EXTRA 300S™

AWARF SERIES Plus

All Wood–Almost Ready To Fly

ASSEMBLY INSTRUCTIONS

HCAZ3078 V 1.0

Congratulations!

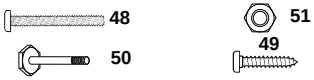
You're about to build in just days what took aviation pioneers years—a powered machine that flies. Specially created for you and other experienced radio control modelers, Hobbico's Extra 300S offers nearly all the excitement of piloting a real airplane...and develops skills that will take you anywhere you want in your hobby.

Know Your Model's Parts

Take a moment now to match the box contents with the items listed below. Following the Extra 300S assembly instructions will be quite easy if you identify and organize the parts before you begin. You may also want to review the glossary of special modeling terms that starts on page 33 of this manual. Words in your instructions that appear in ***bold italic type*** are explained in this section.

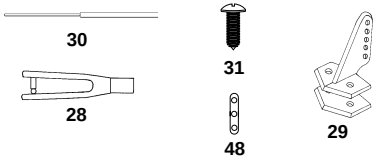
Landing Gear

Part #		Quantity
15	Main landing gear	2
5	Tail gear wire	1
4	Tail wheel	1
14	Main wheels	2
13	Wheel pants	4
48	4 x 18mm bolts	2
49	3 x 10mm sheet metal screws	2
50	Axles	2
51	3mm nuts	6



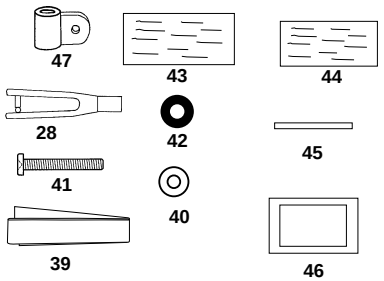
Tail Assembly

Part #		Quantity
1	Stabilizer and elevator	1
16	Rudder and fin	1
28	*Clevises	5
29	*Control horns	2
30	Pushrods	2
31	2mm x 18 mm machine screws	4
48	Elevator splitter plate	1



Wing Assembly

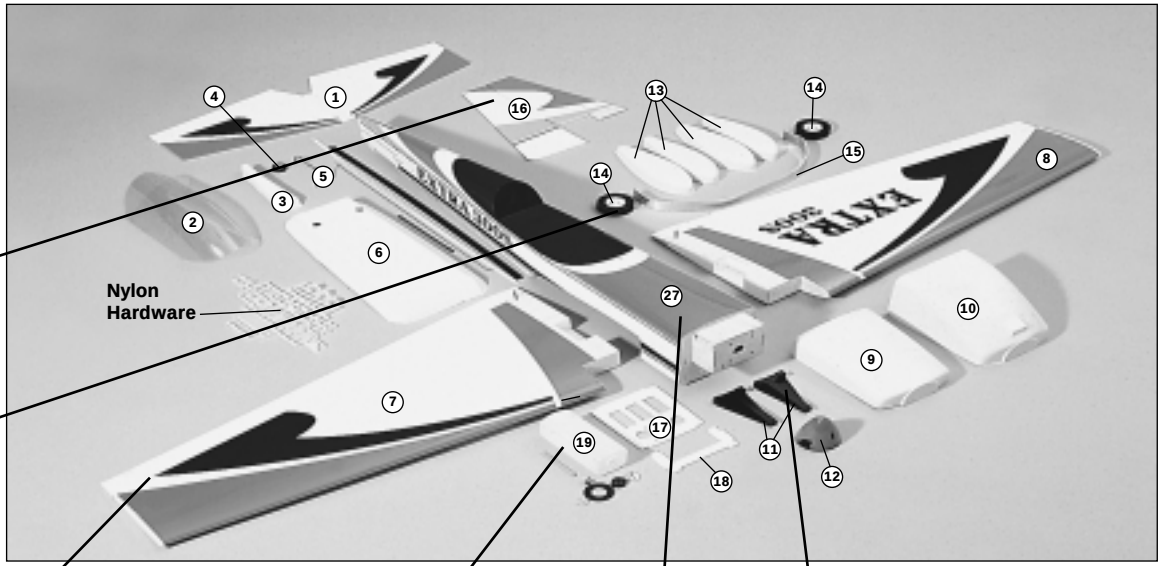
Part #		Quantity
6	Wing fairing	1
7	Right wing panel	1
8	Left wing panel	1
28	*Clevises	2
39	Fiberglass tape	1
40	4mm washers	2
41	4 x 35mm bolt	2
42	4mm O-ring	2
43	Plywood front plate	1
44	Plywood rear plate	1
45	Servo tray supports	2
46	Servo tray	1
47	*Aileron control horns	2



Replacement Parts Available

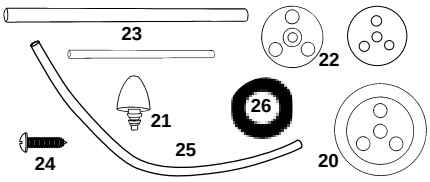
HCAA3621...Wing Kit
HCAA3622...Fuselage Kit
HCAA3623...Cowl Set
HCAA3624...Fin Set
HCAA3625....Wheel Pants Set
HCAA3626....Canopy
HCAA3627....Spinner
HCAA3628....Landing Gear Set

*Parts marked with an asterisk are found on the plastic parts tree.



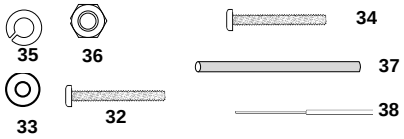
Fuel Tank & Parts

Part #		Quantity
19	Fuel tank	1
20	Rubber tank stopper	1
21	Fuel pick-up weight (clunk)	1
22	Plastic stopper compression disks (one large and one small)	2
23	Aluminum fuel tubing (one short and one long)	2
24	3 x 18mm screw	1
25	Silicone fuel line	1
26	Foam tank collar	1



Engine Mounting Parts

Part #		Quantity
11	Engine mount	2
32	4 x 18mm bolts	4
33	4mm washers	4
34	4 x 25mm bolts	4
35	4mm lock washers	4
36	4mm nuts	4
37	Pushrod tube	1
38	Pushrod wire	1



* Engine mounting parts may differ from those shown in the photo.

Fuse Parts

Part #		Quantity
2	Canopy	1
3	Aft tail cover	1
9	Cowl top	1
10	Cowl bottom	1
12	Spinner	1
17	Servo tray	1
18	Servo tray former	1
27	Fuselage	1

Parts shown smaller than actual size (out of proportion).

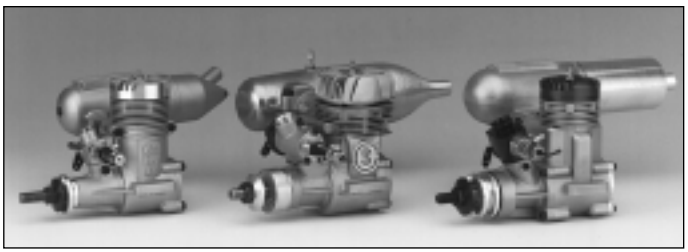
Other Items You'll Need:

Glues

Choose 6-minute and 30-minute epoxy, such as Great Planes Pro™ Epoxy, which has been formulated especially for R/C model building. Pro Epoxies offer a strong bond and a variety of curing times suited for every step of assembly. You'll also need a thin instant-setting CA (cyanoacrylate), a thicker CA+, plus rubbing alcohol for easy epoxy cleanup.

Hardware

Tools and accessories required for assembly include a hobby knife; small and large Phillips screwdrivers; needle nose pliers; drill with 1/16", 1/8", 3/32" 3/16", 5/32" and 17/64" bits; ruler; #64 rubber bands; 1 foot of medium fuel tubing; petroleum jelly; and 400-grit sandpaper.



Model Engine

Power your Extra 300S with any high-quality, .60-size model engine. The O.S. .60 FP, or SuperTigre S-61K are fine engines for this plane. Look for features such as easy break-in, easy starting, efficient carburetion and low maintenance. Check the manufacturer's recommendations for propellers to use with your engine.

Radio Equipment

To let you send the commands that control your Extra 300S's "flight path," you'll need a 4-channel aircraft radio system with four standard servos. Many 4-channel radios include just three servos. You may need to purchase the fourth separately. The servos and radio receiver will be mounted on-board your model and need to be cushioned from jolts and vibration. One-half inch thick foam rubber sheets (HCAQ1050) are available for this purpose.

Getting Ready for Flight

Your Hobbico Extra 300S is ready for takeoff in as little as 20 hours. Your hobby dealer or flying instructor (see next page) can help you decide what accessories you'll need for flight. Most are one-time only purchases—and your instructor will probably allow you to use his field box until you can outfit your own with a glow plug starter, fuel pump and "chicken stick" or electric starter. You will need to provide your own fuel. Use glow fuel with a 10-15% nitro blend to keep your engine performing at its peak...and your Extra 300S will have the power to make you an accomplished pilot!

Other General Items Required

Epoxy Brushes (GPMR8062)	Mixing Sticks (GPMR8055)	Clothespins	Foam Rubber (HCAQ1050)
T-Pins (HCAR5150)	Masking Tape	String	Felt-Tip Pen
Sanding Block	Adjustable Wrench	Paper Towels	Builders Triangle Set (HCAR0480)
Plastic Wrap or Wax Paper	Round Toothpicks	Bondo Filler	Wire Cutter
70% Isopropyl Alcohol	Small Hobby Clamps	Razor Saw	Thread Locking Compound

Find a Flying Instructor

The best way to begin flying your Extra 300S is with an experienced R/C pilot or flying instructor at your side. You'll learn faster, and avoid risking your model before you're truly ready to solo.

Where do you find an instructor? Ask at your local hobby shop. They'll have information about flying clubs in your area whose membership includes qualified instructors. You should also join the Academy of Model Aeronautics (AMA), a 165,000 member-strong national organization with more than 2,300 chartered clubs across the country. Through any one of them, instructor training programs are available. Contact the AMA at the address or phone number below:

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302
Office: (317) 287-1256
Toll Free: (800) 435-9262
Fax: (317) 741-0057

AMA SINCE 1936
JOIN THE AMA

WARNING! This is not a Toy! Please follow these safety precautions:

Before you fly:

1. Make sure that no other fliers are using your radio frequency.
2. Your radio transmitter must be the FIRST thing you turn ON, and the LAST thing you turn OFF.
3. Double check all control surfaces.
4. Make sure that the transmitter & receiver batteries are fully charged.

Fuel storage and care:

1. Do not smoke near your engine or fuel.
2. Store all engine fuel in a safe, cool, dry place, away from children and pets. Model fuel will evaporate, so make sure that you always store it with the cap secure.

When starting and running your engine:

1. Always wear safety glasses.
2. Make certain that your glow plug clip is securely attached to the glow plug and cannot pop off, possibly falling into the spinning propeller.
3. Use a "chicken stick" or electric starter to start the engine – NOT your fingers.
4. Make sure that the wires from your starter and glow plug clip cannot become tangled with the spinning propeller.
5. Do not stand at the side of the propeller when you start or run the engine. Even at idle speed, the spinning propeller will be nearly invisible.
6. If any engine adjustments are necessary, approach the engine only from behind the spinning propeller.

90-Day Limited Warranty

If you, as the original owner of this model, discover defects in parts or workmanship within 90 days of purchase, Hobbico will repair or replace it – at the option of our authorized U.S. repair facility, Hobby Services – without charge. Our liability does not include cost of shipping to us. However, Hobby Services will pay shipping expenses to return your model to you.

You must provide proof of purchase, such as your original purchase invoice or receipt, for your model's warranty to be honored.

This warranty does not apply to damage or defects caused by misuse or improper assembly, service or shipment. Modifications, alterations or repair by anyone other than Hobby Services voids this warranty. We are sorry, but we cannot be responsible for crash damage and/or resulting loss of kits, engines, accessories, etc.

Repair Service

Your Extra 300S must be returned directly to Hobby Services for warranty work. The address is:
Hobby Services, Attn: Service Department, 1610 Interstate Drive, Champaign, IL 61821-1067 Phone: (217) 398-0007.

Please follow the instructions below when returning your model. This will help our experienced technicians to repair and return it as quickly as possible.

1. ALWAYS return your entire system, including airplane and radio.
2. Disconnect the receiver battery switch harness and make sure that the transmitter is turned off. Disconnect all batteries and drain all fuel.
3. Include a list of all items returned and a THOROUGH, written explanation of the problem and service needed. If you expect the repair to be covered under warranty, also include your proof of purchase.
4. Include your full return address and a phone number where you can be reached during the day.

If your model is past the 90-day warranty period or is excluded from warranty coverage, you can still receive repair service through Hobby Services at a nominal cost. Repair charges and postage may be prepaid or billed COD. Additional postage charges will be applied for non-warranty returns. All repairs shipped outside the United States must be prepaid in U.S. funds only.

All pictures, descriptions and specifications found in this instruction manual and on the product package are subject to change without notice. Hobbico maintains no responsibility for inadvertent errors.

Wing Assembly

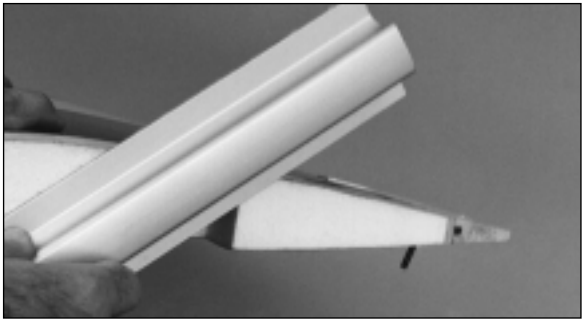
General Inspection

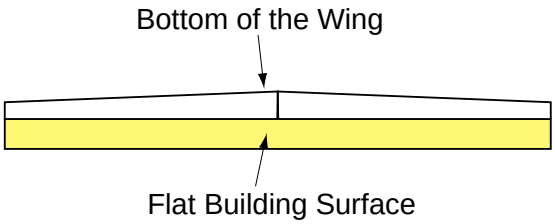
❏ Remove the fuselage, wing panels, rudder assembly and stabilizer assembly from their bags. Inspect all items closely to check for any damage. If any damage is found, contact the the place your Extra was purchased, or Hobby Services to obtain replacement for your damaged items. Also check for any covering that may have came loose. If any is found, it can be reattached using Medium CA glue.

Prepare the Wing Panels:

❏ Mark the **ailerons** using masking tape, then remove them from the **wing panels** and set them aside. This marking process is done to insure the proper ailerons can be returned to its respective panel when the ailerons are reattached.

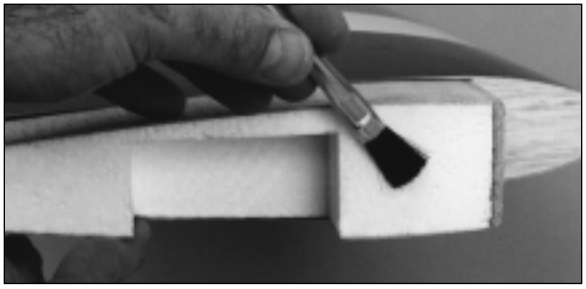
Test Fit the Wing Panels:

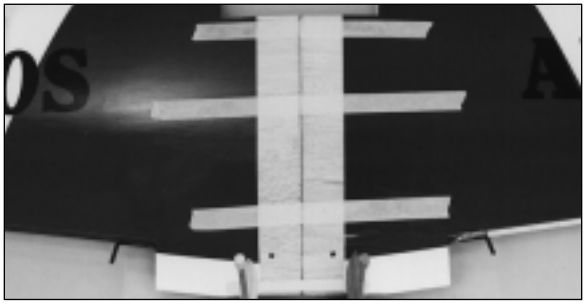




❏ The wing panels in the Extra 300S are joined upside down. The top of the **wing must** be flat on your work surface to obtain the proper dihedral angle. Test fit the panels together to make sure there is **no gap** between the panels. If any gap exists, use a flat sanding block or similar tool to sand the **wing roots** to achieve a perfect fit between the panels.

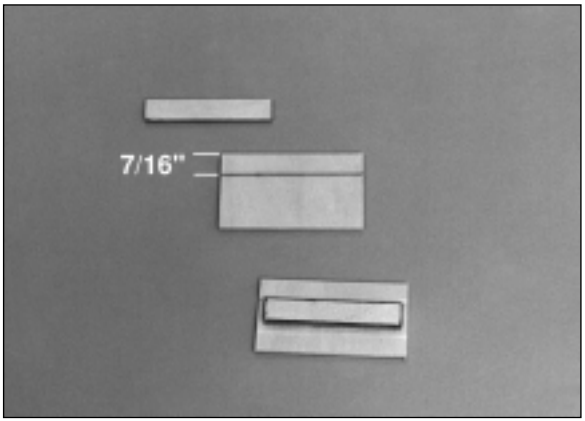
Join the Wing Panels:





❏ After putting down a piece of plastic to protect your work surface, mix up 3/4 oz.of 30-minute epoxy and liberally coat the root of each panel. Securely tape the panels together, making sure that the **leading edges** of the wing are lined up with each other. The rear of the wing can be held in alignment using clamps and mixing sticks. Clean up any excess epoxy that may remain using a paper towel and 70% Isopropyl Alcohol. Use books or some other form of weight to hold the wing panels flat against the work surface while the epoxy dries.

