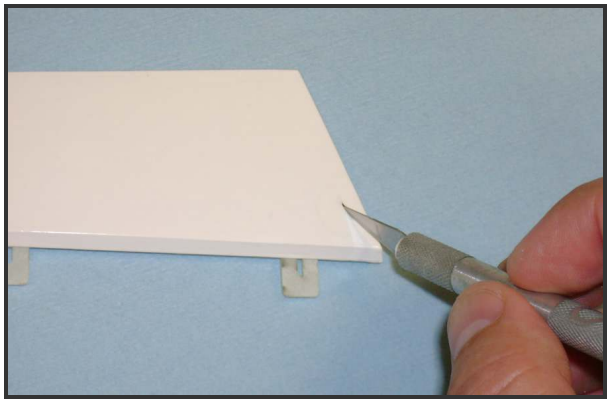
Required Parts

- Stabilizers (Elevators) [E]
- Rudder [R]
- Control Horns [H6]

Required Tools and Adhesives

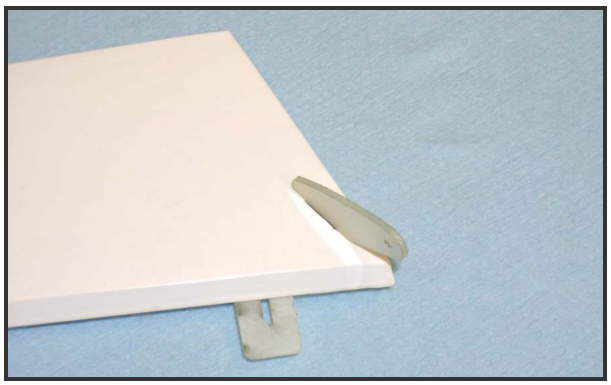
- Removable Tape
- Sharp Hobby Knife
- 5 Minute Epoxy Adhesive

- Work on one elevator at a time or mark one elevator and one horizontal stabilizer with a piece of removable tape, this way you will not mix up left and right elevators.
- Separate the elevator from the horizontal stabilizer. Look for the hard point where the control horn will be attached, it will be close to the root of the elevator. Cut away the covering from the slot where the control horn will be bonded.



Separate rudder from vertical stabilizer and remove the covering from the control horn slot

- Dry fit the control horn in the slot, make any adjustments as necessary.



Dry fit the control horn

- Once you are happy with the fit of the control horn repeat the steps for the other elevator and for the rudder.
- Bond all three control horns to their respective control surfaces using 5 minute epoxy adhesive.

Hinge Rudder and Elevators

Required Parts

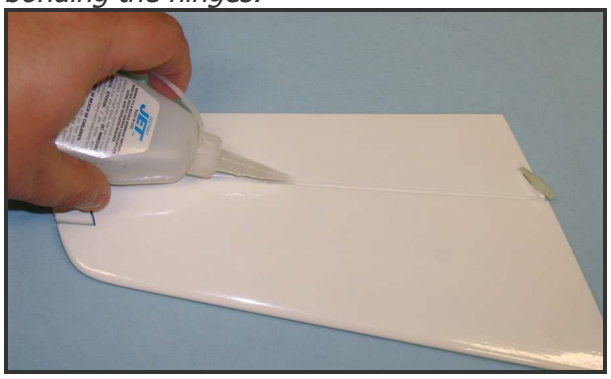
- Fuselage [F]
- Stabilizers (Elevators) [E]
- Rudder [R]

Required Tools and Adhesives

- Thin CA Adhesive

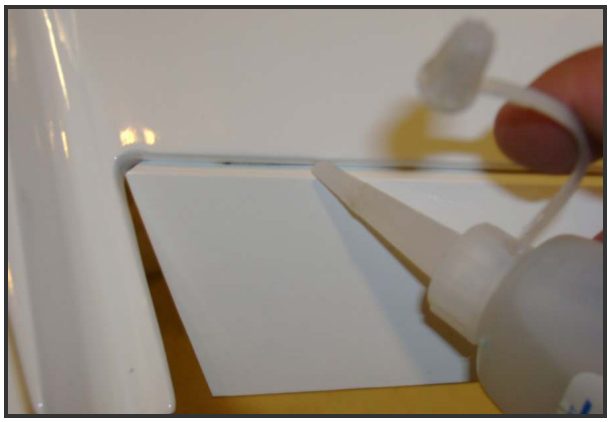
- If they are attached, separate the elevators from the stabilizers and the rudder from the fuselage.
- Seat, center and straighten all the hinges on all the control surfaces. There should be four hinges per control surface, if any are missing use some from the spare hinge bag.
- Insert one elevator into a horizontal stabilizer making sure the hinges remain straight and centered.

  Tip: the hinges can be held in position with T-pins if they shift when inserting the control surface. Remember to remove the T-pins before bonding the hinges.



Bond elevators using thin CA adhesive

- Note: If any hinge slots are missing hinges add them from the supplied spare hinge bag [H5].
- Once the control surface is in place and you have checked all of the gaps place some thin CA adhesive on both sides of all hinges. Set aside to dry.
- Repeat the same steps for the other elevator and for the rudder.



Bond rudder using thin CA adhesive

- Once everything has dried, give each control surface a firm tug to ensure the hinges are bonded properly.

Wing and Elevator Attachment

Bond Horizontal Stabilizers

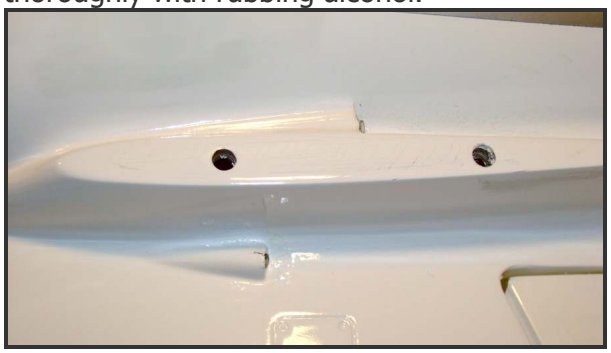
Required Parts

- Fuselage [F]
- Stabilizers (Elevators) [E]
- Horizontal Stabilizer Mounting Tubes [H3]

Required Tools and Adhesives

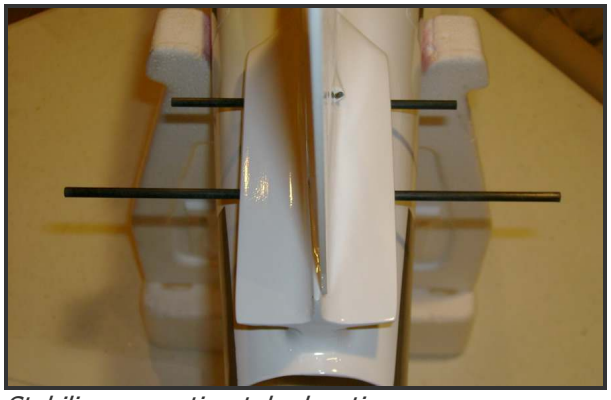
- Hobby Knife
- 12 Minute Epoxy Adhesive
- Sandpaper
- Rubbing Alcohol

- Clear any flashing from the elevator tube holes in the fuselage. Remove the paint and roughen the surface where the horizontal stabilizers will be mounted. When finished clean the area thoroughly with rubbing alcohol.



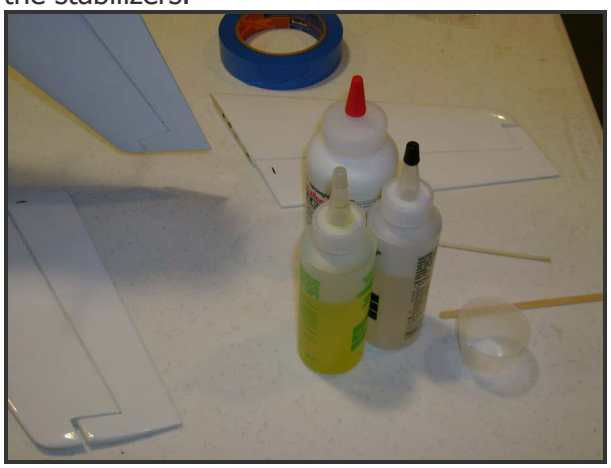
Remove paint and roughen mounting area

- Dry fit the horizontal stabilizer assembly (the longer tube goes aft). If the stabilizers don't seat properly, trim the tubes slightly until the desired fit is achieved.



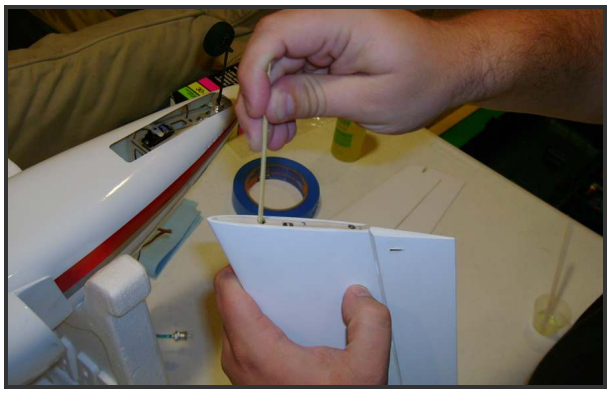
Stabilizer mounting tube locations

- Use sand paper to roughen both ends of the carbon fiber mounting tubes. This will ensure positive adhesion when assembling the horizontal stabilizers. Clean the tubes thoroughly with rubbing alcohol.
- Bond the stabilizers to the fuselage using epoxy adhesive as shown in the following sequence of images. Take care to put adhesive on the stabilizer tubes and on all contact surfaces of the stabilizers.

