EXCELLERON 90

SPORTSMAN AVIATION

INSTRUCTIONS FOR FINAL ASSEMBLY

The Sportsman Aviation Excelleron 90 ARF is distributed exclusively by Global Hobby Distributors
18480 Bandilier Circle, Fountain Valley, CA 92708

GLOBAL

Kit Product Number 127565

Specifications:

- **Wing Span:** 66.5 Inches
- **Wing Area:** 865 Square Inches
- **Length:** 67.5 Inches
- **Weight RTF:** 8 - 8.5 Pounds
- **Wing Loading:** 20 - 22 Ounces Per Square Foot
- **Functions:** Ailerons, Elevator, Rudder & Throttle
- **Engine Required:** .91 - 1.10 Two-Stroke
  .91 - 1.20 Four-Stroke
- **Radio Required:** 4Ch or More w/5 Ball Bearing Servos

The Excelleron 90 ARF Requires the Use of High-Torque Servos. Please See Page # 4 For More Information.

✦**IMPORTANT**✦ The Sportsman Aviation Excelleron 90 ARF is not intended for inexperienced pilots. It is in no way a trainer. If you are not comfortable flying aerobatic aircraft, we strongly suggest returning the Excelleron 90 ARF (brand new, in the box with all original packaging and your dated sales receipt) to the place of purchase.

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SAFETY WARNING

This R/C airplane is not a toy! If misused or abused, it can cause serious bodily injury and/or damage to property. Fly only in open areas and preferably at a dedicated R/C flying site. We suggest having a qualified instructor carefully inspect your airplane before its first flight. Please carefully read and follow all instructions included with this airplane, your radio control system and any other components purchased separately.

FOR YOUR INFORMATION

To make your modeling experience totally enjoyable, we recommend that you get experienced, knowledgeable help with assembly and during your first flights. Your local hobby shop has information about flying clubs in your area whose membership includes qualified instructors. If there is no hobby shop in your area, we recommend that you contact the AMA at the address below. They will be able to help you locate a flying field near you.

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie IN 47302-9252
(800) 435-9262
www.modelaircraft.org

OUR GUARANTEE

Sportsman Aviation guarantees this kit to be free from defects in both material and workmanship at the date of purchase. This does not cover any component parts damaged by use, misuse or modification. **In no case shall Sportsman Aviation's liability exceed the original cost of the purchased kit.**

In that Sportsman Aviation has no control over the final assembly or material used for final assembly, no liability shall be assumed for any damage resulting from the use by the user of the final user-assembled product. By the act of using the final user-assembled product, the user accepts all resulting liability.

INTRODUCTION

Thank you for purchasing the Sportsman Aviation Excelleron 90 ARF. Before completing the final assembly of your new airplane, please carefully read through this instruction manual in its entirety. Doing so will ensure your success the first time around!

SPORTSMAN AVIATION EXCELLERON 90 ARF FEATURES

- Precision-Built, CAD-Designed Airframe for Light Weight and Great Flight Characteristics
- Real Iron-On Heat-Shrink Covering Material, High-Definition Color Scheme
- Durable, Lightweight Aluminum Main Landing Gear Bracket and Tail Wheel Assembly
- Prepainted Fiberglass Cowling, Wheel Pants and Clear Molded Canopy
- Soft-Mount Engine Mounting System
- Includes High-Quality Hardware - Fuel Tank, Pushrods, Engine Mount, Wheels, Etc.
- Fast and Easy Assembly - Over 60 High-Resolution Digital Photos and Drawings to Guide You

This instruction manual is designed to guide you through the entire assembly process of your new airplane in the least amount of time possible. Along the way you'll learn how to properly assemble your new airplane and also learn tips that will help you in the future. We have listed some of our recommendations below. Please read through them before beginning assembly.

- Please read through each step before beginning assembly. You should find the layout very complete and straightforward. Our goal is to guide you through assembly without any of the headaches and hassles that you might expect.
- There are check boxes next to each procedure. After you complete a procedure, check off the box. This will help prevent you from losing your place.
- Cover your work table with brown paper or a soft cloth, both to protect the table and to protect the parts.
- Keep a couple of small bowls or jars handy to put the small parts in after you open the accessory bags.
- We're all excited to get a new airplane in the air, but take your time. This will ensure you build a straight, strong and great flying airplane.
- If you come across this symbol ☞, it means that this is an important point or an assembly hint.

If you should find a part missing or damaged, or have any questions about assembly, please contact us at the address below:

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Fountain Valley CA 92708

Phone: (714) 963-0329 **Fax: (714) 964-6236** **Email: service@globalhobby.net**

CHECK IT OUT! We urge you to come check out our website at http://globalservices.globalhobby.com. There you will find public message boards frequented by other Sportsman Aviation ARF product owners and the Sportsman Aviation ARF support staff. This is a great place to learn about new Sportsman Aviation ARF products, get help and suggestions for your current Sportsman Aviation ARF products or just simply hang out and chat with people that share your same interests.

To enable us to better serve your needs, please include your email address with any correspondence you send to us. Your email address will be added to our Customer Service Database so you will automatically receive free updates and tech notices for your particular product. You will also receive repair status updates (if applicable) and other important information about your product as it becomes available.

IMPORTANT INFORMATION ABOUT YOUR EMAIL ADDRESS

Global Hobby Distributors will not disclose the information it collects to outside parties. Global Hobby Distributors does not sell, trade, or rent your personal information to others . Your privacy is important to us.

SECTION 1: OUR RECOMMENDATIONS

This section describes our recommendations to help you in deciding which types of accessories to purchase for your new Sportsman Aviation Excelleron 90 ARF. **Please read through this entire section very carefully. We have provided you with tips and recommendations that, if followed, will result in a great flying airplane. Failure to follow our recommendations may result in a poor flying airplane.**

What Engine Should I Use?

The Excelleron 90 ARF will fly well with a variety of different engines. The airplane is designed to be flown with .91 - 1.10 size two-stroke engines or .91 - 1.20 size four-stroke engines. Engines in the lower end of the size range will fly the airplane adequately, but the airplane really does perform best with engines in the higher end of the size range. Whether you're using a two-stroke or four-stroke engine, your engine's stock muffler should fit without modification. The airplane does include a soft-mount system that is designed to be used with .91 size engines. If you decide to use a 1.10 - 1.20 size engine, we suggest purchasing a stronger soft-mount system designed for 1.20 size beam-mounted engines. The Dave Brown VibraDamp soft-mount system is suggested.

What Radio System and Servos Should I Use?

To get the most out of the Excelleron 90 ARF, we suggest using a four or more channel computer radio system with mixing capabilities. Since there are two separate aileron servos used, they can be plugged separately into the receiver, allowing you the capability of flaperon and spoileron mixing, differential mixing and flaperon/spoileron to elevator mixing. The Excelleron 90 ARF is a big airplane with large control surfaces, so using high-torque ball bearing servos is a must. For crisp, positive control, we suggest using high-quality, dual ball bearing servos with a minimum of 65oz/in of torque on the flight control surfaces. For throttle control, a standard ball bearing servo can be used.

◆**IMPORTANT**◆ Although you would lose mixing capabilities, the airplane can be flown using a basic four-channel radio control system. If you do this, you will need to use a servo Y-Harness to join the two aileron servos together.

What Else Do I Need?

The Excelleron 90 ARF includes most of the hardware you'll need to finish the airplane. You will need to purchase separately a spinner, remote fueling valve, two servo extension leads and some basic building materials, such as adhesives, protective foam rubber for your radio equipment and fuel tubing. We've provided a list below of the items we used on the airplane shown in this instruction manual.

Here's a List of What We Used to Finish Our Excelleron 90 ARF:

QTY. 1	210970	Magnum XL .91RFS Four-Stroke Engine
QTY. 1	237155	Magnum 2-3/4" Chrome Spinner*
QTY. 1	609560	APC 14 x 6 Composite Propeller
QTY. 4	759394	Hitec HS-605BB High-Torque Servos
QTY. 1	444104	Cirrus CS-36 Standard Servo
QTY. 2	444713	Cirrus 12" Servo Extensions
QTY. 1	115490	Thunderbolt Four-Stroke Glow Plug
QTY. 1	237500	Magnum Fueling Valve
QTY. 1	115923	Global XX Silicone Fuel Tubing
QTY. 1	868638	Dubro 1/4" Protective Foam Rubber
QTY. 1	867903	Dubro 3/8" Heat-Shrink Tubing
QTY. 1	592642	Williams Bros. 1/6 Scale Sportsman Pilot (Optional)**

*Includes 5/16 - 24 shaft adapter with 5mm socket-cap retaining screw.

**If you purchase the optional pilot, you will also need various colors of enamel paint and a small paint brush to paint the pilot.

If you use a basic four-channel radio control system, you will also need to purchase separately one Cirrus Y-Harness (P/N 444728) to join the two aileron servos.

◆**IMPORTANT**◆ The part number for the Cirrus servo is compatible with all name-brand radio control systems. This servo uses a universal connector. The part number for the Hitec servos and the Cirrus servo extensions are compatible with Hitec and JR radio control systems. These items are also available with connectors that are compatible with Futaba and Airtronics radio control systems.

SECTION 2: TOOLS AND SUPPLIES REQUIRED

The tools and supplies listed below will be necessary to finish the assembly of your Sportsman Aviation Excelleron 90 ARF. We suggest having these items on hand before beginning assembly.

- ❑ Kwik Bond Thin C/A # 887500
- ❑ Kwik Bond Thick C/A # 887510
- ❑ Kwik Bond 5 Minute Epoxy # 887560
- ❑ Kwik Bond 30 Minute Epoxy # 887565
- ❑ Kwik Bond C/A Debonder # 887545
- ❑ Pacer Formula 560 Canopy Glue # 339176
- ❑ Wilhold Silicon Sealant # 335407
- ❑ Pacer Z-42 Blue Threadlocker # 339162
- ❑ Lightweight Oil or Petroleum Jelly
- ❑ # 0, # 1 & # 2 Phillips Head Screwdrivers
- ❑ 2.5mm & 3mm Hex Wrenches
- ❑ Adjustable Open-End Wrenches (2)
- ❑ Wire Cutters
- ❑ Needle Nose Pliers
- ❑ Excel Modeling Knife # 692801
- ❑ Scissors
- ❑ Electric Drill
- ❑ Assorted Drill Bits
- ❑ Dubro T-Pins # 567685
- ❑ Ernst Airplane Stand # 223977
- ❑ Rotary Tool w/Cutting Disc & Sanding Drum
- ❑ Ruler
- ❑ Pencil
- ❑ Builder's Triangle
- ❑ 220 Grit Sandpaper w/Sanding Block
- ❑ Masking Tape
- ❑ Waxed Paper
- ❑ Paper Towels
- ❑ Rubbing Alcohol
- ❑ NHP Epoxy Mixing Sticks # 864204
- ❑ NHP Epoxy Mixing Cups # 864205
- ❑ Global Heat Gun # 360920 (Optional)

SECTION 3: KIT CONTENTS

We have organized the parts as they come out of the box for easier identification during assembly. Before you begin assembly, group the parts as we list them below. This will ensure that you have all of the parts before you begin assembly and it will also help you become familiar with each part.

If you find any parts missing or damaged, please contact us at:

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18480 Bandilier Circle
Fountain Valley CA 92708

On the Web
http://globalservices.globalhobby.com

Phone: (714) 963-0329 **Fax: (714) 964-6236** **Email: service@globalhobby.net**

AIRFRAME ASSEMBLIES

- ❑ (1) Fuselage
- ❑ (1) Right Wing Panel w/Aileron
- ❑ (1) Left Wing Panel w/Aileron
- ❑ (1) Horizontal Stabilizer w/Elevator Halves
- ❑ (1) Vertical Stabilizer w/Rudder

THROTTLE CONTROL SYSTEM

- ❑ (1) 26-3/4" Pushrod Wire w/Z-Bend
- ❑ (1) 17-3/4" Nylon Pushrod Housing
- ❑ (1) Servo Connector w/Grub Screw, C-Clip & Washers

MAIN LANDING GEAR ASSEMBLY

- ❑ (1) Prebent Aluminum Main Gear Strut
- ❑ (2) Fiberglass Wheel Pants
- ❑ (2) Main Gear Wheels
- ❑ (2) M5 x 35mm Threaded Axles
- ❑ (2) M5 Hex Nuts
- ❑ (4) M3 x 12mm Machine Screws
- ❑ (4) M3 Flat Washers
- ❑ (2) Wheel Collars w/Grub Screws
- ❑ (2) M2 x 8mm Flange-Head Wood Screws

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KIT CONTENTS, CONTINUED....

AILERON CONTROL SYSTEM

- ❑ (2) 7-1/2" Threaded Wires
- ❑ (2) Threaded Nylon Control Horn Mounts
- ❑ (2) Nylon Control Horn Backplates
- ❑ (2) Nylon Adjustable Control Horns
- ❑ (6) M2 x 25mm Machine Screws
- ❑ (2) Nylon Clevises w/Steel Pins
- ❑ (2) Nylon Snap Links
- ❑ (8) Steel-Pinned Hinges

ELEVATOR CONTROL SYSTEM

- ❑ (2) Stranded Steel Cables
- ❑ (4) Threaded Nylon Control Horn Mounts
- ❑ (4) Nylon Adjustable Control Horns
- ❑ (6) M2 x 32mm Machine Screws
- ❑ (6) M2 Hex Nuts
- ❑ (4) Threaded Couplers
- ❑ (2) Z-Bend Couplers
- ❑ (6) Flanged Crimp Collets
- ❑ (4) Nylon Clevises w/Steel Pins
- ❑ (6) Steel-Pinned Hinges

RUDDER CONTROL SYSTEM

- ❑ (1) Stranded Steel Cable
- ❑ (2) Threaded Nylon Control Horn Mounts
- ❑ (2) Nylon Adjustable Control Horns
- ❑ (3) M2 x 32mm Machine Screws
- ❑ (3) M2 Hex Nuts
- ❑ (2) Threaded Couplers
- ❑ (2) Z-Bend Couplers
- ❑ (4) Flanged Crimp Collets
- ❑ (2) Nylon Clevises w/Steel Pins
- ❑ (3) Steel-Pinned Hinges

TAIL WHEEL ASSEMBLY

- ❑ (1) Tail Wheel Wire w/Tail Wheel
- ❑ (1) Aluminum Tail Wheel Bracket
- ❑ (1) Wheel Collar w/Grub Screw
- ❑ (2) M2 x 8mm Flange-Head Wood Screws

FUEL TANK ASSEMBLY

- ❑ (1) 420cc Fuel Tank
- ❑ (1) Large Diameter Metal Plate
- ❑ (1) Small Diameter Metal Plate
- ❑ (1) Rubber Stopper
- ❑ (1) Fuel Pick-Up "Clunk"
- ❑ (1) M3 x 18mm Machine Screw
- ❑ (1) Silicone Fuel Tubing
- ❑ (3) Aluminum Tubing

ENGINE MOUNT ASSEMBLY

- ❑ (4) Rubber Isolation Mounts
- ❑ (4) Predrilled Aluminum Plates w/Threaded Holes
- ❑ (4) Predrilled Aluminum Plates w/Plain Holes
- ❑ (4) M4 x 12mm Socket-Cap Screws
- ❑ (4) M4 Flat Washers
- ❑ (8) M3 x 18mm Socket-Cap Screws
- ❑ (4) M4 x 30mm Wood Screws
- ❑ (4) M4 Flat Washers

MISCELLANEOUS FUSELAGE PARTS

- ❑ (1) Fiberglass Cowling
- ❑ (1) Clear Canopy
- ❑ (1) Plywood Servo Tray
- ❑ (1) Precovered Fuselage Tail Fairing
- ❑ (8) M2 x 8mm Flange-Head Wood Screws
- ❑ (2) Heat-Shrink Tubing (1/4" Diameter)
- ❑ (1) 1.5mm Hex Wrench
- ❑ (2) Nylon Fuel Line Plugs (Optional)
- ❑ (1) Decal Set

MISCELLANEOUS WING PARTS

- ❑ (1) Belly Pan
- ❑ (2) Molded Aileron Servo Fairings
- ❑ (1) Hardwood Wing Joiner
- ❑ (1) Plywood Wing-Screw Doubler
- ❑ (2) M4 x 40mm Socket-Cap Screws
- ❑ (2) M4 Flat Washers
- ❑ (2) 4mm Rubber Grommets
- ❑ (8) M2 x 6mm Wood Screws

SECTION 4: REPLACEMENT PARTS

We stock a complete line of replacement parts for your Sportsman Aviation Excelleron 90 ARF. Listed below are the replacement parts that are available along with their respective part numbers for easy ordering convenience. We suggest ordering directly from your local dealer. If your dealer does not stock Sportsman Aviation products, you can order directly from us at the address shown below:

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Excelleron 90 ARF - Complete	127565	Fiberglass Wheel Pants	170182
Instruction Manual	170204	Clear Molded Canopy	170183
Wing Set	170205	Fuel Tank Set (420cc)	170184
Fuselage Set	170208	Soft-Mount Engine Mount Assembly	170185
Stabilizer Set	170209	Hardware Set	170186
Fiberglass Cowling	170214	Tail Wheel Assembly	170187
Belly Pan	170180	Decal Set	170179
Aluminum Landing Gear Strut	170181		

SECTION 5: A NOTE ABOUT COVERING MATERIAL

The covering material used on the Sportsman Aviation Excelleron 90 ARF is real iron-on, heat-shrink covering material, not cheap "shelf paper." Because of this, it is possible with heat and humidity changes that the covering material on your airplane may wrinkle or sag. This trait is inherent in all types of heat-shrink covering material. To remove any wrinkles that might be visible you will need to purchase, or borrow from a fellow modeler, a heat iron. If you need to purchase one, the **Global Heat Sealing Iron # 360900** is recommended.

Follow this simple procedure to remove the wrinkles:

❑ Plug in and turn on the sealing iron to the medium-high temperature setting. Allow the sealing iron to heat up for approximately 5 - 7 minutes.

❑ After the sealing iron has reached temperature, lightly apply the sealing iron to the wrinkled section of the covering. Move the sealing iron slowly over the wrinkled section until the covering tightens and the wrinkles disappear.

✦IMPORTANT✦ You will notice that the color of the covering will darken when it is heated. When the covering cools back down, it will return to its normal color.

☞ If the color layer smears from any of the seams the temperature of the sealing iron is too hot. Turn the temperature dial down and wait about 5 minutes for the sealing iron to adjust to the lower temperature. You can remove any excess color streaks using a paper towel soaked with a small quantity of Acetone.