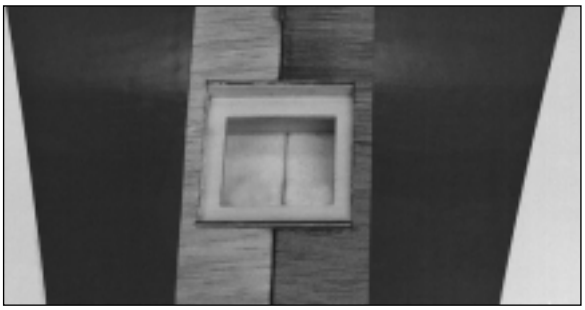
Prepare the Servo Box Plates:



❏ Locate the 2-3/8" x 1-3/8" x 1/16" **plywood front plate** and the 2-3/8" x 1-1/4" x 1/16" **plywood rear plate**. Also locate the two 2-1/8" x 7/16" x 1/16" **servo tray supports**. Draw a line on both the front and rear plywood plates, 7/16" from the top. Using Medium CA, glue the servo tray supports into position.

Note: Before mixing any epoxy, perform a trial run of this step to make sure that all parts fit securely. The servo tray in this step will hold the front and rear plates in position while the epoxy dries.

Construct the Aileron Servo Box:



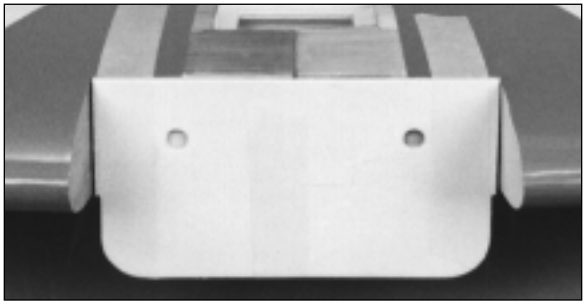
❏ Coat the entire inside of the **servo box** using 30-minute epoxy. Install the front and rear plates with the servo tray supports towards the top of the wing. Apply a small amount of epoxy to the servo tray supports and install the **aileron servo tray**.

Reinforcing the Wing Center Section:

❏ Lightly sand the **center section** of the wing to remove any excess epoxy and smooth the center section for the application of the Fiberglass Cloth. Starting on the bottom of the wing, cut a piece of the 2-3/4" fiberglass so that it is 1/16" shorter than the chord of the wing. Mix up 3/4oz. of 30-Minute epoxy. Using an epoxy brush, apply a coat of epoxy to the wing center section. Lay the fiberglass cloth down, and gently squeegee the cloth so the epoxy comes through the cloth. Use the squeegee to help spread the epoxy over the cloth. Clean up any excess epoxy that may have gotten onto the covering of the wing using a paper towel and 70% Isopropyl Alcohol.

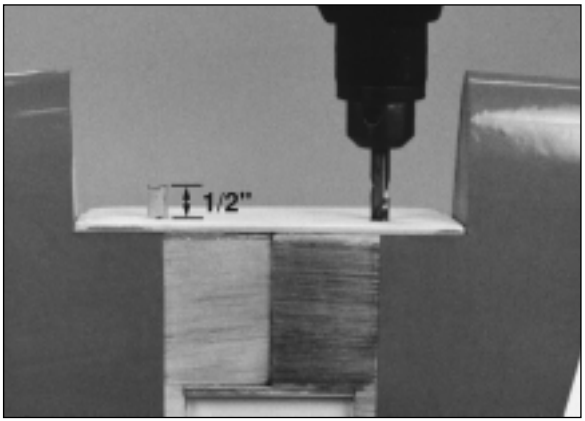
❏ After the epoxy has fully cured, repeat this process for the top of the wing. Fiberglass the area in front of the servo box separately from the rearward area. Trim any fiberglass that may protrude from the wing edges using a hobby knife.

Attach the Wing Front Former:



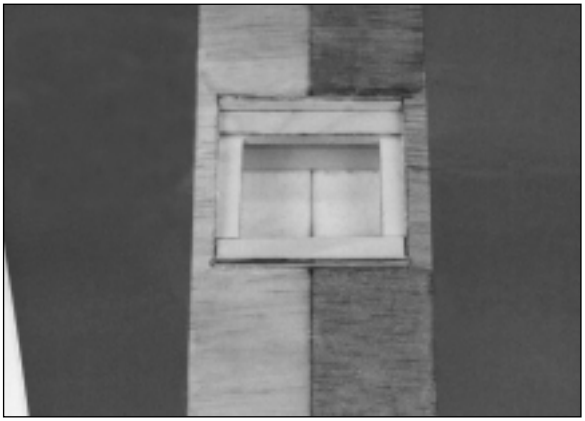
❏ Lightly sand the front of the wing to remove any excess epoxy and to even up the front of the wing. Attach the **wing front former** using 30-Minute epoxy. The wing front former is properly aligned when the top edge of the former is even with the top edge of the wing. Use masking tape to hold the former in position until the epoxy has fully cured.

Install Wing Alignment Dowels:



❏ Using a 17/64" drill bit, drill two holes into the front of the wing using the wing front former as a guide. Drill these holes 1-3/4" deep. After test fitting the dowels into the holes, glue the **wing dowels** into place. Make sure to leave 1/2" of the dowel exposed to fit into the fuselage.

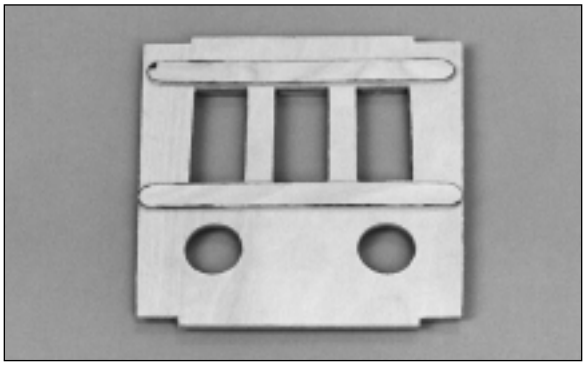
Install Aileron Tray Doublers:



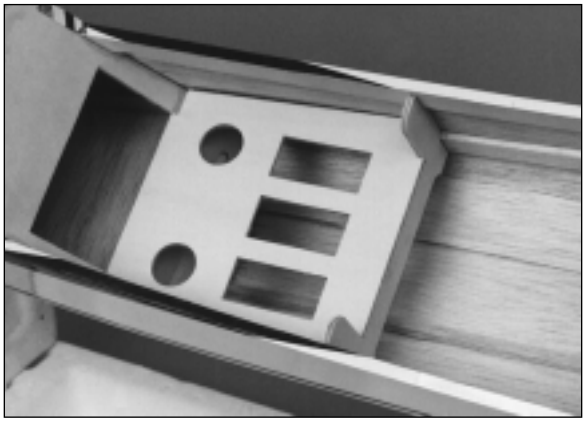
❏ Cut two **mixing sticks** to fit into the openings of the servo box as shown. Glue them into position using Medium CA.

Fuse Assembly

Install Servo Tray Doublers:

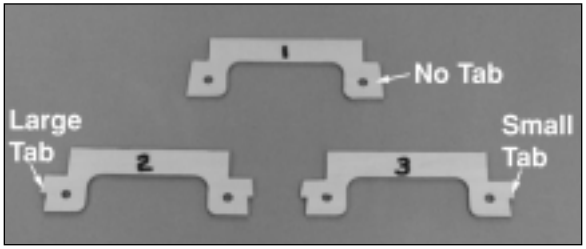


❏ Using Medium CA, glue two mixing sticks to the **servo tray** as shown. **Do not** let the sticks overlap into the openings for the servo or the sides of the servo tray.



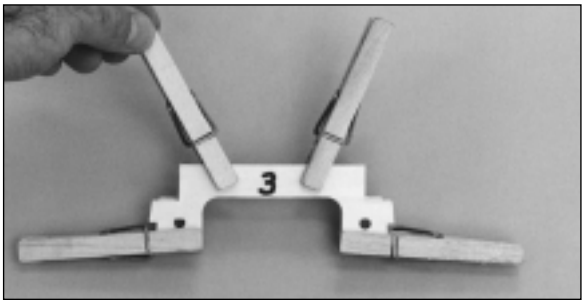
❏ Using Medium CA, install the servo tray and **servo tray former** into position. Note that the doublers are on the underside of the servo tray.

Locate the Wing Bolt Mount:



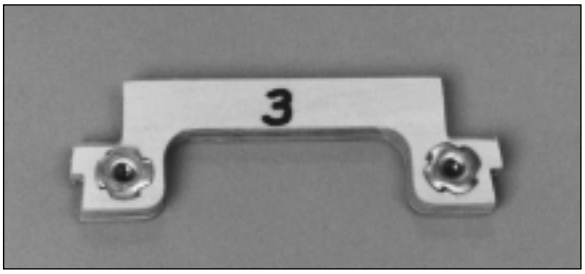
❏ Locate the three **wing bolt plates** – they should be numbered. If the numbering can't be read, use the photo to distinguish the differences between the plates and number them accordingly.

Laminate the Wing Bolt Mounts:



❏ Apply 30-minute epoxy to one side of each the #1 and #3 wing bolt mounts. Stack the mounts in numerical order – 1, 2, 3. Align the holes in the mounts and use either clamps or clothespins to hold the mounts together and in alignment until the epoxy has cured.

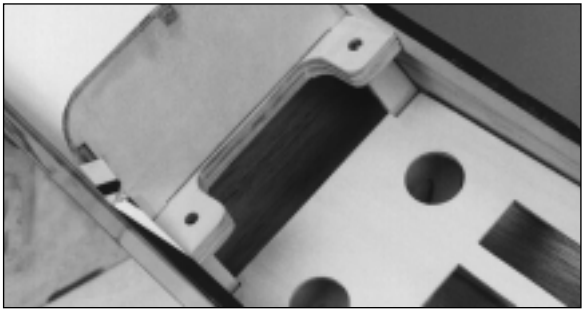
Install the Blind Nuts:



❏ Clean up the holes in the wing bolt mounts using a 3/16" drill bit. Install the **blind nuts** into mount plate #3 by gently tapping them into place using a hammer. Apply a small amount of Medium CA to the blind nuts to hold them into position. Be careful not to get any CA into the threaded area of the nuts.

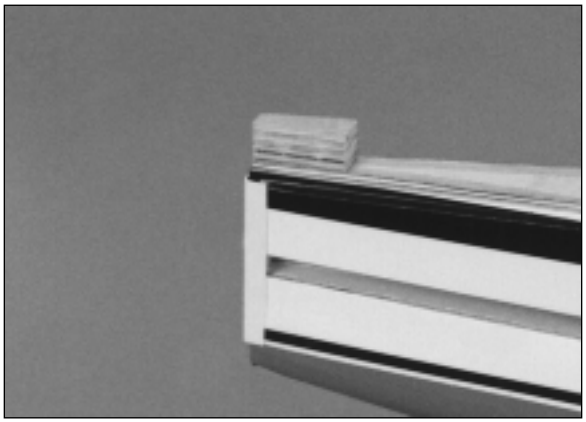
Note: Perform the next two steps with the same batch of epoxy.

Install the Wing Bolt Mount:



❏ Test fit the wing bolt mount into the fuselage, with the blind nut on the inside of the fuselage. Light sanding may be required to achieve a snug fit of the mount. Once a good fit has been achieved, glue it into position using 30-minute epoxy.

Install the Tail Mounting Block:

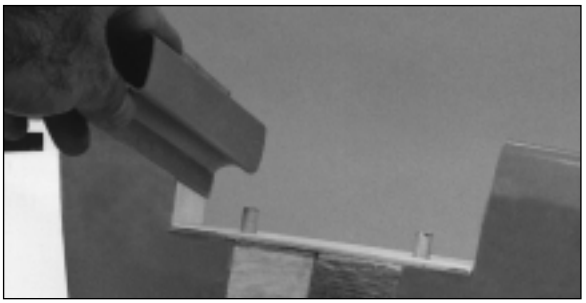


❏ With the excess epoxy, glue the **tail mounting block** into position at the rear of the fuselage.

Attach the Wing to the Fuselage

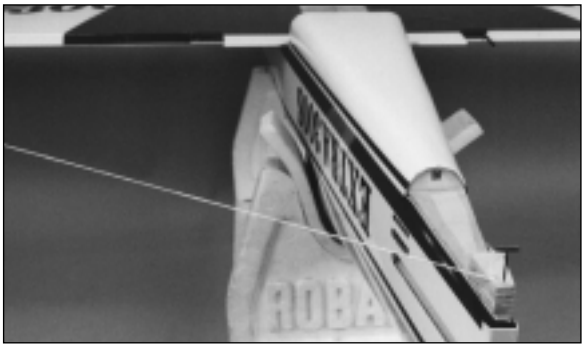
Fitting the Wing to the Fuselage:

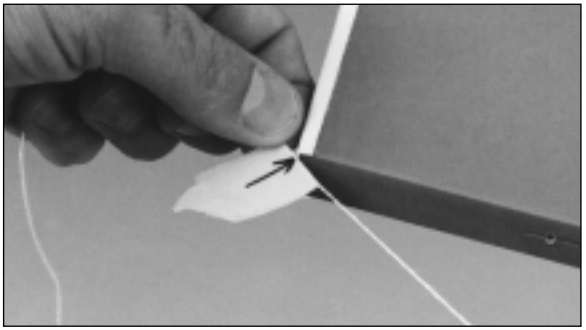
❏ Clean up the holes for the wing dowels in the fuselage using a 17/64" drill bit.



❏ Test fit the wing into position. The wing may need slight sanding to fit around the fuselage. If so, remove only a small amount of material at a time until the wing fits into position. Make sure to apply a thin coat of Thin CA to the exposed wood so that fuel won't damage the wood over time.

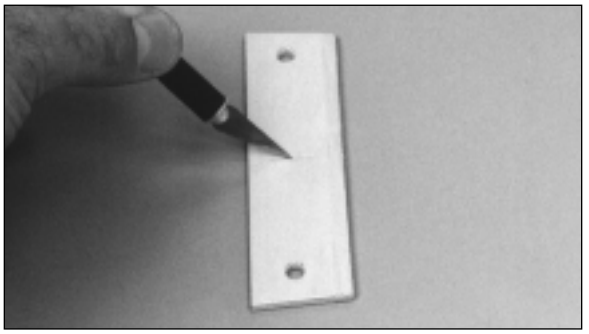
Aligning the Wing:





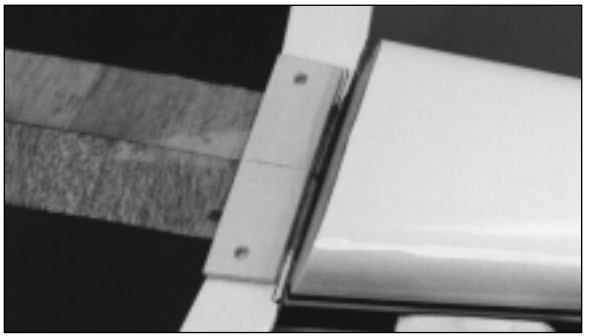
❏ Place a T-pin in the center of the tail mounting block at the rear of the fuselage. Tie a piece of string to the pin. Pull the string to the **wing tip** and put a piece of masking tape on the line at the wing tip. Put an arrow on the tape, then slide the tape so that it points at the tip of the wing. Swing the line over to the opposite tip and see if the arrow aligns with the other tip. If not, adjust the position of the wing in the fuselage. Slide the tape to indicate the new wing position, and swing the line back to the opposite tip. Continue this process until the arrow lines up with each tip. Make a mark from the wing to the fuselage to indicate the proper alignment.

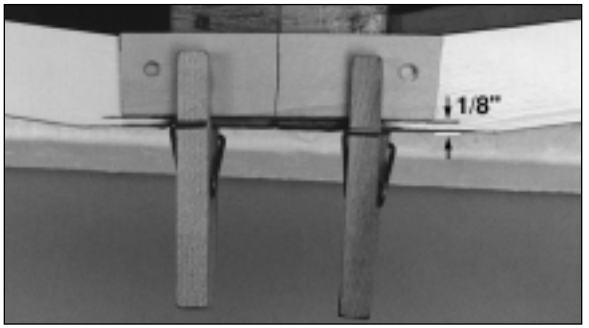
Prepare the Wing Bolt Plate:



❏ Using the embossed line on the wing bolt plate as a reference, lightly score the plate. Be careful not to cut the plate too deep, as the scoring of the plate is simply to allow it to bend to match the dihedral of the wing.

Install the Wing Bolt Plate:

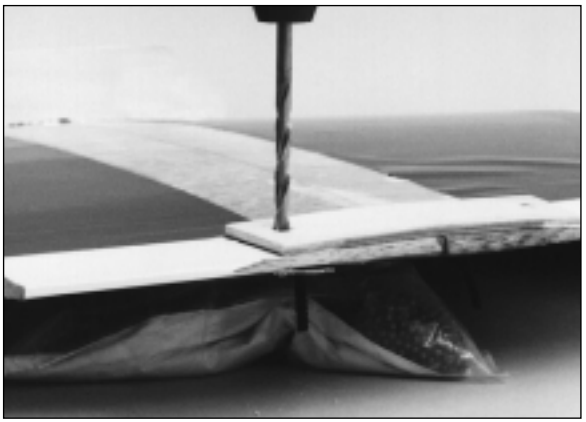


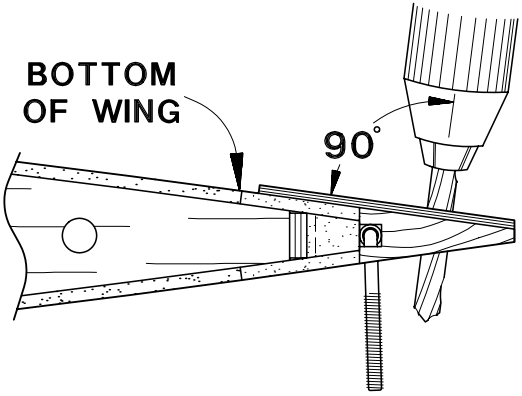


❏ Lightly sand the fiberglass at the trailing edge of the wing to make sure that the wing bolt plate will rest on a flat surface. Draw a line 1/8" from the trailing edge of the wing. Align the wing bolt plate so the rear edge lines up on this line. With the wing aligned on the fuselage, align the wing bolt plate so it is centered between the fuse sides. Mark the position of the plate and remove the

wing. Trim away any covering that may be beneath the wing bolt plate so that is resting on either wood or fiberglass. Using 30-minute epoxy, glue the wing bolt plate into position on the wing. Use clothespins or masking tape to hold the plate in position until the epoxy has cured.