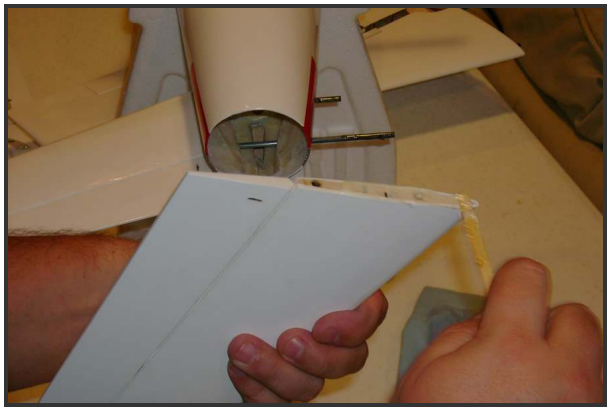


Bond the horizontal stabilizers with epoxy adhesive

Apply adhesive to the fuselage and to the stabilizer tubes



Apply adhesive inside the horizontal stabilizers



Apply adhesive to the exposed wood of the horizontal stabilizer

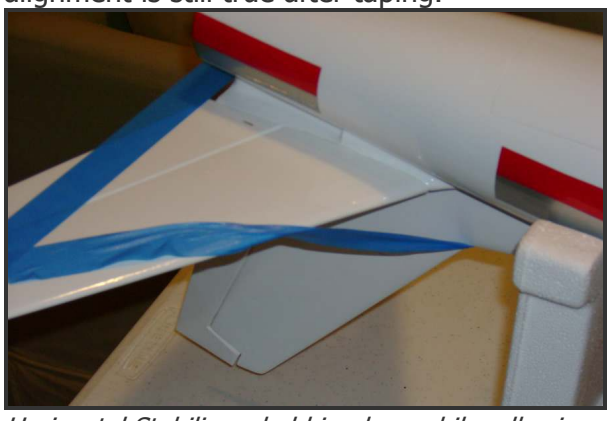
Slide the horizontal stabilizer into position

Horizontal stabilizer in its final position

- Clean any excess adhesive using a rag with rubbing alcohol.

Clean any excess adhesive using a rag with rubbing alcohol

- Ensure the horizontal stabilizers are parallel and level in all directions. Tape the stabilizers in place while the adhesive dries ensuring the alignment is still true after taping.



Horizontal Stabilizers held in place while adhesive dries

Bond Wings

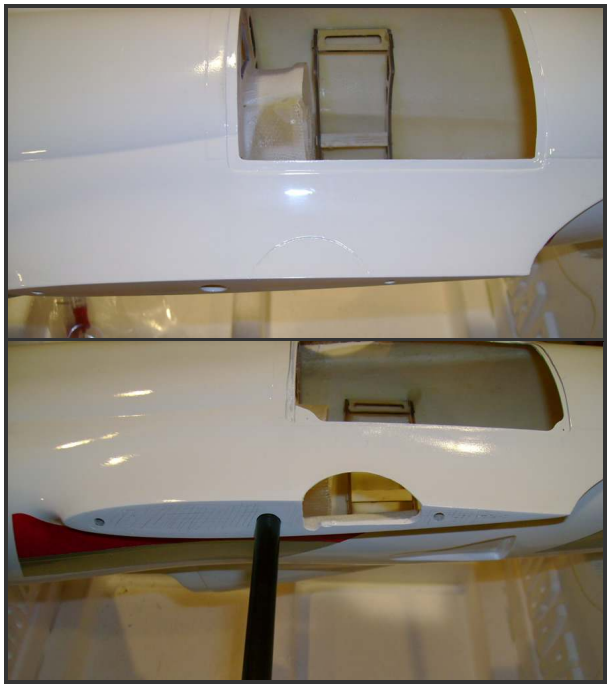
Required Parts

- Fuselage [F]
- Wings [W]
- Wing Tube [H3]

Required Tools and Adhesives

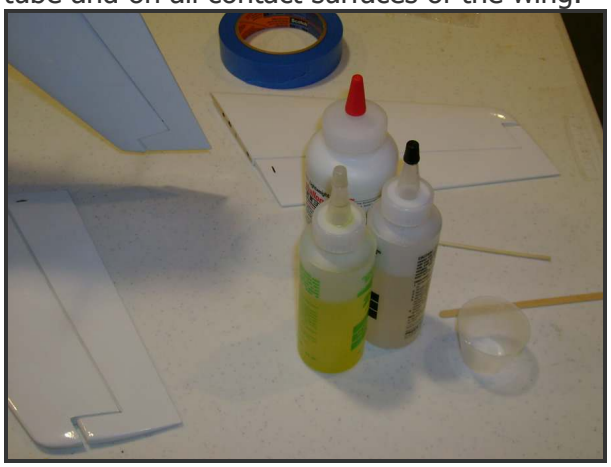
- Hobby Knife
- 12 Minute Epoxy Adhesive
- Sandpaper
- Rubbing Alcohol

- If you are going to use retracts you must cut away the retract clearance slots on the fuselage before attaching the wing. The following image shows the area which needs to be cut away (follow the provided panel lines). The process for notching the fuselage is the same process you follow for cutting out the nose gear opening (see chapter ***Main Gear, Retractable (Optional)***).
- If you are not using retracts you must cut a hole in the wing seat to route the servo wires through. Use the wing for reference to determine where to cut the hole.



If you are using retracts, cut openings for gear clearance

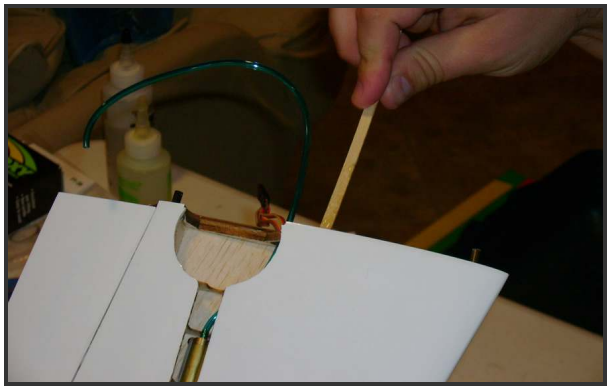
- To mark the proper mating slot on the side of the wing seat temporarily place the wing in position using the wing tube. Use the cutout profile on the wing root rib to trace the profile of the area to be cut on the fuselage.
- Remove any flashing from the wing tube hole and ensure the wing tube fits properly. Remove the paint and roughen the surface where the wings will be mounted (see second image above). When finished clean the area thoroughly with rubbing alcohol.
- Dry fit the wings. If the wings don't seat properly, trim the wing tube slightly until the desired fit is achieved.
- Use sand paper to roughen both ends of the wing tube; this will ensure positive adhesion when assembling the wings. Clean the wing tube thoroughly with rubbing alcohol.
- Bond the wings to the fuselage using epoxy adhesive as shown in the following sequence of images. Take care to put adhesive on the wing tube and on all contact surfaces of the wing.



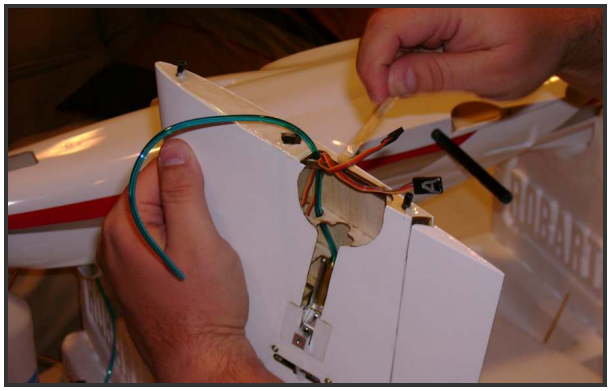
Bond the wing with epoxy adhesive

Apply adhesive to the fuselage and wing tube

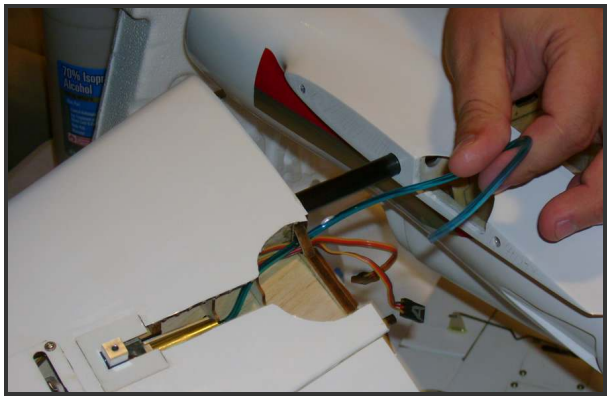
Apply adhesive inside the locating pin holes



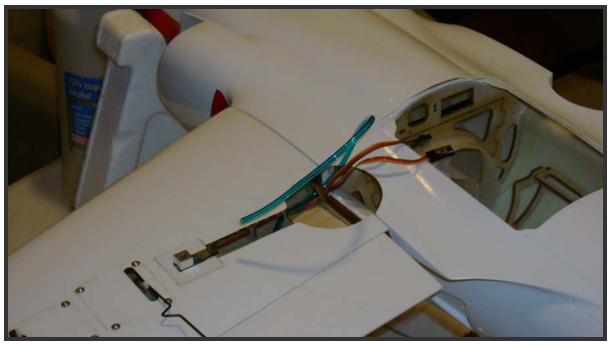
Apply adhesive inside the wing tube cavity



Apply adhesive to the exposed wood of the wing

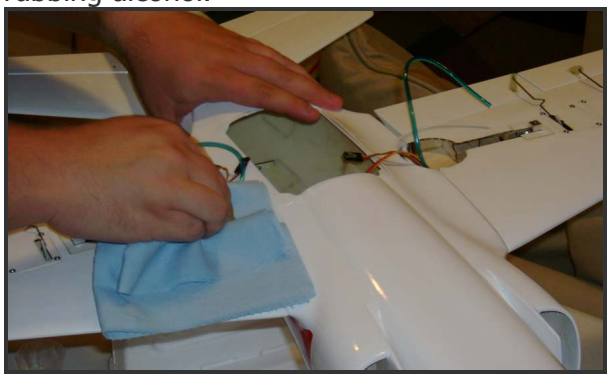


Slide the wing into position ensuring the servo wires and air lines are routed properly



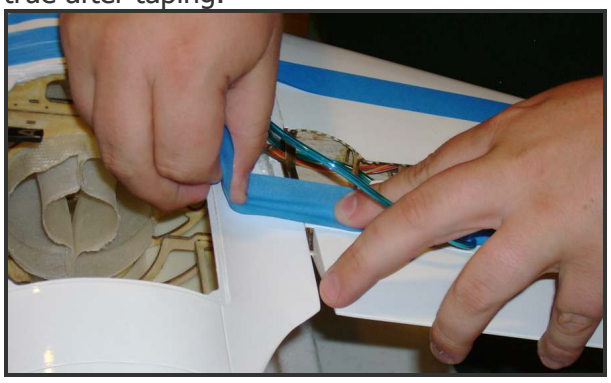
Wing in its final position

- Clean any excess adhesive using a rag with rubbing alcohol.