PRO TIP We do not suggest storing your airplane in an extremely hot environment (like the back of your car in direct sunlight) for any length of time. The extreme heat could cause the covering material to wrinkle or sag and possibly damage the canopy and/or the fragile components of your radio control system.

SECTION 6: WING ASSEMBLY

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

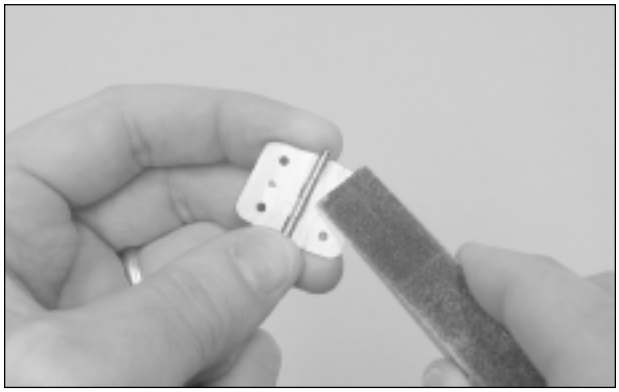
- ❑ (1) Right Wing Panel w/Aileron
- ❑ (1) Left Wing Panel w/Aileron
- ❑ (8) Steel-Pinned Hinges
- ❑ (2) Molded Aileron Servo Fairings
- ❑ (1) Hardwood Wing Joiner
- ❑ (8) M2 x 6mm Wood Screws

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond 5 Minute Epoxy
- ❑ Kwik Bond 30 Minute Epoxy
- ❑ Lightweight Oil or Petroleum Jelly
- ❑ # 1 Phillips Head Screwdriver
- ❑ Excel Modeling Knife
- ❑ Electric Drill
- ❑ 1/16" Drill Bit
- ❑ Ruler
- ❑ Pencil
- ❑ 220 Grit Sandpaper w/Sanding Block
- ❑ Masking Tape
- ❑ Paper Towels
- ❑ Rubbing Alcohol
- ❑ NHP Epoxy Mixing Sticks
- ❑ NHP Epoxy Mixing Cups
- ❑ Global Heat Gun (Optional)

STEP 1: HINGING THE AILERONS

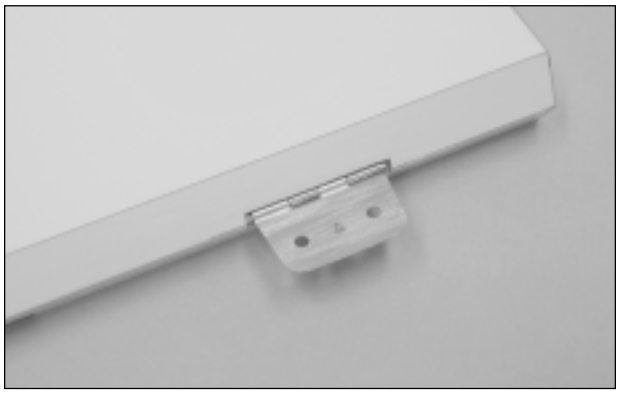
◆IMPORTANT◆ The hinges are NOT glued into place from the factory. For flutter-free control surfaces, it is imperative that the hinges be glued in properly. This is achieved by having a tight hinge gap and using plenty of epoxy glue. Poor hinge installation can lead to control surface flutter which can result in a catastrophic failure of the airframe.



❑ Carefully remove the aileron and four hinges from one wing panel.

❑ Using 220 grit sandpaper with a sanding block, lightly sand both sides of the mounting tabs on each of the four hinges, to roughen the smooth metal surfaces.

◆IMPORTANT◆ You must roughen the metal so that the epoxy will stick to it. If you don't roughen the metal, the hinge(s) may pull out during flight.



❑ Slide each of the hinges into the aileron and center them in the middle of the hinge slots.

❑ Using a modeling knife, carefully cut a shallow bevel in the aileron directly above and below each hinge. The bevel should be deep enough so that when you push the hinge in further, the pivot point of the hinge will be flush with the leading edge of the aileron. This will ensure that there will be little to no hinge gap when the aileron is hinged into place.

❑ When satisfied with the fit and alignment, remove the hinges and carefully apply a thin coating of lightweight oil or petroleum jelly to **only the pivot point** of each hinge.

◆IMPORTANT◆ Do not omit this procedure. Applying lightweight oil or petroleum jelly to the pivot point will prevent the hinges from being glued solid when you install them.

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❑ Mix a small quantity of 5 minute epoxy and carefully glue each of the four hinges into only the aileron for now. Make sure that the hinges' pivot point is straight and flush with the leading edge of the aileron, then remove any excess epoxy, using a paper towel and rubbing alcohol. Allow the epoxy to set up for about 10 minutes before proceeding.

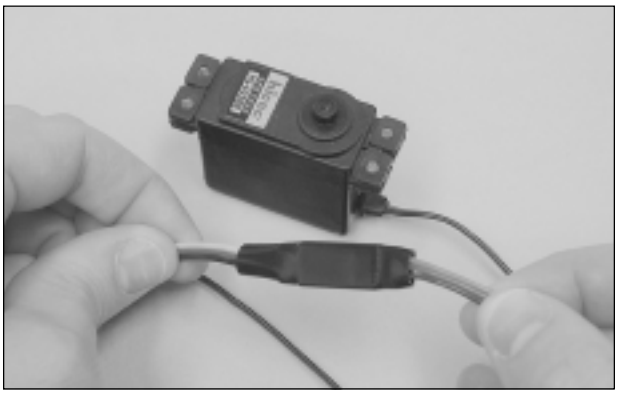
❑ After the epoxy has set up, apply another coating of lightweight oil or petroleum jelly to each hinge pivot point, then hinge the aileron to the wing, using 5 minute epoxy, making sure that the leading edge of the aileron is pushed firmly up against the trailing edge of the wing panel, and that the ends of the aileron don't rub against the wing. There should be no more than a 1/32" wide hinge gap to reduce the possibility of flutter. Remove any excess epoxy, using a paper towel and rubbing alcohol, and allow the epoxy to set up before proceeding.

❑ After the epoxy sets up, pivot the aileron up and down several times to free up the hinges. If you notice any excess dried epoxy on any hinge pivot point, it can be removed by carefully using the tip of a modeling knife to cut it away.

❑ Repeat the previous procedures to hinge the aileron to the other wing panel, then pull firmly on each aileron to double-check that all of the hinges hold solidly.

STEP 2: INSTALLING THE AILERON SERVOS

❑ Install the rubber grommets and brass collets onto your two aileron servos, making sure to install the collets with the flanges toward the **bottom** of the servos.

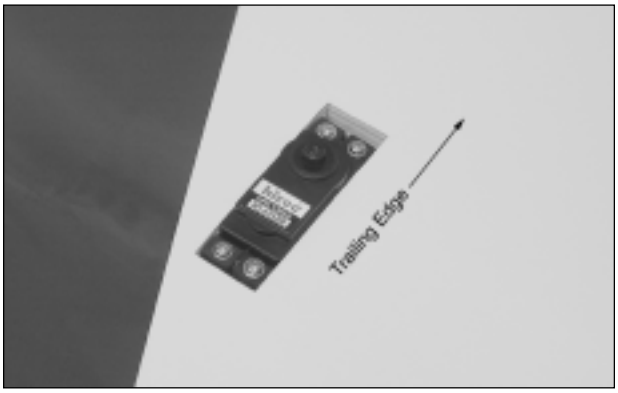


❑ Plug one 12" aileron servo extension onto each of your aileron servo leads.

❑ To prevent the servo leads from pulling apart during assembly, or worse, during flight, secure the plugs together using a short piece of 3/8" diameter heat-shrink tubing (not included).

☞ If you don't want to use heat-shrink tubing, wrapping the plugs with masking tape works well, too.

❑ Working with one wing panel for now, use a modeling knife to cut away and remove the covering material from over the precut servo mounting hole in the bottom of the wing and from the precut servo extension exit hole in the top of the wing. The servo mounting hole is located 14-1/4" out from the root rib and 5-3/4" in front of the aileron hinge line. The servo extension exit hole is located 1" out from the root rib and 7-7/8" in front of the trailing edge.



❑ Install the aileron servo onto the plywood servo mounting rails, making sure to first pull the aileron servo extension lead through the wing and out the exit hole in the top of the wing, using the length of string that's been preinstalled in the wing.

◆IMPORTANT◆ When installed, the servo output shaft should be toward the trailing edge of the wing.

☞ Drill 1/16" diameter pilot holes for the servo mounting screws.

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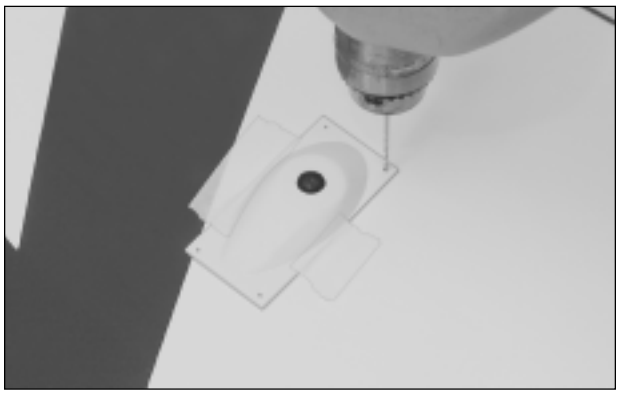


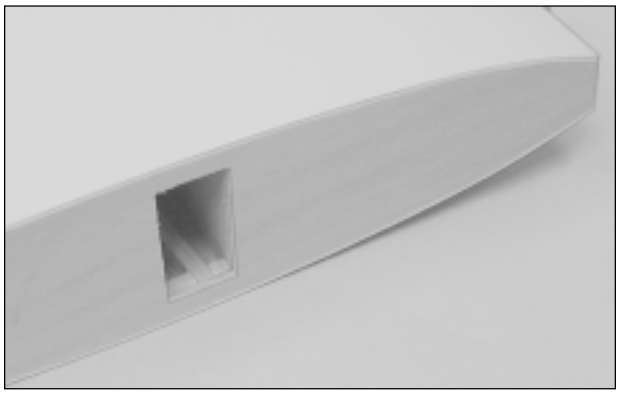
❑ After installing the aileron servo, position one molded servo fairing over the servo, making sure that the predrilled hole in the servo fairing is centered over the servo output shaft. When satisfied with the alignment, hold the servo fairing in place, using a couple of pieces of masking tape.

❑ Carefully drill four 1/16" diameter pilot holes through the servo fairing and into the wing, using the molded dimples on the servo fairing as a guide.

❑ Secure the servo fairing to the wing, using four M2 x 6mm wood screws.

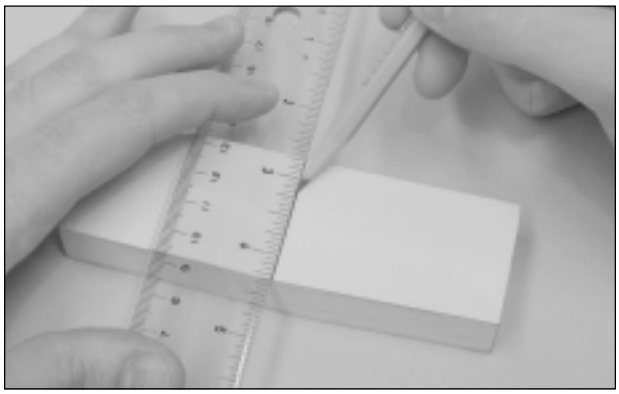
❑ Repeat the previous procedures to install the second aileron servo and molded servo fairing to the other wing panel.

STEP 3: JOINING THE WING PANELS



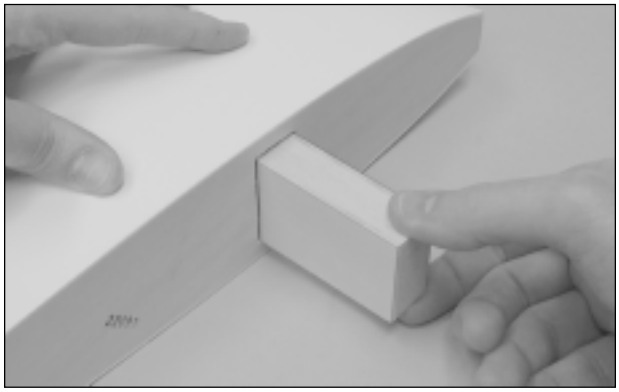
❑ Using a modeling knife, cut away and remove the excess covering material that overlaps onto the root ribs of each wing panel, leaving about 1/16" overlapped so it does not pull away.

◆IMPORTANT◆ It's very important to the integrity of the wing center-section joint that you remove as much covering material from the root ribs as possible. Do not omit this procedure or the wing center-section joint may fail during flight.



❑ Use a ruler and a pencil to locate and draw a vertical centerline on each side of the hardwood wing joiner.

◆IMPORTANT◆ The top of the wing joiner is straight and the bottom is cut in the shape of a shallow "V." When you test-fit the wing joiner in the next procedure, make sure that the top of the joiner (the straight side) is toward the TOP of the wing panels.



❑ Test-fit the wing joiner into each wing panel. It should slide easily into each wing panel up to the centerline you drew.

◆IMPORTANT◆ When the wing joiner is installed, it should not fit tightly into the wing panels. It should actually be slightly loose. This will ensure that when you glue the wing joiner into place that epoxy can get into the joints between the wing joiner and the wing joiner box.

☞ If the wing joiner does not fit properly, use 220 grit sandpaper with a sanding block to lightly sand the edges and tips of the wing joiner, until you are satisfied with the fit.

❑ Slide both wing panels together with the wing joiner temporarily installed (without using glue).

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❑ While holding the two wing panels together firmly, make sure that both wing panels are lined up at both the leading and trailing edges, then look carefully at the center-section joint: the wing panels should fit together tightly with few or no gaps in the joint.

☞ If the wing panels do not fit together properly, remove the wing joiner and use 220 grit sandpaper with a sanding block to lightly sand the edges and tips of the wing joiner, until you are satisfied with the fit.

❑ When satisfied with the fit and alignment, pull the wing panels apart and remove the wing joiner.

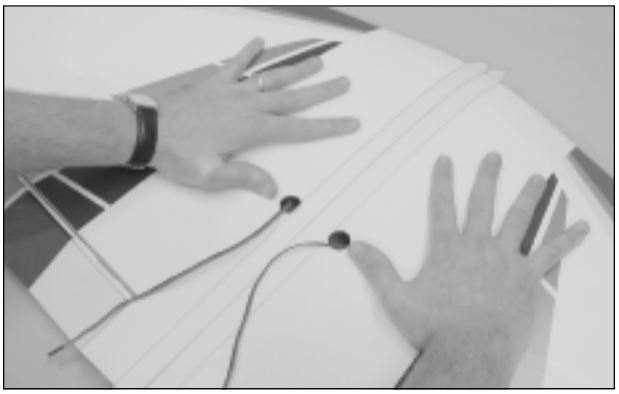
❑ Apply a long strip of masking tape to the top and bottom edges of the root rib on each wing panel.

☞ The masking tape will prevent excess epoxy from getting onto the wing panels when you join them.

❑ Mix a generous amount of 30 minute epoxy. Working with only one wing panel for now, apply a thin layer of epoxy inside the wing joiner box and to only half of the wing joiner. Make sure to cover the top and bottom, as well as the sides, and use enough epoxy to fill any gaps.

✦WARNING✦ Use only 30 or 45 minute epoxy to install the wing joiner and to join the wing panels together. **Do not use 5 minute epoxy. It is not strong enough. If you use 5 minute epoxy, the wing will fail during flight.**

❑ Slide the wing joiner into the wing panel up to its centerline, **making sure that the top of the wing joiner is toward the top of the wing panel.** Quickly remove any excess epoxy, using a paper towel and rubbing alcohol, and allow the epoxy to set up before proceeding.



❑ After the epoxy has set up, test-fit both wing panels together again to double-check that they still fit together properly. Check the leading and trailing edges, too. It's important that they be even with each other.

❑ Mix a generous amount of 30 minute epoxy and apply a thin layer to the exposed half of the wing joiner, the inside of the wing joiner box in the second wing panel, and the **entire surface of BOTH root ribs**. Make sure to use enough epoxy to fill any gaps - don't skimp.

✦IMPORTANT✦ It is of the utmost importance to the integrity of the wing center-section joint that you apply a generous amount of epoxy to **both root ribs** and the wing joiner. Not using enough epoxy can result in wing failure during flight.

❑ Slide the two wing panels together again and realign them. Quickly wipe away any excess epoxy, using a paper towel and rubbing alcohol, and use pieces of masking tape to hold the two wing panels aligned until the epoxy fully cures.

✦IMPORTANT✦ Once the epoxy has fully cured, remove the masking tape and double-check the center-section joint. If any gaps are present, mix a small quantity of 30 minute epoxy and carefully fill any remaining gaps. Quickly remove any excess epoxy, using a paper towel and rubbing alcohol, and allow the epoxy to thoroughly cure.

SECTION 7: BELLY PAN INSTALLATION

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

- ❑ (1) Fuselage
- ❑ (1) Belly Pan
- ❑ (1) Plywood Wing-Screw Doubler
- ❑ (2) M4 x 40mm Socket-Cap Screws
- ❑ (2) M4 Flat Washers
- ❑ (2) 4mm Rubber Grommets

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

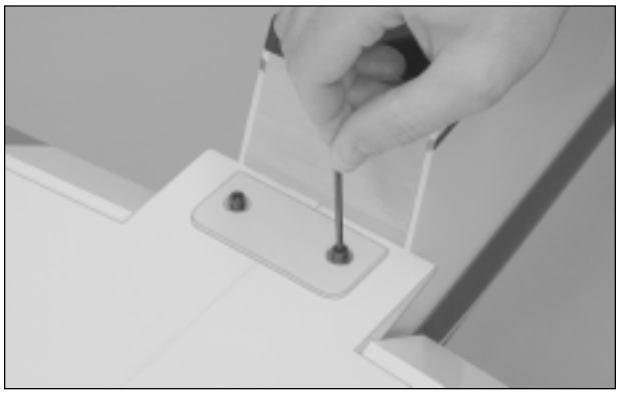
- ❑ Wilhold Silicon Sealant
- ❑ 3mm Hex Wrench
- ❑ Excel Modeling Knife
- ❑ Ernst Airplane Stand
- ❑ 220 Grit Sandpaper w/Sanding Block
- ❑ Masking Tape
- ❑ Waxed Paper
- ❑ Paper Towels

STEP 1: MOUNTING THE WING

❑ Using a modeling knife, cut away and remove the covering material from over the top and bottom of the two predrilled wing-screw mounting holes in the wing. One hole is located in each wing panel, 1" out from the centerline and 1" in front of the trailing edge.