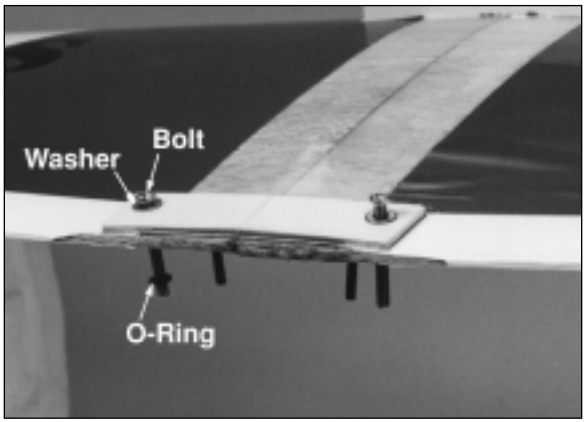
Drilling for the Wing Bolts:





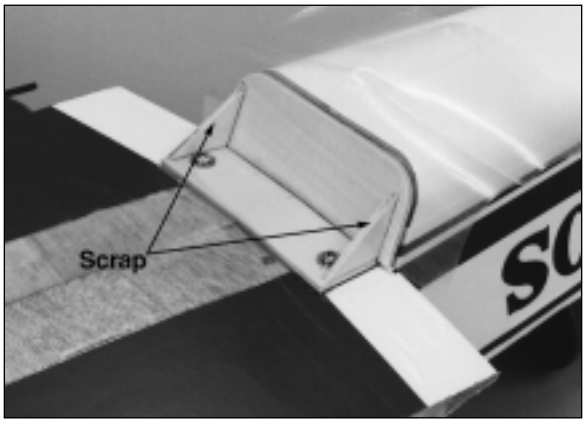
❏ Using the holes in the wing bolt plate as a guide, drill two 3/16" holes through the wing. Make sure that the drill remains perpendicular to the wing bolt plate in all directions.

Install the Wing Bolts:

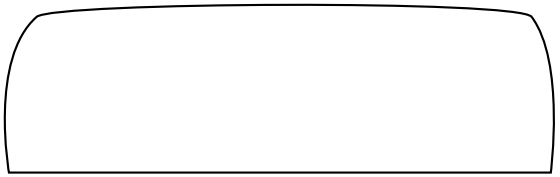


❏ Slide a M4 washer onto a **M4 x 35 wing bolt**. Pass the bolt through the hole just drilled from the bottom of the wing. Place a **M4 O-ring** onto the bolt so it won't fall out of the wing during transport.

Install the Rear Wing Former:



Rear Wing Former

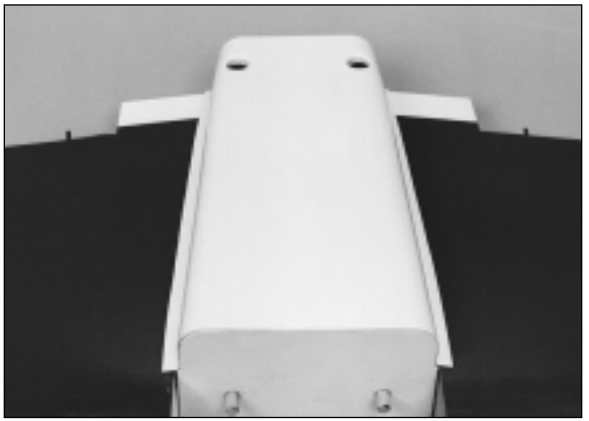


❏ Use one of the empty plastic bags and place it between the wing and the fuselage at the rear. Position the **rear wing former** so there is a 1/16" gap between the former and fuselage. Glue the former into position using Medium CA. Using leftover plywood found in the kit, make two former reinforcements to prevent the former from moving. Glue these into position on top of the wing bolt plate using Medium CA.

Trimming the Wing Fairing:

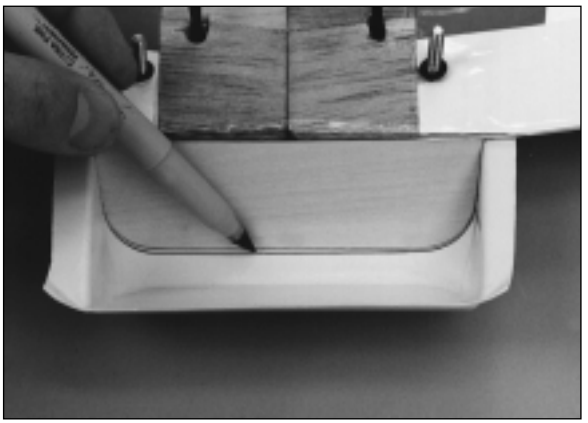
❏ Use a hobby knife or polycarbonate scissors to trim out the **wing fairing**. Trim only the sides at this time.

Install the Wing Fairing:



❏ Glue the wing fairing into position using Medium CA.

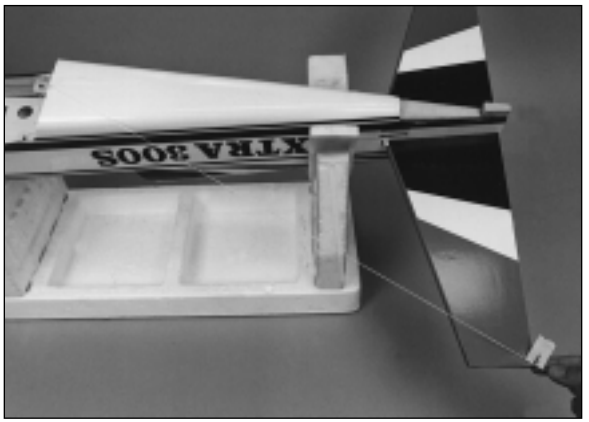
Fitting the Wing Fairing:



❏ Align the rear scribe line to the trailing edge of the wing. Temporarily tape the wing fairing into position. Turn the wing over and check to make sure that the wing bolts can be easily accessed through the holes in the fairing. If not, adjust the position slightly until access can be made. Mark the positions of the rear wing former and **front wing former**. Remove the fairing and trim it along the lines just drawn. Save the excess plastic for use in a later step.

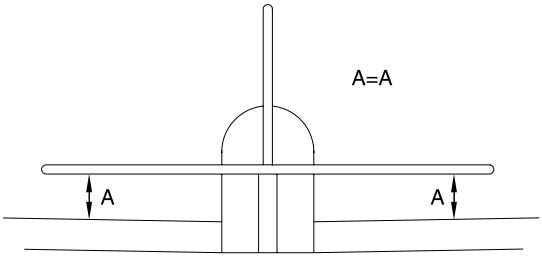
Stabilizer and Vertical Fin Installation

Center the Stabilizer:



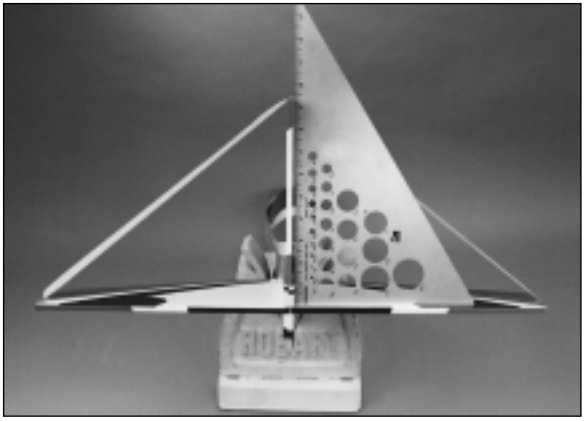
❏ Remove the plastic tail piece and cut the tail post using a razor saw. Carefully mark the centerline of the stabilizer. Slide the stabilizer into position so that it is centered in the opening. Use the T-pin and string alignment technique to properly align the stabilizer in the fuselage. Mark the stabilizer so that it can be returned to proper alignment for the following step.

Horizontal Stabilizer Alignment:



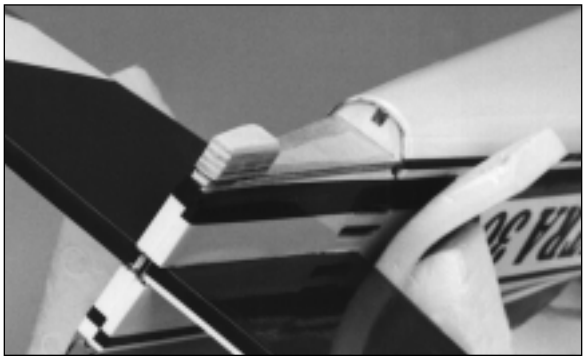
❏ With the wing bolted on, slide the stabilizer into position, centering it using the marks made in the previous step. Check to make sure that the stabilizer is parallel to the wing. If not, sand the stabilizer opening in the fuselage. Continue checking and sanding until the horizontal alignment is correct. Once you are satisfied with the alignment, mix up some 30-minute epoxy and glue the stabilizer into position. Clean up any excess epoxy using a paper towel and 70% isopropyl alcohol.

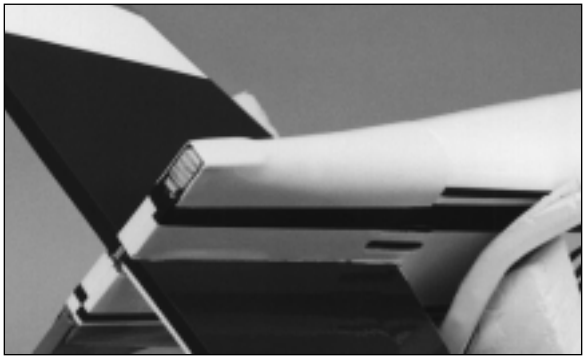
Install the Vertical Fin:



❏ Test fit the **vertical fin** into position. Using a builders triangle, check that the vertical fin is perpendicular to the stabilizer. If the fin is not perpendicular, lightly sand the opening in the fuselage until proper alignment of the fin can be achieved. Use a generous amount of 30-minute epoxy to make sure that the area in the fuselage where the fin fits is well coated. Slide the fin into position and use masking tape to hold the fin while the epoxy cures.

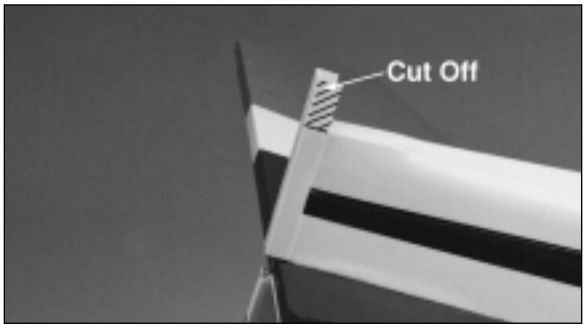
Trim the Aft Fuselage Cover:





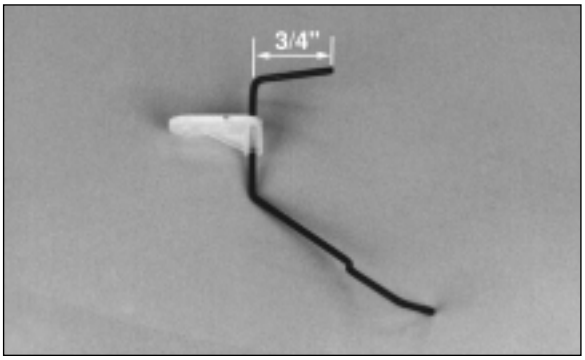
❏ Use a hobby knife or polycarbonate scissors to trim out the **aft fuselage cover** along the scribed lines. Test fit the cover into position. Sand a slight radius on the **tail mounting block** to allow the aft fuselage cover to fit tightly against the block. Adjust the fit of the cover so that is rests in the recessed areas of the fuselage. Once satisfied with the fit of the cover, glue it in place using Medium CA.

Installing the Tail Cover:



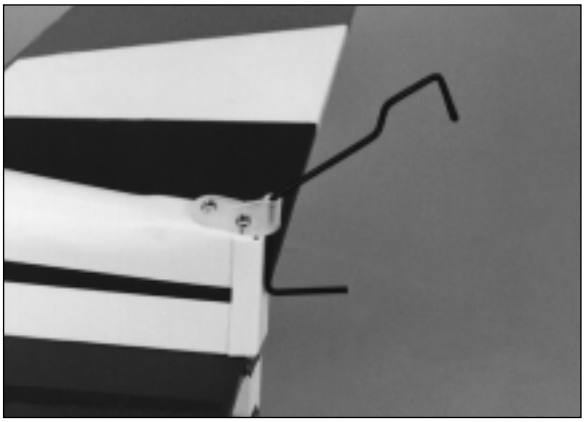
❏ Test fit the **tail cover** into position so that is tight against the bottom of the stabilizer. Mark and trim the excess material that is below the aft fuselage cover. Glue the tail cover into position using Medium CA.

Prepare the Tail Gear:



❏ Pass the pre-bent **tail gear wire** through the **tail gear bushing**. Measure 3/4" from the end of the wire and make a 90° bend in the wire so that it passes back over the lower portion of the tail gear wire.

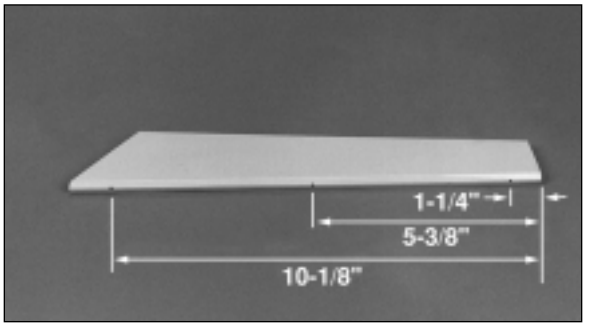
Mounting the Tail Gear Assembly:



❏ Position the **tail gear assembly** so that the wire is tight against the tail cover. Mark the positions for the screws and drill them using a 1/16" drill bit. Attach the assembly using three M2.6 x 10 wood screws.

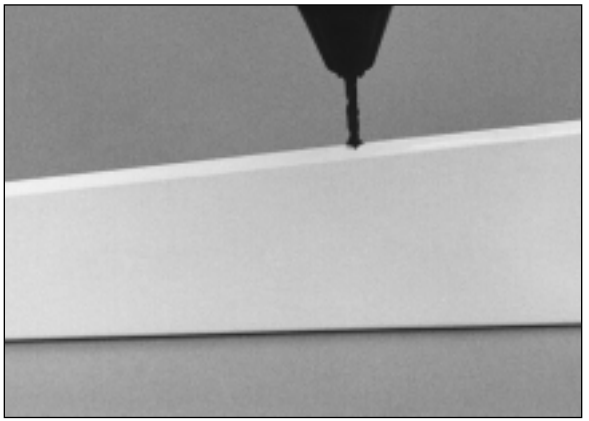
Mounting Control Surfaces

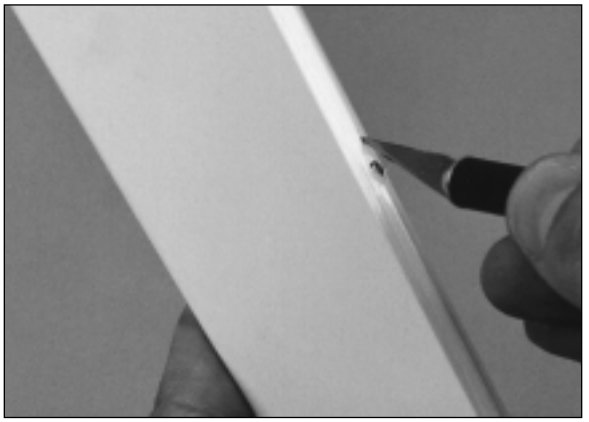
Locate the Elevator Hinges:



❏ Measure and mark the positions for the **elevator hinges** as shown in the photo.