Clean any excess adhesive using a rag with rubbing alcohol

- Ensure the wings are parallel and level in all directions. Tape the wings in place while the adhesive dries ensuring the alignment is still true after taping.



Wings held in place while adhesive dries

- Once the adhesive has cured and if you are installing retracts you can now complete the retract installation as per the instructions in chapters ***Main Gear, Retractable (Optional)*** and ***Air Retract Mechanism (Optional)***.

Fan and Thrust Duct Installation

Assemble Thrust Duct

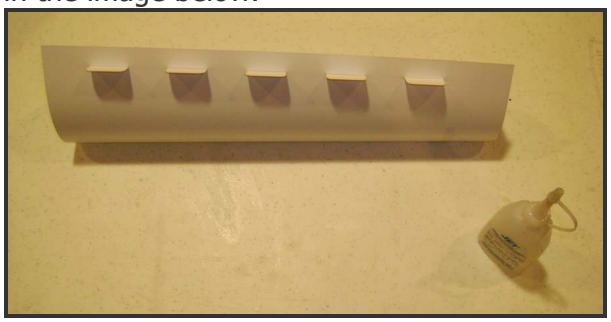
Required Parts

- Thrust Duct [M1]

Required Tools and Adhesives

- Low Tack Tape
- Thin CA Adhesive

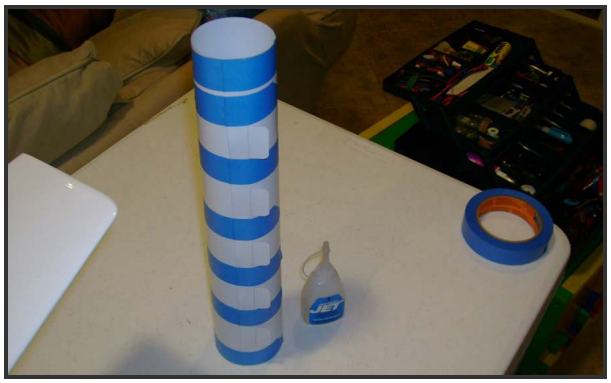
- Stitch together the thrust duct by inserting the tabs into the slots from the inside-out as shown in the image below.



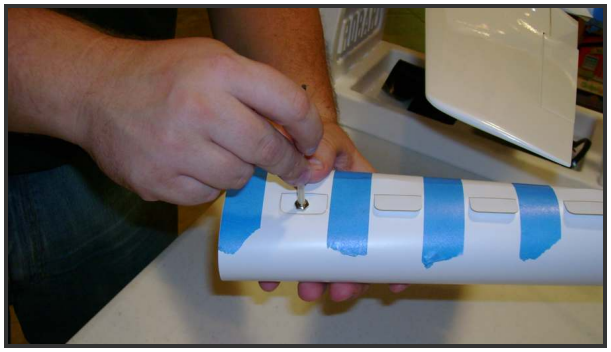
Stitch together the thrust duct

Note; although it may seem the duct will come together better if stitched from the outside-in this should be avoided. It is critical the inside surface of the thrust duct be as smooth as possible in order to ensure undisturbed airflow and optimal thrust. If the tabs are on the inside of the thrust duct, they will create turbulence and reduce the output of the power system. Once the duct is bonded, it will attain a round cross section.

- Flatten the overlap in the thrust duct along the length of the duct using a piece of tape between each of the tabs. Bond the edge of the thrust duct using thin CA adhesive; press on the edge to keep it down. Bond the tabs to the duct using the same process. Work your way down the entire length of the thrust duct.

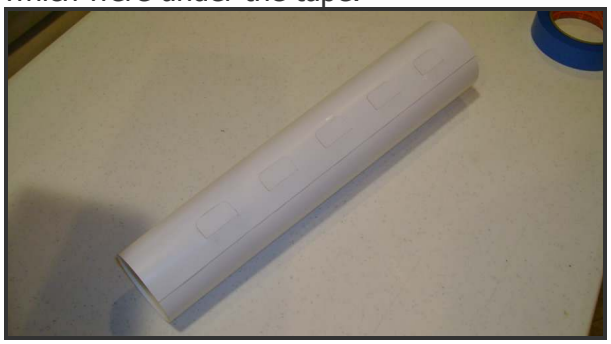


Hold together the duct with tape and bond with thin CA adhesive



Hold the tabs in place as the CA adhesive cures

- When the adhesive has cured, remove the tape from the thrust duct. Complete the assembly by running some adhesive along the duct edges which were under the tape.



Completed thrust duct

Mount Fan Unit and Thrust Duct

Required Parts

- Fuselage [F]
- Thrust Duct [M1]
- EDF Unit Shroud [M2]
- EDF and Motor Unit
- EDF Unit Mounting Zip Ties

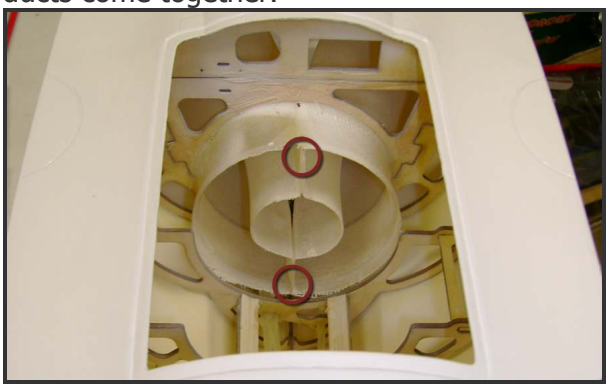
Required Tools and Adhesives

- Thin CA Adhesive
- Packing Tape
- Scissors

- Unpack the fan unit from the box. Set aside the zip ties for now, they will be used later to mount the fan unit to the airplane. Check that the fan is securely mounted onto the motor shaft, if it isn't then go ahead and tighten it now.

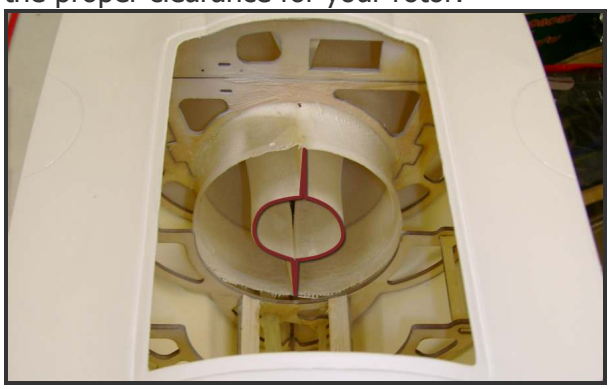
Fan unit

- Notice the notches on either end of the front edge of the fan unit. These notches will fit over the center edges where the two fiberglass inlet ducts come together.



Inlet ducts showing EDF alignment positions

- In a proper fan unit installation the fan housing should make contact with the outer edge of the fiberglass inlet ducts without the rotor getting too close to the inside edge of the ducts. If you are using the SAPAC 70MM EDF unit the duct clearance is set at the factory. If you are using any other fan unit you may have to remove material in the area shown in the image below. Use a rotary tool with a grinding or sanding attachment, or other similar approach, to create the proper clearance for your rotor.

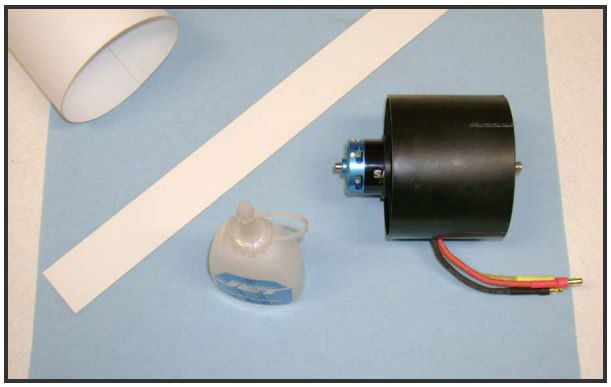


Area where ducts should be trimmed to create rotor clearance when using non SAPAC EDF units

- Before inserting the fan unit place the zip ties in position around the fan unit saddle. If you place the zip ties in opposite orientations as shown in the image below you will not accidentally cross connect them when tightening them around the fan unit.