❑ Place the wing into the wing saddle, push it forward completely, then push the trailing edge down into place.

☞ Two holes have been predrilled in the forward bulkhead to accept the wing hold-down dowels in the leading edge of the wing.



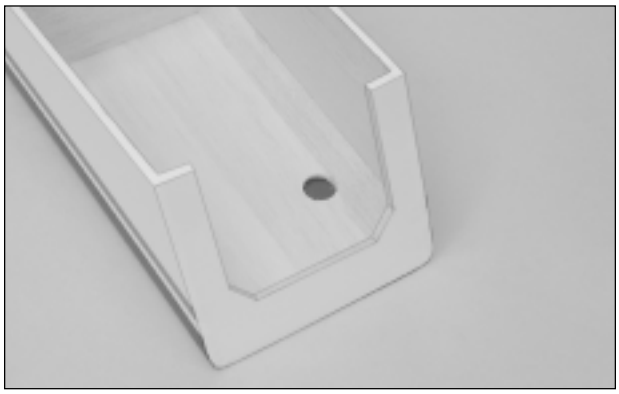
❑ Align the holes in the wing with the preinstalled blind nuts in the wing mounting block inside the fuselage.

❑ Secure the wing into place, using the plywood wing-screw doubler, two M4 x 40mm socket-cap screws and two M4 flat washers.

☞ Two 4mm rubber grommets have been included to conveniently keep the wing-mounting screws from falling out when you take off the wing. The next time you take off the wing, simply slide the grommets over the end of the screws, from the top of the wing.

STEP 2: ALIGNING THE BELLY PAN

❑ Using a modeling knife, cut away and remove the covering material from over the two precut wing-screw access holes in the bottom of the belly pan.



❑ Using a modeling knife, carefully cut out the back of the belly pan, as shown.

✦IMPORTANT✦ Cutting out the back of the belly pan will allow you to retrieve the wing screws and washers should they ever fall loose into the belly pan after it's glued to the wing.

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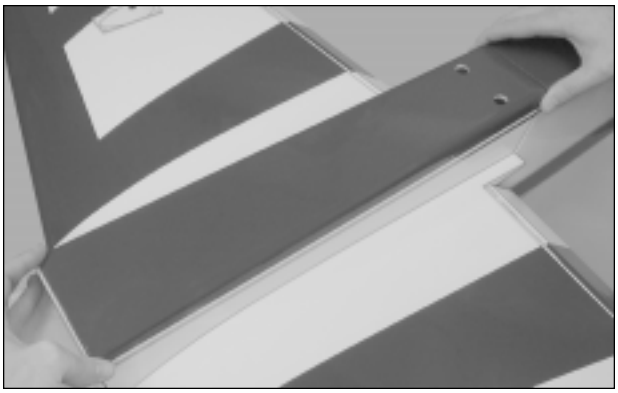


❑ With the wing installed onto the fuselage, position the belly pan onto the wing. When lined up properly, the sides and bottom of the belly pan should be even with the sides and bottom of the fuselage, and there should be few or no gaps between the base of the belly pan and the wing.

☞ So that the cowling will fit flush with the bottom of the belly pan when it's installed later, the front of the belly pan will be 1/16" taller than the forward bulkhead. This is normal.

◆IMPORTANT◆ So that the wing can be installed and removed, there should be about a 1/16" wide gap between the fuselage and the front and back of the belly pan.

If there are gaps between the base of the belly pan and the wing, use 220 grit sandpaper to sand away some material from the base of the belly pan. Remove small amounts of material at a time and recheck the fit often until you are satisfied with the fit.

STEP 3: INSTALLING THE BELLY PAN

❑ Remove the wing, lay a long piece of waxed paper over the wing saddle, then reinstall the wing, making sure that the ends of the waxed paper are covering the joints between the fuselage and the leading and trailing edges of the wing.

◆IMPORTANT◆ It's important to use waxed paper or plastic wrap when you glue the belly pan to the wing. The waxed paper will ensure that you don't accidentally glue the wing to the fuselage when you glue the belly pan into place.

❑ Apply a generous bead of silicon sealant to the base of the belly pan, making sure that you cover all of the gluing surfaces. This includes not only the sides of the belly pan, but the front and back, too.

☞ Make sure to use enough silicon sealant to fill any small gaps or irregularities in the glue joint.

❑ Set the belly pan into place and realign it. The sides and bottom of the belly pan should be even with the sides and bottom of the fuselage. When satisfied with the alignment, push the belly pan down firmly and remove any excess silicon sealant, using a paper towel and water. Hold the belly pan securely in place, using pieces of masking tape, until the silicon sealant completely cures.

◆IMPORTANT◆ It will take the silicon sealant about 24 hours to fully cure. We suggest not moving the assembly during this time. You must allow sufficient time for the silicon sealant to dry.

❑ After the silicon sealant has fully cured, remove the masking tape from the belly pan, then remove the wing from the fuselage.

❑ Look carefully at the glue joint between the belly pan and the wing. If there are any gaps in the glue joint, carefully fill them using extra silicon sealant, making sure to remove any excess before it cures, using a paper towel and water. This will ensure the strongest possible bond.

SECTION 8: STABILIZER INSTALLATION

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

- ❑ (1) Horizontal Stabilizer w/Elevator Halves
- ❑ (1) Vertical Stabilizer w/Rudder
- ❑ (9) Steel-Pinned Hinges
- ❑ (1) Tail Wheel Wire w/Tail Wheel
- ❑ (1) Aluminum Tail Wheel Bracket
- ❑ (1) Wheel Collar w/Grub Screw
- ❑ (2) M2 x 8mm Flange-Head Wood Screws
- ❑ (1) Precovered Fuselage Fairing
- ❑ (1) 1.5mm Hex Wrench

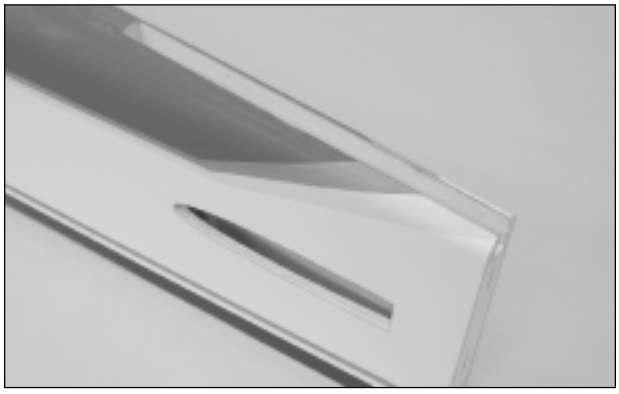
YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thin C/A
- ❑ Kwik Bond 5 Minute Epoxy
- ❑ Kwik Bond 30 Minute Epoxy
- ❑ Kwik Bond C/A Debonder
- ❑ Pacer Z-42 Blue Threadlocker
- ❑ Lightweight Oil or Petroleum Jelly
- ❑ # 1 Phillips Head Screwdriver
- ❑ Wire Cutters
- ❑ Needle Nose Pliers
- ❑ Excel Modeling Knife
- ❑ Electric Drill
- ❑ 1/16" & 5/64" Drill Bits
- ❑ Dubro T-Pins
- ❑ Ernst Airplane Stand
- ❑ Ruler
- ❑ Pencil
- ❑ Builder's Triangle
- ❑ 220 Grit Sandpaper w/Sanding Block
- ❑ Masking Tape
- ❑ Paper Towels
- ❑ Rubbing Alcohol
- ❑ NHP Epoxy Mixing Sticks
- ❑ NHP Epoxy Mixing Cups

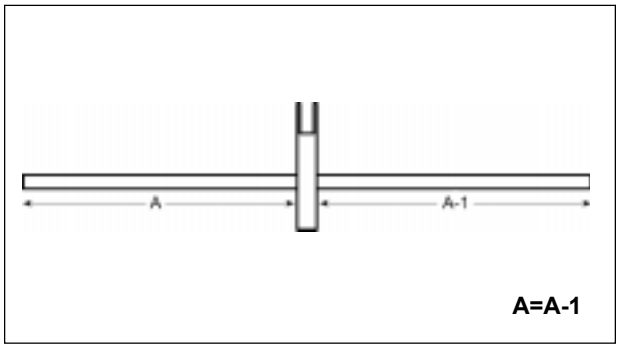
STEP 1: ALIGNING THE HORIZONTAL STABILIZER

❑ Remove the two elevator halves and six hinges from the horizontal stabilizer and set them aside for now.

◆**IMPORTANT**◆ Don't skip ahead and hinge the elevator halves before installing the stabilizer. If you hinge the elevator halves now, it will be impossible to install the stabilizer.



❑ Using a modeling knife, cut away and remove the covering material from over the horizontal and vertical stabilizer mounting slots in the back of the fuselage.



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❑ Slide the horizontal stabilizer into the mounting slot and center it by carefully measuring out from each side of the fuselage to each end of the stabilizer (at the trailing edge only for now). When the stabilizer is centered, both measurements will be equal.

☞ Make sure that the top of the stabilizer is toward the top of the fuselage.

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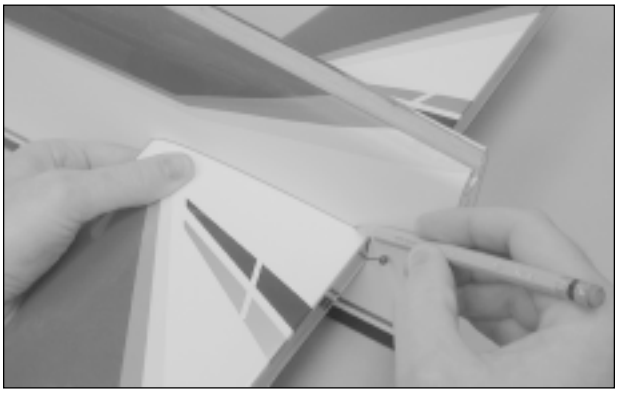
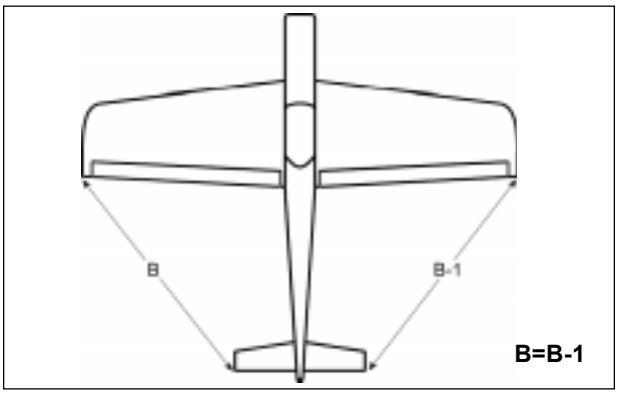


❑ When you're satisfied that the stabilizer is centered at the trailing edge, draw a mark on each side of the stabilizer (at the trailing edge) where it meets the fuselage sides.

❑ With the marks on the stabilizer lined up with the fuselage sides, hold **only** the trailing edge of the stabilizer in position using a T-Pin.

✦IMPORTANT✦ The front of the stabilizer should be able to pivot from side to side and the back should stay firmly in place and aligned. The trailing edge should not be allowed to move from side to side.



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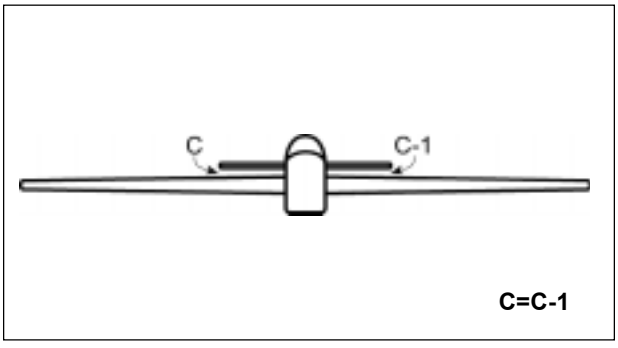
❑ With the wing mounted to the fuselage, use a ruler to measure the distance between the tips of the stabilizer and the tips of the wing. Pivot the front of the stabilizer until both of these measurements are equal.

☞ When both of these measurements are equal, you're assured that the stabilizer is square to the wing.

❑ When you are satisfied that the stabilizer is square to the wing, use a pencil to draw a couple of marks on each side of the front of the stabilizer where it and the fuselage sides meet, then use a couple of pieces of masking tape or T-Pins to hold the stabilizer firmly in place and aligned.



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❑ With the stabilizer held firmly in place, look from the front of the airplane at both the wing and the stabilizer. When aligned properly, the stabilizer should be parallel to the wing.

☞ If the stabilizer is out of alignment, remove it and use 220 grit sandpaper with a sanding block to sand down the higher side of the stabilizer mounting slot, then reinstall the stabilizer and check the alignment once more. Repeat this procedure until you are satisfied with the alignment.

❑ When satisfied with the alignment, hold the stabilizer firmly in place and aligned, then use a pencil to draw a line on each side of the stabilizer where it meets the fuselage sides. Do this on both the top and the bottom.

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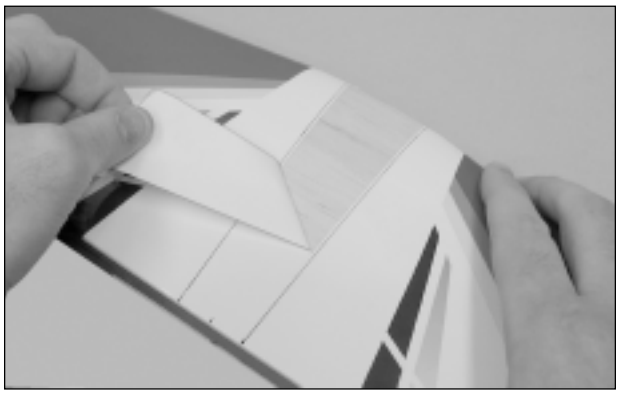
STEP 2: MOUNTING THE HORIZONTAL STABILIZER



❑ Remove the stabilizer from the fuselage.

❑ Using a modeling knife, carefully cut away and remove the covering material from between the lines you drew. Do this on both the top and the bottom.

◆**WARNING**◆ When cutting through the covering to remove it, cut with only enough pressure to cut through only the covering itself. Cutting down into the balsa structure could weaken the stabilizer and cause it to fail during flight.

❑ Mix and apply a generous amount of 30 minute epoxy to **ONLY the top and bottom** gluing surfaces of the stabilizer.

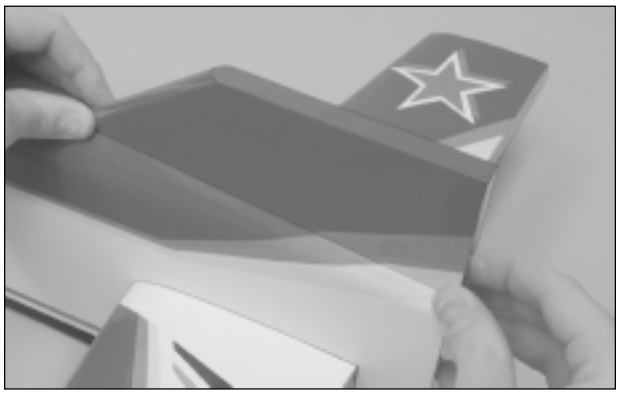
◆**IMPORTANT**◆ Because the stabilizer has to slide into place through the fuselage, apply epoxy only to the stabilizer. This will prevent the epoxy from spreading over the entire length of one half of the stabilizer when you slide it into place.

❑ Slide the stabilizer back into place and realign it, double-checking all of your measurements once more before the epoxy sets up. Quickly remove any excess epoxy and use pieces of masking tape or T-Pins to hold the stabilizer in place and aligned until the epoxy has fully cured.

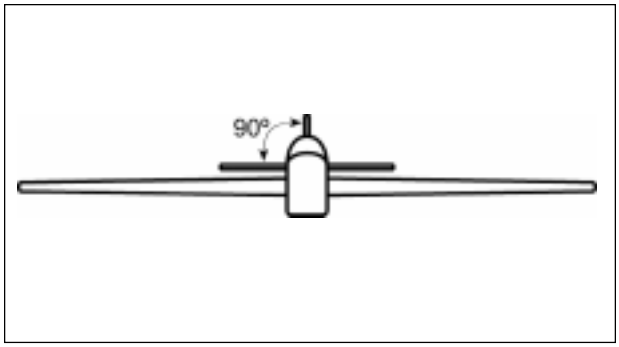
◆**IMPORTANT**◆ After the epoxy has fully cured, remove the masking tape and look closely at the glue joint. If there are any gaps between the stabilizer and the fuselage, fill them using 30 minute epoxy for added strength. Again, before the epoxy sets up, remove any excess epoxy, using a paper towel and rubbing alcohol.

STEP 3: ALIGNING & MOUNTING THE VERTICAL STABILIZER

❑ Remove the rudder and three hinges from the vertical stabilizer and set them aside for now.



❑ Push the vertical stabilizer down into its mounting slot. To align it properly, the trailing edge of the stabilizer should be even with the back edge of the fuselage and the stabilizer should be pushed down firmly.



❑ With the vertical stabilizer in position, use a builder's triangle to check that the vertical stabilizer is aligned 90º to the horizontal stabilizer.

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❑ When satisfied with the fit and alignment, carefully cut away and remove the covering material from the gluing surfaces and glue the vertical stabilizer into place, using a generous amount of 30 minute epoxy. Quickly remove the excess epoxy and use pieces of masking tape to hold the vertical stabilizer in place until the epoxy has fully cured.

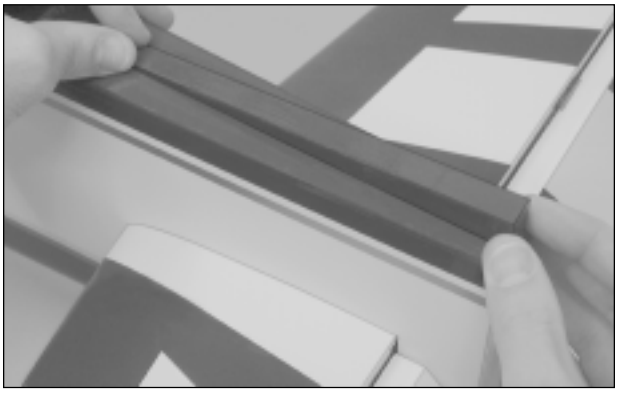
STEP 4: HINGING THE ELEVATOR HALVES

❑ Hinge the elevator halves, using the same techniques that you used to hinge the ailerons. Each elevator half is hinged using three hinges. When hinging the elevator halves, there should be no more than a 1/16" wide gap between each elevator counter-balance and the ends of the horizontal stabilizer.