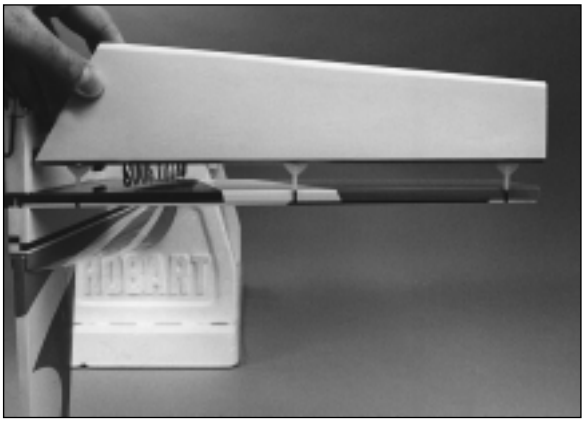
Preparing the Elevator for Hinges:





❏ Using a 1/8" drill bit, drill a hole 5/8" deep at the locations marked. Use a hobby knife to cut a 1/8" deep slot 1/4" above and below the hole to allow free movement of the hinge. Test fit the hinges into the **elevators.**

Prepare the Stabilizer for Hinges:

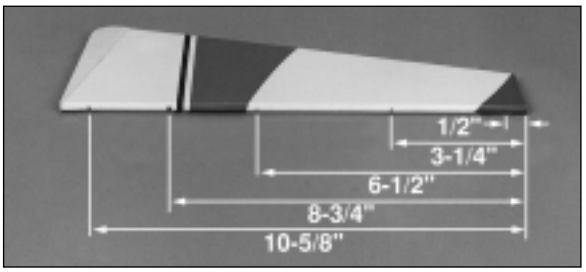


❏ Using the same measurements from the elevators, mark the positions for the hinges on the stabilizer. Double check that the positions are correct by holding the elevator to the stabilizer and matching the hinge positions. Adjust the positions if necessary. Drill and slot the stabilizer for the hinges.

Glue the hinges into position:

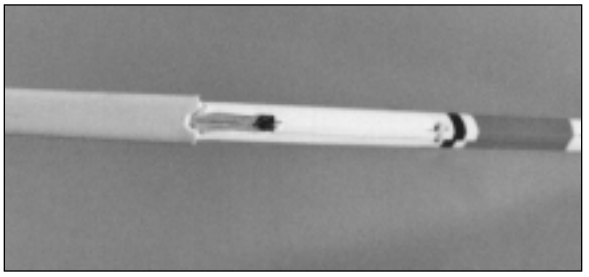
❏ Test fit the elevators to the stabilizer with the hinges installed. Move the elevators up and down to make sure that the elevators move freely without any binding. Once satisfied with the fit of the hinge, glue it in place using the following technique: Mix up 1/4 oz. of 30-minute epoxy. Using a round toothpick, force some epoxy into the drilled holes in the stabilizer. Apply some epoxy to one side of the hinges, and position them into the stabilizer. Apply some more epoxy to the exposed hinge. Force epoxy into the holes in the elevators using the blunt end of a cut-off toothpick and slide the elevators into position. Push the elevators so that there is a gap of only 1/32" or less between the elevators and the stabilizer. Clean up any excess epoxy using a paper towel and 70% isopropyl alcohol. Allow the epoxy to cure before continuing onto the next step.

Locate the Rudder Hinges:



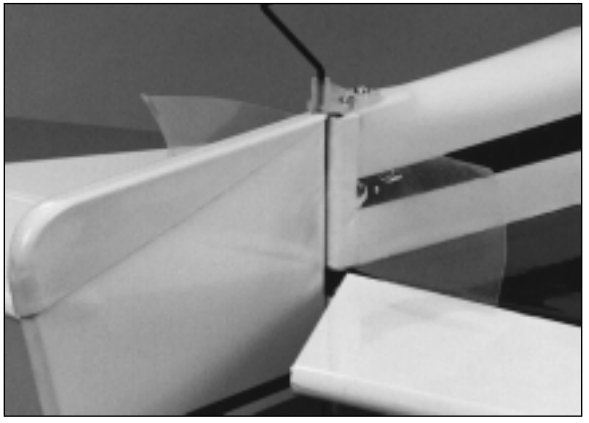
❏ Measure and mark the positions for the **rudder hinges** as shown in the photo.

Prepare the Rudder:



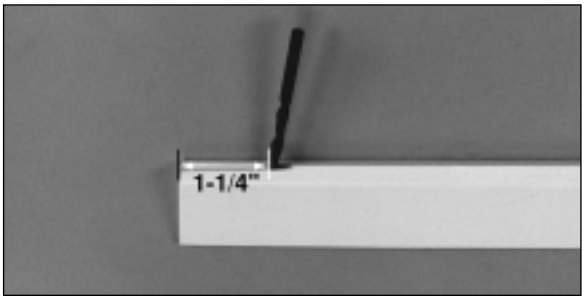
❏ Using the same method as for the elevators, drill and slot the **rudder** for hinges. **Do not** slot the bottom hole. Using a hobby knife, cut a groove from the bottom hole that extends to the bottom of the rudder. Trim the lower plastic slightly. This is to provide a channel for the tail gear wire to pass when the rudder is installed.

Installing the Rudder:



❏ Roughen the tail gear wire where it will be inserted into the rudder with 80-grit sandpaper. Insert a small piece of plastic cut from an empty parts bag between the tail gear wire and the tail cover to prevent the accidental gluing of the wire to the cover. Use the same technique of gluing the hinges on the elevator to glue the rudder hinges. Make sure the tail gear wire is securely glued into the rudder with epoxy.

Preparing the Aileron:



❏ Measure in 1-1/4" in from the end of the aileron. Drill a 5/32" hole that is 1" deep at this location for the aileron torque rod.

Installing the Ailerons:

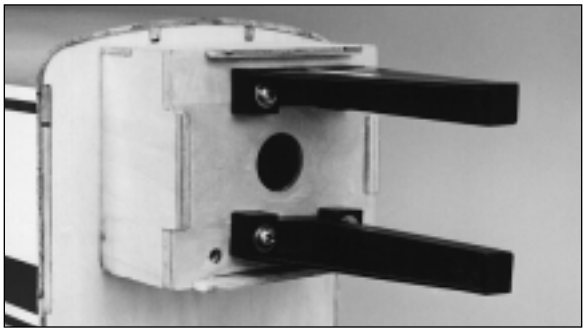
❏ Since the holes are pre-drilled for the aileron hinges, all that is needed is to cut the slots. Roughen the **torque rod** using 80-grit sandpaper. Tape some scrap plastic under the **aileron torque rod** to prevent gluing the rod to the wing. Apply some petroleum jelly to the aileron torque rod and work it up into the **aileron torque rod tube** to prevent the epoxy from gluing the torque rod assembly together. Test fit the aileron into position to make sure it does not bind against the center of the wing during operation. Glue the ailerons into position using the same hinge gluing method.

Mounting the Engine

❏ Now would probably be the best time to fuelproof the **engine** and **fuel tank compartments**. Use your favorite method for this process. We recommend using 30-minute epoxy thinned with isopropyl alcohol, then just brush the mixture onto the surface you want to fuelproof. Be careful not to get any epoxy into the blind nuts that are already installed in the firewall.

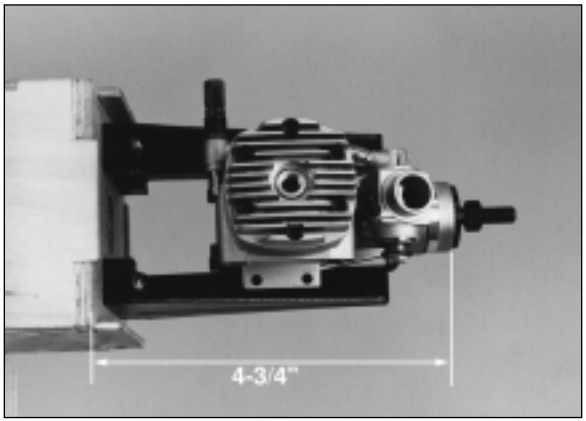
Note: If you intend on performing high “G” maneuvers with your Extra 300S, it is suggested that you create a fillet of 30-minute epoxy behind the firewall to help increase the dispersion of loads from the engine to the fuse sides.

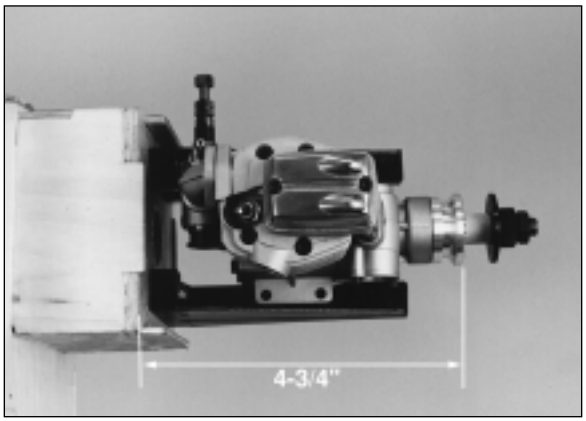
Install the Engine Mount:



❏ Using four **M4 x 18 bolts** and four **M4 washers**, temporarily attach the **engine mount** to the firewall. **Do not** tighten the bolts at this time.

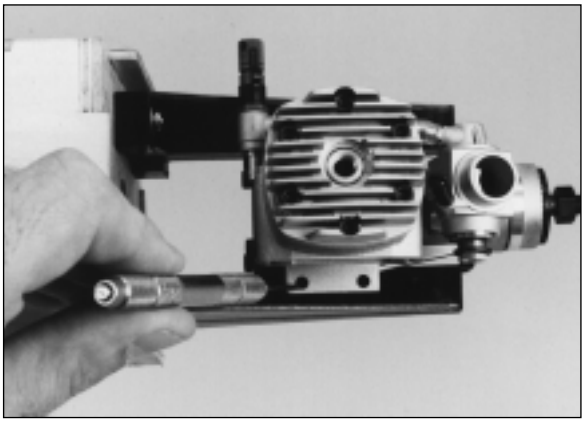
Positioning the Engine:

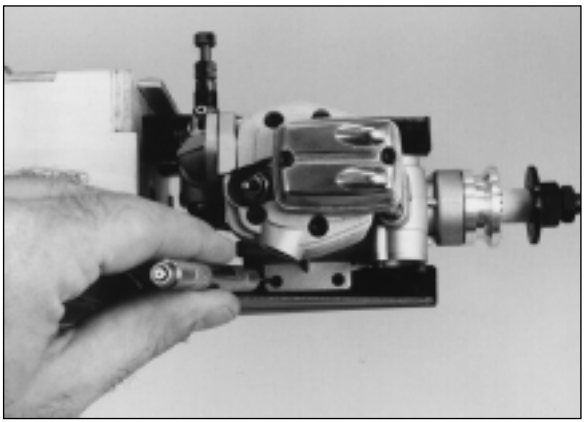




❏ Position the engine between the engine mounts. Slide the mounts together to fit against the engine. Adjust the distance of the drive washer from the firewall so that it is 4 3/4" away from the firewall.

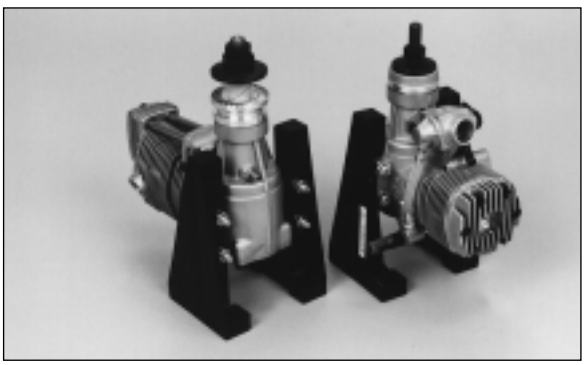
Marking the Engine Mount:





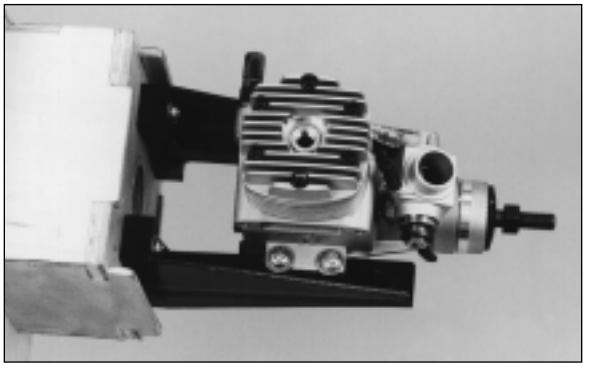
❏ After checking the distance of the drive washer from the firewall, and that the engine is perpendicular to the firewall, mark the positions for the **engine bolts** using a 1/16" drill bit. Remove the engine and mount from the firewall and drill a hole at the positions marked using a 5/32" drill bit.

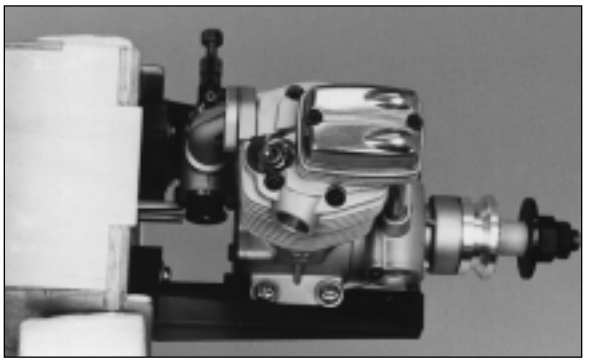
Attach the Engine to the Mount:



❏ Using four each of the **M4 x 28 bolts**, **M4 washers**, **M4 lock washers** and **M4 nuts**, attach the engine to the engine mount as shown in the photo. The washers will be on the top of the **engine mounting flange** and the lock washers on the bottom of the engine mount. Temporarily tighten the bolts at this time.

Install the Engine:

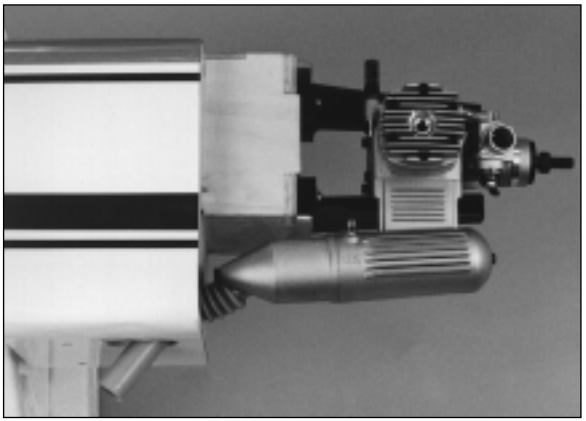




❏ Reattach the engine mount to the firewall. Tighten up the mount to the firewall, then the engine to the mount.

Note: If you are installing a four-stroke engine, the throttle pushrod location will have to be changed. This location will vary depending on the manufacturer of your particular engine. It would be advisable to relocate the pushrod at this time.

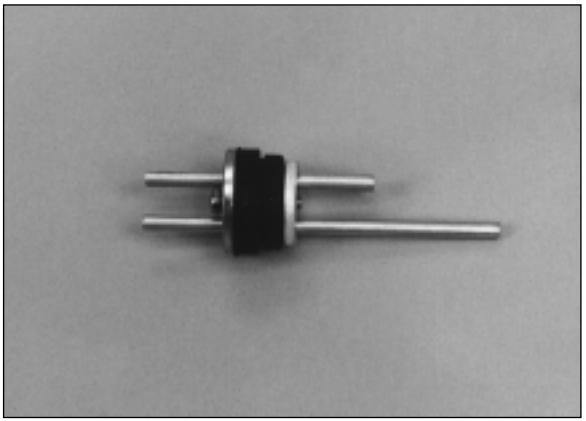
Install the Muffler (Two-Stroke):



❏ Open the access panels in both the firewall and fuselage bottom if you are planning on using the standard muffler. Install the muffler as shown, routing the exhaust through the access holes to the bottom of the fuselage as shown. You may need to enlarge the holes depending on your muffler configuration.

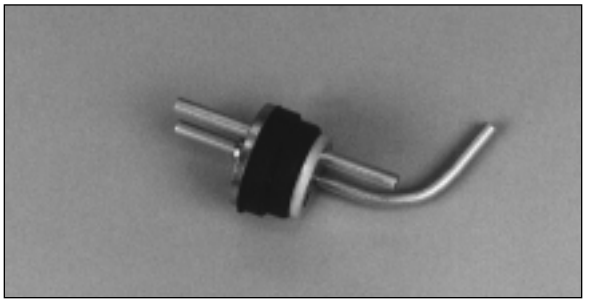
Assemble and Install the Fuel Tank

Assemble the Fuel Tank Plug:



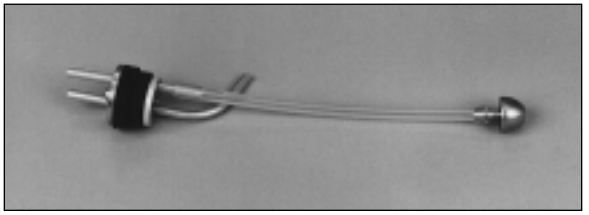
❏ Push one long and one short **aluminum tube** through the **rubber stopper** (the third aluminum tube will not be used). Place the two **metal disks** over the tubes. The larger disk will go in the front of the stopper, or to the outside. Insert the **M3 x 15 screw** from the front and thread it into the rear disk. **Do not** tighten the screw at this time.

Bend the Vent Tube:



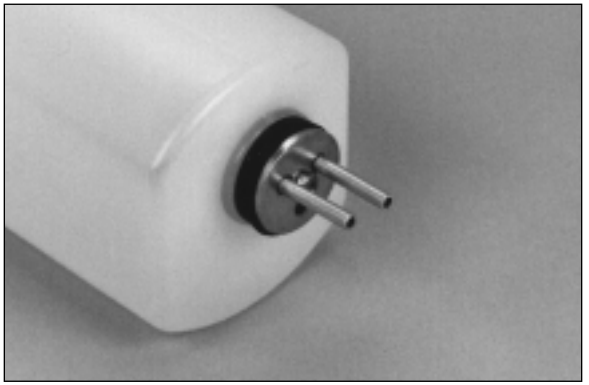
❏ Bend the longer tube (pressure tube) up as shown so that it will come within 1/16" of touching the top of the tank when installed. Use your fingers to bend the tube, being careful not to kink it closed.