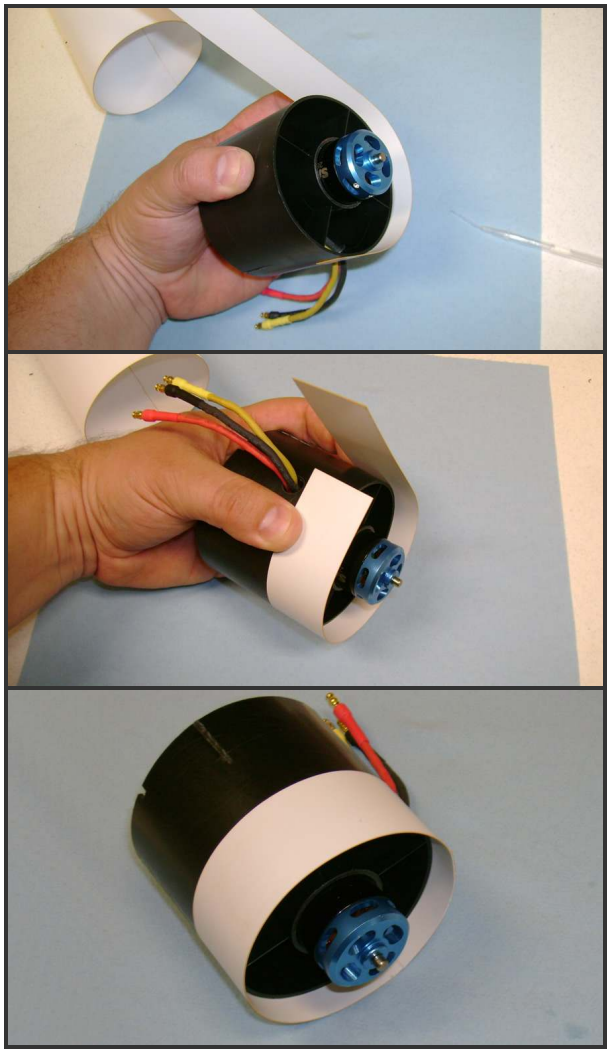
Zip ties in position, note opposite orientation

- Since the inside diameter of the thrust duct is dimensioned to match the inside diameter of the fan unit the thrust duct does not slip over the fan unit, instead a shroud ring is used to keep both components aligned.



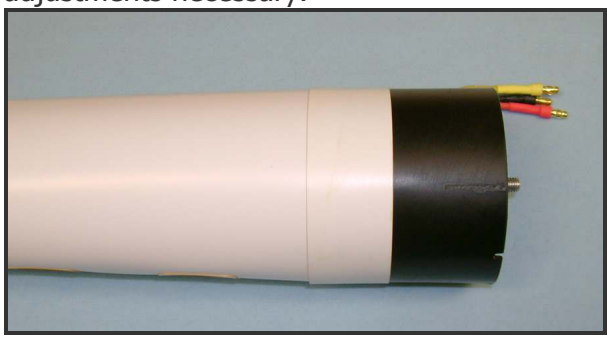
Thrust duct, fan shroud and EDF unit

- Prepare the EDF unit to receive the thrust duct by bonding the shroud piece around the rear of the EDF unit (the side without the notches). Use thin CA adhesive sparingly for this task, avoid getting any adhesive on any part of the fan or rotor.



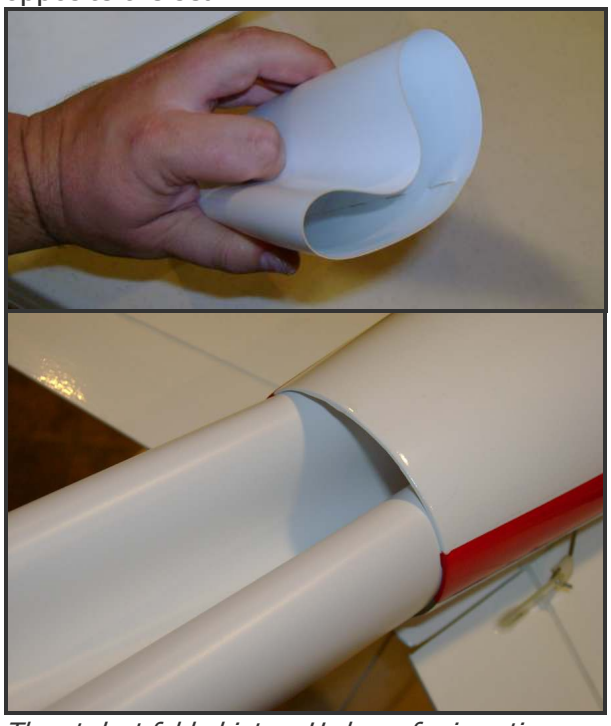
Bonding the fan shroud

- Test the thrust duct in the fan shroud, make any adjustments necessary.



Test fit the thrust duct in fan shroud and EDF unit

- Insert the EDF unit in position through the fan access hatch. You may have to feed it in motor end first and then turn it in position to get it to fit. Temporarily seat it in position with the wires facing upwards but don't attach it yet.
- Insert the thrust duct through the tail of the airplane by folding it into a **U** shape as shown in the image below. Fold the duct on the side opposite the seam.

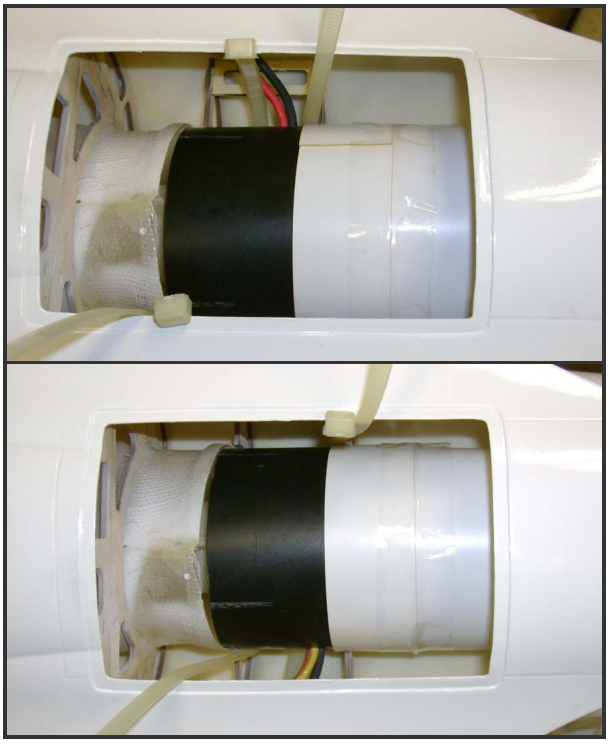


Thrust duct folded into a U shape for insertion through the tail of the airplane

- Fit the thrust duct inside the fan shroud and place the unit back in its final position. It is important the EDF unit be pushed as far forward

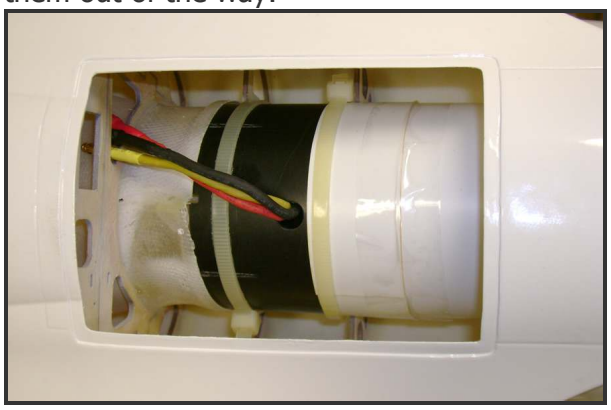
as possible and that the notches engage the inlet ducts, this will guarantee the geometry of the fan and the thrust duct are correct.

- Tape the thrust duct to the fan with packing tape. Place tape as far around the sides as possible.
- Once the thrust duct has been partially attached you can slide the fan unit slightly backward and rotate it in both directions to complete taping the bottom side of the thrust duct. It is important to get a tight seal all the way around the fan unit to avoid air leakage and optimize thrust.



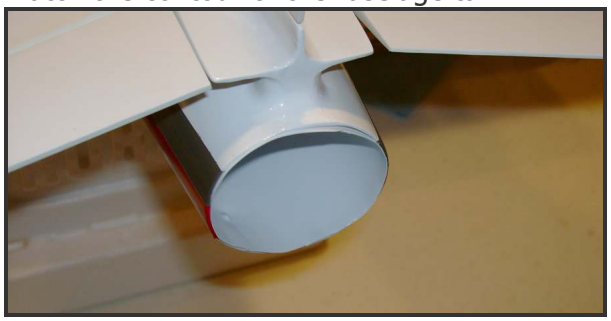
Rotate fan and thrust duct to tape all the way around

- After the thrust duct has been taped turn the fan unit and thrust duct back to where the motor wires point straight up (towards the bottom of the airplane). Place it in its final position pushed as far forward as possible and with the notches in the fan unit engaged with the inlet ducts.
- Tighten the zip ties around the fan unit by hand until they are snug. Don't over-tighten the zip ties as this may deform the fan housing, potentially causing the fan blades to rub against it. Remember, the thrust is transferred directly from the fan to the inlet ducts. The zip ties only hold the fan in place; they don't take any of the thrust.
- Push the forward zip-tie as far forward as it will go and push the rear zip-tie as far back as it will go. Trim the excess from the zip-ties and rotate them out of the way.



Fan and thrust duct assembly completed

- Use scissors to trim the end of the thrust duct to match the contour of the fuselage tail.



Trim the thrust duct to the edge of the fuselage

Wire and Mount ESC and Attach Fan Access Hatch Cover

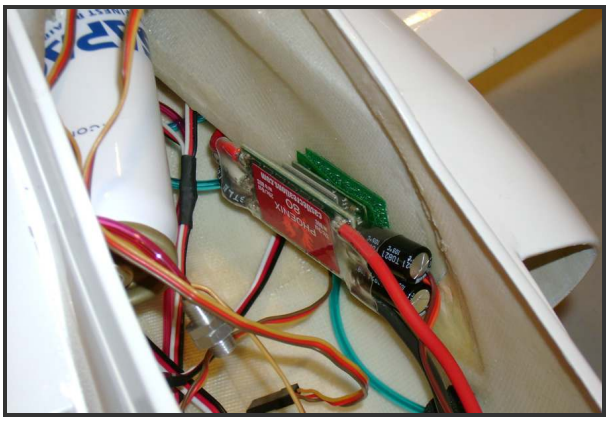
Required Parts

- Fuselage [F]
- Fan Access Hatch Cover [F1]
- ESC (Electronic Speed Control)

Required Tools and Adhesives

- Mounting Tape or Equivalent
- Packing Tape

- Ensure you mount the ESC where it will receive optimum cooling. A good location is between the two thrust ducts as negative pressure pulls air between the ducts towards the fan.