◆IMPORTANT◆ Don't forget that when hinging the elevator halves to sand the mounting tabs of the hinges to roughen the metal and to counter-sink the hinges into the elevator halves to minimize the hinge gap. Don't forget to apply lightweight oil or petroleum jelly to each hinge pivot point to keep from gluing the hinges solid, too.

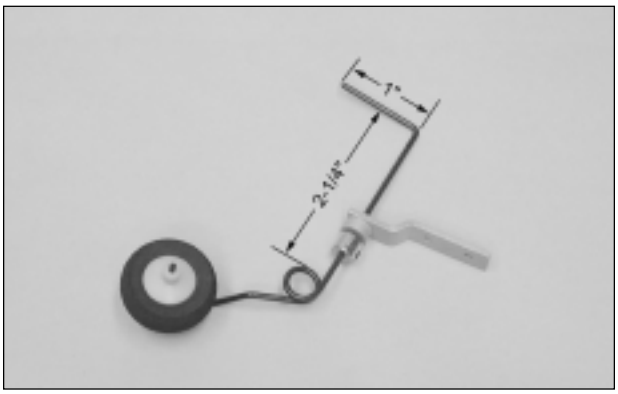
STEP 5: INSTALLING THE TAIL WHEEL WIRE

❑ Using a modeling knife, cut away and remove the covering material from over the fuselage tail fairing mounting slot in the bottom of the fuselage. The slot is located on the centerline of the fuselage, 3-1/2" in front of the back edge of the fuselage.



❑ Using a generous amount of 5 minute epoxy, glue the fuselage tail fairing to the bottom of the fuselage, making sure that the back edge of the fuselage tail fairing is even with the back edge of the fuselage and that the fuselage tail fairing is pushed down firmly against the fuselage.

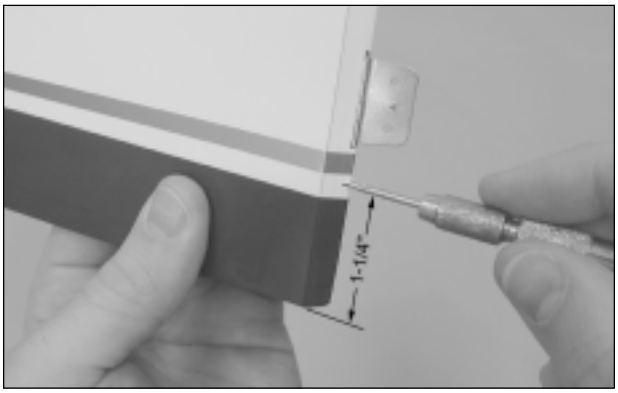
☞ Make sure to remove the covering material from the gluing surfaces before gluing the fuselage tail fairing into place.



❑ Slide the wheel collar, followed by the aluminum mounting bracket onto the tail wheel wire, making sure that the bushing on the tail wheel bracket is down toward the coil in the tail wheel wire, as shown.

❑ Using needle nose pliers, carefully make a 90º bend in the tail wheel wire, 2-1/4" up from the top of the coil.

❑ Using wire cutters, cut off the excess wire, leaving 1" of wire beyond the bend.



❑ Using a ruler and a pencil, measure up 1-1/4" from the bottom of the rudder (at the leading edge) and draw a mark.

❑ Using a drill with a 5/64" diameter drill bit, carefully drill a 1-1/8" deep hole into the leading edge of the rudder, at the mark you drew.

◆IMPORTANT◆ Be careful to make sure that you drill the hole perpendicular to the leading edge and be careful not to drill out through the sides of the rudder.

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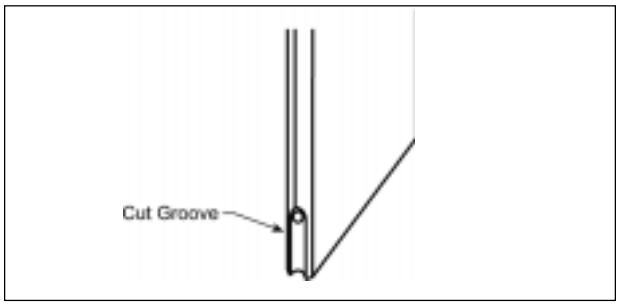


❑ Using a modeling knife, carefully cut a shallow groove in the leading edge of the rudder from the base of the hole down to the bottom of the rudder.

❑ Test-fit the tail wheel wire into the hole you drilled. When properly aligned, the wire should rest within the groove and the front edge of the wire should be flush with the leading edge of the rudder.

☞ With the tail wheel wire in place, double-check that the tail wheel is lined up with the bottom of the rudder. This will ensure that the tail wheel will track properly with the rudder.

❑ When satisfied with the fit and alignment, remove the tail wheel wire and use 220 grit sandpaper to roughen **only** the gluing surfaces of the wire.

❑ Glue the tail wheel wire into place, using a generous amount of 5 minute epoxy. Remove any excess epoxy, using a paper towel and rubbing alcohol, and allow the epoxy to set up before proceeding.

STEP 6: HINGING THE RUDDER

❑ Hinge the rudder, using the same techniques that you used to hinge the ailerons and the elevator halves. The rudder is hinged using three hinges. When hinging the rudder, the bottom of the rudder should be even with the bottom of the fuselage tail fairing and there should be no more than a 1/16" wide gap between the rudder counter-balance and the top of the vertical stabilizer.

◆IMPORTANT◆ Don't forget that when hinging the rudder to sand the mounting tabs of the hinges to roughen the metal and to counter-sink the hinges into the rudder to minimize the hinge gap. Don't forget to apply lightweight oil or petroleum jelly to each hinge pivot point to keep from gluing the hinges solid, too.

❑ After the epoxy fully cures, mount the aluminum tail wheel bracket to the bottom of the fuselage tail fairing, using two M2 x 8mm wood screws.

◆IMPORTANT◆ Before installing the wood screws, drip several drops of thin C/A into the pilot holes you drilled and allow the C/A to fully cure. The C/A will harden the surrounding plywood, making the mounting area stronger.

☞ Plywood has been preinstalled in the fuselage tail fairing to thread the wood screws into.

❑ Partially thread the grub screw into the wheel collar. Push the wheel collar firmly against the tail wheel bracket and tighten the grub screw securely, using the hex wrench provided.

☞ We suggest applying a drop of Blue Threadlocker to the grub screw so that it doesn't come loose during flight.

SECTION 9: MAIN LANDING GEAR INSTALLATION

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

- ❑ (1) Prebent Aluminum Main Gear Strut
- ❑ (2) Fiberglass Wheel Pants
- ❑ (2) Main Gear Wheels
- ❑ (2) M5 x 35mm Threaded Axles
- ❑ (2) M5 Hex Nuts
- ❑ (4) M3 x 12mm Machine Screws
- ❑ (4) M3 Flat Washers
- ❑ (2) Wheel Collars w/Grub Screws
- ❑ (2) M2 x 8mm Flange-Head Wood Screws
- ❑ (1) 1.5mm Hex Wrench

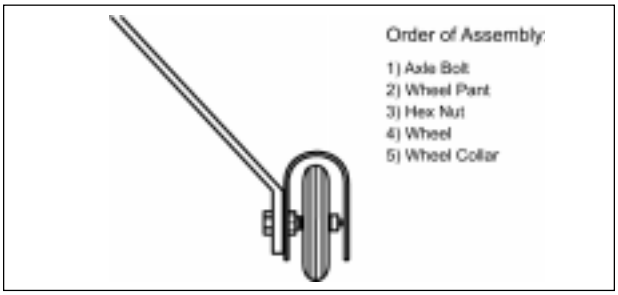
YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thin C/A
- ❑ Pacer Z-42 Blue Threadlocker
- ❑ # 1 & # 2 Phillips Head Screwdrivers
- ❑ Adjustable Open-End Wrenches (2)
- ❑ Electric Drill
- ❑ 1/16" Drill Bit
- ❑ Ernst Airplane Stand
- ❑ Pencil

STEP 1: INSTALLING THE MAIN GEAR STRUT

❑ Install the main gear strut onto the bottom of the fuselage, using four M3 x 12mm machine screws and four M3 flat washers. Blind nuts have been preinstalled into the landing gear mounting block to thread the machine screws into.

STEP 2: INSTALLING THE WHEELS & WHEEL PANTS



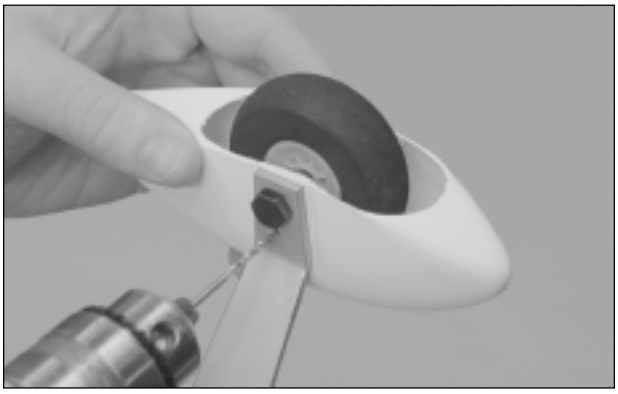
☞ The wheels and wheel pants are installed using the order of assembly shown at left.

❑ Slide one M5 x 35mm threaded axle through the predrilled hole in the main gear strut.

❑ Partially slide one wheel pant, followed by one M5 hex nut, main gear wheel and wheel collar onto the threaded axle.

❑ While holding the wheel pant in position (the molded recess in the side of the wheel pant should be parallel with the front and back edges of the main gear strut), use two adjustable wrenches to firmly tighten the threaded axle and hex nut.

✦IMPORTANT✦ Tighten the assembly firmly so that the wheel pant cannot rotate under pressure.



❑ While holding the wheel pant aligned, drill a 1/16" diameter pilot hole through the wheel pant, using the small predrilled hole in the main gear strut as a guide.

✦IMPORTANT✦ Before installing the wood screw in the next procedure, drip several drops of thin C/A into the pilot hole you drilled and allow the C/A to fully cure. The C/A will harden the surrounding plywood, making the mounting area stronger.

❑ Install and tighten one M2 x 8mm flange-head wood screw to lock the wheel pant into place and keep it from turning.

❑ Install the grub screw into the wheel collar (with a drop of Blue Threadlocker to lock it into place) and tighten it firmly, using the hex wrench provided. Double-check that the wheel spins freely.

❑ Repeat the previous procedures to install the second wheel and wheel pant assembly. Before locking the second wheel pant assembly into place, double-check that both wheel pants are lined up with each other when viewed from the side.

SECTION 10: ENGINE INSTALLATION

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

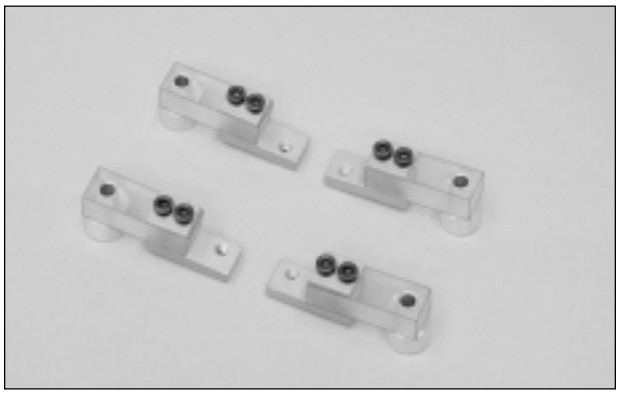
- ❑ (4) Rubber Isolation Mounts
- ❑ (4) Predrilled Aluminum Plates w/Threaded Holes
- ❑ (4) Predrilled Aluminum Plates w/Plain Holes
- ❑ (4) M4 x 12mm Socket-Cap Screws
- ❑ (4) M4 Flat Washers
- ❑ (8) M3 x 18mm Socket-Cap Screws
- ❑ (4) M4 x 30mm Wood Screws
- ❑ (4) M4 Flat Washers

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thin C/A
- ❑ Pacer Z-42 Blue Threadlocker
- ❑ # 2 Phillips Head Screwdriver
- ❑ 2.5mm & 3mm Hex Wrenches
- ❑ Adjustable Wrench
- ❑ Electric Drill
- ❑ 3/32" Drill Bit
- ❑ Ernst Airplane Stand
- ❑ Pencil

STEP 1: INSTALLING THE ENGINE MOUNTING BRACKETS

✦IMPORTANT✦ The following steps outline the installation of a four-stroke engine. If you are installing a two-stroke engine, the installation procedures are the same.

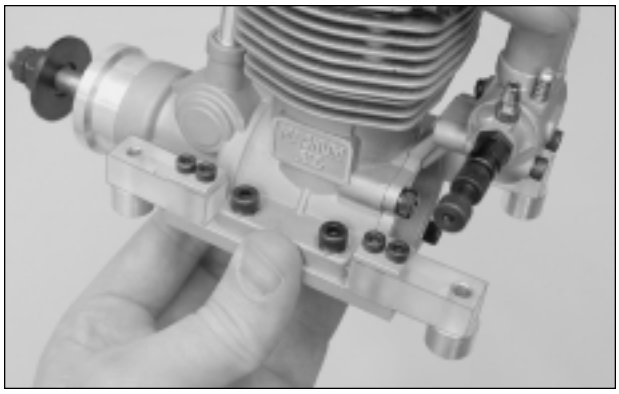


❑ Use the drawing included in the engine mount assembly bag to carefully assemble the four engine mounting brackets, using eight M3 x 18mm socket-cap screws, as shown.

✦IMPORTANT✦ When assembling the mounting brackets, we strongly recommend applying Blue Threadlocker to the socket-cap screws. This will prevent the screws from loosening during flight.

If you're planning on using a 1.20 size engine, we suggest using a stronger soft-mount system, such as the Dave Brown VibraDamp soft-mount system.

❑ Remove the muffler assembly and the high speed needle valve from your engine and set them aside until later.



❑ Carefully install each of the four mounting brackets onto your engine, using four M4 x 12mm socket-cap screws and four M4 flat washers.

☞ When tightening the screws, make sure that the mounting brackets are parallel with the engine mounting lugs.

✦IMPORTANT✦ Don't apply Blue Threadlocker to the four socket-cap screws yet. Wait until after you've installed the throttle pushrod wire in the next section.

STEP 2: ALIGNING & INSTALLING THE ENGINE

❑ Slide your spinner backplate onto the engine and secure it into place, using the engine's propeller washer and nut.

❑ Temporarily place the engine assembly onto the hardwood mounting beams.

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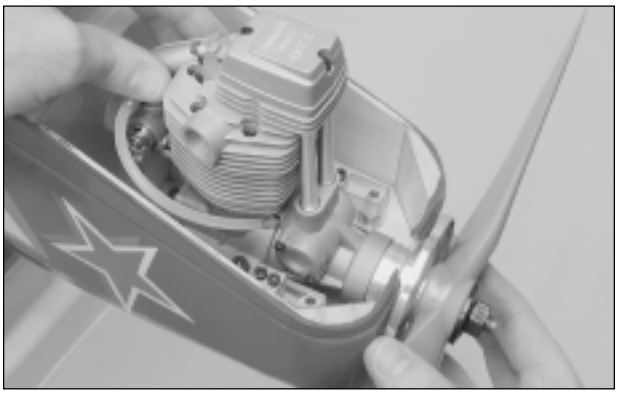
◆**IMPORTANT**◆ If your particular engine is narrower than the width between the hardwood mounting beams, you can angle the mounting brackets out so that they will line up over the hardwood beams. If the particular brand of engine you're using is wider than the width between the hardwood mounting beams, you will need to widen the width between the mounting beams. This isn't too difficult and is accomplished most easily using a rotary tool with a sanding drum.



❑ Align the engine, using your spinner backplate as a guide. When aligned properly, the spinner backplate should be centered between the fuselage sides and there should be a 3/32" - 1/8" wide gap between the back of the spinner backplate and the front of the fuselage.

◆**IMPORTANT**◆ Since the engine is soft-mounted, it will tend to vibrate and oscillate during idle. If you have less than a 3/32" wide gap between your spinner backplate and the fuselage, it's possible that the spinner backplate could hit the front of the fuselage. Any oscillations seen during idle will go away as the engine transitions to full throttle.

◆**IMPORTANT**◆ Depending on the length of your engine, you may need to cut away a portion of the two pieces of balsa triangle stock at the front of the fuselage, so that the engine can be positioned far enough forward to allow the 3/32" - 1/8" wide gap between the back of the spinner backplate and the front of the fuselage.

❑ When satisfied with the alignment, carefully mark the locations of the four bracket mounting screws, using a pencil.

❑ Remove the engine assembly and drill 3/32" diameter pilot holes through the hardwood mounting beams, at the marks you drew.

◆**IMPORTANT**◆ Be careful not to drill through the top of the fuselage, especially when drilling the two forward holes. Before installing the wood screws, drip several drops of thin C/A into the pilot holes and allow the C/A to fully cure. The C/A will harden the surrounding hardwood, making the mounting area stronger.

❑ Reposition the engine assembly and secure it into place, using four M4 x 30mm wood screws and four M4 flat washers. Tighten the screws firmly to secure the engine assembly into place.