Install the Clunk:



❏ Locate the **clunk** (metal fuel pick-up weight) and the **fuel tubing**. Attach the fuel tubing to the aluminum tube that is not bent. Attach the clunk to the opposite end of the fuel tubing.

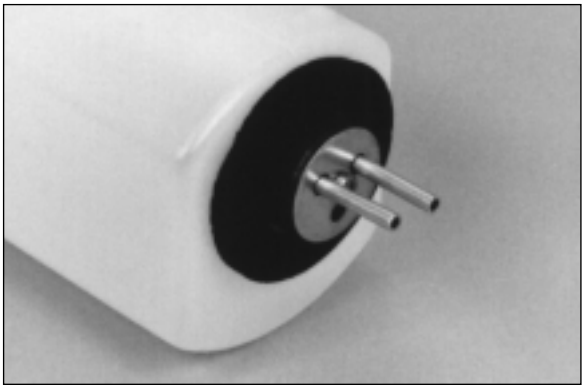
Install the Stopper Assembly:



❏ The stopper assembly can now be inserted into the fuel tank. The pressure tube should be adjusted so the tube is pointed straight up, resting 1/16" from the top of the tank. Position the stopper so that the tubes are positioned side-to-side. Make sure the clunk can move freely in the tank. If not, remove the stopper and shorten the fuel tube slightly and reinstall the stopper. After

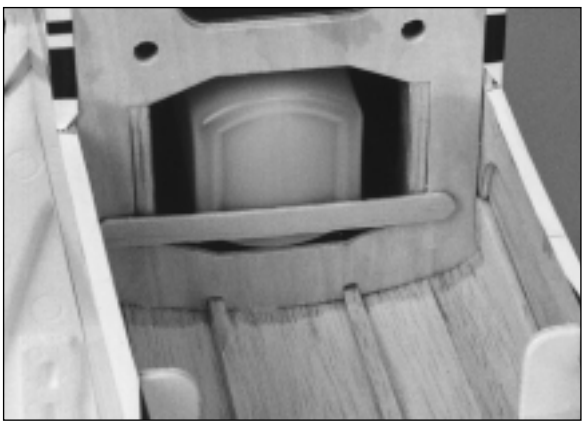
making sure the stopper is fully seated and the clunk moves freely, tighten the screw to secure the stopper into position. **Do not** overtighten the screw, as this may strip the threads or possibly damage the tank or stopper.

Install the Foam Tank Collar:



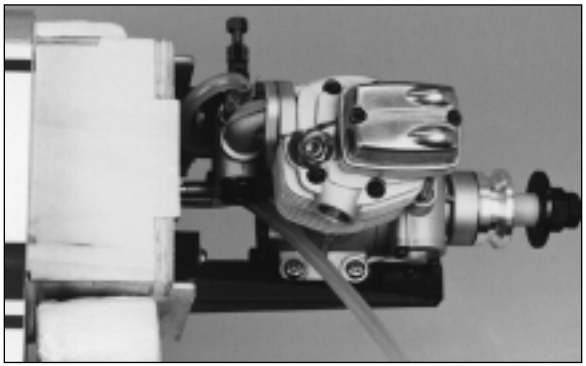
❏ Locate the foam **tank collar** and slide it into position. It should rest against the fuel tank when installed.

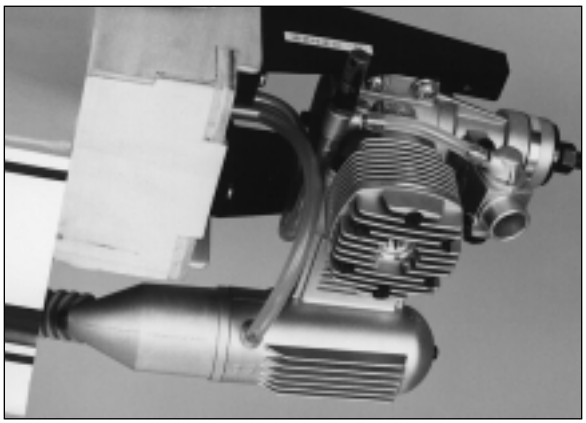
Install the Fuel Tank:



❏ Slide the fuel tank into position. Secure its location by gluing a mixing stick at the rear of the **fuel tank** as shown. Make sure to glue the stick low as shown, as a higher position may interfere with the installation of the wing.

Attach the Fuel Tubing:

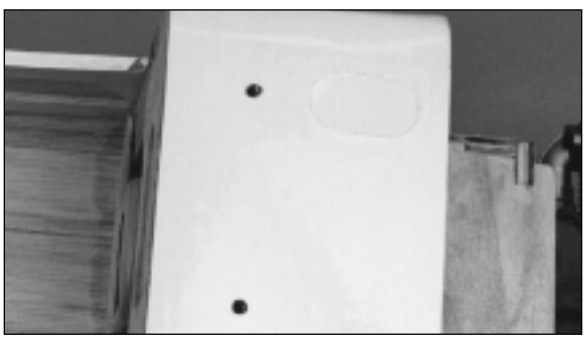




❏ Cut two 8" pieces of 3/32" fuel tubing. Attach these to the vent and fill tubes on the fuel tank. Attach the other ends to their proper positions on the engine. (On the four-stroke, leave the pressure line free for the time being). Trim the fuel lines if they are too long or have kinks or sharp bends that may cause fuel flow problems.

Install the Landing Gear

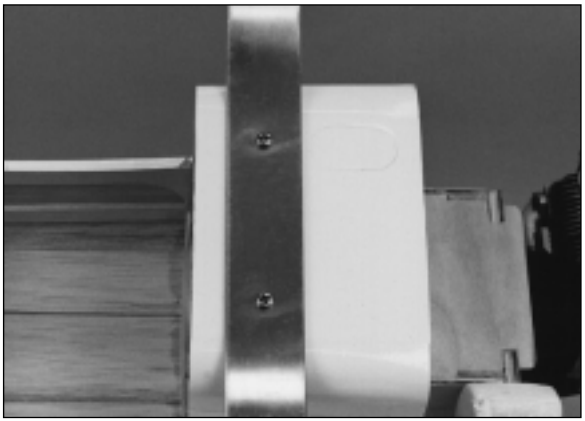
Locate the Landing Gear Blind Nuts:



❏ Locate the position of the **landing gear blind nuts** by gently pressing the covering. They should be located 1"

in front of the wing saddle. Trim the covering using a hobby knife to expose the blind nuts.

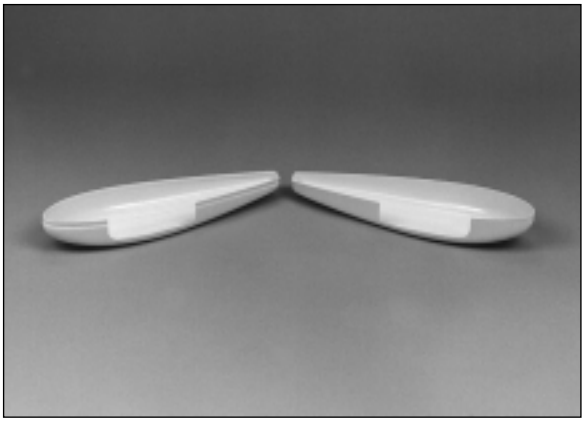
Attach the Landing Gear:



❏ Attach the **landing gear** to the fuselage using two **M4 x 18 bolts**. Use a small amount of thread locking compound on the bolts to prevent them from vibrating loose during flight.

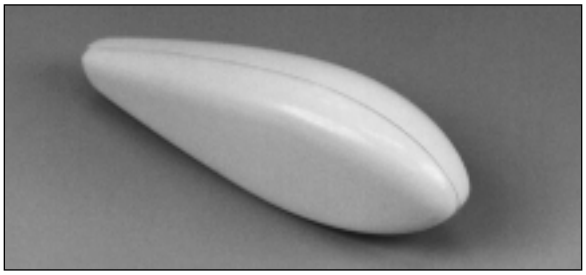
Preparing the Wheel Pants

Trimming the Wheel Pants:



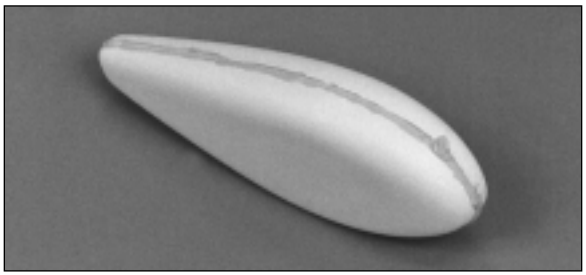
❏ Using a hobby knife or Polycarbonate scissors, trim the wheel pants along the scribed lines. Before cutting the opening for the wheel, you can use a T-bar sander to even up the cut to provide for a cleaner seam between the two pant halves.

Joining the Wheel Pant Halves:



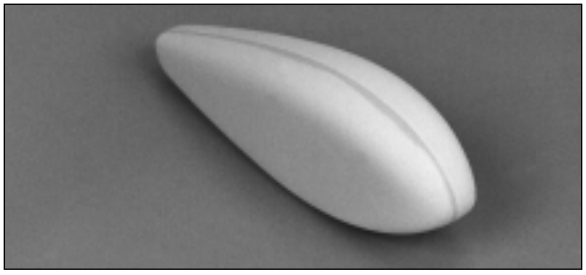
❏ Using Medium CA, glue the two **wheel pant halves** together. **Do not** use any accelerator on the **wheel pants**, as it will damage the plastic.

Filling your Pants:



❏ Fill the seam on the wheel pants using either Squadron® White Putty or Bondo®. The Bondo will have a faster cure time and is easily sanded, but must be purchased in larger quantities. The Squadron White Putty works well, but requires a longer curing time. It may also take a few applications, as this filler shrinks as it dries. You may also want to apply thin coats of the Squadron White Putty to help in speeding up the cure time, as thinner coats will dry faster than thicker ones.

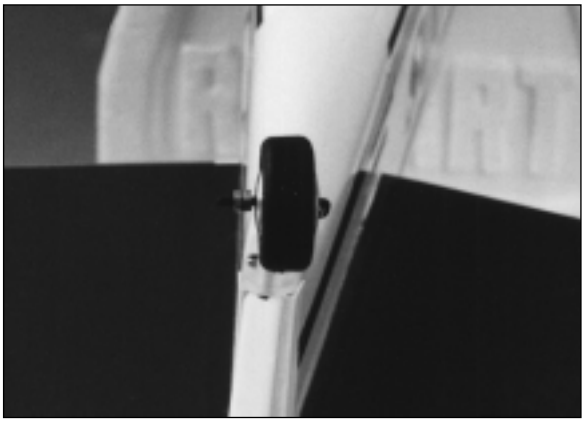
Painting the Wheel Pants:

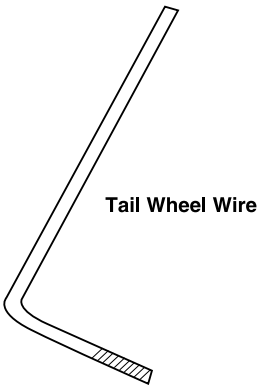


❏ After the filler has cured, sand it down so there is a smooth, unnoticeable seam using 400-grit sandpaper. Sand the entire wheel pant using the same sandpaper. Wash the wheel pant with a mild soap to remove any dust or oil and mask the wheel pant so it can be painted to match the box. Use a good fuelproof paint for the painting process. It is suggested to paint the wheel pants at the same time as the cowling.

Installing the Wheels

Install the Tail Wheel:



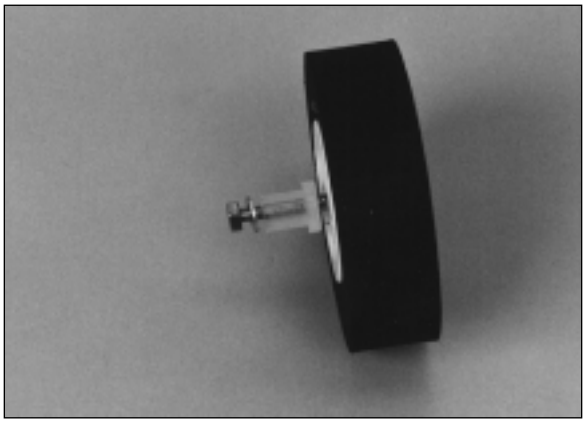


❏ Slide the **tail wheel** onto the **tail wheel wire**. Secure the wheel by using two **M2 nuts**, locking them together so they won't loosen and fall off.

Locating the Axle Position:

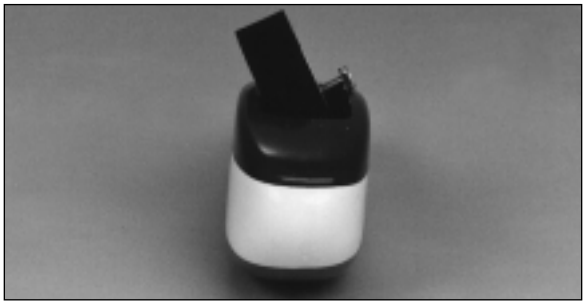
❏ Mark the position for the **axle** on the wheel pant. This location should be centered with the opening, and 1/4" from the bottom of the pant. Drill the location with a 5/32" drill bit. Glue the supplied plywood disc slightly above the hole using Medium CA. Make sure to make both a right and left wheel pant.

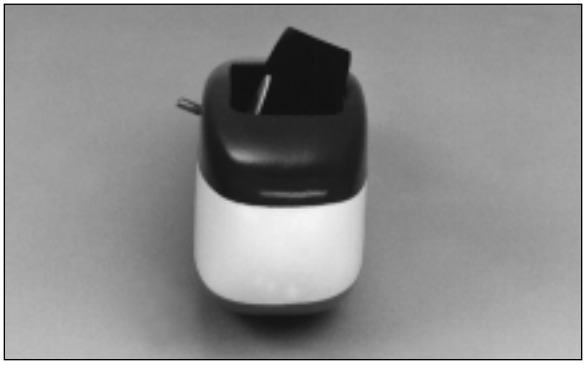
Installing the Axle:



❏ Install the **axle**, **bushing**, **M3 washer** and **M3 nut** as shown in the photo. The bushing is on the recessed side of the wheel. Only thread the nut so it is flush with the end of the axle as shown.

Install the Wheel into the Pant:

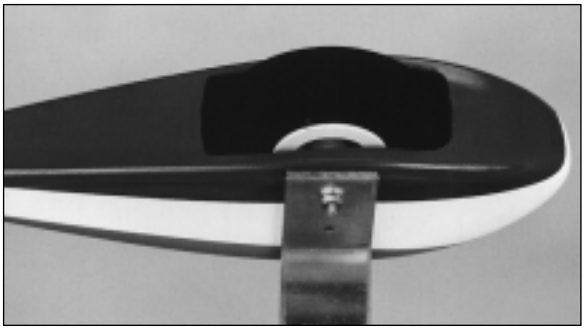




❏ Pull the axle so the bushing is tight against the wheel. Place the wheel assembly into the wheel pant as shown in the photo. Slowly turn the axle, pressing the nut against the inside of the wheel pant. This is done to tighten the nut. Once you can't turn the axle, there

should be enough of the axle exposed on the outside of the pant to continue tightening. **Do not** tighten the nut too much, as the wheel will need to rotate freely on the axle.

Temporarily attach the Wheel Pants:

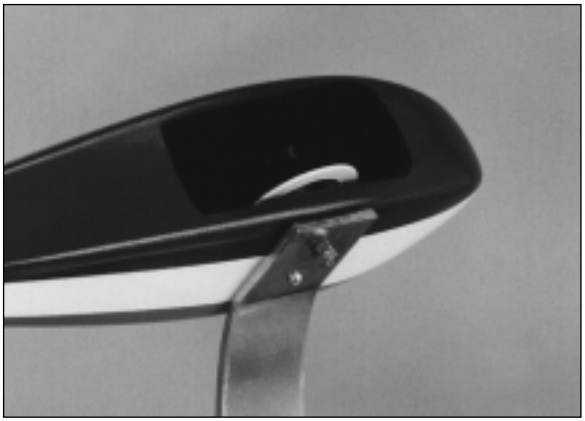


❏ Using one **M3 nut**, attach the wheel pant assembly to the **landing gear**. The nut only needs to be snug at this time.

Positioning the Wheel Pants:

❏ Position the wheel pants as shown in the photo.

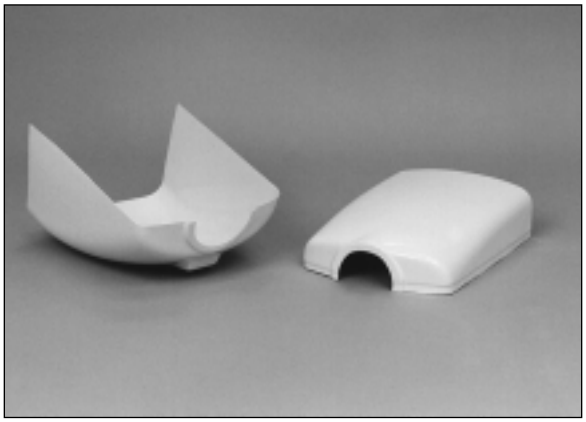
Securing the Wheel Pants:



❏ Drill a 1/16" hole through the open hole in the landing gear. It should drill into the plywood disc that was glued in earlier. Harden the plywood using a drop of Thin CA. Install an **M3 x 10 sheet metal screw**. Tighten the **M3 nut**, making sure the wheels rotate freely. Install a second M3 nut at this time, to “jam” the first nut into position and to prevent it from loosening.