ESC mounted in position

- Feed the ESC wires around the inlet ducts and connect them to the motor wires.

  Tip: this is a good time to run up the motor and verify that it spins in the correct direction. If the motor spins backwards simply swap two of the wires coming from the ESC.

- Trim the fan access hatch cover to size using the inscribed panel lines. Test fit the fan access hatch cover; make any necessary adjustments at this time.

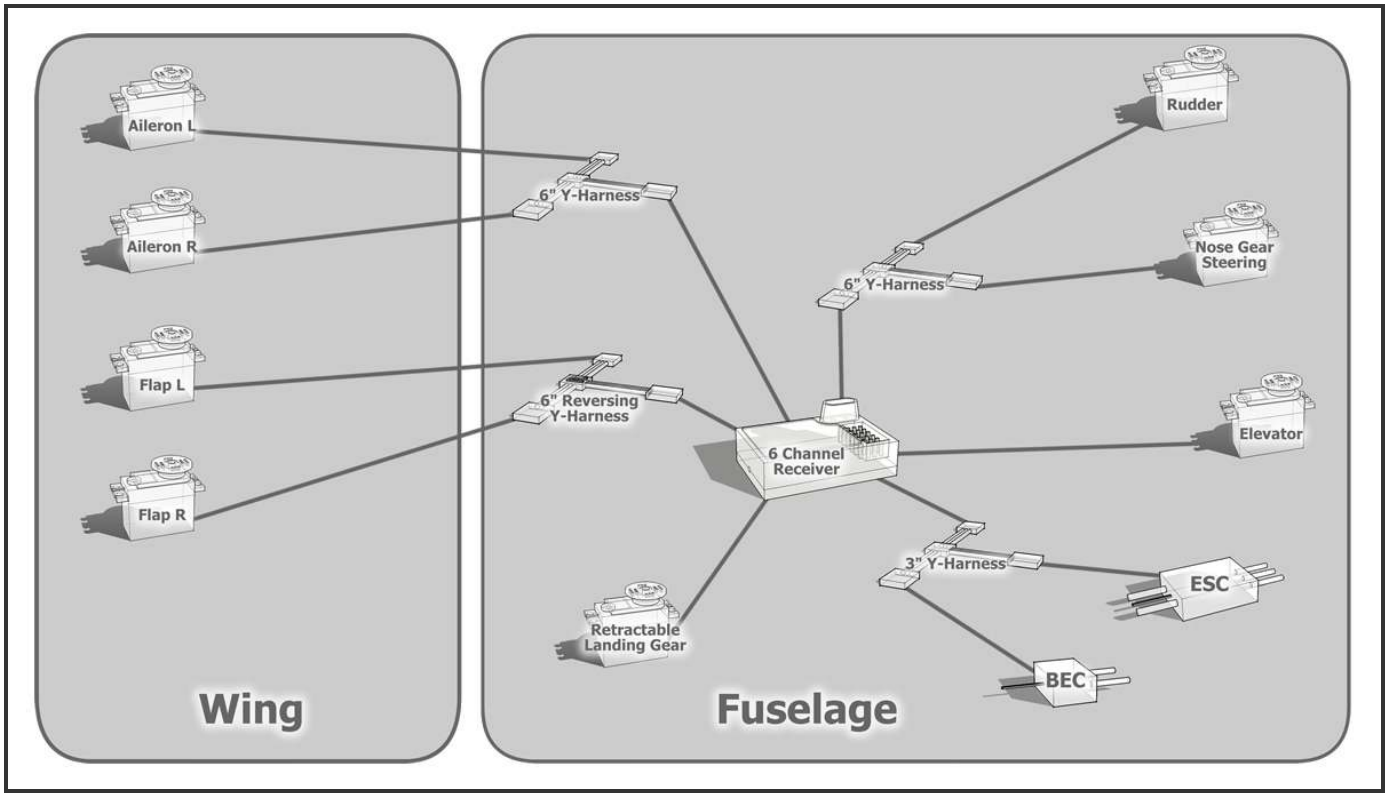
Trim the fan access hatch cover

- Complete the power system installation by attaching the fan access hatch cover with packing tape. This will allow for easy removal if fan maintenance is necessary in the future.

Attach the fan access hatch cover with tape

Radio Installation

Radio Installation Overview Diagram



Representative 6 channel radio installation

Mount Elevator and Rudder Servo

Required Parts

- Fuselage [F]
- Elevator Servo + Hardware
- Rudder Servo + Hardware

Required Tools and Adhesives

- Thin CA Adhesive
- Screw Driver

» The elevator and Rudder servos are mounted in the rear of the cockpit in front of the turtle-deck. The mounting process is the same for the other servos; pre-drill the mounting holes and reinforce them with thin CA adhesive before mounting the servos with the screws supplied with the servos.

» If you will be using different servos for elevator and rudder, the elevator servo goes on the right side of the fuselage as the pilot would see it; this side has two control rod sleeves.

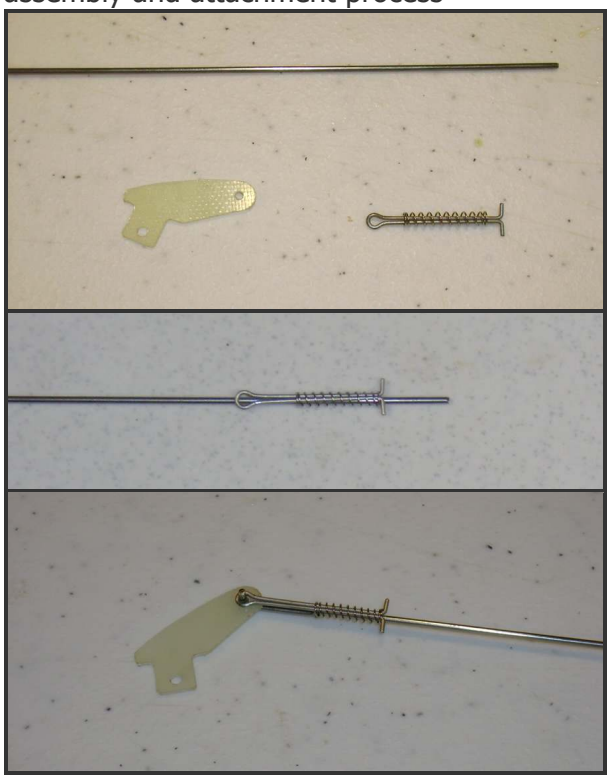
Elevator and rudder servos mounted in position

Assemble Elevator and Rudder Control Rods

Required Parts

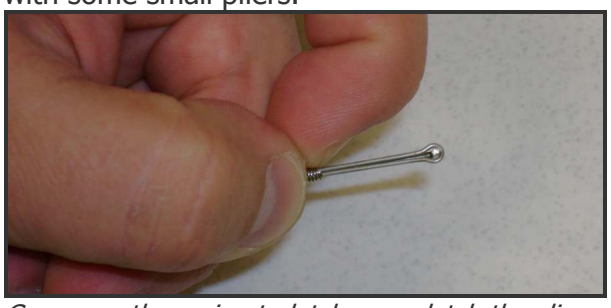
- Control Rods [H4]
- Control Rod Clips [H6]

- The clips at the end of the elevator and rudder control rods need to be assembled. The following sequence of images shows the assembly and attachment process



Control rod clip components and assembly sequence

- To attach the clips you may need to pull back on the spring, this can be done with your fingers or with some small pliers.



Compress the spring to latch or un-latch the clips

Install Elevator and Rudder Control Rods

Required Parts

- Fuselage [F]
- Control Rod Assemblies [H4]
- Linkage Stopper [H6]

Required Tools and Adhesives

- Screw Driver
- Hex Wrench
- Thick CA Adhesive

- Slide the control rods into their sleeves from the rear of the aircraft forward. Attach the control rods to the elevator halves and to the rudder.

Control rods installed on the tail surfaces

- Install the provided linkage stoppers on your servo arms using the holes closest to the center (you may adjust them later if you desire more control throw). Put a drop of thick CA adhesive on the nut to ensure it doesn't come loose; take care not to bond the linkage stopper to the servo arm.
- Connect your servos to your radio and center them. Slide the linkage stoppers over the control rods and install the servo arms with the screws provided with your servos. Center the control surfaces and tighten the set screws holding the control surfaces in a neutral position.

Completed servo installation

Mount BEC and/or Receiver Battery

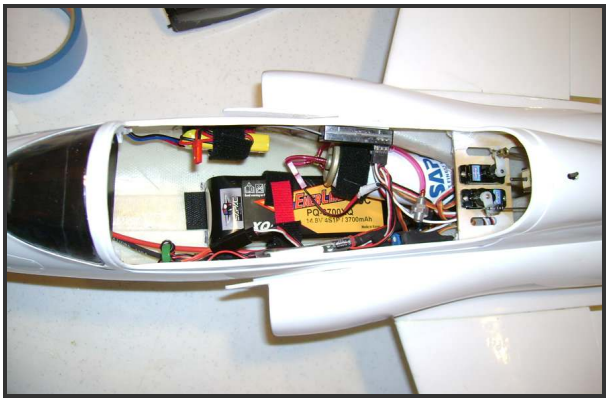
Required Parts

- Fuselage [F]
- BEC and/or Radio Battery (optional)

Required Tools and Adhesives

- Mounting Tape or Equivalent

- If you plan to use a BEC and/or a receiver battery, and haven't mounted them yet, this is the time to install them. Find a good location for the installation such as the side of the cockpit or the inlet ducts.