SECTION 11: THROTTLE CONTROL SYSTEM INSTALLATION

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

- ❑ (1) 26-3/4" Pushrod Wire w/Z-Bend
- ❑ (1) 17-3/4" Nylon Pushrod Housing
- ❑ (1) Servo Connector w/Grub Screw, C-Clip & Washers
- ❑ (1) Plywood Servo Tray
- ❑ (1) 1.5mm Hex Wrench

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thin C/A
- ❑ Kwik Bond 5 Minute Epoxy
- ❑ # 1 Phillips Head Screwdriver
- ❑ Wire Cutters
- ❑ Needle Nose Pliers
- ❑ Excel Modeling Knife
- ❑ Electric Drill
- ❑ 1/16", 5/64" & 5/32" Drill Bits
- ❑ Ernst Airplane Stand
- ❑ Ruler
- ❑ Pencil
- ❑ 220 Grit Sandpaper w/Sanding Block
- ❑ Paper Towels
- ❑ Rubbing Alcohol
- ❑ NHP Epoxy Mixing Sticks
- ❑ NHP Epoxy Mixing Cups

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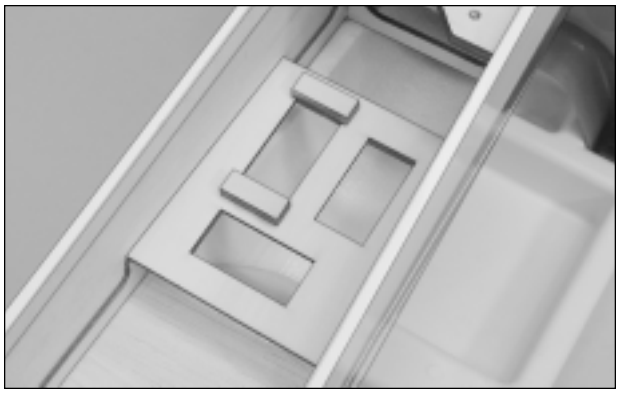
STEP 1: INSTALLING THE SERVO TRAY



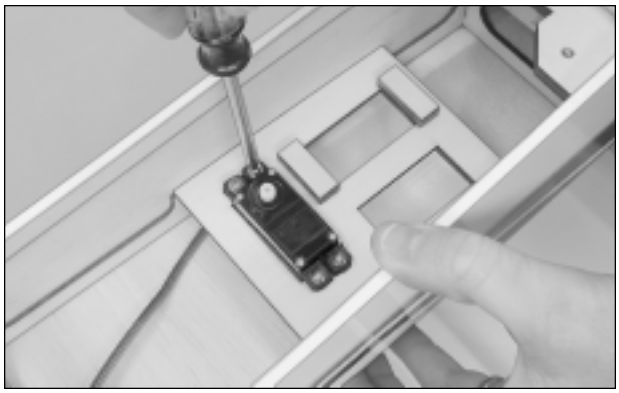
❑ Test-fit the plywood servo tray into the fuselage, making sure that the cutout for the throttle servo is toward the front of the fuselage, as shown.

◆IMPORTANT◆ Orientate the servo tray so that the 1/4" tall plywood blocks that are glued onto the servo tray are toward the left side of the fuselage. This will ensure that the servos line up with the preinstalled pull-pull cable guide tubes.

☞ The servo tray rests on top of the plywood fuselage side doublers.

❑ When satisfied with the fit, glue the servo tray into place, using a generous amount of 5 minute epoxy. Remove any excess epoxy, using a paper towel and rubbing alcohol, and allow the epoxy to completely set up before proceeding.

STEP 2: INSTALLING THE THROTTLE SERVO



❑ Install the rubber grommets and brass collets onto your throttle servo, making sure to install the collets with the flanges toward the bottom of the servo.

❑ Install the throttle servo into the cutout in the front of the plywood servo tray, making sure to first drill 1/16" diameter pilot holes for the mounting screws.

◆IMPORTANT◆ When installed, the servo output shaft should be toward the left side of the fuselage, as shown.

STEP 3: INSTALLING THE THROTTLE PUSHROD

◆IMPORTANT◆ Since we are using a four-stroke engine in our model, attaching the throttle pushrod wire to the engine's throttle arm can be more tricky than if we were using a two-stroke engine. This is because the carburetor on most four-stroke engines is on the back of the engine, close to the firewall. To make connecting the throttle pushrod wire easier, we positioned the pushrod housing nearer the fuselage side and made a 180º bend in the end of the pushrod wire. This allows the Z-Bend to be connected to the throttle arm without causing the pushrod wire to bind. This also ensures that the throttle pushrod wire will not interfere with the installation of the fuel tank assembly. Installing the throttle pushrod wire will be the same if you are using a two-stroke engine. The only difference will be that you will locate the throttle pushrod housing to suit your engine's throttle arm and you won't need to make a 180º bend in the pushrod wire.

❑ Using a 5/32" diameter drill bit, drill a hole through the firewall for the throttle pushrod housing. The hole should be located the same height from the bottom of the fuselage as your engine's throttle arm, but far enough out from the center of the firewall so that the pushrod housing doesn't interfere with the fuel tank when it's installed later. We drilled the hole 3/8" in from the fuselage side.

☞ You will need to remove your engine to drill the hole and install the pushrod housing.

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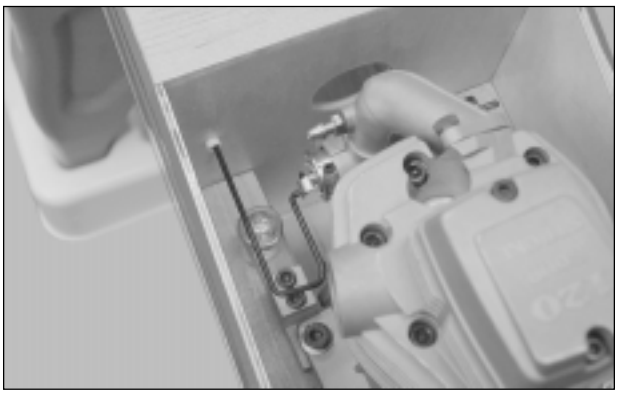
❑ Using a modeling knife, cut the nylon pushrod housing to a length of 14-1/2".

❑ Slide the nylon pushrod housing into the hole in the firewall. Adjust the nylon pushrod housing so that the end of the pushrod housing is flush with the front of the firewall, then glue the pushrod housing into place, using thin C/A.

◆IMPORTANT◆ Because the pushrod housing is long, we also drilled a 5/32" diameter hole through the forward bulkhead and through the center bulkhead, to support the pushrod housing. Make sure that when you drill the hole through the center bulkhead, the hole is positioned so that the pushrod wire will line up with your throttle servo arm when it's installed later.

❑ Remove the throttle arm from your engine and install the Z-Bend in the pushrod wire into the outermost hole in the throttle arm. You may need to enlarge the hole in your engine's throttle arm, using a 5/64" diameter drill bit, to accommodate the wire.

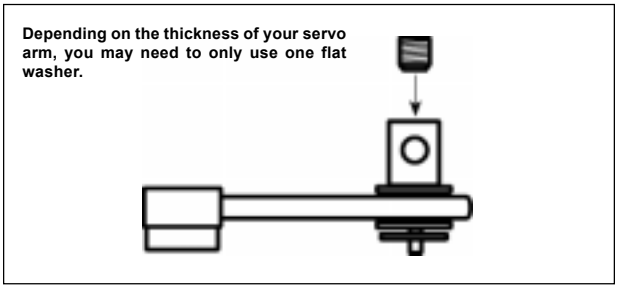


❑ Using a pair of pliers, carefully make a shallow 180º bend in the pushrod wire and slide it into the pushrod housing.

☞ If you're using a two-stroke engine, you don't need to make a 180º bend in the pushrod wire.

❑ Install the throttle arm onto your engine and double-check that the pushrod wire does not bind. The carburetor barrel should open and close smoothly and completely. You may need to make minor bends in the pushrod wire, so that the pushrod assembly will operate smoothly.

STEP 4: INSTALLING THE SERVO CONNECTOR



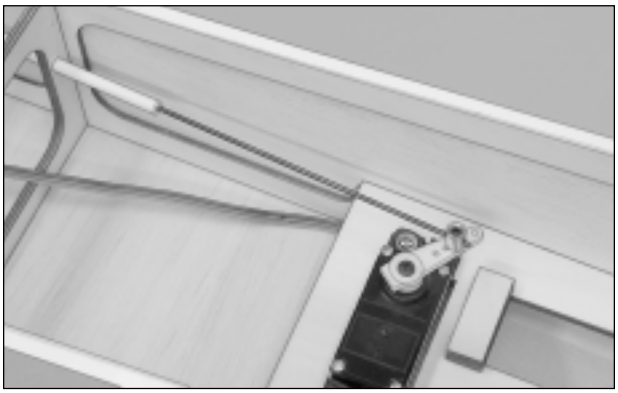
❑ Using a modeling knife, cut away all but one arm from a "4-point" servo horn.

❑ Enlarge the hole in the servo arm that is 9/16" out from the center of the servo arm, using a 5/64" diameter drill bit.

❑ Install the servo connector onto the servo arm, using two flat washers (one on top of the arm and one on the bottom) and the C-clip provided.

❑ Connect your radio system and plug the throttle servo into the receiver. Check to ensure that the throttle servo output shaft is rotating in the correct direction. When the throttle control stick is moved forward, from the idle to the full throttle position, the servo output shaft should rotate in the correct direction to open your engine's throttle barrel. If it doesn't, flip the servo reversing switch on your transmitter.

❑ Position the throttle control stick and the throttle trim lever on your transmitter to their lowest positions, then slide the servo connector/servo horn assembly over the plain end of the throttle pushrod wire.



❑ After making sure that the throttle barrel is in the fully closed position, angle the servo horn about 45º from center and attach it to the servo output shaft. The servo connector should be facing the side of the fuselage, as shown.

❑ While holding the throttle barrel fully closed, install and tighten the grub screw in the top of the servo connector, using the hex wrench provided.

❑ Use wire cutters to cut away and remove the excess pushrod wire, and install and tighten the servo horn retaining screw to hold the servo horn securely to the servo.

SECTION 12: ELEVATOR CONTROL SYSTEM INSTALLATION

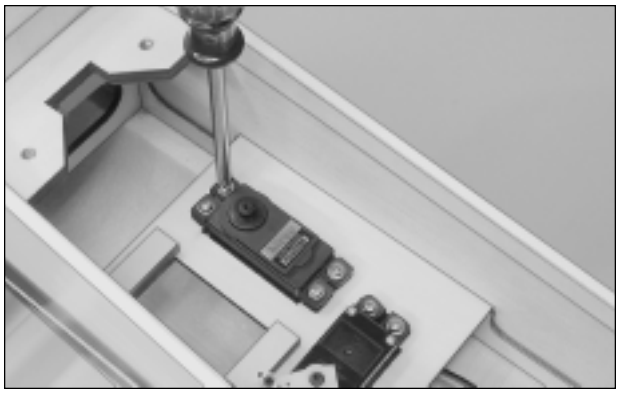
YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

- ❑ (2) Stranded Steel Cables
- ❑ (4) Threaded Nylon Control Horn Mounts
- ❑ (4) Nylon Adjustable Control Horns
- ❑ (6) M2 x 32mm Machine Screws
- ❑ (6) M2 Hex Nuts
- ❑ (4) Threaded Couplers
- ❑ (2) Z-Bend Couplers
- ❑ (6) Flanged Crimp Collets
- ❑ (4) Nylon Clevises w/Steel Pins

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thin C/A
- ❑ # 1 Phillips Head Screwdriver
- ❑ Adjustable Wrench
- ❑ Wire Cutters
- ❑ Needle Nose Pliers
- ❑ Excel Modeling Knife
- ❑ Electric Drill
- ❑ 1/16" & 5/64" Drill Bits
- ❑ Ernst Airplane Stand
- ❑ Ruler
- ❑ Pencil
- ❑ Masking Tape

STEP 1: INSTALLING THE ELEVATOR SERVO



❑ Install the rubber grommets and brass collets onto your elevator servo, making sure to install the collets with the flanges toward the bottom of the servo.

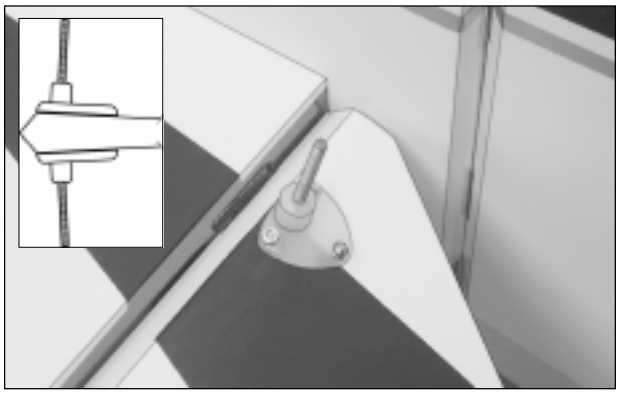
❑ Install the elevator servo into the right-side cutout in the plywood servo tray, making sure to drill 1/16" diameter pilot holes for the mounting screws.

◆IMPORTANT◆ When installed, the servo output shaft should be toward the back of the fuselage, as shown.

STEP 2: INSTALLING THE ELEVATOR CONTROL HORNS

◆IMPORTANT◆ Before installing the threaded control horn mounts, please refer to section 20 on page # 37 about sealing the elevator hinge gaps. It is strongly recommended that you do this, and it is much easier to do it now than later.

❑ Using a modeling knife, cut away and remove the covering material from over the four elevator pull-pull cable exit holes in the sides of the fuselage. Two holes are located on each side of the fuselage, 6-3/4" in front of the rudder hinge line. One hole is 1-7/8" up from the bottom of the fuselage and the other hole is 4-5/8" up from the bottom of the fuselage.



❑ Position one threaded nylon control horn mount onto the bottom of one elevator half, making sure that the centerline of the control horn mount is 1-1/4" out from the inside edge of the elevator half (at the hinge line), and that the front edge of the control horn mount is parallel to the elevator hinge line.

❑ When satisfied with the alignment, mark and drill 5/64" diameter pilot holes through the elevator half for the three mounting screws.

☞ Make sure that you drill the holes straight through the elevator half and not at an angle.

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PRO TIP Before installing the threaded nylon control horn mounts in the next procedure, drip several drops of thin C/A into the pilot holes in the elevator half and allow the C/A to fully cure. The C/A will harden the surrounding balsa, making the mounting area stronger.

❑ Install one threaded nylon control horn mount to the top and to the bottom of the elevator half, using three M2 x 32mm machine screws and three M2 hex nuts. Tighten the hex nuts firmly, then cut away the excess screw material, using a pair of wire cutters.

◆IMPORTANT◆ We suggest applying a drop of thin C/A to each hex nut to prevent them from loosening during flight.

❑ Thread one nylon adjustable control horn onto each threaded nylon control horn mount, making sure that the adjustable control horns are 7/8" out from the base of the control horn mounts.

❑ Repeat the previous procedures to align and install the threaded nylon control horn mounts to the top and bottom of the second elevator half.

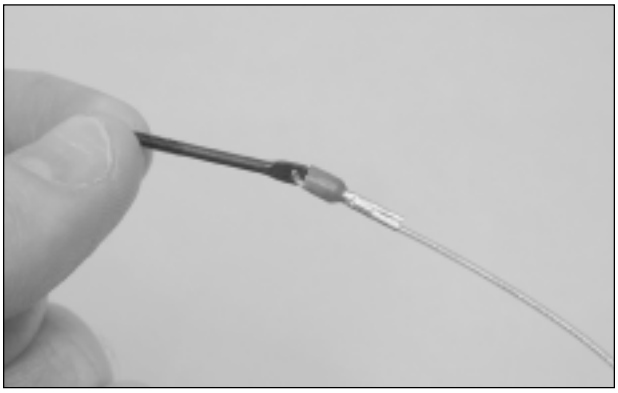
STEP 3: INSTALLING THE ELEVATOR PULL-PULL CABLES

❑ Using a pair of wire cutters, carefully cut the two sets of stranded steel cable exactly in half.

◆IMPORTANT◆ If the ends of the cable begin to unravel, use your fingers to twist the ends back into shape.

❑ Working with one length of cable for now, slide one flanged crimp collet, non-flanged side first, over one end of the cable.

❑ While holding the collet in place so it doesn't slide off, carefully thread the same end of the cable through the hole in one threaded coupler.

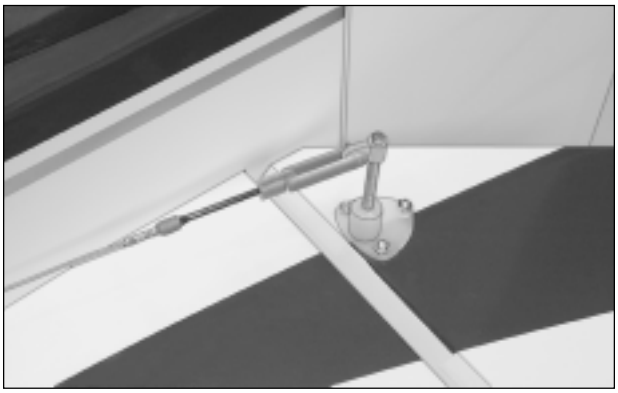


❑ Loop the cable around the coupler and slide the end of it back through the crimp collet.

❑ Hold the short end of the cable with a pair of pliers and firmly slide the crimp collet forward so that the flange covers the end of the coupler, then firmly squeeze the crimp collet, using a pair of pliers, to lock the cable into place.

❑ For an extra measure of security, carefully apply a couple of drops of thin C/A to the crimp collet. The C/A will "wick" between the crimp collet and the cable, making the joint even stronger. **Do not omit this procedure.**

❑ Repeat the previous procedures to install the three remaining threaded couplers onto one end of the three remaining lengths of cable.



❑ Carefully thread one nylon clevis onto each threaded coupler. Use a pair of pliers to keep the coupler from turning.

❑ Feed the plain end of each of the four lengths of cable through the two exit holes in each side of the fuselage and into the servo compartment, then snap each clevis into the control horns.

◆IMPORTANT◆ The clevis/cable assembly that exits near the top of the fuselage connects to the upper control horn, and the clevis/cable assembly that exits near the bottom of the fuselage connects to the lower control horn.

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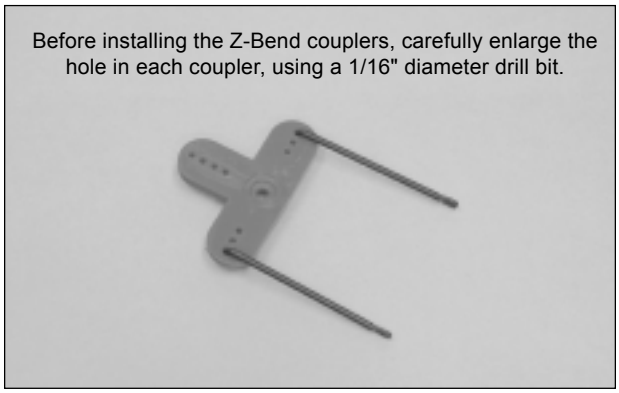
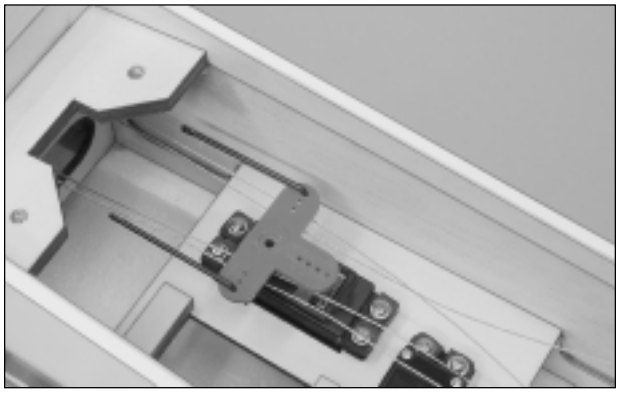

Before installing the Z-Bend couplers, carefully enlarge the hole in each coupler, using a 1/16" diameter drill bit.