Preparing the Cowling

Trimming the Cowling:

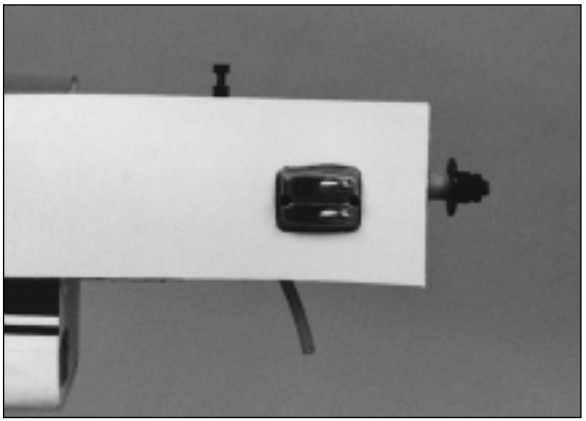


❏ Using a hobby knife or polycarbonate scissors, trim out the **upper** and **lower cowl halves** as shown. Measure 1/4" inside the raised area for the **spinner ring** and trim out the area for the shaft on the engine. Use a T-bar to even up the edges of the cowl.

Gluing the cowl halves together:

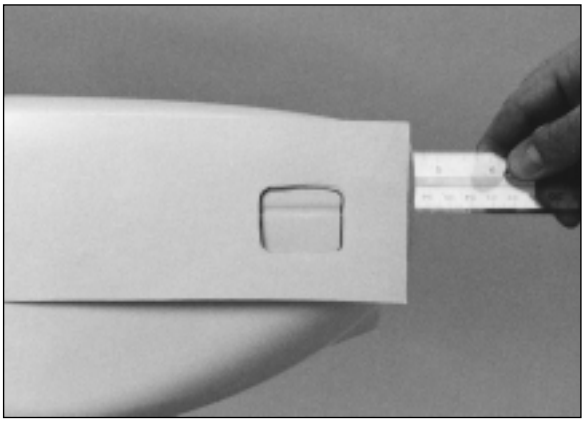
❏ Glue the upper and lower cowl halves together using Medium CA. Remember not to use any accelerator. Cut the air openings in the front as shown in the photo. Make sure to round the corners of the air openings. If not, the cowl may crack at the corners.

Locating the Engine position:



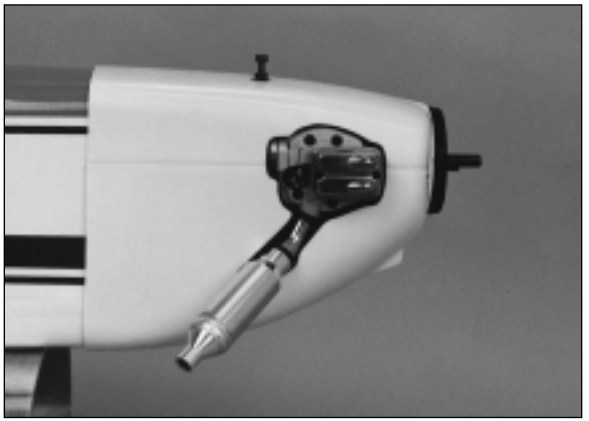
❏ Use a thin piece of cardboard to make a template for the cutout in the cowl for the engine. Cut the opening to match the shape of the head on your particular engine. Tape the template to the fuselage side to indicate the position of the head.

Marking the Engine Location on the Cowl:



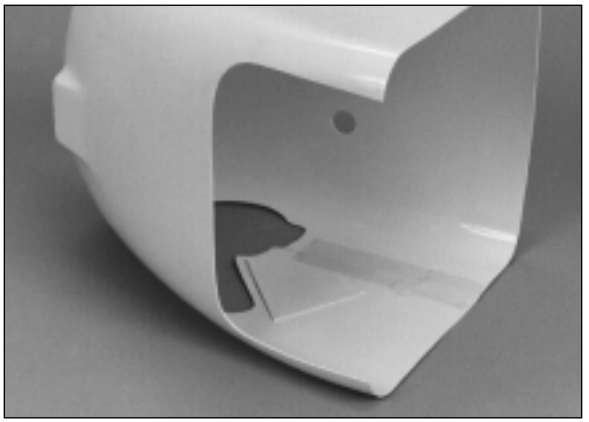
❏ Place the backplate of your spinner on the engine and measure the distance between the firewall and the backplate (it should be 4-3/4"). Remove the engine from the fuselage, then position the cowl on the fuselage so the forward edge is 1/8" **aft** of the measurement you just made. Use a felt-tip marker to mark the position of the head onto the cowl surface.

Trimming the Cowl:



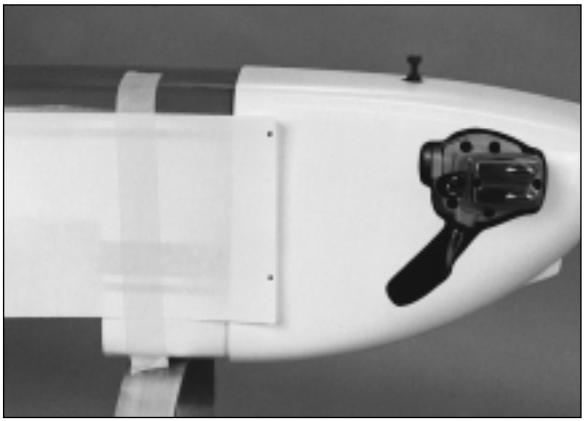
❏ Using the mark just made, trim the cowl to fit around the head of the engine. Use the same template method to locate the needle valve also. It is best to start small and enlarge the hole for a proper fit. Test fit the cowl to check if enough material has been removed. Continue the test fit/trim process until there is sufficient clearance between the cowl and engine.

Reinforcing the Cowl:



❏ Reinforce the seam of the cowl using the **12" x 7/8" fiberglass cloth** (included in the kit) and Medium CA. The fiberglass is best applied by applying the CA, then using a scrap from one of the parts bag, press the fiberglass to the cowl. Glue the scrap saved from the wing fairing to add support to any areas that could flex excessively. Cut out an opening in the bottom of the cowling to allow the air to escape from the cowling during flight.

Attach the Cowl to the Fuselage:



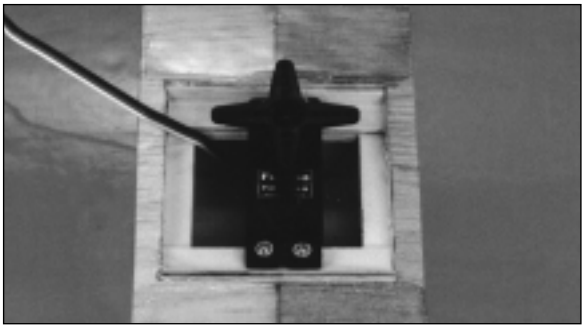
❏ Use a card stock template to locate the **front bulkhead** on the fuselage. Position the cowl with the **spinner** and **propeller** installed on the engine. Drill four positions (2 on each side), as shown in the photo using a 1/16" drill bit. Remove the cowl and place a drop of Thin CA into the hole, but don't fill the hole. This is to harden the wood so that the screw does not pull out of the wood.

Painting the Cowl:

❏ Fill all the seams that are on the cowl using the same method that was used on the wheel wants. Paint the cowl to match the trim that is on the fuselage. We used LustreKote™ Missile Red, Royal Blue and White, as they are a very good match to the colors on the fuse. Feel free to use any fuelproof paint you are the most comfortable using. We painted the wheel pants and cowl at the same time.

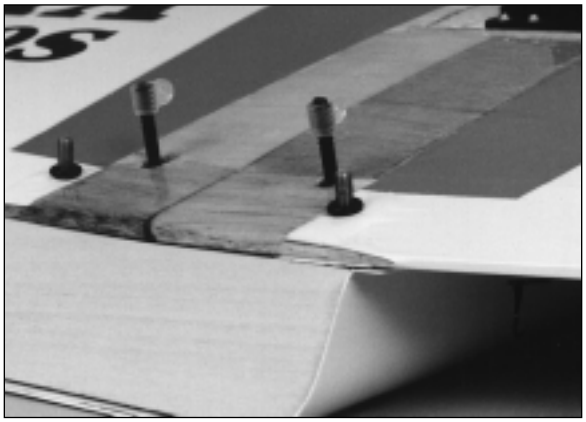
Install the Radio

Install the Aileron Servo:



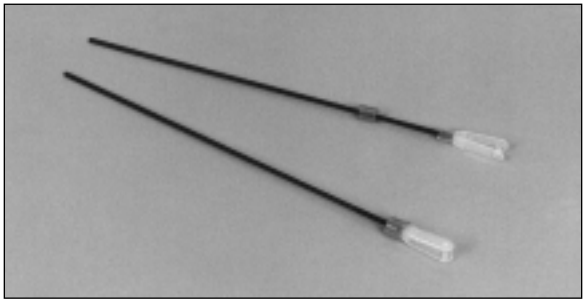
❏ Install the aileron servo as shown. Make sure that the servo is centered in the servo box.

Install the Aileron Torque Rod Connector:



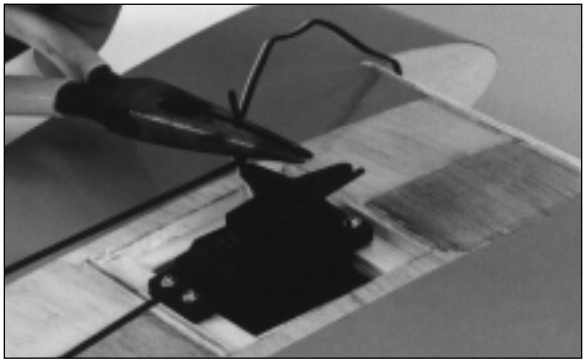
❏ Locate the **aileron torque rod connector** on the parts tree. The correct connectors have a larger hole for the torque rods to thread into. Thread the connector onto the torque rod fully until it is slightly below the end of the torque rod.

Prepare the Aileron Linkages:



❏ Thread a **nylon clevis** 14 turns onto a **6" threaded rod**. Cut a 1/4" piece of **fuel tubing** and slide it partially onto the clevis. Prepare two rod assemblies.

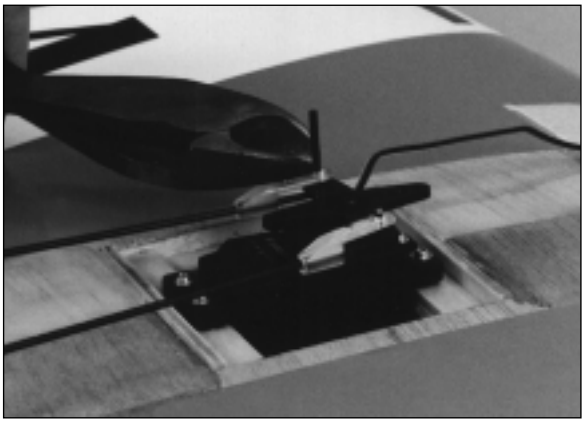
Bending the Aileron Linkages:



❏ Attach the clevises to the **aileron torque rod connectors**. Mark the position where the linkage

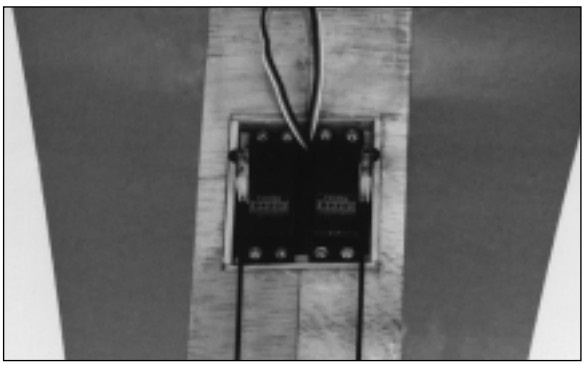
intersects the **aileron servo horn** with the aileron aligned to neutral. Bend the linkage 90° at this point using pliers.

Connect the linkage to the servo:



❏ Use a **nylon pushrod connector** to attach the linkage to the servo. Use a Dremel® MultiPro™ or wire cutter to trim the excess linkage above the connector. Check that the ailerons are even and neutral. Adjust the clevises to achieve a neutral position for the aileron if they are not even. Slide the fuel tubing over the clevises to secure them to the aileron torque rod connector.

Optional Dual Aileron Servos

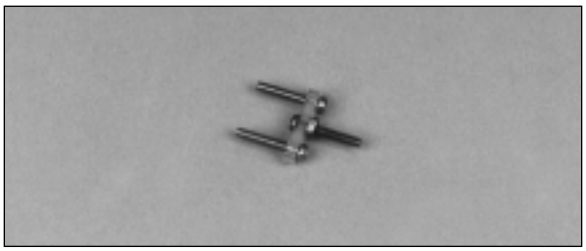


❏ Another option that can be used is the installation of two aileron servos. This will provide more authority to the ailerons if your intention is doing “high stress” maneuvers. A “Y” connector can be used to do a simple couple of these servos. For those that have a computer radio, the servos can be “mixed” to provide other functions other than that of ailerons. It is up to you as to the function they will perform. Although not necessary, the most common use is as flaps. By having both ailerons “drop” around 1/4", the landing speed of the Extra can be reduced, lowering the changes of the wing stalling at the lower speed.

Install the Radio Components:

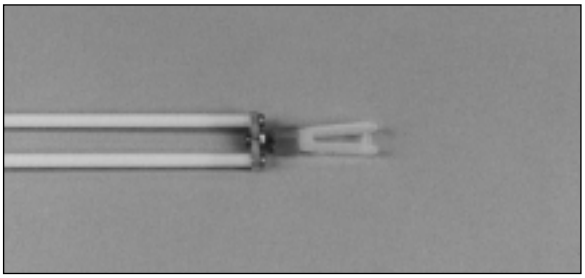
❏ After installing the **rubber grommets** and **bushings** according to the radio manufacturer’s instructions, position the servos in the servo tray as shown. Route the **servo leads** forward. Mount the **switch** opposite of the exhaust. We used the Great Planes Switch/Charge Jack (GPMM1000) to allow for easy and convenient checking and charging of the **receiver battery**. Plug the servos into the **receiver** according to the radio instructions. Wrap the receiver and battery in foam to prevent any damage from the vibration of the engine. It is not necessary to secure the battery and receiver at this time, as they may need to be repositioned during the balancing of your aircraft. Just remember after balancing that they are secure in the fuselage.

Prepare the Elevator Splitter:



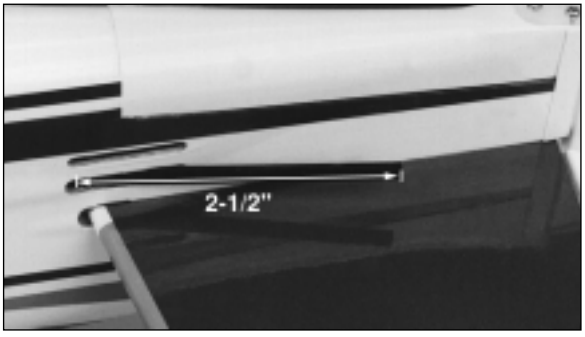
❏ Using three **M2 x 16 screws**, one **M2 nut** and the **nylon splitter plate**, assemble the elevator splitter as shown in the photo.

Prepare the Elevator Pushrods:



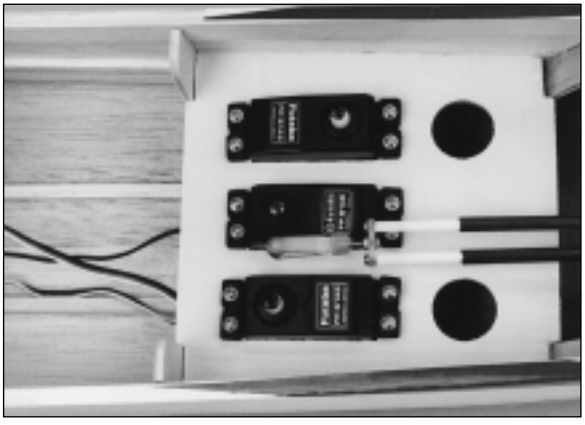
❏ After sliding a 1/4" piece of fuel tubing onto a clevis, thread the clevis onto the center screw 14 turns. Completely thread the **white inner pushrods** onto the two outer screws as shown.

Install the Outer Pushrod Tubes:



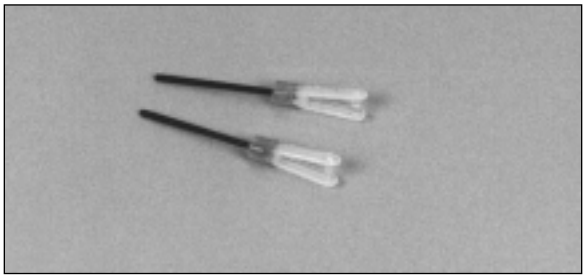
❏ Roughen the outside of the **pushrod tubes** using 80-grit sandpaper. Slide the **outer pushrod tubes** into the fuselage from the slots that are closest to the elevator. Leave 2-1/2" of the tube outside of the fuselage. Secure the tubes to the fuselage using Medium CA.