Representative cockpit gear installation

Mount Receiver and Connect Servos

Required Parts

- Fuselage [F]
- Receiver and Extensions

Required Tools and Adhesives

- Mounting Tape or Equivalent

- There are many different ways to configure the radio system in the Viper Jet. Anything from a 5 channel installation (ailerons, elevator, rudder, flaps and throttle) up to a 6 channel setup (+retracts). The installation can use as many as 8 servos and 9 channels plus receiver battery or BEC. There are also multiple mixing options possible with modern computer radios. Depending on your gear and configuration you will decide which radio installation is best suited for your model.
- Connect all the leads in the cockpit to the receiver and its corresponding extensions. Mount the receiver to the side of the fuselage in the cockpit using mounting tape or hook and loop fastener (alternately the receiver can be mounted in the EDF compartment). Clean up all the wiring and make sure nothing will be fouled up when installing or removing the flight battery. Secure any extensions or y-harnesses which may come loose with servo lead security clips, string or other equivalent method.
- If you will be using a single radio channel for the flaps you will need a reversing Y-harness, a servo match box or one reversed servo. This will allow the servos to operate in opposite directions.

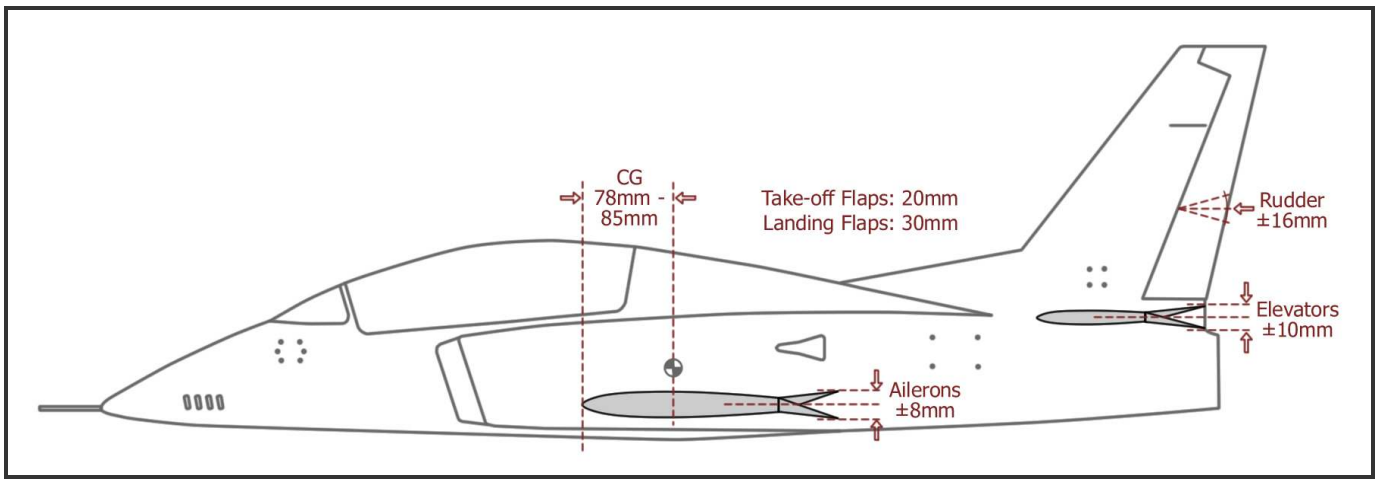
Test Radio Installation and Set-up Control Throws

Required Parts

- Completed Airplane
- Radio

- The final step in the installation of the radio system is to set up control throws and test direction of motion. The following diagram shows the recommended control throws.

  Note: All control throws are measured at the widest point of the control surface.



Control throw reference diagram

- Aileron Control Throw: 8mm each way.
- Elevator Control Throw: 10mm each way.
- Rudder Control Throw: 16mm each way.
- Take-off Flap Control Throw: 20mm.
- Landing Flap Control Throw: 30mm.

- This is also a good time to test all other systems such as the retractable landing gear and the power system.

Fins, Cockpit, Canopy and Decals

Install Fins

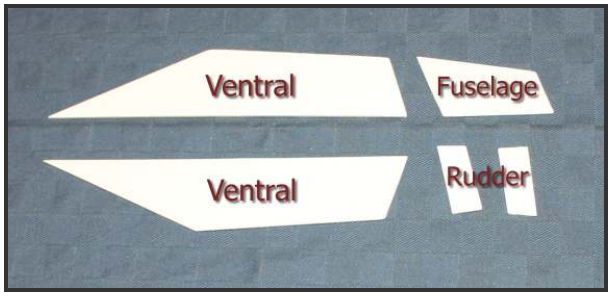
Required Parts

- Completed Airplane
- Fins [F3]

Required Tools and Adhesives

- Hand Drill & Drill Bits
- Hole Reamer
- 5-Minute epoxy Adhesive

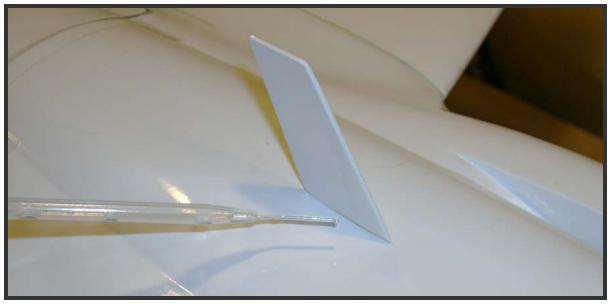
- There are three types of fins for the Viper Jet; two ventral fins, one fuselage fin and two rudder fins.



There are three types of fins for the Viper Jet

- The location and orientation of the fins is shown in the images below:

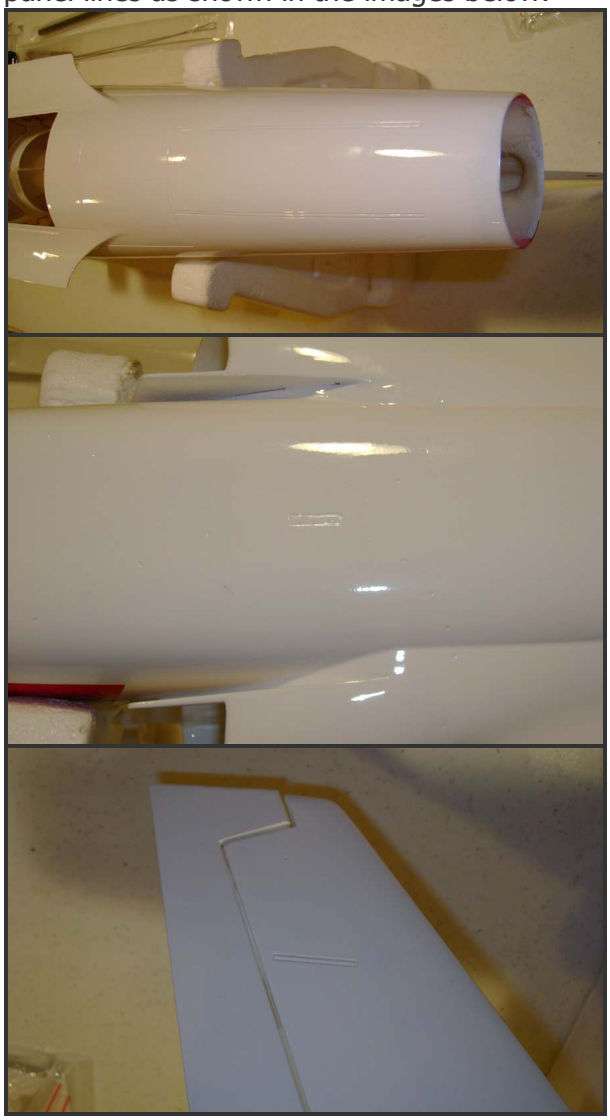
Ventral fin locations



Fuselage fin location

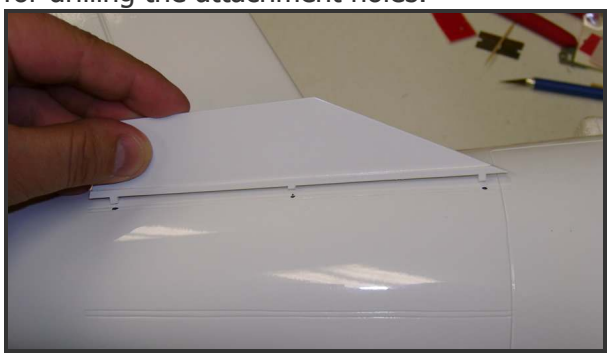
Rudder fin location

- The locations are etched into the fuselage with panel lines as shown in the images below.



Fin panel lines

- The process for attaching the fins is the same for all fins so it will be described only once.
- Mark the fin guide pin locations on the fuselage for drilling the attachment holes.



Mark guide pin locations

- Drill the holes using a hand drill. If necessary use a hole-reamer to enlarge the holes. Dry fit the fins and make any necessary adjustments.

Note: When drilling the holes for the ventral fins ensure you don't accidentally drill through the thrust tube.

Drill guide pin holes

- Repeat the process for all remaining fins.
- Bond all the fins using 5-minute epoxy adhesive.