❑ Using a modeling knife, cut away only one arm from a large "4-point" servo horn.

❑ Enlarge the hole in two opposite servo arms that is 9/16" out from the center of the servo arm, using a 5/64" diameter drill bit.

❑ Install the Z-Bend in each of the two Z-Bend couplers into the hole in the servo arms that you enlarged.

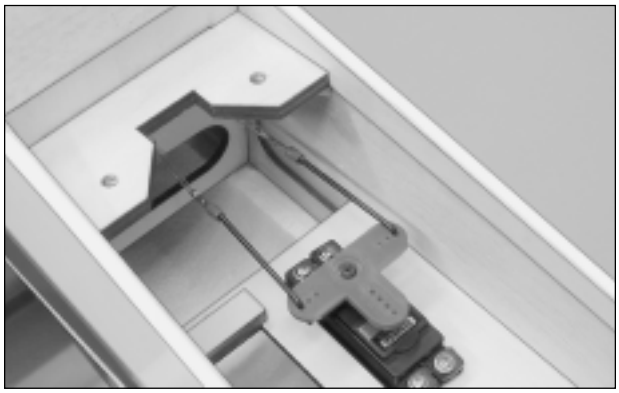
❑ Connect your radio system and plug the elevator servo into the receiver. Center the servo by double-checking that the elevator trim lever on your transmitter is centered.



❑ Attach the servo horn to the elevator servo, making sure that the servo horn is centered.

☞ The two Z-Bend couplers should be toward the back of the fuselage, as shown.

❑ Use a couple of pieces of masking tape, taped between the elevator halves and the stabilizer, to hold both elevator halves centered.



❑ Carefully attach the two lengths of cable from the left side of the fuselage to the Z-Bend coupler on the left side of the servo arm, then attach the two lengths of cable from the right side of the fuselage to the Z-Bend coupler on the right side of the servo arm, using the same techniques that you used previously. Make sure that all four lengths of cable are pulled tight. There should not be any slack in the cables.

❑ Install and tighten the servo horn retaining screw, provided with your servo, to secure the servo horn into place, then use wire cutters to cut away the excess lengths of cable.

◆**IMPORTANT**◆ Remember, for an extra measure of security, carefully apply a couple of drops of thin C/A to the crimp collets. **Do not omit this procedure.**

❑ Remove the pieces of masking tape from the elevator halves. With your radio system turned on, double-check to ensure that the elevator servo horn and both elevator halves are still centered. If the elevator halves are not centered, adjust the clevises until they are.

❑ Check the tension of the pull-pull cables. To do this do the following: move the elevator control stick completely back. Both elevator halves should deflect up. Let the control stick go and check to see if both elevator halves return to center. Do this a couple of times in each direction. If the elevator halves do not come back to center, one or more pull-pull cables are too tight. You can adjust the tension of the cables by adjusting the clevises. Ideally, the cables should be as tight as possible, while still allowing both elevator halves to center. The cables should not have slack in them, yet they should not be so tight that the linkage and/or the servo bind.

SECTION 13: RUDDER CONTROL SYSTEM INSTALLATION

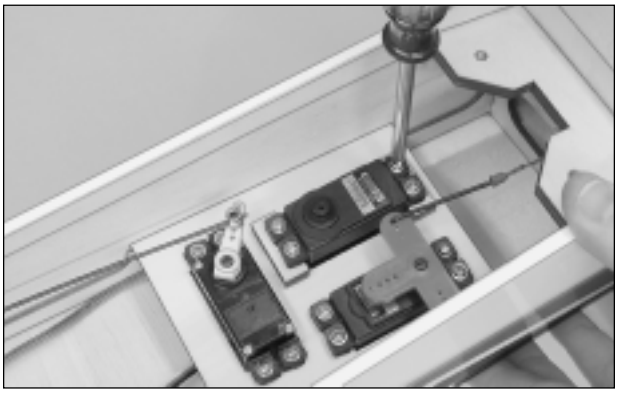
YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

- ❑ (1) Stranded Steel Cable
- ❑ (2) Threaded Nylon Control Horn Mounts
- ❑ (2) Nylon Adjustable Control Horns
- ❑ (3) M2 x 32mm Machine Screws
- ❑ (3) M2 Hex Nuts
- ❑ (2) Threaded Couplers
- ❑ (2) Z-Bend Couplers
- ❑ (4) Flanged Crimp Collets
- ❑ (2) Nylon Clevises w/Steel Pins

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thin C/A
- ❑ # 1 Phillips Head Screwdriver
- ❑ Adjustable Wrench
- ❑ Wire Cutters
- ❑ Needle Nose Pliers
- ❑ Excel Modeling Knife
- ❑ Electric Drill
- ❑ 1/16" & 5/64" Drill Bits
- ❑ Ernst Airplane Stand
- ❑ Ruler
- ❑ Pencil
- ❑ Masking Tape

STEP 1: INSTALLING THE RUDDER SERVO



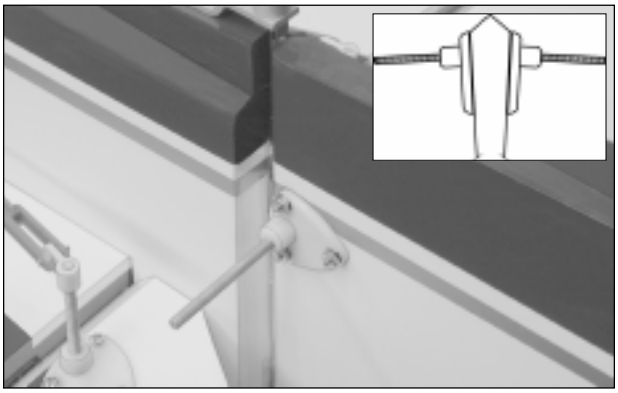
❑ Install the rubber grommets and brass collets onto your rudder servo, making sure to install the collets with the flanges toward the bottom of the servo.

❑ Install the rudder servo into the left-side cutout in the plywood servo tray (on top of the 1/4" tall blocks), making sure to drill 1/16" diameter pilot holes for the mounting screws.

◆IMPORTANT◆ When installed, the servo output shaft should be toward the front of the fuselage, as shown.

STEP 2: INSTALLING THE RUDDER CONTROL HORNS

❑ Using a modeling knife, cut away and remove the covering material from over the rudder cable exit hole in each side of the fuselage. The holes are located 6-3/4" in front of the rudder hinge line and 1-3/8" above the bottom of the fuselage.



❑ Install one threaded nylon control horn mount onto each side of the rudder, using three M2 x 32mm machine screws and three M2 hex nuts. The centerline of the control horn mounts should be 1-3/4" up from the bottom of the rudder (at the hinge line), and the front edge of the control horn mounts should be parallel to the rudder hinge line.

◆IMPORTANT◆ Remember to apply a couple of drops of thin C/A into the mounting holes to reinforce the balsa. It's also important to drill the holes straight through the rudder and not at an angle.

❑ Carefully cut away the excess screw material, using a pair of wire cutters.

❑ Thread one nylon adjustable control horn onto each threaded control horn mount, making sure that the adjustable control horns are 7/8" out from the base of the threaded control horn mounts.

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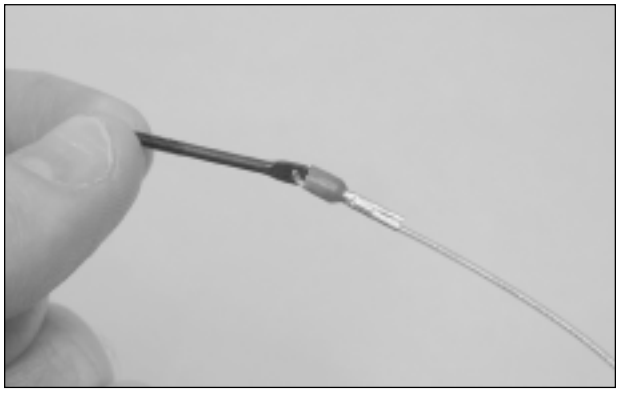
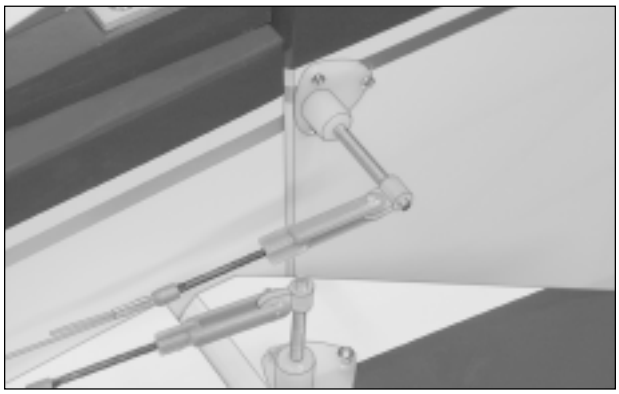
STEP 3: INSTALLING THE RUDDER PULL-PULL CABLES

❑ Using a pair of wire cutters, carefully cut the stranded steel cable exactly in half.



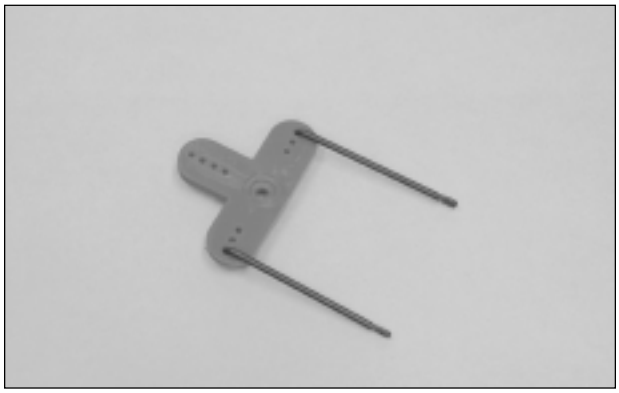
❑ Attach one threaded coupler to one end of each of the two lengths of cable, using the same techniques that you used to attach the threaded couplers to the lengths of cable used for the elevator halves.

◆IMPORTANT◆ Remember, for an extra measure of security, carefully apply a couple of drops of thin C/A to the crimp collets.



❑ Carefully thread one nylon clevis onto each threaded coupler. For security, thread the clevises on completely.

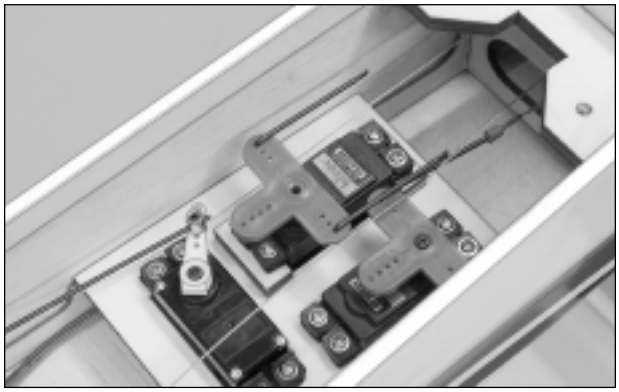
❑ Feed the plain end of each cable through the exit hole in each side of the fuselage and into the servo compartment, then snap each clevis into the adjustable control horns.



❑ Using a modeling knife, cut away only one arm from a large "4-point" servo horn.

❑ Enlarge the hole in two opposite servo arms that is 9/16" out from the center of the servo arm, using a 5/64" diameter drill bit.

❑ Install the Z-Bend in each of the two Z-Bend couplers into the hole in the servo arms that you enlarged.



❑ Connect your radio system and plug the rudder servo into the receiver. Center the servo by double-checking that the rudder trim lever on your transmitter is centered.

❑ Attach the servo horn to the rudder servo, making sure that the servo horn is centered.

☞ The two couplers should be toward the back of the fuselage, as shown.

❑ Use a couple of pieces of masking tape, taped between the rudder and the stabilizer, to hold the rudder centered.

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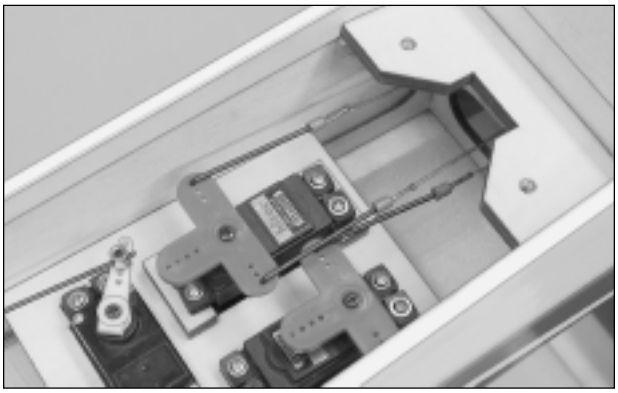
❑ Attach the two lengths of cable to the Z-Bend couplers, using the same techniques that you used previously, making sure that both lengths of cable are pulled tight. There should not be any slack in the cables.



❑ Install and tighten the servo horn retaining screw, provided with your servo, to secure the servo horn into place, then use wire cutters to cut away the excess cable.

❑ Remove the pieces of masking tape from the rudder. With your radio system turned on, double-check to ensure that both the rudder servo horn and the rudder are still centered. If the rudder is not centered, adjust the clevises until it is.

❑ Check the tension of the pull-pull cables. To do this do the following: move the rudder control stick to one side. Let the control stick go and check to see if the rudder returns to center. Do this a couple of times in each direction. If the rudder does not come back to center, one or both pull-pull cables are too tight. You can adjust the tension of the cables by adjusting the clevises. Ideally, the cables should be as tight as possible, while still allowing the rudder to center. The cables should not have slack in them, yet they should not be so tight that the linkage and/or the servo bind.

SECTION 14: AILERON CONTROL SYSTEM INSTALLATION

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

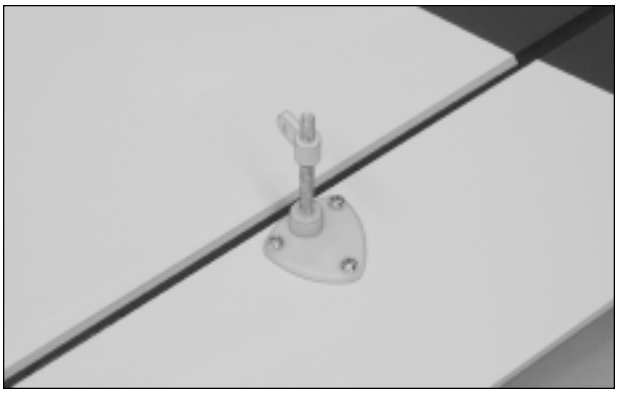
- ❑ (2) 7-1/2" Threaded Wires
- ❑ (2) Threaded Nylon Control Horn Mounts
- ❑ (2) Nylon Control Horn Backplates
- ❑ (2) Nylon Adjustable Control Horns
- ❑ (6) M2 x 25mm Machine Screws
- ❑ (2) Nylon Clevises w/Steel Pins
- ❑ (2) Nylon Snap Links

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thin C/A
- ❑ # 1 Phillips Head Screwdriver
- ❑ Wire Cutters
- ❑ Needle Nose Pliers
- ❑ Excel Modeling Knife
- ❑ Electric Drill
- ❑ 5/64" Drill Bit
- ❑ Ruler
- ❑ Pencil
- ❑ Masking Tape

STEP 1: INSTALLING THE CONTROL HORNS

✦IMPORTANT✦ Before installing the control horns, please refer to section 20 on page # 37 about sealing the aileron hinge gaps. It is strongly recommended that you do this, and it's much easier to do it now than later.



❑ Install one threaded nylon control horn mount onto the bottom of one aileron, making sure that the centerline of the control horn mount is 12-7/8" out from the inside edge of the aileron, and that the base of the control horn mount is parallel to the aileron hinge line.

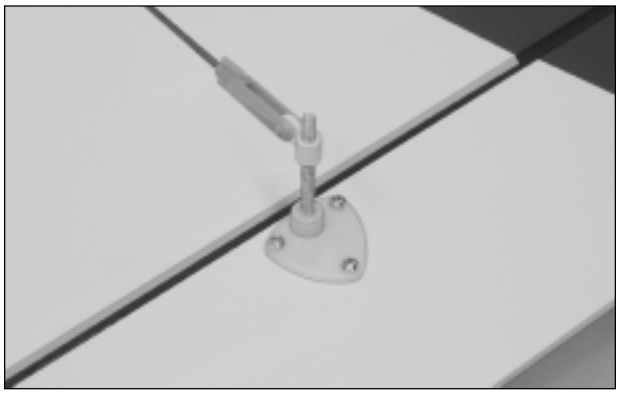
✦IMPORTANT✦ Remember to apply a couple of drops of thin C/A into the mounting holes to reinforce the balsa.

Continued On Next Page ☛

❑ Carefully cut away the excess screw material, using a pair of wire cutters, then thread one nylon adjustable control horn onto the threaded control horn mount, making sure that the adjustable control horn is 7/8" out from the base of the threaded control horn mount.

STEP 2: INSTALLING THE AILERON PUSHROD ASSEMBLY

❑ Carefully thread one nylon clevis onto one threaded aileron pushrod wire. For security, thread the clevis on completely.



❑ Snap the clevis into the adjustable control horn.

❑ Using a modeling knife, cut away all but one arm from a "4-point" servo horn.

◆IMPORTANT◆ The servo horn that you use needs to have a long arm, so that when the pushrod wire is attached, it won't interfere with the molded aileron servo fairing.

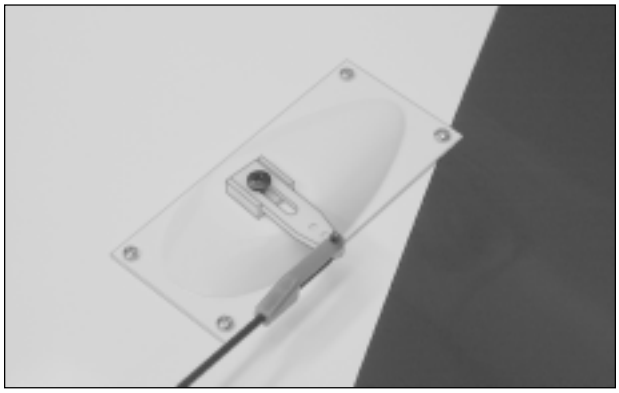
❑ Enlarge the hole in the servo arm that is 9/16" out from the center of the servo arm, using a 5/64" diameter drill bit.