Install the Elevator Pushrods:



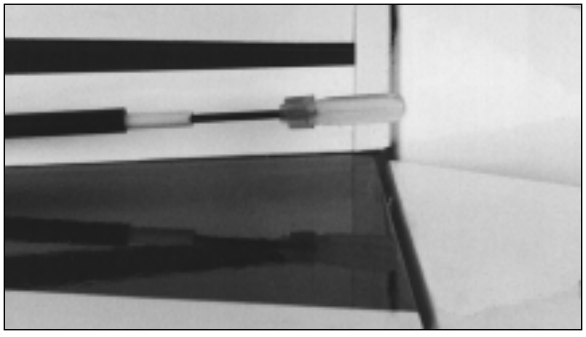
❏ Slide the pushrod assembly into the **outer pushrod tubes**. Attach the clevis to the servo horn and slide the fuel tubing into position.

Prepare the Elevator Clevises:



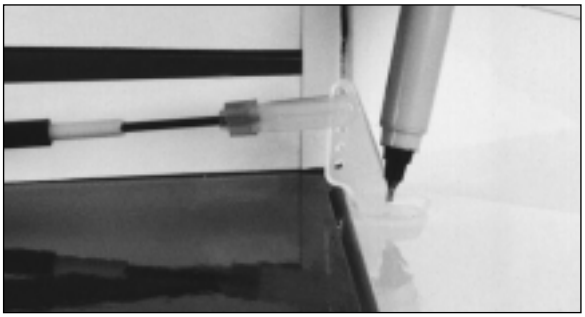
❏ Collect two each: clevises, **1-5/8" threaded studs** and 1/4" pieces of fuel tubing. Slide the 1/4" pieces of fuel tubing onto the clevises. Thread the clevises onto the threaded studs 14 turns. The clevises attach to the end of the stud that has fewer threads.

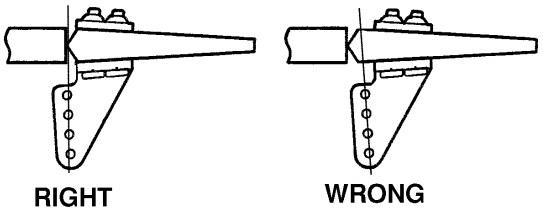
Install the Elevator Clevises:



❏ Thread the **elevator clevises** into the inner pushrods. Only a few turns are required at this time, as the final adjusting will take place in a later step.

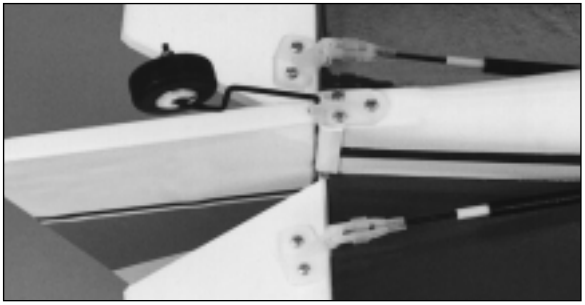
Marking the Position of the Control Horns:

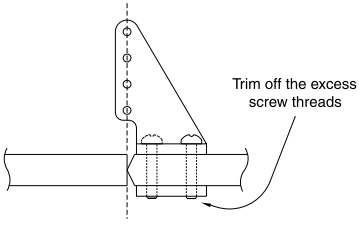




❏ Attach the clevises onto the **control horns**. Position the control horn on the elevator so that the pushrod will operate without any binding. The control horn should also be aligned with the hinge line of the elevator as shown in the drawing. Mark the position of the two holes in the control horn using a felt-tip pen.

Install the Control Horns:



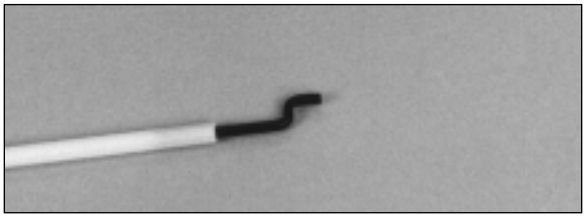


❏ Drill two 1/8" holes through the elevator at the marks. Insert two **M2 x 16 screws** through the control horn and the elevator, finally screwing them into the **control horn backplate**. Harden the underlying control surface by gently puncturing the covering using a T-pin. Use Thin CA to harden the balsa underneath the covering. Tighten the screws, being careful not to damage the underlying balsa. Cut off the excess threads using a wire cutter or a Dremel MultiPro with a cut-off wheel. Repeat this process for the other elevator half. Adjust the clevises, threading them in or out, to level the elevators with the servo in a centered position. Slide the 1/4" fuel tubing into position after the elevators are adjusted.

Install the Rudder Pushrod:

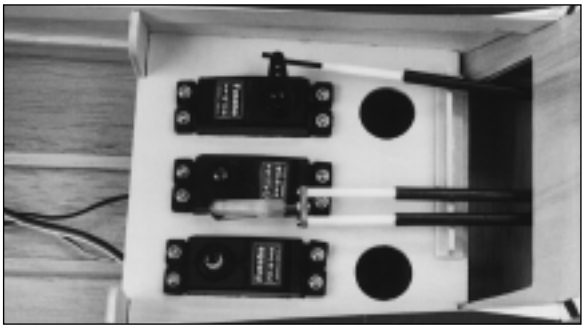
❏ Install the **rudder pushrod** using the same method as the elevator pushrods. The exit on the fuselage may need to be opened up slightly to accept the outer tube. Enlarge it towards the bottom of the elevator to prevent any interference with the former.

Prepare the Rudder Inner Pushrod:



❏ Cut 1/4" off one end of the **inner pushrod**. Thread a "Z" bent wire into the inner pushrod until the threads are fully into the inner pushrod.

Install the Inner Pushrod:

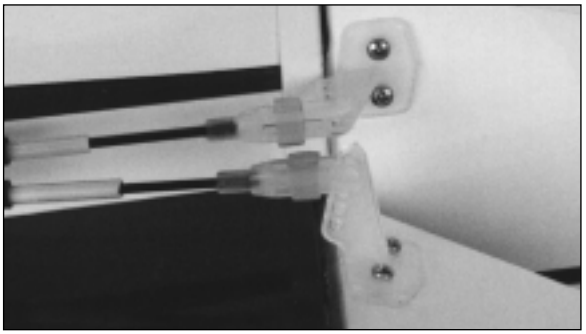


❏ Remove the servo horn from the rudder servo and place the “Z” bend through a servo horn. Slide the inner pushrod into the **outer pushrod** and attach the servo horn to the **rudder servo**. Build a small brace from mixing sticks to secure the outer pushrod tubes for the elevator and rudder as shown.

Install the Rudder Clevis:

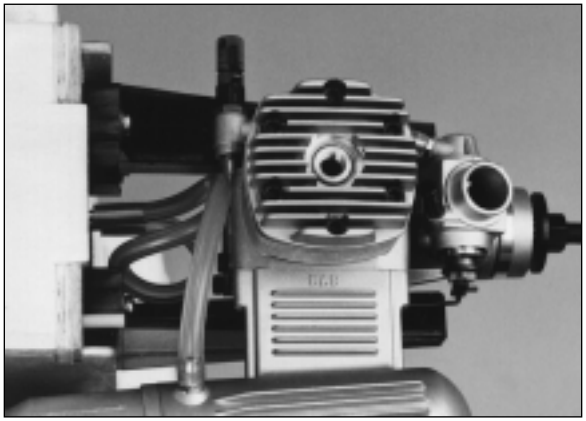
❏ Assemble a **rudder clevis** assembly using the same procedure that was used for the elevator clevis. Thread the clevis into the inner pushrod. Attach a control horn to the clevis and position it onto the rudder. After making sure that the rudder linkage will not bind, mark the position of the control horn on the rudder.

Attach the Rudder Control Horn:



❏ Drill two 1/8" holes through the rudder at the marks. Harden the underlying balsa with Thin CA, then insert two **M2 x 16 screws** through the control horn and the rudder, finally screwing them into the **control horn backplate**. Tighten the screws, being careful not to damage the underlying balsa. Cut off the excess threads using a wire cutter or a Dremel MultiPro with a cut-off wheel. Adjust the clevis, threading it in or out, to neutralize the rudder with the servo in neutral. Slide the 1/4" fuel tubing into position after the rudder has been adjusted.

Install the Outer Throttle Tube:



❏ Install the Outer Throttle Tube as shown in the photo. On a two-stroke, the Outer Throttle Tube should be at least 1/4" past the firewall.

Trimming the Outer Throttle Tube:

❏ Trim the opposite end of the **outer tube** so it is flush with the **servo tray former**. Attach the "Z" bend of the **throttle pushrod** to the **throttle lever** and slide the pushrod into the outer tube.

Attach the Pushrod to the Servo:

❏ Move the throttle stick and trim lever on the transmitter into the center, or neutral position. Turn on the transmitter and receiver. Attach the servo horn so that it is 90° to the servo (The rudder and elevator servos are shown in this position). A notch can be cut in the servo tray former to assist in securing the **outer throttle pushrod**. Move both the throttle stick and trim to the fully open position. Open the carburetor to fully open by moving the linkage. Mark the throttle linkage and make a "Z" bend to attach the linkage to the servo arm. Move the throttle stick and trim to the fully closed position and check that the carburetor is fully closed. If not, move the position of the linkage away from the center of the servo arm, or towards the center on the carburetor lever. If the servo is binding (signified by a humming sound) change the throttle linkage opposite of that mentioned above. After the carburetor can be operated smoothly from fully open to fully closed, turn off the receiver and transmitter.

Install the Canopy

Install the Instrument Panel:

❏ Trim the **instrument panel decal** from the decal sheet. Install it as shown in the photo. You will need to trim the upper portion of the decal flush with the top of the fuselage.

Attaching the Canopy:

❏ Trim the canopy using polycarbonate scissors or a hobby knife. Before gluing the canopy would be a good time to detail the cockpit of your aircraft. A Williams Brothers 1/6 Scale Pilot (WBRQ2484) would be a great addition to add realism to your Extra 300S. Glue the canopy in place using Z-R/C-56 adhesive. After the glue has dried, apply the gold striping tape.

Balance the Airplane Laterally

Special Note: Do not confuse this procedure with "checking the C.G." or "balancing the airplane fore and aft."

❏ 1. Attach the wing and engine as if the aircraft is ready to fly.

❏ 2. With the wing level, lift the model by the engine propeller shaft and the fin post (this may require two people). Do this several times.

❏ 3. If one wing always drops when you lift the model, it means that side is heavy. Balance the airplane by gluing weight to the other wing tip. **Note:** An airplane that has been laterally balanced will track better in loops and other maneuvers.

Balance Your Model

Note: This section is **very** important and must **not** be omitted! A model that is not properly balanced will be unstable and possibly unflyable.

❏ 1. Accurately mark the balance point on the bottom of the wing on both sides of the fuselage. The balance point is located 2-1/8" from the front of the wing fairing to the back. This is the balance point at which your model should balance for your first flights. Later, you may wish to experiment by shifting the balance up to 3/8" forward or back to change the flying characteristics. Moving the balance forward may improve the smoothness and arrow-like tracking, but it may then require more speed for takeoff and make it more difficult to slow down for landing. Moving the balance aft makes the model more agile with a lighter and snappier "feel" and often improves knife-edge capabilities. In any case, please start at the location we recommend and do not at any time balance your model outside the recommended range.

❏ 2. With the wing attached to the fuselage, all parts of the model installed (ready to fly), and an empty fuel tank, hold the model at the marked balance point with the stabilizer level.

❏ 3. Lift the model. If the tail drops when you lift, the model is "tail heavy" and you must add weight* to the nose. If the nose drops, it is "nose heavy" and you must add weight* to the tail to balance. **Note:** Nose weight may be easily installed by using a Heavy Spinner Hub or gluing lead weights to the firewall. Tail weight may be added by using Great Planes (GPMQ4485) "stick-on" lead weights, and later, if the balance proves to be OK, you can open the fuse bottom and glue these in permanently.

*If possible, first attempt to balance the model by changing the position of the receiver battery and receiver. If you are unable to obtain good balance by doing so, then it will be necessary to add weight to the nose or tail to achieve the proper balance point.

Install Receiver, Battery and Antenna

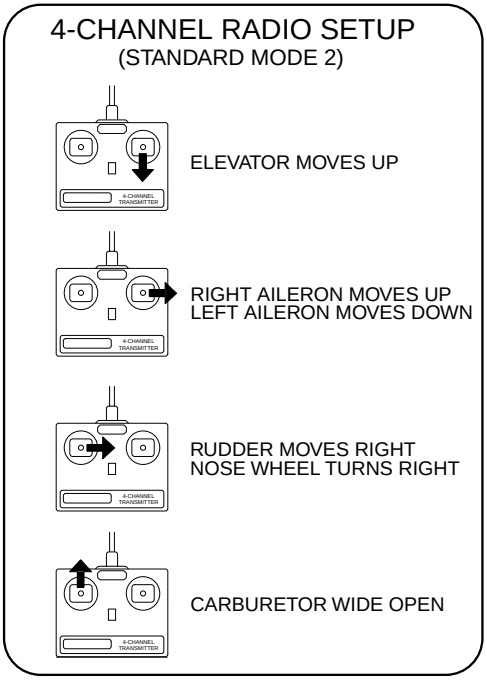
❏ 1. Wrap the receiver and battery in 1/2" foam rubber (Hobbico HCAQ1050) securing the foam with rubber bands.

❏ 2. Protect both components from fuel leakage by sealing them in plastic wrap or plastic bags. Seal the plastic closed with masking tape.

❏ 3. We installed a pushrod tube (not included in the kit) along the bottom of the fuse, on the inside, as a conduit for the antenna. The antenna was then inserted and pushed to the aft end of the fuse.

❏ 4. The receiver and battery may be secured with additional layers of foam rubber to wedge them in place.

❏ 5. Make sure the control surfaces move in the proper direction as illustrated in the following sketch:



❏ 6. Adjust your pushrod hookups as necessary to provide the proper control surface movements as listed.

Control Surface Throws

We recommend the following control surface throws:

Note: Throws are measured at the widest part of the elevators, rudder, and ailerons.

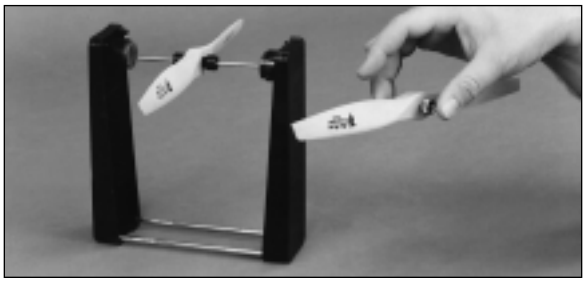
ELEVATOR:	(High Rate) 5/16" (8mm) up and down	(Low Rate) 1/4" (6mm) up and down
RUDDER:	right as much as possible	left as much as possible
AILERONS:	(High Rate) 7/16" (11mm) up and down	(Low Rate) 5/16" (8mm) up and down

The surface throws and balance for this aircraft have been extensively tested. We are confident that they represent the settings at which this model flies best. Please set up your aircraft to the specifications listed above. If, after a few flights, you would like to adjust the throws to suit your tastes, that is fine. Too much throw can force the plane into a stall or a surprise snap roll, so remember..."more is not better."

Pre-Flight

Charge the batteries
Follow the battery charging procedures in your radio instruction manual. You should always charge your transmitter and receiver batteries the night before you go flying, and at other times as recommended by the radio manufacturer.

Balance the propeller
Balance your propellers carefully before flying. An unbalanced prop is the single most significant cause of damaging vibration. Not only will engine mounting screws and bolts vibrate out, possibly with disastrous effect, but vibration will also damage your radio receiver and battery. Vibration will cause your fuel to foam, which will, in turn, cause your engine to run rough or quit.



We use a Top Flite Precision Magnetic Prop Balancer (TOPQ5700) in the workshop and keep a Great Planes Fingertip Balancer (GPMQ5000) in our flight box.

Find a safe place to fly
The best place to fly your R/C model is an AMA (Academy of Model Aeronautics) chartered club field. Ask your hobby shop dealer if there is such a club in your area and join. Club fields are set up for R/C flying and that makes your outing safer and more enjoyable. The AMA also can tell you the name of a club in your area. We recommend that you join AMA and a local club so you can have a safe place to fly and have insurance to cover you in case of a flying accident. (The AMA address is listed on page 5 of this instruction book).

If a club and its flying site are not available, you need to find a large, grassy area at least 6 miles away from any other R/C radio operation like R/C boats and R/C cars and away from houses, buildings and streets. A schoolyard may look inviting but it is too close to people, power lines and possible radio interference.

Ground check the model
If you are not thoroughly familiar with the operation of R/C models, ask an experienced modeler to check to see that you have the radio installed correctly and that all the control surfaces do what they are supposed to. The engine operation also must be checked and the engine "broken-in" on the ground by running the engine for at least two tanks of fuel. Follow the engine manufacturer's recommendations for break-in. Check to make sure all screws remain tight, that the hinges are secure and that the prop is on tight.

Range check your radio
Wherever you do fly, you need to check the operation of the radio before every time you fly. First, make sure no one else is on your frequency (channel). With the transmitter antenna collapsed and the receiver and transmitter on, you should be able to walk at least 100 feet away from the model and still have control. Have someone help you. Have them stand by your model and while you work the controls, tell you what the various control surfaces are doing.

Repeat this test with the engine running at various speeds with an assistant holding the model. If the control surfaces are not always acting correctly, **do not fly!** Find and correct the problem first.