Bond the fins with 5-minute epoxy

Install Pitot Tube

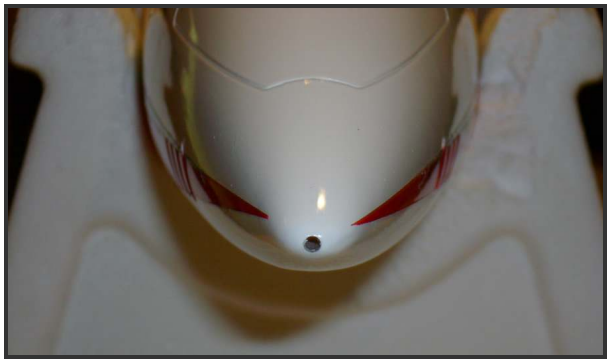
Required Parts

- Fuselage [F]
- Carbon Fiber Pitot Tube [F4]

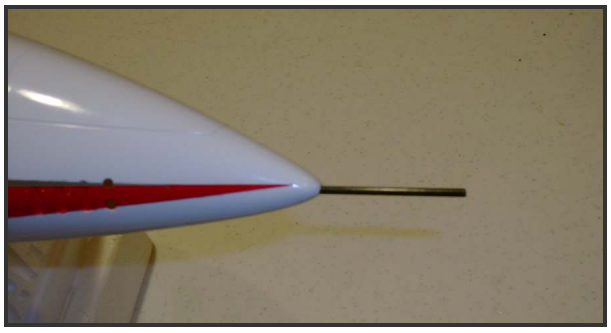
Required Tools and Adhesives

- Thin CA Adhesive

- The nose of the Viper Jet has a hole drilled in it for mounting of the Pitot tube. Insert the Carbon Fiber Pitot tube into the slot and bond with thin CA adhesive.



Hole in the nose of the fuselage for the Pitot tube



Pitot tube bonded in position

- You can use this location with a functional Pitot tube such as the ones found on data acquisition systems.
  If you desire to do that, mount the tube supplied with the data collection system in the hole in the nose of the fuselage. Alternately you can connect the air pressure hose to the supplied Carbon Fiber tube.

Install Main Cockpit

Required Parts

- Fuselage [F]
- Cockpit & Canopy [C]

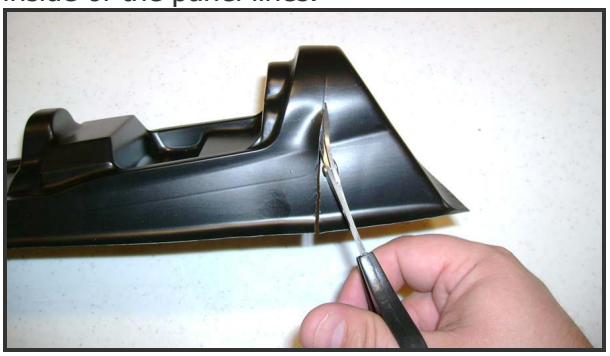
Required Tools and Adhesives

- Scissors
- CA Adhesive

- The following image shows the components comprising the cockpits and the canopies of the Viper Jet. *Note: the fan access hatch cover shown in this image isn't used in these steps*.

Cockpit and canopy components

- Trim the cockpit to the panel lines supplied. Note that the panel lines are more visible on the inside of the cockpit. Trim carefully just to the inside of the panel lines.

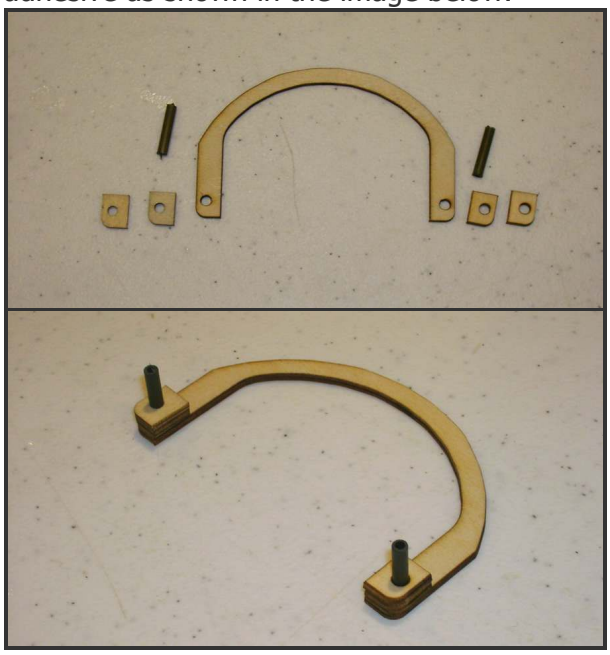


Trim the cockpit to the panel lines

- Lay the cockpit on the fuselage and make any adjustments to the cockpit until you get a good fit.

Dry fit the cockpit and make any adjustments

- Assemble the front pin components using CA adhesive as shown in the image below.



Cockpit front pin assembly

- Bond the front pin assembly to the front of the canopy using CA adhesive. Ensure the assembly is bonded straight and aligned with the top of the cockpit.

Bond the front pin assembly to the cockpit

- Bond the real latch plate to the rear of the canopy using CA adhesive. Ensure the latch plate is bonded straight and aligned with the top of the cockpit.

Bond the latch plate to the cockpit

- Once the adhesive has dried, test fit the cockpit on the fuselage and ensure smooth operation of the latch. Make any adjustments necessary to achieve a good fit.

Dry fit the cockpit and test the latch

Bond Main Canopy to Cockpit

Required Parts

- Fuselage [F]
- Cockpit & Canopy [C]

Required Tools and Adhesives

- Scissors
- Wax Paper or Low Tack Tape
- Canopy Glue

- Trim the canopy carefully just to the inside of the panel lines.

Trim the canopy to the panel lines

- With the cockpit mounted on the body, dry fit the canopy and make any necessary adjustments.
- To get the best fit for the cockpit & canopy bond the canopy to the cockpit with the cockpit mounted on the fuselage.
- To avoid accidentally bonding the canopy assembly to the fuselage, protect the fuselage with some wax paper or some low tack tape. Bond the canopy to the cockpit using canopy glue (or equivalent).

Bond the canopy to the cockpit using canopy glue

Install Front Cockpit and Canopy

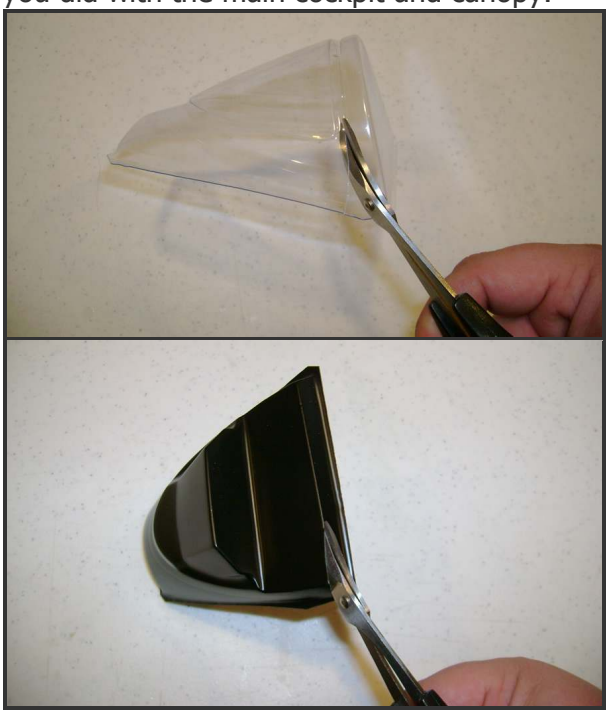
Required Parts

- Fuselage [F]
- Cockpit & Canopy [C]

Required Tools and Adhesives

- CA Adhesive
- Canopy Glue

- There are 3 components comprising the front canopy and cockpit assembly; a lower cockpit, an upper cockpit and the canopy itself.
- Trim all three components to the panel lines as you did with the main cockpit and canopy.



Trim front cockpit and canopy components

- Start the assembly of the front cockpit by bonding the upper cockpit component to the lower cockpit component using CA adhesive. The upper cockpit component acts as a visor and extends out past the instrument panel on the lower cockpit component. An image of this is shown below.

Bond the upper cockpit component to the lower cockpit component with CA adhesive.

- Hold the front canopy and the front cockpit assembly is place in the fuselage. Determine how the pieces align and remove them from the fuselage for assembly. Bond the front canopy to the front cockpit using canopy glue.

Bond the canopy to the cockpit using canopy glue

- Once the assembly is complete, dry-fit it into the fuselage and make any necessary adjustments. Bond the assembly to the fuselage using canopy glue.

Bond the front canopy assembly to the fuselage using canopy glue

- Test fit the full canopy to ensure there is no interference between the front canopy components and the main canopy components.

Completed canopy assembly

- If you would like the instrument panel for the pilot to be visible from the main cockpit you can cut a hole in the main cockpit as shown in the image below; this will give the airplane a more scale appearance.

Scale cutout in main cockpit

Apply Decals

Required Parts

- Completed Airplane
- Decals [D]

Required Tools and Adhesives

- Low Tack Tape

- To apply the decals first remove the surrounding waste around the decals leaving only the parts which will be applied to the airplane.

Decal ready to be applied to airplane

- Place a piece of low tack tape over the decal; this will hold the pieces of the decal together as you apply it to the airplane.

Place a piece of low tack tape on the decal

- Remove the backing from the decal.

Remove the backing from the decal

- Place the decal on the fuselage in the desired position.
The decals are water-slide decals so if you like

you can use a small misting of water under the decal and slide it around until you have placed it in the desired location. When you are happy with the placement, squeegee any excess water using a credit card or similar implement and dry the excess water with a paper towel. If you do use water, wait for the water to dry completely and for the decal to be well adhered before attempting to remove the tape.

Decal placed in position

- Remove the low tack tape.

Remove tape

- The following image shows the decal positions for the Viper Jet.