❑ Connect your radio system and plug the aileron servo into the receiver. Center the servo by double-checking that the aileron trim lever on your transmitter is centered.

❑ Use a couple of pieces of masking tape, taped between the aileron and the wing, to hold the aileron centered.

❑ Attach the servo horn to the servo, making sure that it's centered and points toward the wing tip.

❑ With the aileron and the servo horn centered, draw a mark on the aileron pushrod wire where it crosses the hole that you enlarged in the servo arm.



❑ Using a pair of pliers, carefully bend the pushrod wire up at a 90º angle and cut off the excess, leaving 5/16" of wire beyond the bend.

❑ Secure the pushrod wire to the servo arm, using one nylon snap-keeper. The pushrod wire should be positioned on the bottom of the servo arm, as shown.

❑ Install the servo horn retaining screw to secure the servo horn to the servo.

◆IMPORTANT◆ The pushrod wire needs to be positioned on the bottom of the servo arm, so that the end of the pushrod wire will not interfere with the molded aileron servo fairing.

❑ Repeat the previous steps and procedures to install the second pushrod assembly onto the opposite aileron.

❑ Remove the masking tape from both ailerons and double-check that the two servo arms and both ailerons are still centered. If the ailerons are not centered, adjust the clevises until they are.

SECTION 15: FUEL TANK ASSEMBLY & INSTALLATION

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

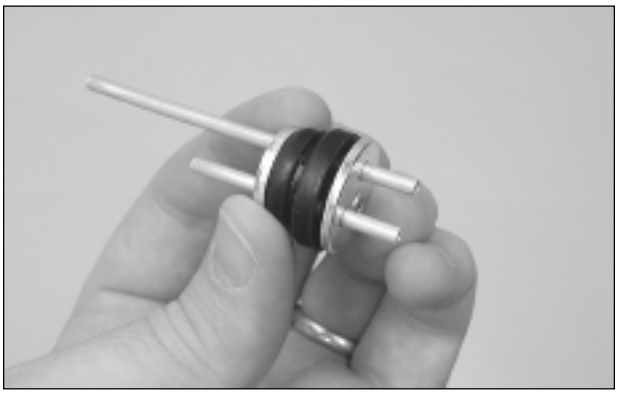
- ❑ (1) 420cc Fuel Tank
- ❑ (1) Large Diameter Metal Plate
- ❑ (1) Small Diameter Metal Plate
- ❑ (1) Rubber Stopper
- ❑ (1) Fuel Pick-Up "Clunk"
- ❑ (1) M3 x 18mm Machine Screw
- ❑ (1) Silicone Fuel Tubing
- ❑ (3) Aluminum Tubing

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thick C/A
- ❑ Wilhold Silicon Sealant
- ❑ # 2 Phillips Head Screwdriver
- ❑ Excel Modeling Knife
- ❑ Ernst Airplane Stand
- ❑ Ruler
- ❑ Pencil
- ❑ 220 Grit Sandpaper w/Sanding Block

STEP 1: ASSEMBLING THE RUBBER STOPPER

◆**IMPORTANT**◆ Discard one of the two longer aluminum tubes. It will not be used for our style of fuel tank setup.

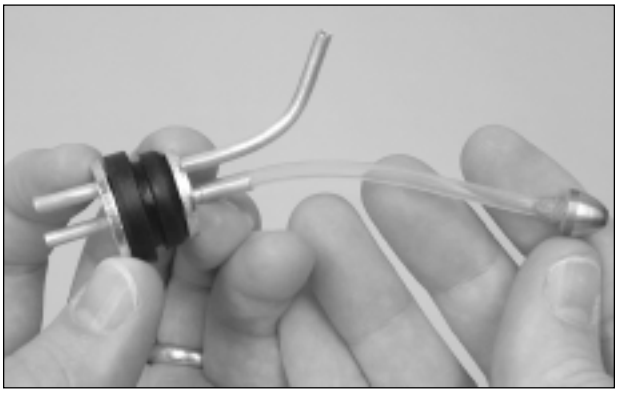


❑ Push the two aluminum tubes through the rubber stopper. Slide the large diameter metal plate over the tubes at the front of the stopper and slide the small diameter metal plate over the tubes at the rear of the stopper.

❑ Using a ruler, measure the distance that the two aluminum tubes protrude from the front of the stopper assembly. This distance should be 3/8". If it is not, adjust the tubes by pushing them forward or backward until you are satisfied with the alignment.

❑ Carefully bend the longer of the two aluminum tubes up at a 45º angle, being careful not to "kink" the tubing as you bend it.

☞ When the stopper assembly is installed in the fuel tank, the top of the vent tube (the tube you just bent) should rest just below the top of the fuel tank. You can tell the top of the fuel tank from the bottom because the top is a **shorter** distance from the center of the fuel tank opening.



❑ Secure one end of the silicone fuel tubing onto the end of the fuel pick-up "clunk."

❑ Slide the silicone fuel tubing, with the fuel pick-up attached, onto the end of the aluminum fuel pick-up tube (straight tube). While holding the aluminum tube in place, adjust the length of the silicone tubing until the fuel pick-up is 4-1/2" back from the rear of the stopper assembly.

❑ Push the M3 x 18mm machine screw through the stopper assembly, from the front, and partially thread it into the small diameter metal backplate.

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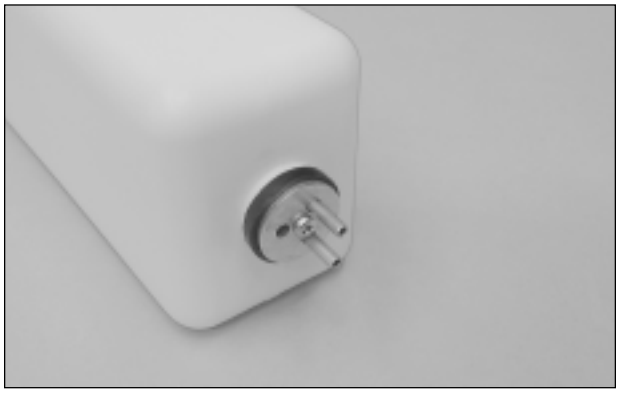
STEP 2: INSTALLING THE RUBBER STOPPER ASSEMBLY

❑ Carefully push the stopper assembly into the molded hole in the front of the fuel tank and rotate the stopper assembly until the aluminum vent tube rests just below the top of the fuel tank.

PRO TIP If you have trouble seeing the vent tube, hold the fuel tank assembly up to a bright light. This will illuminate the inside of the tank, making it easy to see the tubing inside.



❑ When satisfied with the alignment, tighten the machine screw until the rubber stopper expands and seals the fuel tank opening.

◆IMPORTANT◆ Don't overtighten the machine screw or you might strip the threads in the small metal plate.

❑ With the rubber stopper assembly installed, double-check to make sure that the fuel pick-up can move freely inside the fuel tank. Ideally, the fuel pick-up should be about 1/4" in front of the back of the fuel tank.

STEP 3: INSTALLING THE FUEL TANK

❑ Cut two pieces of silicone fuel tubing to a length of 8" and install them to the aluminum tubes at the front of the tank.

PRO TIP Mark the ends of the silicone tubing "vent" and "pick-up" so you don't confuse them when it comes time to connect them to the engine later on.

❑ Feed the ends of the fuel tubing through the predrilled hole in the firewall and slide the fuel tank into position, making sure that the stopper assembly lines up with, and is pushed into, the predrilled hole in the firewall.

❑ To align the fuel tank properly, the fuel tank should be pushed forward as far as possible and the bottom back of the fuel tank should rest in the cutout in the forward bulkhead.

◆IMPORTANT◆ When you slide the fuel tank into position, make sure that the top of the fuel tank is toward the top of the fuselage.

The back of the fuel tank must not protrude out of the forward bulkhead or it will interfere with the front of the wing when it's mounted.

❑ Use your favorite method to secure the fuel tank into position. We glued a scrap piece of plywood above the fuel tank to support it, then we used silicon sealant to glue the fuel tank to the plywood support piece and to the forward bulkhead.

☞ Make sure that the fuel tank is held firmly in place. The last thing you want is for it to come loose during flight.

SECTION 16: COWLING & CANOPY INSTALLATION

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

- ❑ (1) Fiberglass Cowling
- ❑ (1) Clear Canopy
- ❑ (8) M2 x 8mm Flange-Head Wood Screws
- ❑ (2) Nylon Fuel Line Plugs (Optional)

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Kwik Bond Thin C/A
- ❑ Pacer Formula 560 Canopy Glue
- ❑ # 1 Phillips Head Screwdriver
- ❑ Adjustable Wrench
- ❑ Excel Modeling Knife
- ❑ Scissors
- ❑ Electric Drill
- ❑ 1/16", 5/64" & Other Assorted Size Drill Bits
- ❑ Ernst Airplane Stand
- ❑ Rotary Tool w/Cutting Disc & Sanding Drum
- ❑ Ruler
- ❑ Pencil
- ❑ 220 Grit Sandpaper w/Sanding Block
- ❑ Masking Tape
- ❑ Paper Towels

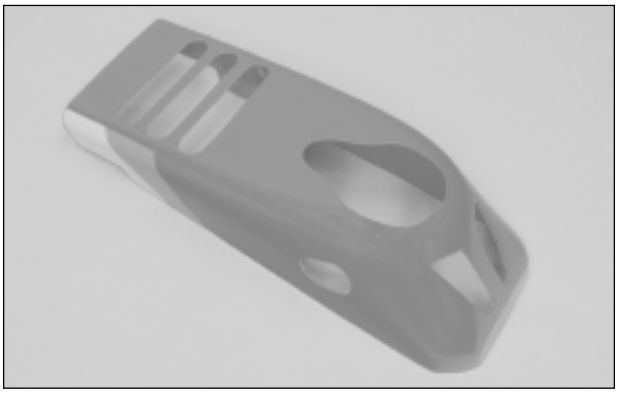
STEP 1: ALIGNING THE COWLING

◆IMPORTANT◆ To prevent dust and debris from entering your engine during the fitting and aligning of the cowling, we strongly suggest covering the engine exhaust port and carburetor opening with small pieces of paper towel.

❑ Before fitting and installing the cowling, we mounted our fueling valve to the fuselage side, hooked up the fuel lines (except the pressure line) and drilled holes through the fuselage sides to adjust the engine's needle valves. If you want, you can mount your fueling valve in the cowling, but it's much easier and more convenient to mount it to the fuselage side.

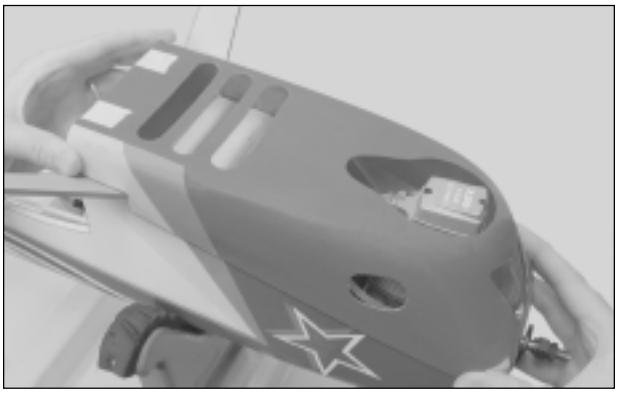
◆IMPORTANT◆ If you elect not to use a fueling valve, we have provided two nylon fuel line plugs to use as "Fuel Dots."

❑ Fit the cowling to the fuselage and carefully mark the areas of the cowling that must be removed to clear your engine's cylinder head and muffler.



❑ Using a rotary tool with a cutting disc and a sanding drum, carefully cut out the areas of the cowling necessary to clear your engine's cylinder head and muffler. Carefully cut out the molded air-intake holes in the front of the cowling, too.

◆IMPORTANT◆ Notice that we also cut a series of air-exit slots in the back of the cowling. This is very important. We suggest that the air-exit area be 30% larger than the air-intake area to ensure proper engine cooling.



❑ Place the cowling back onto the fuselage and realign it.

☞ It may be necessary to trim the back of the cowling flush with the forward bulkhead, and/or remove some portion of the cowling around the landing gear strut to make the cowling fit perfectly.

❑ When satisfied with the fit and alignment, hold the cowling firmly in place, using pieces of masking tape.

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STEP 2: MOUNTING THE COWLING

❑ With the cowling held firmly in place, drill 1/16" diameter pilot holes into the cowling and through the fuselage sides for the eight flange-head wood screws. Locate four holes on each side of the cowling, equally spaced apart.

❑ Remove the cowling and enlarge **only** the holes in the cowling, using a 5/64" diameter drill bit.

◆**IMPORTANT**◆ Enlarging the holes will prevent the fiberglass from being cracked when you install the wood screws.

❑ To strengthen the holes in the fuselage that the wood screws will thread into, carefully apply a couple of drops of thin C/A into the holes and let it dry completely before installing the cowling.

❑ After the C/A has fully cured, install the cowling, using eight M2 x 8mm flange-head wood screws.

❑ Install your propeller, spinner and muffler assembly to finish off the installation.

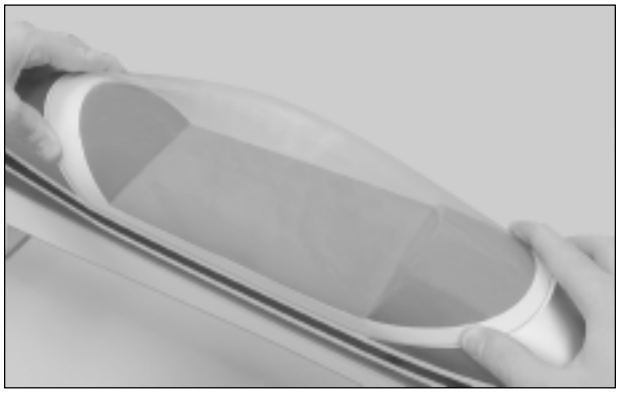
PRO TIP We installed a short needle valve extension so that we could adjust the high-speed needle valve easier.

STEP 3: ALIGNING & INSTALLING THE CANOPY

❑ Using a pair of scissors, carefully cut out the canopy along the molded scribe line.

❑ Using 220 grit sandpaper with a sanding block, carefully sand the edges of the canopy smooth and straight.

◆**IMPORTANT**◆ Be careful not to scratch the surface of the canopy.



❑ Set the canopy onto the fuselage and align it. When aligned properly, the edges of the canopy should be centered over the cockpit area and the canopy should be centered from side-to-side when viewed from the front.

❑ If you've purchased a pilot for your airplane, carefully paint and install it now before gluing the canopy into place.

❑ When satisfied with the alignment, carefully glue the canopy into place, using Pacer Formula 560 Canopy Glue. Remove any excess glue before it dries, using a paper towel soaked with **water**, and use pieces of masking tape to hold the canopy in place until the glue fully cures.

PRO TIP To make the installation look even cleaner, we suggest applying 3/16" or 1/4" wide white trim tape around the joint between the canopy and the fuselage.

SECTION 17: FINAL ASSEMBLY

YOU'LL NEED THE FOLLOWING PARTS FROM THE KIT:

- ❑ (1) Decal Set

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ # 1 Phillips Head Screwdriver
- ❑ Excel Modeling Knife
- ❑ Scissors
- ❑ Electric Drill
- ❑ 5/64" Drill Bit
- ❑ Ernst Airplane Stand
- ❑ Masking Tape

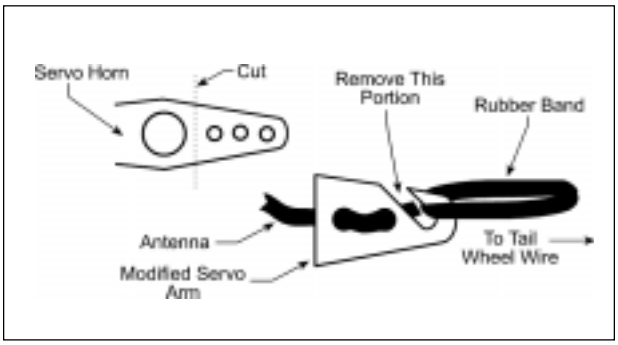
STEP 1: INSTALLING THE RECEIVER, BATTERY PACK & SWITCH

◆IMPORTANT◆ We don't suggest permanently installing the receiver and battery pack until you have balanced the airplane. How the airplane initially balances will determine where you need to mount the receiver and battery pack.

❑ Wrap the receiver and battery pack in foam rubber to protect them from vibration. Use masking tape or rubber bands to hold the foam in place.

◆IMPORTANT◆ Do not wrap the foam rubber too tightly or its vibration dampening quality will be reduced.

❑ After you've found the final location of the receiver and battery pack, mount them into the fuselage, using your favorite method. Strips of Velcro® work well or sandwich them in place, using a couple of scraps of balsa wood glued between the fuselage sides.



❑ After installing the receiver, drill a 5/64" diameter hole through the fuselage floor for the antenna to exit. Unwrap the receiver antenna and feed it out through the hole.

❑ Using a modeling knife, carefully make an antenna mount out of an extra servo horn. Remove one of the arms and cut it into the shape shown.

❑ Use the modified servo arm and a rubber band and T-Pin to secure the end of the antenna to the tail wheel wire.

❑ Mount the switch to the fuselage side (opposite the muffler) and connect the battery lead to the switch, and the switch and servo leads to the receiver.

PRO TIP If you will be flying your Excelleron 90 ARF using a non-computer radio system without mixing capabilities, you will need to plug a Y-Harness into the two aileron servo leads. This will allow both aileron servos to be plugged into the aileron channel in your receiver. The Y-Harness should be long enough so that you can easily plug it into the receiver when you install the wing.

If you will be flying your Excelleron 90 ARF using a computer radio with mixing capabilities, you may want to plug each aileron servo lead into your receiver separately. Depending on the length of the aileron servo extension leads that you used, you may need to use two more 12" aileron extension leads, so that you can easily plug the aileron servos into the receiver when you install the wing.

STEP 2: APPLYING THE DECALS

❑ Using a clean cloth, wipe the airframe down completely to remove any dust, debris and oil. We suggest using rubbing alcohol to wipe the airframe down in the areas where the decals will be applied.