Engine safety precautions

Note: Failure to follow these safety precautions may result in severe injury to yourself and others.

Keep all engine fuel in a safe place, away from high heat, sparks or flames, as fuel is very flammable. Do not smoke near the engine or fuel and remember that the engine exhaust gives off a great deal of deadly carbon monoxide. Therefore, **do not** run the engine in a closed room or garage. Get help from an experienced pilot when learning to operate engines.

Use safety glasses when starting or running engines.Do not run the engine in an area of loose gravel or sand, as the propeller may throw such material in your face or eyes.

Keep your face and body as well as all spectators away from the plane of rotation of the propeller as you start and run the engine.

Keep items such as these away from the prop: loose clothing, shirt sleeves, ties, scarfs, long hair or loose objects (pencils, screwdrivers) that may fall out of shirt or jacket pockets into the prop.

Use a “chicken stick” device or electric starter follow the instructions supplied with the starter or stick. Make certain the glow plug clip or connector is secure so that it will not pop off or otherwise get into the spinning propeller.

Make all engine adjustments from **behind** the rotating propeller. The engine gets hot! Do not touch it during or after operation. Make sure fuel lines are in good condition so fuel will not leak onto a hot engine, causing a fire.

To stop the engine, cut off the fuel supply by closing off the fuel line or follow the engine manufacturer’s recommendations. Do not use hands, fingers or any body part to try to stop the engine. Do not throw anything into the prop of a running engine.

AMA Safety Code (Excerpt)

Read and abide by the following Academy of Model Aeronautics Official Safety Code:

General

1. I will not fly my model aircraft in sanctioned events, air shows, or model flying demonstrations until it has been proven to be airworthy by having been previously successfully flight tested.

2. I will not fly my model aircraft higher than approximately 400 feet within 3 miles of an airport without notifying the airport operator. I will give right of way to and avoid flying in the proximity of, full scale aircraft. Where necessary an observer shall be used to supervise flying to avoid having models fly in the proximity of full scale aircraft.

3. Where established, I will abide by the safety rules for the flying site I use, and I will not willfully and deliberately fly my models in a careless, reckless and/or dangerous manner.

7. I will not fly my model unless it is identified with my name and address or AMA number, on or in the model.

9. I will not operate models with pyrotechnics (any device that explodes, burns, or propels a projectile of any kind.)

Radio control

1. I will have completed a successful radio equipment ground check before the first flight of a new or repaired model.

2. I will not fly my model aircraft in the presence of spectators until I become a qualified flier, unless assisted by an experienced helper.

3. I will perform my initial turn after takeoff away from the pit or spectator areas, and I will not thereafter fly over pit or spectator areas, unless beyond my control.

4. I will operate my model using only radio control frequencies currently allowed by the Federal Communications Commission.

The model is a great flying sport scale airplane that flies smoothly and predictably, yet is highly maneuverable. Compared to other taildraggers, its flight characteristics

are quite docile and forgiving. It does not, however, have the self-recovery characteristics of a primary R/C trainer; therefore, you must either have mastered the basics of R/C flying or obtained the assistance of a competent R/C pilot to help you with your first flights.

Takeoff: If you have dual rates on your transmitter, set the switches to "high rate" for takeoff, especially when taking off in a crosswind. Although this model has good low speed characteristics, you should always build up as much speed as your runway will permit before lifting off, as this will give you a safety margin in case of a "flame-out." When you first advance the throttle and the tail begins to lift, the plane will start to turn left (a characteristic of all "tail draggers.") Be ready for this and correct by applying sufficient right rudder to hold it straight down the runway. The left-turning tendency will go away as soon as the tail is up and the plane picks up speed. Be sure to allow the tail to come up. Depending on the surface you are flying from, you will need to apply very little to no up elevator until flying speed is obtained. Do not hold the tail on the ground with too much up elevator, as the model will become airborne prematurely and will possibly stall. When the plane has sufficient flying speed, lift off by smoothly applying up elevator (do not "jerk" it off to a steep climb!) Then climb out gradually.

Flying: We recommend that you take it easy with your model for the first several flights, gradually "getting acquainted" with this realistic plane as your engine gets fully broken-in. Add and practice one maneuver at a time, learning how she behaves in each. For ultra-smooth flying and normal maneuvers, we recommend using the "low rate" settings as listed on page 31. "High rate" elevator may be required for crisp snap rolls and spins. "High rate" rudder is best for knife edge. Speed is the key to good knife-edge performance.

CAUTION (THIS APPLIES TO ALL R/C AIRPLANES): If, while flying, you notice any unusual sounds, such as a low-pitched "buzz," this may be an indication of control surface "flutter." Because flutter can quickly destroy components of your airplane, any time you detect flutter you must immediately cut the throttle and land the airplane! Check all servo grommets for deterioration (this will indicate which surface fluttered) and make sure all pushrod linkages are slop-free. If it fluttered once, it probably will flutter again under similar circumstances unless you can eliminate the slop or flexing in the linkages. Here are some things which can result in flutter: excessive hinge gap; not mounting control horns solidly; sloppy fit of clevis pin in horn; elasticity present in flexible plastic pushrods; side-play of pushrod in guide tube caused by tight bends; sloppy fit of Z-bend in servo arm; insufficient glue used when gluing in the elevator joiner wire or aileron torque rod; excessive flexing of aileron, caused by using too soft balsa aileron; excessive "play" or "backlash" in servo gears and insecure servo mounting.

Landing: When it's time to land, fly a normal landing pattern and approach. The model will probably bleed off airspeed more rapidly than the sport planes you are used to. For this reason, keep a few clicks of power on until you are over the runway threshold. For your first landings, plan to land slightly faster than stall speed and on the main wheels, as this is the easiest way to land your model. Later, with a little technique, you will find you can make slow, 3-point landings.

Glossary of Terms

Ailerons – Hinged control surfaces located on the trailing edge of the ***wing,*** one on each side, which provide control of the airplane about the ***roll axis***. The control direction is often confusing to first time modelers. For a right roll or turn, the right hand aileron is moved upward and the left hand aileron downward and vice versa for a left roll or turn.

Canard – A unique type of airplane, in which the ***wing*** is located near the back of the ***fuselage*** and the ***horizontal stabilizer*** is located at the nose of the fuselage.

Carburetor – The part of the ***engine*** which controls the speed or throttle setting and lean/rich mixture via setting of the ***needle valve***.

Charge Jack – The plug receptical of the ***switch harness*** which the charger is plugged into to charge the airborne battery. An ***expanded scale voltmeter (ESV)*** can also be plugged into it to monitor battery voltage during a flying session. It is advisable to mount the charge jack in an accessible area of the ***fuselage*** so an ESV can be used without removing the wing.

Charger – Device used to recharge batteries and is usually supplied with the radio if ***NiCd*** batteries are included.

Chicken Stick – A hand held stick used to flip start a model airplane ***engine***.

Words show in italics are defined elsewhere in this glossary.

Clunk – A weighted fuel pick up used in a fuel tank to assure the intake line is always in fuel.

Clevis – A small clip which is threaded or soldered onto the wire end of a ***pushrod*** and connects the pushrod to the ***control horn*** of a control surface. The threads allow fine adjustment of length of the ***pushrod***.

Computer Radio – A radio control unit in which the ***transmitter*** has several advanced functions which can be programmed completely to fine tune an airplane without making mechanical changes.

Control Horn – The arm which is attached to a control surface at the hingeline and is connected to a ***pushrod***.

Dead Stick – A term used to describe unpowered flight (glide) when the ***engine*** quits running.

Delta Wing – An airplane with a triangle shaped ***wing***. Delta wings have no ***horizontal stabilizer***.

Dihedral – The V shaped bend in the ***wing***. Typically more dihedral causes more aerodynamic stability in an airplane, and causes the ***rudder*** to control both the ***roll and yaw axis***. This is why some ***trainers*** and ***sailplanes*** require only 3-channels of radio control—i.e., having no ***ailerons***.

Electric Starter – A hand held, electric motor used for starting a model airplane ***engine***.

Elevator – Hinged control surface located at the trailing edge of the horizontal ***stabilizer,*** which provides control of the airplane about the ***pitch axis*** and causes the airplane to climb or dive. The correct direction of control is to pull the ***transmitter*** elevator control stick back, toward the bottom of the transmitter, to move the elevator upward, which causes the airplane to climb and vice versa to dive.

Elevon – Control surfaces used on a flying wing or ***Delta Wing*** type airplanes, located at the trailing edge of the ***wing*** like ailerons. Elevons move both up or down together to control the ***pitch axis*** like an ***elevator,*** and move differentially to control the ***roll axis*** like ***ailerons***. Elevons require either a mechanical or electronic channel mixer.

Engine – The source of thrust of an airplane.

Expanded Scale Voltmeter (ESV) – Device used to read the battery voltage of the on board battery pack or ***transmitter*** battery pack.

Flaps – Hinged control surface located at the trailing edge of the ***wing*** inboard of the ***ailerons***. The flaps are lowered to produce more aerodynamic lift from the wing, allowing a slower takeoff and landing speed. Maneuvering flaps move up and down in conjunction with the ***elevator,*** and enhance the pitch control of the airplane. This is used on some aerobatic type of models, and requires a mechanical or electronics channel mixer. **Note:** Flaps and Maneuvering Flaps are advanced features and are not necessary or recommended on ***trainer aircraft***.

Flaperon – Control Surfaces on a standard type airplane, located at the trailing edge of the ***wing,*** which function as ***ailerons*** by moving differentially, and as flaps by moving up or down together. Flaperons require either a mechanical or electronic channel mixer. **Note:** Flaperons are an advanced feature and are not recommended on ***trainer aircraft***.

Flight Box – A special box used to hold and transport all equipment used at the flying field.

Flight Pack – or Airborne pack. All of the radio equipment installed in the airplane, – i.e., ***Receiver, Servos, Battery*** and **Switch Harness**.

Foam Rubber – A soft foam material used to wrap the ***receiver*** and airborne battery for vibration dampening in the airplane.

Fuel Over Flow Line (Vent) – The fuel line which is either open to atmospheric pressure or attaches to the muffler pressure nipple, to pressurize the ***fuel tank*** for better fuel flow to the engine. This is the line through which the fuel will overflow when the tank is full.

Fuel Pick Up Line – The fuel line in the fuel tank through which the fuel travels to the ***carburetor***. Typically a flexible tube with a weight or ***"Clunk"*** on the end which allows it to follow the fuel with changes in aircraft altitude. This is the line through which the tank is filled.

Fuel Tank – The container which holds the fuel in an airplane.

Fuselage – The body of an airplane

Fun Fly Airplane – A specialty model designed to be very lightweight and perform very tight, rapid, maneuvers such as loops and rolls.

Glow Plug Clip/Battery – A 1.2 volt battery, which is connected to the glow plug on a model airplane engine

for starting. The battery is removed once the ***engine*** is running steadily.

High Wing – An airplane with the wing mounted on top of the ***fuselage***.

Hinge – A flexible or hinged blade which is glued into a control surface and trailing edge to allow control surface deflection or movement. **Note:** It is extremely important that all hinges are permanently glued into both the control surface and trailing edge. Improper gluing will cause a crash.

Horizontal Stabilizer – The horizontal tail surface at the back of the ***fuselage*** which provides aerodynamic pitch stability and control to the airplane.

Low Wing – An airplane with the wing mounted on the bottom of the ***fuselage***.

Main Landing Gear – The landing gear and wheels which are usually on the bottom of the ***fuselage*** under the wing on a high wing airplane, or on the bottom of the wing on a low wing airplane.

Mid Wing – An airplane with the wing mounted in the center of the ***fuselage,*** between the top and bottom.

Muffler – A device attached to the exhaust stack of the ***engine*** to reduce noise, and increase back pressure which helps low speed performance. **Note:** Most R/C Clubs require the use of mufflers.

Needle Valve – Adjustment on a ***carburetor*** used to set proper fuel mixture. Some carburetors have separate needle adjustments for low and high throttle. Typically turning the needle clockwise (screwing in) leans the mixture and vice versa. However, there are a few exceptions. Refer to the ***engine*** manufacturer's instructions.

NiCd – Nickel Cadmium battery. Rechargeable batteries which are typically used as power for radio control ***transmitters*** and ***receivers***.

Nitro – NitroMethane, a fuel additive which increases a model airplanes' ability to idle low and improves high speed performance. Ideal nitro content varies from engine to engine. Refer to the engine manufacturer's instructions for best results. Nitro content in fuel is indicated by the Nitro percent of the fuel.

Nose Gear – The landing gear at the nose of the airplane if the airplane is a Tricycle landing gear type. Typically connected to the ***rudder servo*** for steering while on the ground.

Pattern Airplane – A model airplane designed to perform precision aerobatics.

Pitch Axis – The airplane axis controlled by the ***elevator***. Pitch is illustrated by holding the airplane at each wingtip. Raising or lowering the nose is the pitch movement. This is how the climb or dive is controlled.

Pushrod – A rigid piece of wood, fiberglass, nylon or steel used to transfer movement from a ***servo*** to a control surface or throttle.

Pylon Racing Airplane – A model airplane designed for racing. They are flown around a set course of three (3) "Pylons."

Receiver (Rx) – The radio unit in the airplane which receives the ***transmitter*** signal and relays the control to the ***servos***. This is somewhat similar to the radio you may have in your family automobile, except the radio in the airplane perceives commands from the transmitter and the radio in your car perceives music from the radio station.

Roll Axis – The airplane axis controlled by the ***ailerons***. Roll is illustrated by holding the airplane by the nose and tail. Dropping either wingtip is the roll movement. This is used to bank or turn the airplane.

Rudder – Hinged control surface located at the trailing edge of the ***vertical stabilizer,*** which provides control of the airplane about the **Yaw Axis** and causes the airplane to Yaw left or right. Left rudder movement causes the airplane to Yaw left and right rudder movement causes it to Yaw right.

Sailplane – An airplane which flies without an ***engine***. Sailplanes are designed to ride on warm, rising air currents, called thermals. Sailplanes are launched by several methods; a giant sling shot called a high start, a winch which pulls the sailplane up like a kite, or with the assistance of a small engine or electric motor.

Servo – The electronic/ mechanical device which moves the control surfaces or throttle of the airplane according to commands from the ***receiver***. The radio device which does the physical work inside the airplane.

Servo Output Arm – The removable arm or wheel which bolts to the output shaft of a servo and connects to the ***pushrod***.

Spinner – The nose cone which covers the hub of the propeller.

Sport Airplane – A model which possesses some attributes of many of the specialty airplanes and are best for general flying as they are the most versatile and durable.

Switch Harness – The on/off switch for the ***flight pack*** which is mounted in an accessible location on the ***fuselage***.

Tachometer – An optical sensor designed specifically to count light impulses through a turning propeller and read out the engine RPM.

Tail Wheel – The wheel at the tail of the airplane on standard landing gear or tail dragger type airplanes. Steering is typically coupled to the ***rudder*** for ground handling.

Threaded Horns – Small nylon horns which thread onto the threaded portion of the ***aileron torque rods*** and connect to the ***clevis*** of the ***aileron pushrods***.

Torque Rods – Rigid bent wire rods inserted into ***ailerons,*** running along the ***wing trailing edge*** and bent down to connect to the aileron ***servo pushrods.***

Trainer Airplane – A model designed to be inherently stable and fly at low speeds, to give first time modelers time to think and react as they learn to fly.

Transmitter (Tx) – The hand held radio controller.This is the unit that sends out the commands that you input.

Transmitter Modes –
Mode I. Left hand stick controls ***elevator*** and ***rudder***. Right hand stick controls ***throttle*** and ***aileron***.

Mode II. Left hand stick controls ***throttle*** and ***rudder***. Right hand stick controls ***elevator*** and ***aileron***. Mode II is by far the most popular in the United States.

Mode III. Left hand stick controls ***throttle*** and ***aileron***. Right hand stick controls ***elevator*** and ***rudder***.
Single Stick. A special ***transmitter*** with only one stick. ***Elevator*** and ***Aileron*** are controlled with the stick. ***Rudder*** is controlled by twisting the end of the stick. Throttle is controlled by a lever on the top or side of the transmitter. **Note:** Single stick equipment is no longer being produced by most of the radio manufacturers.

V-Tail – An airplane which has two tail surfaces in the shape of a V, in lieu of a ***vertical stabilizer*** and ***horizontal stabilizer***. The control surfaces on a V-tail are called ruddevators and function both in the same direction as an ***elevator*** and in opposite directions as a ***rudder***.

Vertical Stabilizer – The non-moving surface that is perpendicular to the ***horizontal stabilizer*** and provides lateral stability. This is the surface the ***rudder*** attaches to.

Wheel Collar – A small, round retaining device used to keep wheels from sliding off an axle.

Wing - The main lifting surface of an airplane.

Yaw Axis – The airplane axis controlled by the ***rudder***. Yaw is illustrated by hanging the airplane level by a wire located at the center of gravity. Left or right movement of the nose is the Yaw movement. Many aircraft are not equipped with ***ailerons*** and the roll and Yaw axis are controlled by the ***rudder***. This is due to the larger amount of ***dihedral*** in the ***wing***. This is why most ***trainer aircraft*** have a larger amount of dihedral.

Z Bend – A simple Z shaped bend in the wire end of a ***pushrod*** which is used to attach the pushrod to a ***servo output arm***.

Z Bend Pliers – An inexpensive plier type tool used for easily making perfect ***Z bends***.