Decal locations

Before You Fly

Set Up Center of Gravity and Verify Control Throws and Directions

Required Parts

- Completed Airplane
- Hook & Loop Fastener for Battery [F5]
- Battery

- As shown in the diagram on page 42 the center of gravity of the Viper Jet is 78mm – 85mm behind the leading edge of the wing where it meets the fuselage. Make sure your center of gravity is close to this location for the maiden flight; you may move it later to suit your flying preference.
- Mount the battery to the bottom of the fuselage using the supplied hook and loop fastener. Move it forwards or backwards until you achieve the desired center of gravity.
- Double check the control throws and the direction of travel for all you control surfaces (including nose wheel steering). Use this opportunity to reverse any channels operating in the wrong direction.
- If your nose wheel steers opposite from your rudder you will need to cross the pull-pull steering wires (in case of retracts). Alternate solutions are to use two channels and a custom program mix on your radio, a reversing Y-Harness or a servo matching box.
- As a reminder, the control throws are as follows:
  - Aileron Control Throw: 8mm each way.
  - Elevator Control Throw: 10mm each way.
  - Rudder Control Throw: 16mm each way.
  - Flap Control Throw: Take-off is 20mm and Landing is 30mm.

Check Power System

- Before flying any electrical plane it is good to test the operation of your power system to ensure you don't exceed the capacity of any of the installed components.
  Connect a meter in-line with your power system and measure the amps and the watts to verify they are within the specifications of your battery, ESC and motor.
- The minimum recommended battery for the SAPAC Viper Jet Composite is a 4S 3300mAh 25C LiPo Battery. You can get extended flight times and better performance by using higher capacity and/or higher C rated batteries. Test multiple configurations to find which battery setup is best for your desired flight profile.

Range Check Your Radio

- Follow the directions provided by your radio manufacturer to range check your radio.
- If control is not positive at the stated distance do not fly your airplane until the situation has been rectified.

Flying Characteristics

- The SAPAC Viper Jet composite is a high performance aircraft with good aerobatic capabilities and can easily perform maneuvers such as loops, 4-point rolls and knife edge flight.
- It has a broad flight envelope and can execute a high speed pass at over 120mph as well as slowing considerably for landing.
- The glide path is shallow; make sure you set up for a long landing.
- The Viper Jet composite is not a beginner's aircraft. If you have limited RC flight experience we recommend you seek the aid of a more experienced pilot or an instructor to handle the first few flights and to validate your skills are adequate to handle this model. Practice as much as you can on a flight simulator before attempting to fly advanced aircraft.

Congratulations, your SAPAC ViperJet MKII Composite build is now complete!

We hope it gives you many hours of enjoyable flight.

Parts Cross Reference

Manual Code	Description	SAPAC Part Number		
		White and Red Trim	Green and White Trim	Brown and Gold Trim
F	Fuselage	SAP12441	SAP12442	SAP12443
F1	Fan Access Hatch Cover	SAP12427	SAP12428	SAP12429
F2	Fixed Landing Gear Hardware, Nose	SAP12433		
F3	Ventral Fins & Winglets	SAP12437	SAP12438	SAP12439
F4	Carbon Fiber Pitot Tube	SAP12431		
F5	Hook & Loop Fastener for Battery	SAP11548		
E	Stabilizers (Elevators)	SAP12447	SAP12448	SAP12449
W	Wings	SAP12444	SAP12445	SAP12446
W1	Fixed Landing Gear Hardware, Main	SAP12434	SAP12435	SAP12436
W2	Wing Servo Hardware	SAP12450		
H3	Wing Tube & Horizontal Stabilizer Mounting Tubes	SAP12455		
H4	Control Rods	SAP12451		
H5	Spare Hinges	SAP12424		
H6	Control Horns, Wing Control Rods, Control Rod Clips & Linkage Stoppers	SAP12456		
M1	Thrust Duct	SAP12457		
M2	EDF Unit Shroud	SAP12458		
T	Wheels & Tires	SAP12432		
C	Cockpit & Canopy	SAP12421		
D	Decals	SAP12453	No Decals	SAP12454
Optional	3200KV MB1 Motor and 70mm Fan Unit	SAP30732		
Optional	Rz180 Retractable Landing Gear	SAP14000		
Optional	Sz180-v Scale Struts	SAP12601		
Optional	M-Power MS-A65 Analog Servo	MPOMSA65		
Optional	M-Power MS-D65M Digital Metal Gear Servo	MPOMSD65M		

Safety, Precautions and Warnings

As the user of this product, you are solely responsible for operating it in a manner that does not endanger yourself and others or result in damage to the product or the property of others.
Carefully follow the directions and warnings for this and any optional support equipment (chargers, rechargeable battery packs, etc.) that you use.
This model is controlled by a radio signal that is subject to interference from many sources outside your control. This interference can cause momentary loss of control so it is necessary to always keep a safe distance in all directions around your model, as this margin will help to avoid collisions or injury.

- Always operate your model in an open area away from cars, traffic or people.
- Avoid operating your model in the street where injury or damage can occur.
- Never operate the model out into the street or populated areas for any reason.
- Never operate your model with low transmitter batteries.
- Carefully follow the directions and warnings for this and any optional support equipment (chargers, rechargeable battery packs, etc.) that you use.
- Keep all chemicals, small parts and anything electrical out of the reach of children.
- Moisture causes damage to electronics. Avoid water exposure to all equipment not specifically designed and protected for this purpose.

2010 Official Academy of Model Aeronautics National Model Aircraft Safety Code

GENERAL

A model aircraft shall be defined as a non-human-carrying aircraft capable of sustained flight in the atmosphere. It may not exceed limitations established in this code and is intended to be used exclusively for sport, recreation, and/or competition.

1. **I will not willfully fly my model aircraft in a careless or reckless manner, and will abide by this Safety Code and any additional rules specific to flying sites.**
2. **I will yield the right-of-way to man-carrying aircraft and will see and avoid all aircraft, utilizing a spotter when appropriate. (See AMA Document #540-D on See and Avoid Guidance.)**
3. I will not fly my model aircraft higher than approximately 400 feet above ground level, when within three (3) miles of an airport without notifying the airport operator.
4. The maximum takeoff weight of a model aircraft, including fuel, is 55 pounds, except for those flown under the AMA Experimental Aircraft Rules.
5. I will not fly my model aircraft in sanctioned events, air shows, or model demonstrations unless **I have previously proven that my aircraft, control system, and piloting skills are adequate by successfully executing all maneuvers intended or anticipated in the specific event. If I am not a proficient pilot, I will not fly in these events unless assisted by an experienced pilot.**
6. I will not fly my model aircraft unless it is identified with my name and address, or AMA number, inside or affixed to the outside of the model aircraft. This does not apply to model aircraft flown indoors.
7. I will not operate model aircraft with metal-blade propellers.
8. I will not operate model aircraft carrying pyrotechnic devices which explode or burn, or any device, which propels a projectile of any kind. Exceptions include Free Flight fuses or devices that burn producing smoke and are securely attached to the model aircraft during flight. Rocket motors up to a G-series size may be used, provided they remain firmly attached to the model aircraft during flight. Model rockets may be flown in accordance with the National Model Rocketry Safety Code; however, they may not be launched from model aircraft. Officially designated AMA Air Show Teams (AST) are authorized to use devices and practices as defined within the Team AMA Program Document.
9. **I will not operate my model aircraft while under the influence of alcohol or while using any drug which could adversely affect my ability to safely control the model.**
10. When and where required by rule, helmets must be properly worn and fastened. They must be OSHA, DOT, ANSI, SNELL or NOCSAE approved or comply with comparable standards.

RADIO CONTROL

1. **All pilots shall avoid flying models over unprotected people.**
2. I will complete a successful radio equipment ground-range check **in accordance with the manufacturer's recommendations** before the first flight of a new or repaired aircraft.
3. At all flying sites a safety line or lines must be established, in front of which all flying takes place. Only personnel associated with flying the model aircraft are allowed at or in front of the safety line. In the case of air shows or demonstrations a straight safety line must be established. An area away from the safety line must be maintained for spectators. Intentional flying behind the safety line is prohibited. (See AMA Document #706 for Recommended Field Layout.)
4. I will operate my model aircraft using only radio-control frequencies currently allowed by the Federal Communications Commission (FCC). Only individuals properly licensed by the FCC are authorized to operate equipment on Amateur Band frequencies.
5. I will not knowingly operate my model aircraft within three (3) miles of any preexisting flying site without a frequency-management agreement. (See AMA Document #922 for Testing for RF Interference. See AMA Document #923 for Frequency Management Agreement.)
6. With the exception of events flown under official AMA Competition Regulations rules, excluding takeoff and landing, no powered model may be flown outdoors closer than 25 feet to any individual, except for the pilot and the pilot's helper(s) located at the flight line.
7. Under no circumstances may a pilot or other person touch a model aircraft in flight while it is still under power, except to divert it from striking an individual. **This does not apply to model aircraft flown indoors**.
8. Radio-controlled night flying requires a lighting system that provides the pilot with a clear view of the model's attitude and orientation at all times.
9. The operator of a radio-controlled model aircraft shall control it during the entire flight, maintaining visual contact without enhancement other than by corrective lenses that are prescribed for the pilot. **First-Person View (FPV) flying may only be conducted in accordance with the procedures outlined in AMA Document #550**.

PARK FLYER SAFE OPERATING RECOMMENDATIONS

- Inspect your model before every flight to make certain it is airworthy.
- Be aware of any other radio frequency user who may present an interference problem.
- Always be courteous and respectful of other users of your selected flight area.
- Choose an area clear of obstacles and large enough to safely accommodate your flying activity.
- Make certain this area is clear of friends and spectators prior to launching your aircraft.
- Be aware of other activities in the vicinity of your flight path that could cause potential conflict.
- Carefully plan your flight path prior to launch.
- Abide by any and all established AMA National Model Aircraft Safety Code.

Please contact your local dealer for support

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