❑ Cut out each of the decals and apply them using the box cover photos for reference.

SECTION 18: BALANCING THE EXCELLERON 90 ARF

YOU'LL NEED THE FOLLOWING TOOLS AND SUPPLIES:

- ❑ Ruler
- ❑ Masking Tape

◆**IMPORTANT**◆ It is critical that your airplane be balanced correctly. Improper balance will cause your airplane to lose control and crash!

Center of Gravity Location:
6-3/4" - 7-1/4" back from the leading edge of the wing, measured at the fuselage sides.

◆**WARNING**◆ This is the recommended C/G range. For test-flying we suggest you start with the C/G in the middle of the range (7"), then move it farther back as you become familiar with the flying characteristics of the airplane. It is not recommended that the C/G be located any farther back than 7-1/4" unless you are a very proficient flyer.

☞ Balance the Excelleron 90 ARF with the fuel tank **empty.**

❑ Install the wing onto the fuselage. Apply two short pieces of masking tape onto the **top** of the wing, **7" back from the leading edge, measured at the fuselage sides.**

❑ Turn the airplane upside down and place your fingers on the masking tape, and carefully lift the airplane. If the nose of the airplane falls, the airplane is nose heavy. To correct this, move the battery pack and/or receiver back far enough to bring the airplane into balance. If the tail of the airplane falls, the airplane is tail heavy. To correct this, move the battery pack and/or receiver forward far enough to bring the airplane into balance. When balanced correctly, the airplane should sit level or slightly nose down when you lift it up with your fingers at the C/G location.

☞ Once you have flown and become familiar with the flight characteristics of the airplane, the C/G can be moved fore or aft within the C/G range to change the flight performance. Moving the C/G back will cause the airplane to be more responsive, but less stable. Moving the C/G forward will cause the airplane to be more stable, but less responsive.

DO NOT FLY THE AIRPLANE BEYOND THE RECOMMENDED BALANCE RANGE OR AN UNCONTROLLABLE CRASH COULD RESULT!

SECTION 19: LATERAL BALANCING THE EXCELLERON 90 ARF

☞ Lateral balancing will make the airplane easier to trim and will make it track straighter in the air. It is strongly recommended.

❑ Turn the airplane upside down and tie one length of string to the propeller shaft and one length of string to the tail wheel wire.

❑ With someone helping you, carefully lift the airplane up by the two pieces of string. Watch how the wing reacts. If one side of the wing drops, that side is heavier than the other. To correct this condition, stick a small piece of self-adhesive lead weight to the bottom of the lighter wing half (the one that doesn't drop). For best mechanical advantage, place the weight as close to the wing tip as possible, but make sure to apply the lead to a solid portion of the wing structure, not to the covering material over an open structural bay or the weight will rip off during flight..

❑ Repeat the procedure a couple of more times to double-check your findings. When done properly the wing should stay level when you lift the airplane.

SECTION 20: AIRCRAFT SETUP INFORMATION

Before adjusting the control throws and flying your new Excelleron 90 ARF, there are some points about the airplane's setup that you should be aware of. If you're a veteran of high-performance airplanes, you've probably heard this information before but, if this is your first high-performance airplane, this information will be very important to you.

SEALING THE HINGE GAPS

Because of the large control surfaces, it is imperative that the aileron and elevator hinge gaps be sealed. Failure to do this can lead to control surface flutter, which in turn can cause your airplane to crash. Sealing the hinge gaps will also provide crisper control response and the airplane will track straighter and fly truer, making trimming much easier.

Hinge gaps can be sealed using heat-shrink covering material or clear vinyl tape. To seal the hinge gaps, using heat-shrink covering material, follow these steps:

❑ Cut a piece of covering material 1" wide and the same length as the hinge line you're going to seal.

❑ Fold the length of covering material in half lengthwise so that there is a sharp crease down the middle of the covering material.

☞ The hinge gap sealing material should be applied to only the bottom of the hinged surfaces. It is not necessary to seal both the bottom and the top.

❑ Remove the protective backing from the covering material. With the control surface fully deflected in the "UP" position, place the length of covering material over the hinge line (on the bottom), making sure that the crease is pushed completely down into the hinge line.

❑ With the control surface fully deflected in the "UP" position, use a heat sealing iron to carefully adhere the covering material to both the trailing edge of the flying surface and the leading edge bevel of the control surface. Use a modeling knife to trim the excess covering material flush with both surfaces.

❑ Pivot the control surface up and down several times to check for free movement. The control surface should be able to smoothly pivot completely up and completely down, without interference from the hinge gap sealing material.

☞ It is not necessary to seal the hinge gap on the rudder, although you could if you wanted to.

CONTROL SURFACE LINKAGES

If you don't maintain the proper mechanical advantage on the control surfaces, control surface flutter may result, which in turn can cause your airplane to lose control and crash. What mechanical advantage means in our case is the distance that the pushrod attachment points (pivot points) are from the servos and the control surfaces.

- Keeping the pushrods as close to the center of the servo arms as possible will increase the servo's resolution. What this means is that when you move the control sticks, the servo arms will have to travel farther to achieve the desired control inputs. This makes the resolution higher, therefore causing the control surface deflection to be more precise. We don't recommend moving the pushrods any farther away from the center of the servo arms than absolutely necessary.

- Keeping the pushrod as far away as possible from the control surface is better than moving it closer. The mechanical advantage is greatly reduced the closer the pushrod is moved toward the control surface. We don't recommend moving the pushrods any closer to the control surfaces than absolutely necessary.

THROTTLE MANAGEMENT

It is very important that you understand throttle management. What this means is no full throttle dives. Full throttle dives should be avoided so as not to cause control surface flutter. When the nose of the airplane drops, decrease the throttle, just as in full-scale aerobatics.

SECTION 21: CONTROL THROWS

If you're using a computer radio system and want to set up your Excelleron 90 ARF to use mixing and be 3D Aerobatics capable, check out the Computer Radio Setup section on the next page. We still recommend setting the control throws to the Test-Flying settings shown below until after your first few test flights.

We recommend setting up the Excelleron 90 ARF using the control throws listed below. These control throws are suggested for initial test-flying because they will allow the airplane to fly smoother and make it easier to control.

TEST-FLYING

Ailerons:	**1" Up**	**1" Down**
Elevator:	**1-1/8" Up**	**1-1/8" Down**
Rudder:	**2-1/2" Right**	**2-1/2" Left**

◆**IMPORTANT**◆ Control throws are measured from the widest point of the control surfaces.

◆**VERY IMPORTANT**◆ After you are finished adjusting the pushrods and control throws, we strongly suggest cutting 1/4" lengths of the 1/4" wide heat-shrink tubing provided and sliding one piece over each nylon clevis and nylon snap link. The tubing will prevent the clevises and snap links from popping open during flight.

Once you're familiar with the flight characteristics of the airplane, you might want to increase the control throws to the aerobatic-flying settings listed below. These control throws will make the airplane more responsive and allow you to do most pattern-style aerobatics with ease.

AEROBATIC-FLYING

Ailerons:	**1-1/8" Up**	**1-1/8" Down**
Elevator:	**1-1/2" Up**	**1-1/2" Down**
Rudder:	**2-3/4" Right**	**2-3/4" Left**

◆**IMPORTANT**◆ Control throws are measured from the widest point of the control surfaces.

◆**VERY IMPORTANT**◆ We do not suggest increasing the control throws beyond the recommended aerobatic-flying settings unless you are a very proficient flyer and read the information provided on the next page. Higher control throws will cause the airplane to be extremely control-sensitive and result in a possible crash if you are not careful.

SECTION 22: COMPUTER RADIO SETUP

Although you don't have to use a computer radio to enjoy the flying qualities of the Excelleron 90 ARF, if you're planning on doing extreme 3D aerobatics, it is recommended. Before making any adjustments, please read and understand your radio's setup manual.

Chances are that if you want to set up your Excelleron 90 ARF with a computer radio to take advantage of mixing capabilities, you probably want an extreme 3D flying machine. In that case, use the 3D Aerobatic control throws listed below.

◆READ THIS BEFORE GOING FURTHER◆

The 3D aerobatic control throws listed below make the airplane extremely control sensitive. Use these control throws only if you have a computer radio that you can program exponential and dual rates into. Your radio system must have the capability to turn these control throws off during normal flight and turn them on before flying 3D maneuvers. Normal flying does not require this amount of control throw. If you're going to be doing 3D flying, we strongly suggest using the Aerobatic-Flying control throws as your low rate control throws and using the 3D Aerobatic control throws as your high rate control throws. Only switch to high rate control throws when preparing to do 3D Aerobatic maneuvers.

3D AEROBATIC CONTROL THROWS

Ailerons:	**1-1/4" Up**	**1-1/4" Down**
Elevator:	**1-1/2" Up**	**1-1/2" Down**
Rudder:	**3-1/2" Right**	**3-1/2" Left**

◆IMPORTANT◆ Control throws are measured from the widest point of the control surfaces.

EXPONENTIAL:

Expo, as it's more commonly referred to, softens the control feel around neutral. This is especially helpful when flying an airplane that uses a lot of control throw. Softening the neutral point makes the airplane fly more smoothly and makes it more likely that you won't over-control. Obviously, you may want to change the expo settings to suit your flying style, but here are some good starting points:

Ailerons: 40%
Elevator: 40%
Rudder: 40%

We strongly suggest programming exponential into your control surfaces. It will make a huge difference when the control throws are set to the 3D Aerobatics control throws. If you don't use exponential with the 3D Aerobatic control throws, the airplane will be so sensitive that you may loose control of it and crash.

FLAPERON AND SPOILERON MIXING:

Plugging the servos separately into the receiver (one into channel 1 and one into channel 6) will allow the use of flaperons (both ailerons down at the same time) and spoilerons (both ailerons up at the same time). These functions can then be mixed with the elevator for extreme pitch changes (high-alpha) useful in extreme 3D aerobatic maneuvers.

Elevator: 1-1/2" Up and Spoilerons (both ailerons up) 3/4"
Elevator: 1-1/2" Down and Flaperons (both ailerons down) 3/4"

◆IMPORTANT◆ Use of more than 3/4" of flaperons and spoilerons will cause excessive drag, negating any of their useful effects. We do not recommend using flaperon and spoileron with elevator mixing during general flying, especially during takeoff and landing.

SECTION 23: PREFLIGHT CHECK & SAFETY

WARNING ABOUT THROTTLE MANAGEMENT

It is very important that you understand throttle management. This means no full throttle dives. Full throttle dives should be avoided so as not to cause control surface flutter and/or airframe failure. When the nose of the airplane drops, decrease the throttle, just as in full-scale aerobatics.

- Completely charge the transmitter and receiver batteries before your first day of flying.
- Check every bolt and every glue joint in the airplane to ensure that everything is tight and well-bonded. This should include all of the control surface hinges as well.
- Double-check that you've installed and tightened all of the servo horn retaining screws.
- Double-check that the receiver and battery pack are properly secured into the fuselage. There's nothing worse than the battery pack coming loose during a violent aerobatic maneuver.
- Double-check that the fuel tank is properly secured into the fuselage.
- Double-check the balance of the airplane. **Do this with the fuel tank EMPTY.**
- Check the control surfaces. They should all move in the correct direction and not bind.
- Make sure that you've installed 1/4" long pieces of heat-shrink material over the clevises and snap-keepers to prevent them from opening during flight.
- If your radio transmitter is equipped with dual rate switches, double-check that they are on the low-rate setting for your first few flights.
- Check to ensure that all of the control surfaces are moving the proper amount in both low and high rate settings.
- Check the receiver antenna. It should be fully extended and not coiled up inside the fuselage. Do not cut the receiver antenna shorter or the range of your radio control system will be greatly reduced.
- Properly balance the propeller. A propeller that is out of balance will cause excessive vibration, which could lead to engine and/or airframe failure, and it will reduce engine efficiency and power.

The following are our general guidelines for your safety and the safety of others. Please read and understand these safety guidelines before going out to the flying field for the first time.

- Do not test-fly your model for the first time without first having it safety-checked by an experienced modeler.
- Do not fly your model higher than approximately 400 feet within 3 miles of an airport without having an observer with you. The observer should tell you about any full-size aircraft in your vicinity and you should always give the right-of-way to full-scale aircraft.
- When flying at a flying field with established rules, you should abide by those rules. You should not deliberately fly your model in a reckless and/or dangerous manner.
- While flying, you should not deliberately fly behind the flight line. If your model should inadvertently fly behind the flight line, you should change course immediately.
- You should complete a successful range check of your radio equipment prior to each new day of flying, or prior to the first flight of a new or repaired model.
- You should perform your initial turn after take- off away from the flightline and/or spectator area.
- You should not knowingly operate your R/C radio system within 3 miles of a preexisting model club flying field without a frequency sharing agreement with that club.

SECTION 24: EXCELLERON 90 ARF FLIGHT-TRIMMING CHART

After you have test-flown and done the initial trim changes to the airplane, use this trimming chart to begin trimming your airplane. Following and adhering to this chart will result in the ability to diagnose trim problems and correct those problems using the simple adjustments shown below. Making these observations and related corrections will result in an airplane that tracks straighter and flies truer.

TRIM FEATURE	MANEUVER	OBSERVATION	CORRECTION
Control Centering	Fly general circles and random maneuvers	Try for hands off straight and level flight	Readjust linkages so the transmitter trim levers are centered
Control Throws	Fly random maneuvers	A) Controls are too sensitive or airplane feels "jerky"	If A) Adjust linkages to reduce control throws
		B) Controls are not sensitive enough or airplane feels "mushy"	If B) Adjust linkages to increase control throws
Engine Thrust Angle*	From straight and level flight, quickly chop the throttle for a short distance	A) Airplane continues in a level attitude for a short distance	If A) Engine thrust angle is correct
		B) Airplane pitches nose up	If B) Decrease engine down thrust
		C) Airplane pitches nose down	If C) Increase engine down thrust
Center of Gravity	From level flight, roll to a 45º bank and neutralize the controls	A) Airplane continues in the bank for a short distance	If A) Center of gravity is correct
		B) Nose pitches up	If B) Add nose weight
		C) Nose pitches down	If C) Remove nose weight or add tail weight
Yaw**	Into the wind, perform inside loops using only elevator. Repeat test performing outside loops from an inverted entry	A) Wing is level throughout	If A) Trim settings are correct
		B) Airplane yaws to right in both inside and outside loops	If B) Add left rudder trim
		C) Airplane yaws to left in both inside and outside loops	If C) Add right rudder trim
		D) Airplane yaws to the right in inside loops and yaws to the left in outside loops	If D) Add left aileron trim
		E) Airplane yaws to the left in inside loops and yaws to the right in outside loops	If E) Add right aileron trim
Lateral Balance**	Into the wind, perform tight inside loops using only elevator	A) Wing is level and airplane falls to either side	If A) Lateral balance is correct
		B) Airplane falls off to the left. Worsens as loops tighten	If B) Add weight to right wing tip
		C) Airplane falls off to the right. Worsens as loops tighten	If C) Add weight to left wing tip
Aileron Control System	With the wing level, pull to a vertical climb and neutralize the controls	A) Climb continues along the same path	If A) Trim settings are correct
		B) Nose tends to go toward an inside loop	If B) Raise both ailerons very slightly
		C) Nose tends to go toward an outside loop	If C) Lower both ailerons very slightly

*Engine thrust angle and center of gravity interact. Check both.

**Yaw and lateral balance produce similar symptoms. Note that the fin may be crooked. Make certain both elevator halves are even with each other and that they both produce the same amount of control deflection throughout the complete deflection range. Right and left references are as if you were in the cockpit.

Cut Along Dotted Line

PRODUCT EVALUATION SHEET

Telling us what you like and don't like determines what model kits we make and how we make them. We would appreciate it if you would take a few minutes of your time to answer the following questions about this kit and your modeling interests. Simply fold this form on the dotted lines, seal with tape and mail it to us. *Do not use staples and make sure our address faces out*.

Global Hobby Distributors will not disclose the information it collects to outside parties. Global Hobby Distributors does not sell, trade, or rent your personal information to others. Your privacy is important to us.

1) Kit: **Sportsman Aviation Excelleron 90 ARF # 127565**

2) Where did you learn about this kit?
- ❑ Magazine Ads
- ❑ Hobby Shop
- ❑ Internet
- ❑ Friend
- ❑ Other

3) What influenced you the most to buy this kit?
- ❑ Magazine Ads
- ❑ Type of Model
- ❑ Recommendation
- ❑ Internet
- ❑ Price
- ❑ Box Art
- ❑ Other

4) Did you have any trouble understanding the written instructions? If yes, please explain.
- ❑ Yes
- ❑ No

_____
_____
_____
_____

5) Did you have any trouble understanding any of the photographs? If yes, please explain.
- ❑ Yes
- ❑ No

_____
_____
_____
_____

6) Were any of the kit parts:
- ❑ Damaged
- ❑ Missing
- ❑ Wrong Size
- ❑ Wrong Shape

If you checked any of the boxes above, did you contact our Customer Service Department to resolve the problem?
- ❑ Yes
- ❑ No

7) Was any of the assembly difficult for you? If yes, please explain.
- ❑ Yes
- ❑ No

_____
_____
_____
_____

8) What did you like most about this kit?
- ❑ Assembly Manual
- ❑ Hardware Supplied
- ❑ Other
- ❑ Parts Fit
- ❑ Price

_____
_____
_____

9) What did you like least about this kit?
- ❑ Assembly Manual
- ❑ Hardware Supplied
- ❑ Other
- ❑ Parts Fit
- ❑ Price

_____
_____
_____

10) Are you satisfied with the finished model? If no, please explain.
- ❑ Yes
- ❑ No

_____
_____
_____
_____

11) How does this kit compare to similar kits by other manufacturers?
- ❑ Better
- ❑ As Good

What is Your Age Group:
❑ 10 & Under ❑ 11 - 20 ❑ 21 - 30 ❑ 31 - 40 ❑ 41 - 50 ❑ 51 - 60 ❑ 61 - 70 ❑ 71 +

How Many Years Have You Been in the Hobby?
❑ Less than 1 ❑ 2 - 4 ❑ 5 - 7 ❑ 8 - 10 ❑ 11 - 15 ❑ 16 - 20 ❑ 20 or More

How Many Models Have You Purchased In the Last Year?
❑ 0 - 1 ❑ 2 - 4 ❑ 5 - 7 ❑ 8 - 10 ❑ 10 or More

Please List any Other Modeling Interests or any Additional Information about This Product: _____

_____
_____
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